Developing the Musical Brain to Boost Early Communication and Listening Skills

EHDI
April 15, 2014

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Financial Disclosure:
Valeri Le Beau joined Advanced Bionics in 2012 as the Consumer Education & Rehab Manager. Advanced Bionics is the manufacturer of the HiResolution Bionic Ear System, including the Naída CI Q70 and Neptune sound processors. Baby Beats is a rehAB resource exclusive to Advanced Bionics.

Non-financial Disclosure:
Baby Beats was developed by Christine Rocca and Valeri Le Beau while employed with Advanced Bionics. They do not receive any additional compensation for Baby Beats.
Developing the Foundation for Communication
The Listening Brain – The Musical Brain

Playing and listening to music works several parts of the brain:

- **Corpus Callosum**: Connects both sides of the brain.
- **Sensory Cortex**: Controls tactile feedback while playing an instrument or dancing.
- **Auditory Cortex**: Listens to sounds, perceives and analyzes tones.
- **Motor Cortex**: Involved in movement while dancing or playing an instrument.
- **Profrontal Cortex**: Controls behavior, expression and decision making.
- **Hippocampus**: Involved in music memories, experiences and context.
- **Visual Cortex**: Involved in reading music or looking at your own dance moves.
- **Cerebellum**: Involved in movement while dancing or playing an instrument, as well as emotional reactions.
- **Nucleus Accumbens & Amygdala**: Involved with the emotional reactions to music.
Early Influence of Music – What Babies Listen For...

- Mother’s voice  Querleu et al., 1984, DeCasper, 1980
- A particular prosodic sequence when sung by the mother during the last weeks of her pregnancy  Mehler, 1988
- A musical sequence  Trehub, 2001
- Sensitive to the rhythmic prosodic features of language  Mehler, 1988
- A given language (maternal)


Early Musical Features Within the Baby’s Voice

- Babble sounds at around the age of 8 weeks
- Phrased vocalisations by 2 months
- By 5 months discriminate adjacent pitches
- 8-11 months perceive/recall melodic contour
- ID speech guides vocalisations/melodic phrasing through musical vocal play
- Singing lullabies, nursery rhymes or improvising their own melodies
- Rhythmic games and melodies


Winkler I et al. Newborn infants can organize the auditory world. Proceedings of the National Academy of Science 2003; 100 (20): 11812 – 11815
Influence of Movement on Developing Communication and Musicality

• Infants sense & perception of rhythm linked to their body movements (Bergeson & Trehub, 2006)

• Basic beat foundation of both music & communication

• Most caregivers move while singing to their infants, making the connection between rhythm and movement

Rhythm influences our perceptual processes related to cognition, affect and motor function
Movement influences the auditory encoding of rhythmic patterns in infants and children
Foundations for Infant Development

Bonding/attachment (parent-child interactions) for pre-verbal communication skills

“The quality of relationships and the learning environment for babies and toddlers is critically important.”

“Children learn through being engaged, doing, watching and copying.”
(The US National Institute of Child Health and Human Development)

Stimulating - Multi-Sensory Environment

“Musical expertise boosts implicit learning of both musical and linguistic structures.” (Francois C., Schon, D. 2011)

“If immersed in a consistent musical experience, developing babies’ brains are able to absorb a comprehensive world of sound, supporting their development in their communication & cognitive abilities.” (Patel 2003)
Do we have the same expectation for Babies with hearing loss?

One in every 1,000 children in the United States are born deaf or hard-of-hearing

• More than 95% of all newborns born in the United States are screened for hearing loss shortly after birth

• Identification at a few weeks of age

• Identified as candidates for cochlear implantation <1yr old

• Early support is vital given that many of these babies are born into families with no experience or history of childhood deafness.

• Identification and interventions before or by six months of age associated with positive outcomes in language, emotional, & social development

There are few resources for families with very young, deaf babies

Development of Baby Beats
Consider the key Musical components in relation to children with hearing impairment

- **RHYTHM**

- **TIMBRE**

- **PITCH**

- **HARMONY**

- **Listening in noise!**
  (Kraus N, Chandrasekaran B. Music training for the development of auditory skills. Nat Rev Neurosci 2010;11:599-605)
Infant Listeners & Pitch Perception
(Bergeson & Trehub, 2006)

- ID Speech higher in pitch, increased pitch range
- Melodic contour most salient factor in melody recognition
- Can recognize transposed melodies, as long as intervals remain constant
- Can discriminate changes in the order of tones in a sequence
- Infants use implied harmonic cues to distinguish duple from triple meter
Infant listeners & Rhythmic Processing

Basic Beat Foundation
(Peretz & Zatorre, 2005)

• Right auditory cortex: steady beat, meter
• Left auditory cortex: groupings, rhythm
• Foundation for all Speech and Musical development
• Basic Beat & Imitation of rhythmic patterns & sequences
Stay with the Basic Beat!
Play the rhythmic sequence!
Why Use Backing Tracks?

- Baby hears your voice and their voice
- Baby separates their mother's voice from accompanying background music
- Develops listening with definition of melody, harmony, bass
- Supports rhythmic impetus
- Baby learns to listen and understand the musical context
- Listening in noise

Kraus N, Chandrasekaran B. Music training for the development of auditory skills. Nat Rev Neurosci 2010;11:599-605
Introducing Baby Beats™
Baby Beats Goals

Use Music Activities To:

• Engage in parent-child interactions early
• Establish listening behaviors early
• Establish early communication skills
• Encourage social & emotional development
• Empower families
**Parental Guidance:** Infants attend well to ‘sing song’ voices and learn through attention. The first voice your child recognizes is your own.

**Goals:**

- Face to face – eye contact, facial expressions, attention
- Repetitive & concurrent movements in time with the music (*multi-sensory*)
- Experience of contrasting musical & vocal rhythms & tempo
- Responding to changes in rhythm, timbre & pitch
- Responding to changes in vocalization


Parental Guidance: Enjoy exploring Instruments together. Instruments are a fun way to interact together and capture your child’s attention and focus.

Goals:
• Listening for sound & silence
• Explore different sounds and tactile feel of the instruments
• Detection, discrimination and identification of instrumental timbre
• Responding to changes in the tempo, rhythm & phrases
• Use of voice alongside playing instruments

Exploring Instruments
Communicative intent


Communicative Musicality (Malloch, 1999)


Innate Musicality


Exploring Animal Sounds & Transportation
Instrumental & Vocal Timbre, Pitch, Harmony

Parental Guidance: Wait for your child to respond to the music and pauses, follow your child’s lead. Wait for your child to make a sound to suggest what you will be.

Goals:
• Discriminating music from voice (symbolic sounds)

• Opportunity for imitation of actions and vocalizations

• Use of Infant Directed Speech by parents is “particularly powerful in attracting infant’s attention” (Cooper, 1997)

• Association of symbolic sounds to an object/picture (toddlers)

• Anticipation - cause and effect
Exploring Transportation
What Did You Hear?
Music as a Foundation for the Development of Communication

Skills developed in the first year of life:

1. Auditory awareness/perception
2. Auditory attention/inhibition
3. Distance hearing
4. Localizing
5. Discrimination
6. Auditory feedback/monitoring
7. Auditory memory
8. Auditory memory span/sequencing
9. Auditory processing

But......Make it a consistent part of every day life
Daily Routines:

Parental Guidance: Use daily routines to talk about the ‘here and now’, keep your language simple

Goals:
• Daily routines happen many times, every day:
  ✓ Meal time
  ✓ Diaper changes/Dressing
  ✓ Going up stairs
  ✓ Washing
• These routines are the perfect opportunity to provide appropriate, repetitive language to link with the action and activity
• Make them fun & encourage repetition by making up little songs!

Baby Beats Notes

Monitors progress in

- Parent-Child interactions
- Pre-verbal skills
- Listening & early communication skills
- Early developmental milestones

Helps parents understand:

- Early listening & communication skills
- How music activity supports development
Why Use Music Now??

- Supports use of Early Appropriate Amplification
- Supports development of Communication & Emerging Pre-verbal skills
- Supports bonding/attachment
- Enhances development of babies’ brains – including the musical brain
- Music can make a long-term difference!
Thank You!

BabyBeats
by Advanced Bionics

A musical journey of sound, music and voice helping little ones learn to listen and communicate.

Children should begin developing communication skills during the very first year of their lives. For families with children experiencing hearing loss, Baby Beats from Advanced Bionics is a motivating, fun program to foster listening and communication development in natural settings, both before and after using hearing aids or receiving cochlear implants.

The Baby Beats Early Intervention Pack is available now from Advanced Bionics. Designed to get you started immediately, using musical activities for communication development, the pack contains:

- Baby Beats Parent Guide
- Baby Beats Music CD
- Instruments: Ocean Drum for Infants; Maracas for Toddlers
- Transportation and Animal Picture Cards
- Duck
- Baby Beats Travel Bag

To order your FREE Baby Beats Pack:
Complete the registration form at AdvancedBionics.com/babybeats-us-order, using the code on this card.

Promo Code: BBPR01