

Can a beat make you speak?

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Introduction

Many societies and cultures around the world engage in rhythmic activities such as dancing, singing and drumming. However, can these rhythm-based movements serve us for more than entertaining purposes?

Neuroscientists discovered that music and rhythm based movements can improve speech disabilities, and can support the treatment of neurological disorders such as Parkinson's disease, stuttering, aphasia and autism. In addition, some studies have shown a correlation between reading ability and beat-keeping ability, as well as reading ability and the consistency of the brain's response to sound.

In this paper, I will focus on how beats and rhythmic movements can improve language impairments.

What is rhythm-based therapy?

Rhythm based therapy is a multi-sensory stimulation of the brain based on the principle of neuroplasticity. Neuroplasticity is the brain's great capacity to change and adapt. It refers to the physiological changes in the brain that happen as the result of our interactions with our environment. This means that if a certain area of the brain is damaged, the brain can bypass that area and find a different pathway that will allow it to carry out the task that the damaged area of the brain typically completes. Rhythm-based therapy uses rhythm, music, colour, voice, text, shapes and movement to stimulate coordination, balance, endurance, attention, memory, body image and social interactions.

The jazz drummer Ronnie Gardiner has developed one of these therapy programs. His program, is designed to help people with injuries and diseases of the central nervous system, it is called the Ronnie Gardiner Rhythm and Music method (RGRM™) and since 1993 it has been implemented in health care and rehabilitation in Sweden.

How does rhythm movement improve language and speech impairments?

The cerebellum in the brain is in charge of all timing and rhythm in our bodies. The cerebellum is located behind the top part of the brain stem (where the spinal cord meets the brain) and is made up of two hemispheres (halves). The cerebellum receives information from the sensory systems, the spinal cord, and other parts of the brain, and then regulates motor movements. The cerebellum operates as an internal timing system that coordinates all our muscle movements. In addition, the cerebellum coordinates the movement of our lips, tongue and vocal chords. The cerebellum is like a metronome that uses sight, sound and proprioception to produce rhythm and tempo in sport, speech and dance.

If the cerebellum becomes impaired, then our judgment of the sound duration might be affected.

Case study

Professor Nina Kraus, PhD, and Adam Tierney, PhD, at Northwestern University, developed a study that examined the relationship between the ability to keep a beat and the brain's response to sound. The scientists used two techniques on 100 teenagers from the Chicago area.

For the first technique the participants were instructed to listen and tap their finger in time with the metronome. The participants' tapping accuracy recorded based on how closely their taps aligned in time with the "tic-toc" of the metronome.

For the second technique they used electroencephalography (EEG) to record brainwaves from a major brain hub for sound processing while the participants listened to the synthesised speech sound "da" repeated periodically over a 30-minute period.

The researchers then calculated how similarly the nerve cells in this region responded each time the "da" sound was repeated. The participants who were more accurate at tapping along to the beat were more consistent in their brains' response to the "da" sound.

What can we do next?

It is clear that rhythm, music and speech can be powerful in stimulating communication and social interactions, due to the strong sensorimotor correlation. For example, a beat or pulse can result in spontaneous motor responses, such as hand clapping, foot stepping and rhythmic vocalizations. Therefore, we need to work together to sing and dance more in order to help our community and particularly those who are in need of gaining vital skills and the capacity to use such skills functionally within everyday life. We need to spread awareness about the application of sound and music therapy in classroom settings, and propose the integration of music- and rhythm-based therapies with other clinical therapies (i.e. speech therapy, occupational therapy).

Did you know that...

- *For patients who are not covered by health insurance, speech therapy typically costs \$200-\$250 for an initial assessment, then about \$100 to almost \$250 per hour in the US.*
- *Humans and songbirds are the only creatures "that automatically feel the beat" of a song.*
- *Nearly 1 in 12 (7.7 percent) U.S. children aged 3-17 has had a disorder related to voice, speech, language, or swallowing in the past 12 months.*
- *More than three million Americans (about one percent) stutter. Stuttering can affect individuals of all ages, but occurs most frequently in young children between the ages of 2 and 6.*
- *Speaking with our hands helps synchronise brain hemispheres and create a rhythm that creates fluidity of ideas and articulation during conversations.*

Resources

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