



IT'S ALL IN YOUR HEAD

The Benefits of Music on the Brain

BY MICHELLE MUTH, MT-BC

Music has been called a universal language and identified as something that can "...express that which cannot be said and on which it is impossible to be silent." -Victor Hugo.

For a child with autism, expressing or receiving communication via the spoken or written word can be very difficult and sometimes feel nearly impossible. Yet, when they hear a song, or someone sings to them, their attention is often more focused and a task begun, and sometimes even completed. What is happening in the brain that causes such a response?

MORE THAN SOMETHING WE SIMPLY HEAR

The field of neuroscience has made great strides in mapping how the brain responds to and is affected by music. Although one of the greatest benefits of music is that it makes us feel good, it is more than simply something "nice". Music can actually change the brain. It has been shown to decrease pain, restore language, stabilize gait, and has proven to be a powerful teaching modality when working with children with autism.

To best understand music and the brain, take a minute to consider when and how you use music in your day. Many of us use music to:

- Motivate during exercise
- Improve work productivity
- Relax and/or fall asleep
- Relieve stress during the car ride home from work
- Represent our mood when feeling sad or angry

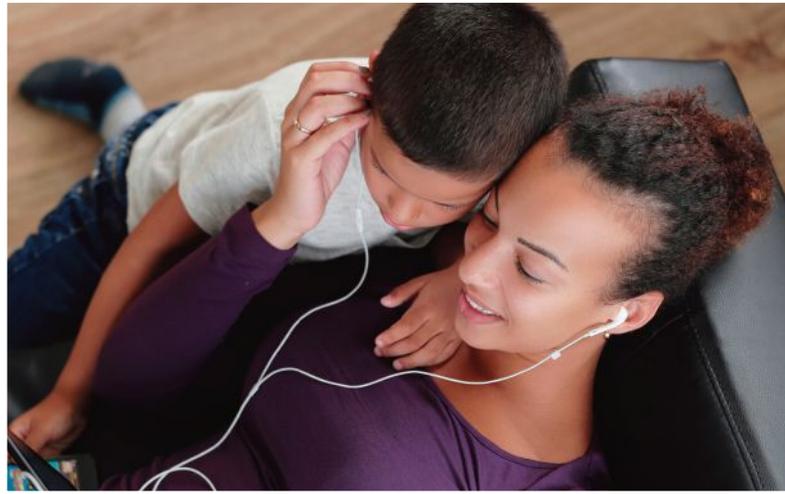
What is it about music that can affect us in so many different ways? How can it change the brain? One word - neuroplasticity.

WHAT IS NEUROPLASTICITY?

Neuroplasticity is the process in which the brain learns by making new connections and pruning old ones. It changes over time and happens throughout the lifespan. Neurotransmitters are vehicles of connection between neurons. Their role is to either excite or inhibit neurons to which they are

connecting. Neuroplasticity requires three main components of the whole brain: **Dopamine; A Clear Signal; and Synchrony.**

Dopamine is a neurotransmitter that sends signals to nerve centers. It plays a major role in reward-motivated behavior, motor control, working memory, and learning reinforcement. Its release triggers a positive response - what we might call a "feel good" experience. Learning reinforcement occurs when the dopamine response is transferred to the stimuli during learning. For example, the first time you bring out a guitar with toddlers, they may hold back, watch, listen and wait to see what happens next. When you strum and sing, the children get excited and join in. This is the feel-good response of the dopamine neurons firing to the auditory cue of the guitar. Next time the guitar is presented, the children will show excitement simply by seeing the guitar, before any music is even played. This is an example of how the learned dopamine response has transferred to the visual cue of the guitar.



A Clear Signal is required for processing purposes. The brain can receive noise, or unorganized sound, but this type of signal requires more effort from the brain to decipher. The brain functions best when it receives a clear signal from outside stimuli. Amazingly, the spoken word has a great deal of noise (ie; misunderstandings, unexpected voice volume, biases, etc), and while the sounds are organized, it requires more effort for the brain to process.

Synchrony, meaning a "simultaneous occurrence", relates to how neurons work together. The discovery of synchrony and cellular learning originates back to 1949 and the Hebbian principle which states, "when an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place." Later research discovered that for this firing to work effectively, the two components must be in sync with one other. Simply put, neurons that fire together, wire together.

MUSIC'S RELATION TO NEUROPLASTICITY

What does music have to do with neuroplasticity? Everything!

- Music stimulates dopaminergic regions of the brain.
- Music provides a clear signal. Recent research found that music, in particular singing, provides a much clearer signal than the spoken word.
- Music, specifically rhythm, is a highly organized structure that occurs in time. It has a pulse that mobilizes us to tap our toes and "move to the beat". Translating to a neuronal level, music creates synchrony, allowing neurons to entrain, move together, and "fire and wire together" creating new connections.
- Music is a whole brain activity. Brain imaging has shown that music activates many regions of the brain simultaneously, whether listening or actively making music. It is no longer considered to solely impact either the right or left side of the brain.

Simply put, music changes the brain.

MAKING IT MEANINGFUL

Clearly, music has an integral part in brain health and development through neuroplasticity. By exposing children to positive experiences, singing and rhythm, significant impacts on their overall development can be obtained. Some of the areas affected include:

- Language development
- Social interaction
- Impulse control
- Adaptability to change
- Behavior management

Parents can use some simple strategies in the home to integrate music into learning. This can look like one or all of the following - and more:

Sing to your child. No matter how inhibited you feel, sing to them. Remember that singing has a clearer signal than the spoken word.

Create or find songs related to tasks or transitions, such as a clean-up song. The song could be used for cleaning up a room, dinner table, toys, etc. You could base it on a common children's song, like Row, Row, Row Your Boat, a folk song, or change the words of a popular song to represent the activity you're teaching. Most importantly, keep it simple.

Make music together. A great way to involve your child in a group activity is to make jovial sounds in conjunction with one another. This activity does not require eye contact; they simply need to listen and keep the beat. To start, pair your child with a child experienced in the music-making activity. Give the new child clear instructions to follow their partner's rhythm, sound, and/or hand movements. In time, they will learn to play together, become more aware of their surroundings and engage more synchronously with the group. Before anyone even realizes it, they'll be engaging in a group activity.

Use/Create instruments. Always consider a child's sensory system when introducing instruments.

- Body percussion is a great way to start making music together. You can clap, snap, pat your legs, tap your toes OR use the body and vocal sounds your child makes and imitate with intention by playing the echo game. Instruct your child to make a sound and you imitate, repeat many times and then switch roles. The moment your child recognizes that they are leading is when communication begins.
- Homemade instruments make great props. Experiment with pots, pans, plastic bowls using wooden spoons, chopsticks, or pencils (the eraser end) and see what sounds resonate with your child. Search the web for ways to make homemade shakers or bongo drums with duct tape.

Music listening. Participate with your child in listening to music. Notice what songs calm or relax them - and might be helpful when anxieties are heightened. Pay careful attention to their response and level of comfort to determine the appropriate length of listening time.

Always remember that no two children are alike. While one child may respond differently than another, the research is clear that exposing children to music positively impacts cognitive growth and development.

Michelle Muth, MT-BC is a board-certified music therapist with advanced training in neurologic music therapy. She is the founder of M3 Music Therapy located outside Pittsburgh. To learn more watch What is Music therapy: A Vlogumentary <http://m3musictherapy.com/music-therapy/advocacy>

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