



AB's global rehabilitation & educational programs

Developing the Musical Brain to Boost Early Communication and Listening Skills

EHDI

April 15, 2014

Valeri V. Le Beau, MS-CCC-SLP
Consumer Education & Rehab Manager
Advanced Bionics



AB's global rehabilitation & educational programs



Valeri V. Le Beau, MS, CCC,SLP, Consumer Education and Rehab Manager at Advanced Bionics brings a lifetime of personal and professional expertise to the field of hearing impairments. Working as a teacher for the hearing impaired and a speech language pathologist, she has trained, mentored, and lectured locally and internationally.

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

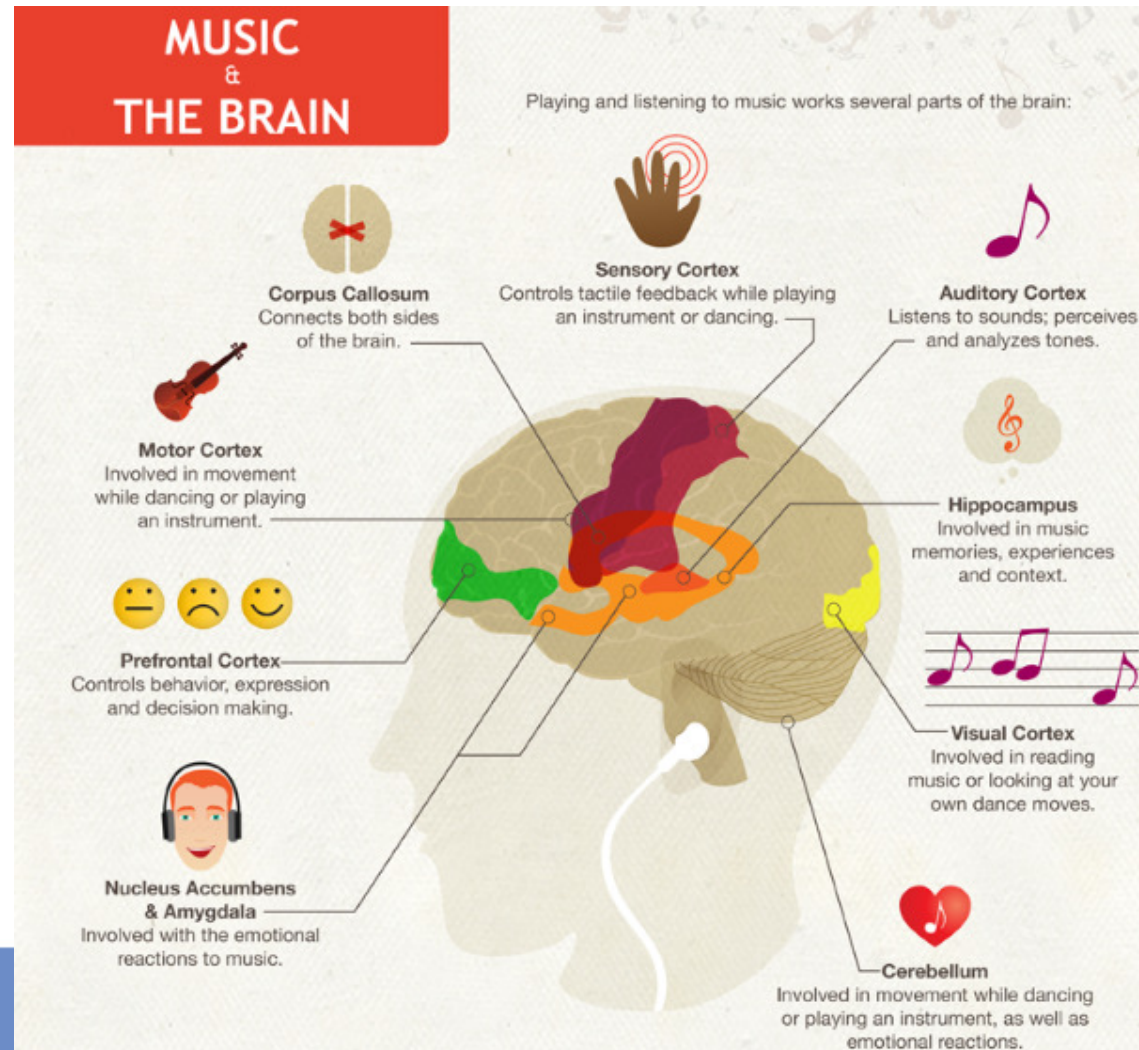




AB's global rehabilitation & educational programs



The Listening Brain – The Musical Brain





AB's global rehabilitation & educational programs

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)

Papousek M. Intuitive parenting: a hidden source of musical stimulation in infancy In: Deliege I, Sloboda J eds. Musical beginnings. Oxford: Oxford University Press; 1996: 88-112

Trehub S. Musical predispositions in infancy In: Zatorre R, Peretz I eds. The biological foundations of music. Annals of the New York Academy of Sciences; 2001:930:1-16

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

Papousek M. Intuitive parenting: a hidden source of musical stimulation in infancy In: Deliege I, Sloboda J eds. Musical beginnings. Oxford: Oxford University Press; 1996: 88-112

Trehub S. Musical predispositions in infancy In: Zatorre R, Peretz I eds. The biological foundations of music. Annals of the New York Academy of Sciences; 2001:930:1-16

Winkler I et al. Newborn infants can organize the auditory world. Proceedings of the National Academy of Science 2003; 100 (20): 11812 – 11815



AB's global rehabilitation & educational programs

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
Phillips-Silver J, Trainor L. Feeling the beat: Movement influences infant rhythm perception. *Science* 2005;308:1430
- Most caregivers move while singing to their infants, making the connection between rhythm and movement
Bonne R, Cunningham J. Children's expression of emotional meaning in music through expressive body movement. *J Nonverbal Behav* 2001;25: 21–41

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)



AB's global rehabilitation & educational programs

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**

Peretz I. Brain specialization for music: new evidence from congenital amusia. In Peretz I, Zatorre R eds. The cognitive neuroscience of music. Oxford University Press; 2003:192-203

- **TIMBRE**

Gfeller K, Knutson JF, Woodworth G, Witt S, DeBus B. Timbral recognition and appraisal by adult cochlear implant users and normal-hearing adults. J Am Acad Audiol 1998;9:1-19

- **PITCH**

Welch G. The musical development and education of young children. In: Spodel B, Saracho O, eds. Handbook of Research on the Education of Young Children. Mahwah, NJ: Lawrence Erlbaum Associates Inc.; 2006:251-267

- **HARMONY**

Brockmeier SJ, et al Music perception of different CI users (unilateral, EAS, bimodal) and comparison to normal hearing subjects as assessed in the MuSIC test. Wien Med Wochenschr 2006;156(suppl 119):Z7-O4.

- **Listening in noise!**

(Kraus N, Chandrasekaran B. Music training for the development of auditory skills. Nat Rev Neurosci 2010;11:599-605)

www.ListeninRoom.com

Music Development

by Chris Barton, MM, MT-BC

AB

BIRTH TO 6 MONTHS Within days of birth, babies are able to discriminate frequencies, or pitch. They prefer soothing music that is sung to them in a high-pitched voice. (There is a reason lullabies have been around since the beginning of time...they work!) Around three months of age, babies begin to "coo" and "sing" when they hear music. These sounds are purposeful and in response to the music itself.

6 MONTHS TO 1 YEAR At this stage, babies are able to recognize when one or two pitches of a familiar melody are changed, but as long as the melodic contour is preserved, they will recognize it. Some of these melodies are stored in long term memory. Infants respond to music by moving repetitively, although not in synchrony to the music. They can process differences in rhythm and match pitches around 55% of the time. Most of their singing consists of descending intervals. Singing to babies can help regulate affect and communicate emotional information.

1 YEAR TO 18 MONTHS Babies are now attempting to match their movements to the music and their motions have expanded to include rocking, rolling and marching. Frequently, a child will spontaneously dance to music. They focus intently, almost to the point of being mesmerized, to music they hear. The vocal range is expanding and there is much more "singing" in response to music.

18 MONTHS TO 36 MONTHS
 Toddlers love to make up their own songs while they play. These often include little snippets of familiar words and melodies, but more often are a running narrative of their actions. Song lyrics are learned before the rhythm or melody. The "ma-ma" interval is practiced repetitively. Many children in the 36 month old group can match pitches and imitate familiar songs, although contour is still more accurate than pitch. The most frequent vocal range starts on the D above middle C and goes up five pitches to A.

Reference: Music, Therapy and Early Childhood: A Developmental Approach, Elizabeth Schwart (2008) Barcelona Publishers.



at this age

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!





AB's global rehabilitation & educational programs

Why Use Backing Tracks?



- Baby hears your voice and their voice
- Baby separates their mothers 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**

Tsang C, Trainor L. Spectral slope discrimination in infancy: sensitivity to socially important timbres.

Infant Behav Dev 2002;25:183–194

Winkler I, Kushnerenko E, Horva'th J, et al. Newborn infants can organize the auditory world. Proc Natl Acad Sci U S A 2003;100:11812–11815

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



AB's global rehabilitation & educational programs

Introducing Baby Beats™





AB's global rehabilitation & educational programs

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





AB's global rehabilitation & educational programs

Movement & Music

Parental Guidance: Infants attend well to 'sing song' voices and learn through attention. The first voice your child recognizes is your own.

Goals:

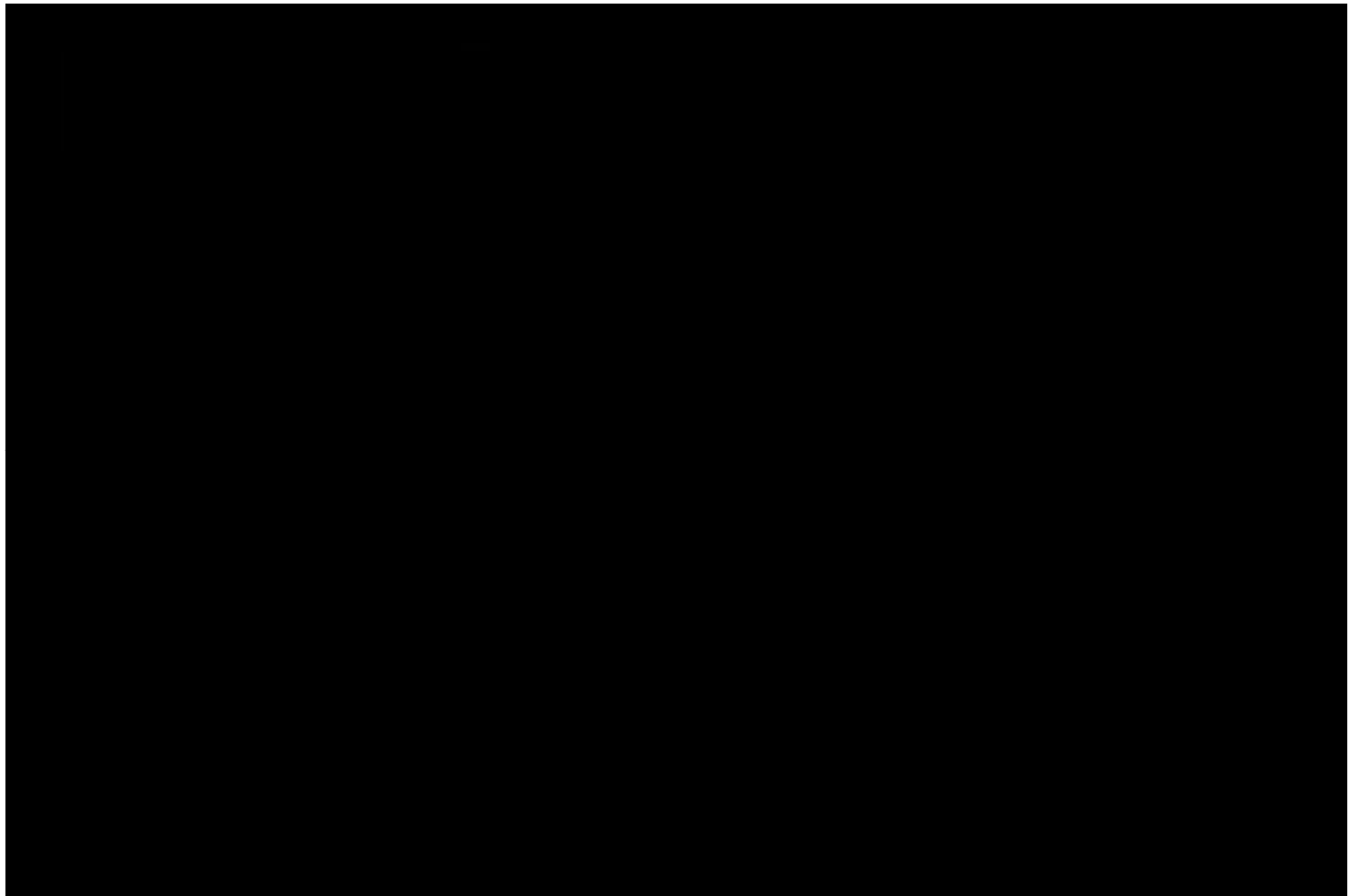
- Face to face – eye contact, facial expressions, attention
- Repetitive & concurrent movements in time with the music (*multi-sensory*)
- Experience of contrasting musical & vocal rhythms & tempo
- Responding to changes in rhythm, timbre & pitch
- Responding to changes in vocalization

Papousek M.(1996) Intuitive parenting: a hidden source of musical stimulation in infancy In: Deliege I, Sloboda J eds. Musical beginnings. Oxford: Oxford University Press;; 88-112

Phillips-Silver J, Trainor L. (2005) Feeling the beat: Movement influences infant rhythm perception; Science; 308:1430



AB's global rehabilitation & educational programs



Exploring Instruments

Developing Timbre & Pitch

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



Lamont A, Cross I. Children's cognitive representatives of musical pitch. *Music Percept* 1994;12:27-55

Welch G. Early childhood musical development. *Res Stud Music Educ* 1998;11:27-41



AB's global rehabilitation & educational programs

Exploring Instruments





AB's global rehabilitation & educational programs

Nurturing...

Communicative intent

Kitamura C, Burnham D. (2003). Pitch and communicative intent in mother's speech: adjustment for age and sex in the first year. *Infancy*, 4, 85-110.

Communicative Musicality (Malloch, 1999)

Malloch S. (1999). Mothers and infants and communicative musicality. *Musicae Scientiæ*, Sp Issue 1999-2000, 29-57.

Querleu D et al. (1984). Reaction of the newborn infant less than 2 hours after birth to the maternal voice. *J Gynecol Obstet Reprod*, 13(2), 125-134

Innate Musicality

Imbert M. The question of innate competencies in musical communication. In: Walli N, Merker B, Brown S, eds. *The Origins of Music*. Cambridge, UK: The MIT Press; 2000:449–462

Trehub SE. Musical predispositions in infancy. *Ann N Y Acad Sci* 2001;930:1–16



AB's global rehabilitation & educational programs





AB's global rehabilitation & educational programs

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





AB's global rehabilitation & educational programs





AB's global rehabilitation & educational programs

Exploring Transportation





AB's global rehabilitation & educational programs

What Did You Hear?



BabyBeats



AB's global rehabilitation & educational programs

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

Source: Pollack, D. (1997) *Educational Audiology for the Limited Hearing Infant and Preschooler*



AB's global rehabilitation & educational programs

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!***



Trehub S. Musical predispositions in infancy In: Zatorre R, Peretz I eds. The biological foundations of music. Annals of the New York Academy of Sciences; 2001:930:1-16

Trehub S. The developmental origins of musicality. Nature Neuroscience 2003; 6: 669-673



AB's global rehabilitation & educational programs

Baby Beats Notes

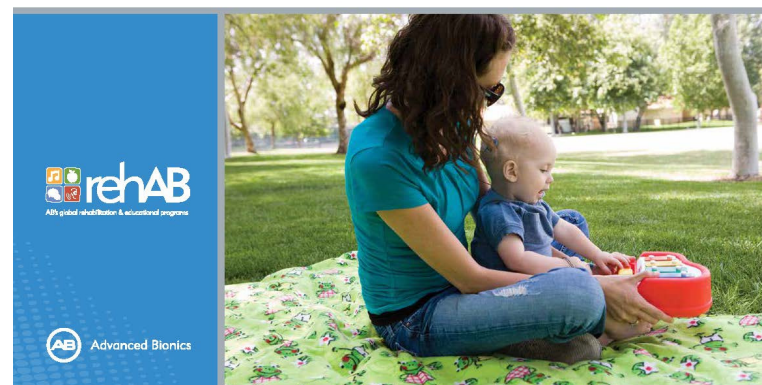
Monitors progress in

- **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**

BabyBeats
NOTES

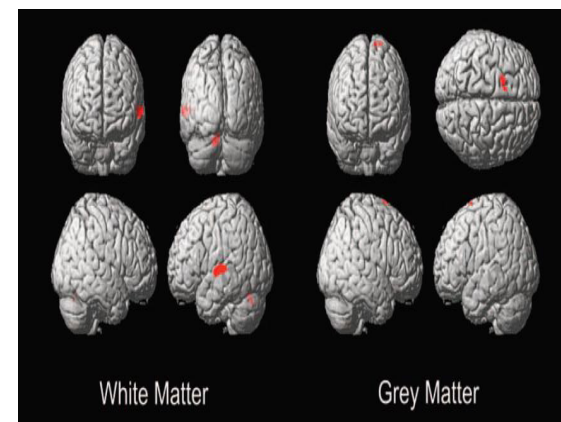




AB's global rehabilitation & educational programs

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!





AB's global rehabilitation & educational programs

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-usorder,
using the code on this card.

Promo Code: BBPRO1

