Background

Williams syndrome (WS) is a neurodevelopmental, genetic disorder associated with a distinct cognitive-behavioral phenotype, including cognitive impairment, anxiety, and hypersociability. People with WS demonstrate increased auditory sensitivities and emotional responsiveness to music but variable musical skill. Our lab uses behavioral and neuroscientific measures to examine the relationships among the different aspects of the WS auditory phenotype, such as how low level auditory processing contributes to their musical interests, as well as the development of musical abilities in this population. We are interested in using music to understand other aspects of the WS phenotype and harnessing music to be an evidence-based intervention for people with WS.

Approaches and Findings

Auditory Sensitivities

Using EEG, we see greater attentional and sensory processing of instrumental timbres in WS.

Emotional Sensitivities

The sensitivity to different timbres may translate to greater emotional sensitivity in WS to happy versus sad musical excerpts as short as 500 ms.

Social Processing

Emotional music affects how individuals with WS process emotional faces. We may be able to use music to help with emotional and social difficulties.

Music Perception

Many individuals with WS do well on tests of melodic and rhythm perception. However, ~11% meet criteria for amusia, or clinical tone-deafness, which is more than in the typical population.

In contrast to typical populations, pitch perception abilities in WS are not associated with general auditory sensitivities or their emotional responsiveness to music.

Music Production

Musical perception skills are highly associated with musical production abilities, such as singing. Brain imaging suggests this is due to auditory-motor feedback loops in WS as it is in typical populations.

Musical Learning

Likely because of their auditory sensitivities, individuals with WS who are explicitly aware of using auditory strategies are better able to learn a new instrument than individuals who only use visual learning or instructional strategies.

Future Directions

In future work, we hope to examine how musical sensitivities and abilities relate to other prominent aspects of the WS phenotype such as hypersociability and impaired spatial skills. We want to understand how their auditory sensitivities affect their emotional connection to music. We want to see how we can use music to help with social relationships and anxiety in WS.

Acknowledgements

ACM Lifting Lives Music Camp
Williams Syndrome Association
Participants and their families

Collaborators: Reyna Gordon, Carolyn Shivers, Nathan Dankner, Jennifer Pryweller, Tricia Thornton-Wells, Sasha Key

Funding: NSF GRFP; NICHD P30.

Printing supported by Vanderbilt Brain Institute and Vanderbilt Vision Research Center