

Music: Soothing Autonomic State and Improving Social Attention

in Children with Autism Spectrum Disorders



Michelle A. Patriquin^a & Angela Scarpa

109 Williams Hall, Department of Psychology, Virginia Tech, Blacksburg, VA 24061

^a Corresponding author: mpatriq@vt.edu

Introduction

•The Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition outlines significant social impairments in Autism Spectrum Disorders (ASD)(DSM-IV; American Psychiatric Association, 2000).

•**Polyvagal Theory (Porges, 2007)**: outlines a Social Engagement System that consists of interconnected cranial nerves that facilitate effective social engagement (i.e., through a soothed physiological state).

•Prior research finds that children with ASD show an over-aroused, or fight-flight, state at baseline and to unfamiliar individuals (Bal et al., 2010; Vaughan Van Hecke et al., 2009).

•Music has the ability to calm cardiovascular functioning (Iwanaga et al., 2005) and improve social behaviors in children with ASD (Whipple, 2004).

Hypotheses:

•Listening to music will dampen a defensive autonomic state in children with ASD relative to listening to an audiobook, as reflected by increased respiratory sinus arrhythmia (RSA) and decreased heart rate (HR).

•Music will also promote social attention as expressed in sharing information, emotion, or interest post-music listening.

Participants

- N = 23, 4-7 years old, prior diagnosis of ASD
- Autistic Disorder (n = 12), Asperger's (n = 10), PDD-NOS (n = 1)
- Participants were matched by auditory hypersensitivities and receptive vocabulary across two groups:

•Music (n = 11)

•Audiobook (n = 12)

Methodology

•**LifeShirt**®: an ambulatory physiology monitor used to measure heart rate (HR) and heart period (HP). The LifeShirt® is considered an accurate measure of R-R intervals and R-waves, both necessary in the calculation of HR and HP (Heilman & Porges, 2007).

Methodology

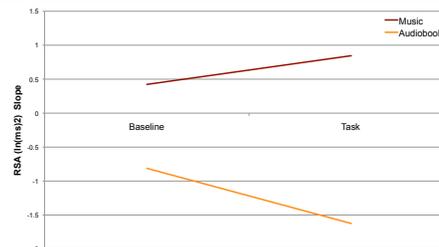
•**Social Interaction Coding Scale (SICS; Bazhenova, 2006)**: social attention was coded via the SICS. Social attention (variable name: child shares) was defined as sharing information, emotion, interest.

•**Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997)**: measured receptive language skills by presenting a stimulus words with a set of pictures to the participant.

Procedure:

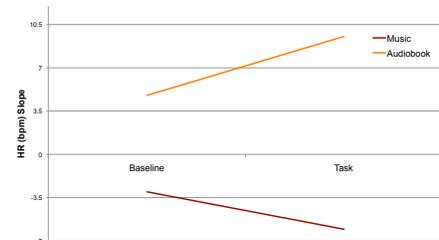
- Baseline (3 minutes)
- Pre-task SICS (10 minutes)
- 12-minute listening period (music or audiobook)
- Post-task SICS (10 minutes)
- Recovery (3 minutes)

RSA: Group x Time Interaction



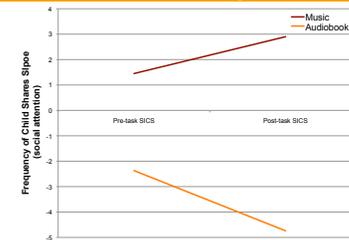
Note: Baseline values are not significantly different. Values plotted are the slope of the change from baseline to task standardized residual RSA. Standardized residuals controlled for initial baseline differences.

HR: Group x Time Interaction



Note: Baseline values are not significantly different. Values plotted are the slope of the change from baseline to task standardized residual HR. Standardized residuals controlled for initial baseline differences.

Social Attention: Group x Time Interaction



Results

•The group (music vs. audiobook) x time (baseline, task) interaction for RSA trended towards significance.

• $F(1,20) = 2.58, p = .06$

•Music group increased RSA from baseline to listening (task)

•The group x time interaction for HR was significant.

• $F(1,18) = 2.85, p = .05$

•Music group decreased HR baseline to listening

•The group x time (pre-task SICS social attention, post-task SICS social attention) was significant.

• $F(1,18) = 6.43, p = .01$

•Music group increased social attention pre-task SICS to post-task SICS

Conclusions

•These results show an increase in RSA and decrease in HR for the Music group, from baseline to task, which may reflect a calmed physiological state when listening to music.

•As predicted, social attention increased after the calmed state was elicited by music.

•Future studies should recruit a larger sample size in order to detect a mediating effect of soothed autonomic state on social attention.

Support



Organization for Autism Research, Graduate Grant