

Hello, everyone!

8/10/23 Music Hour Recap

Last week, we welcomed Dr. Ariel Hight to the CI Music Hour for a discussion about cochlear implants and neuroplasticity. Dr. Hight was born deaf and sign language was his first language. He received his CI at 3.5 years old. He became interested in neuroscience and brain plasticity after his masters degree in medical device engineering.

Ariel explained that neuroplasticity bridges many scales and domains. It can affect processing in the short term and long term, individual brain synapses to entire brain circuits, and from micro detection to macro comprehension.

Cochlear implant users undergo an adaptation period from the moment you turn on the implant to sometime in the future. Research shows us that while there is a lot of variability immediately, over time, the rate of speech perception improves. Current studies are focused on understanding why it takes some people less time or more time to acclimate to speech. Additional studies are being done to understand acclimation to music and better ways to encode the cochlear implant device for music processing.

He continued by explaining that sensory distortions can impair perception and identification, and come in many different types. Neuroplasticity may be the key to compensating for sensory distortions, which is the theory behind the adaptation period to the cochlear implant. There are likely many kinds of distortions that CI users must adapt to, but there are at least two well-defined ones: spectral resolution and temporal resolution. Spectral resolution is the frequency information, or the ability to determine specific notes on the piano. Temporal resolution is in the time domain, or how quickly a sound changes.

Sound encoding is distorted by cochlear implants because of a cochleotopic mismatch. The location where the electrode array processes a frequency does not match where a healthy cochlea would process the same frequency. In current research, there are early indications that residual hearing helps the adaptation to electrical hearing through the CI, but data is inconclusive at the moment. Preliminary data suggests that spectral and temporal resolution improves over initial use (after activation). Interventional techniques are the topics of study now, to see which ways might best stimulate neuroplasticity and expedite the adaptation process. Vagus nerve stimulation and speech rehabilitation are focuses.

Regarding music, Ariel explained that clear lyrics and vocals are more tractable for him; music videos provide a perspective and interpretation of the music. Musical complexity often degrades clarity and enjoyment. He's not sure if he really hears the melody or complex rhythm.