

# Music: Soothing Autonomic State and Improving Social Attention in Children with Autism Spectrum Disorders



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## 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

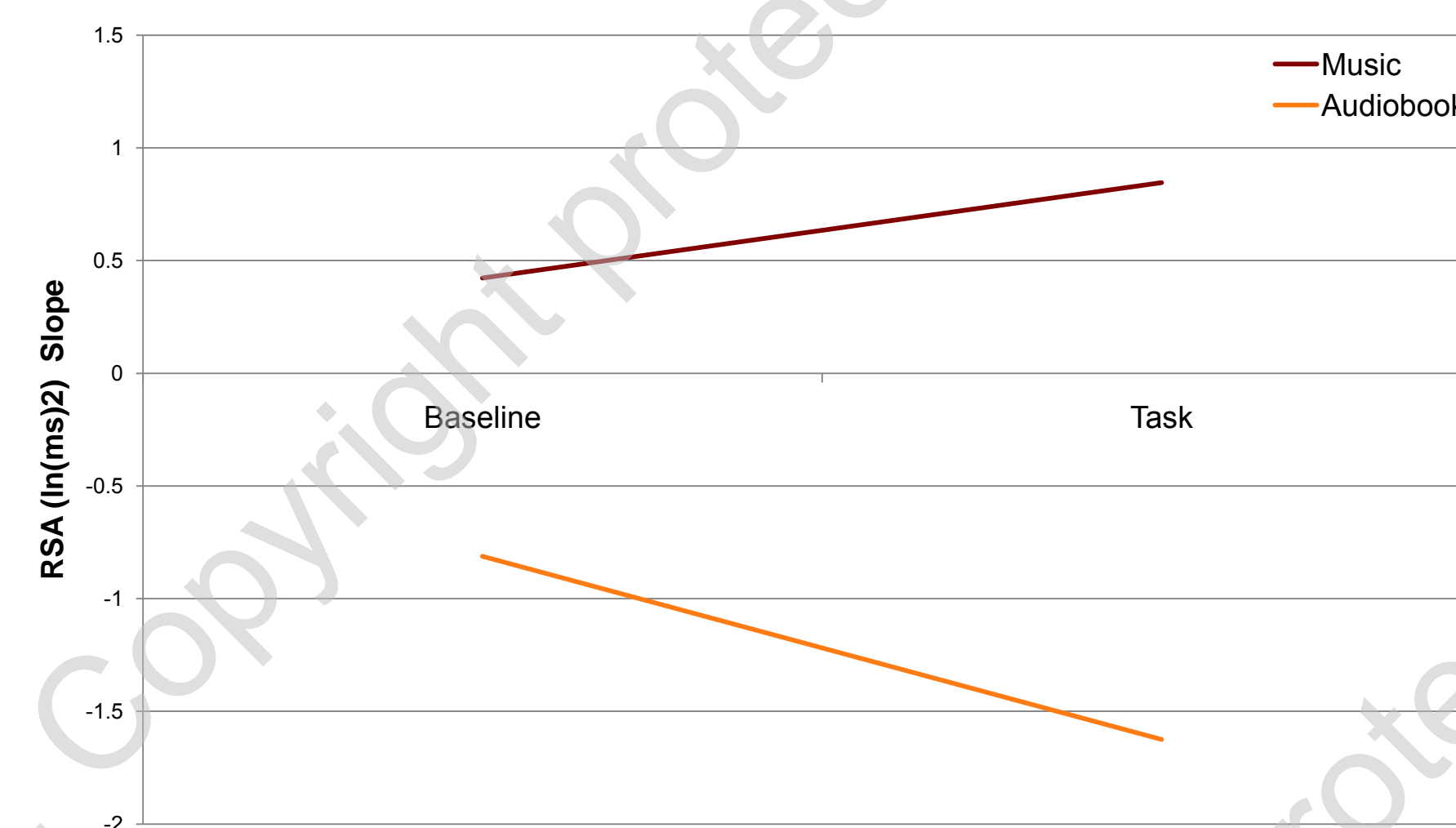
- Social Interaction Coding Scale (SICS; Bazhenova, 2006)**: social attention was coded via the SICS. Social attention (variable name: child shares) was defined as sharing information, emotion, interest.

- 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.

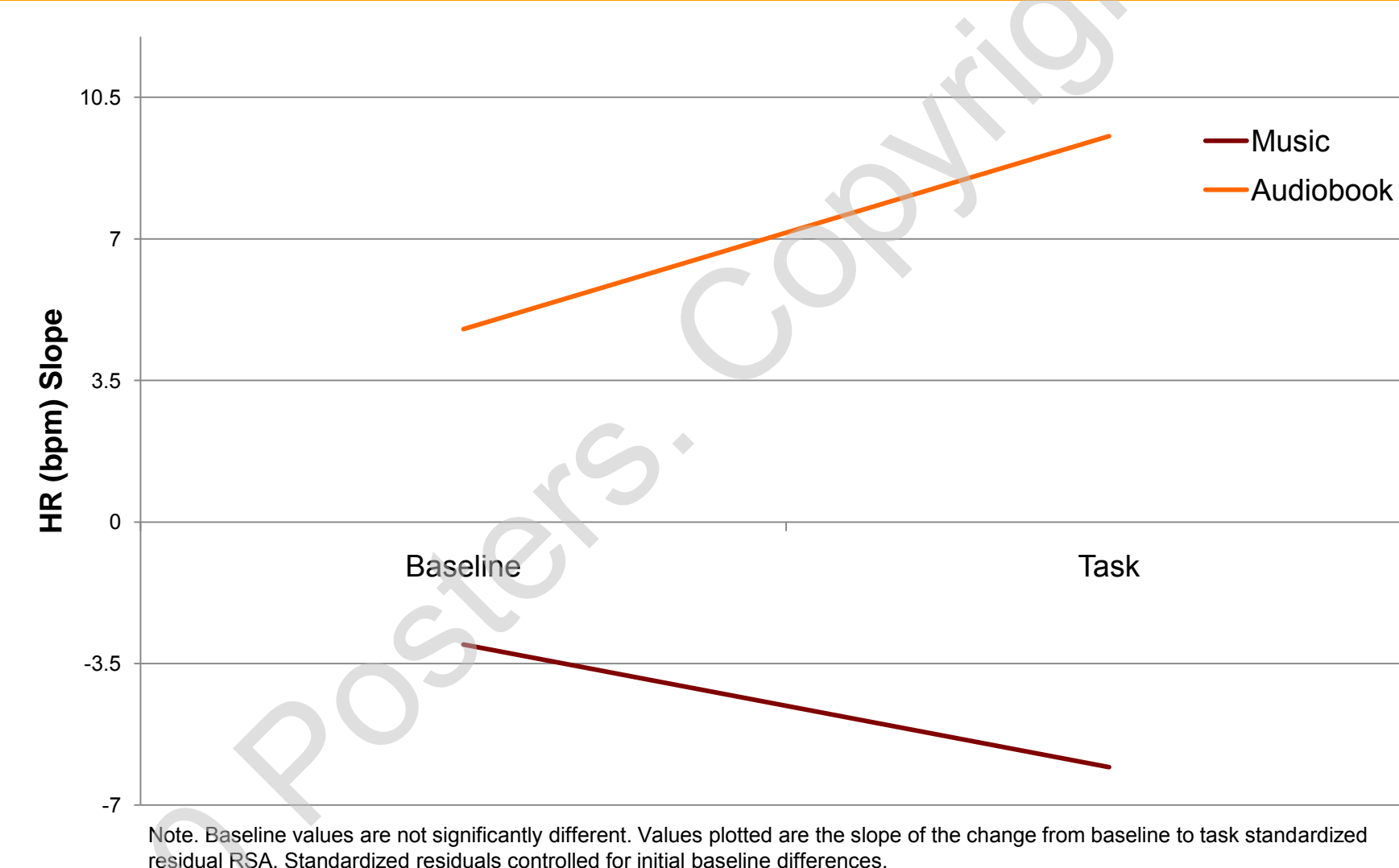
### Procedure:

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

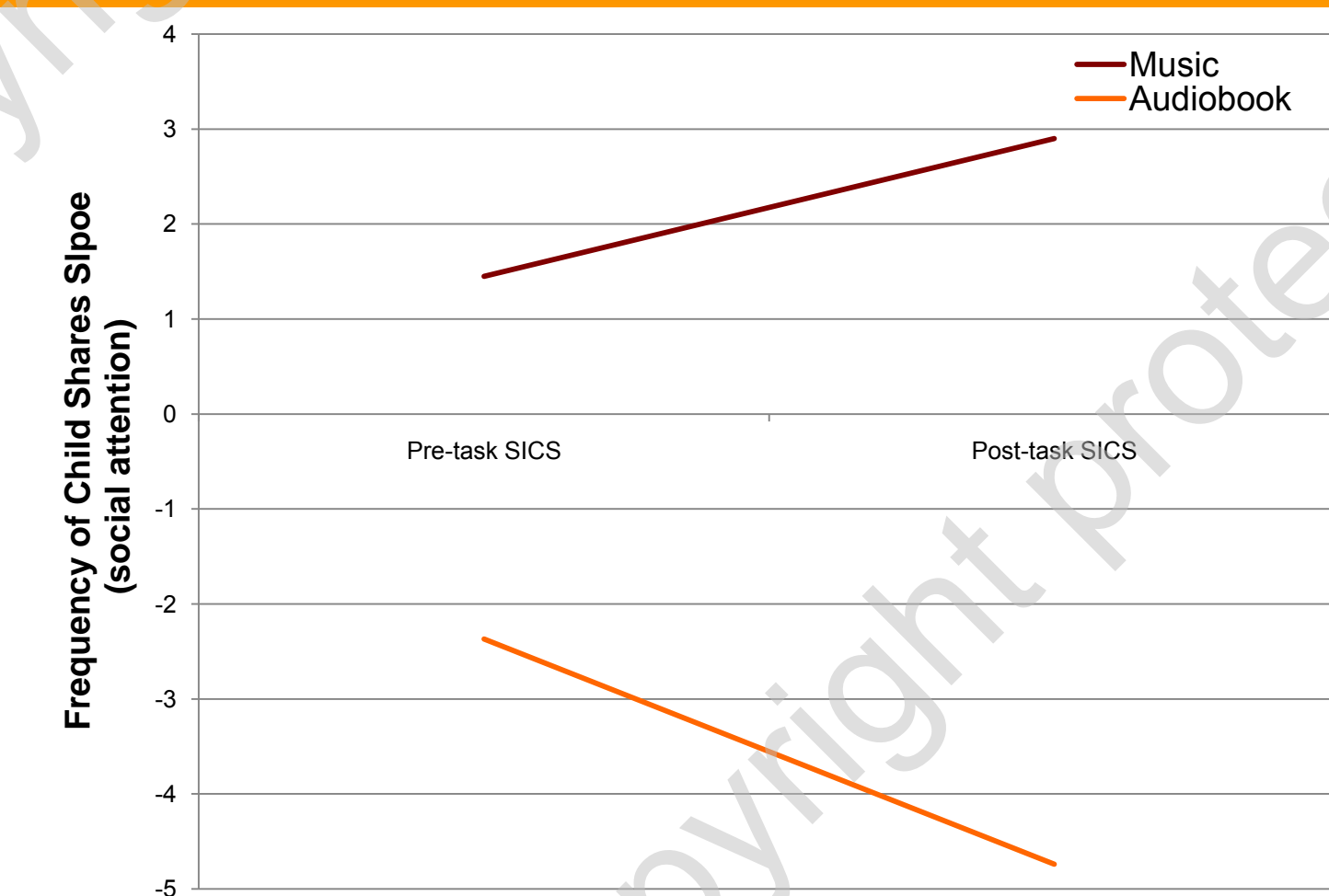
## RSA: Group x Time Interaction



## HR: Group x Time Interaction



## 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