ADDRESSING EMOTIONAL COMMUNICATION THROUGH PROSODY IN COCHLEAR IMPLANT USERS

Monita Chatterjee, Ph.D.

Auditory Prostheses & Perception Laboratory,

Center For Hearing and Speech Perception Research,

Boys Town National Research Hospital,

Omaha, NE

Emotional Prosody and CIs

- Spoken emotion communication is dominated by *how we say it* (prosody) over *what we say* (lexical-semantic cues) **Ben David et al., JSLHR 59 (1), 72-89, 2016; Richter & Chatterjee, Ear & Hearing, In Review 2021**

- Voice pitch and its changes are primary cues to emotional prosody, but are not well represented in CIs, resulting in deficits in emotion perception in CI patients. **Banse & Scherer, J. Pers. Soc. Psychol. 70(3), 614-636, 1996; Deroche et al., Front. Neurosc. 10, 73, 2016; Chatterjee et al., Hearing Research, 322, 151-162, 2015; Luo et al., Trends. Amplif. 11(4), 301-315, 2007.**

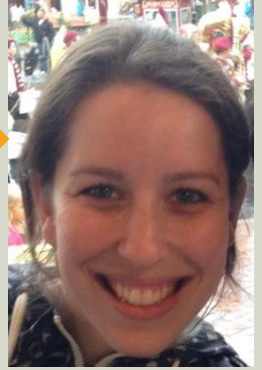
- Emotional communication precedes speech communication in infants– underscores its importance in human development and social communication. **Mastropierri & Turkewitz, Dev. Psychobiol. 35(3), 204-214, 1999; Grossman, Rest. Neurol. & Neurosc., 28(2), 219-236, 2010; Oller et al., Proc. Nat. Acad. Sci., 110(6), 6318-6323, 2013; Palama et al., PLoS One, 13(4), e0194579, 2018.**

- CI patients appear to have similar facial emotion sensitivity compared to hearing peers or even a deficit. So there remains an overall deficit in emotion communication. **Stevenson et al., Ear & Hear 38(5),521-, 2017; Fengler et al., PLoS One, 12(10), e0185821, 2017.**

- Demonstrated links between CI patients' quality of life and their sensitivity to emotional prosody (both child and adult CI recipients) → implications for both development and aging **Schorr et al., J.S.L.H.R. 52(1), 141-152, 2009; Luo et al., J.Acoust.Soc.Am. 144(5), EL429.**

EMOTION: STIMULI

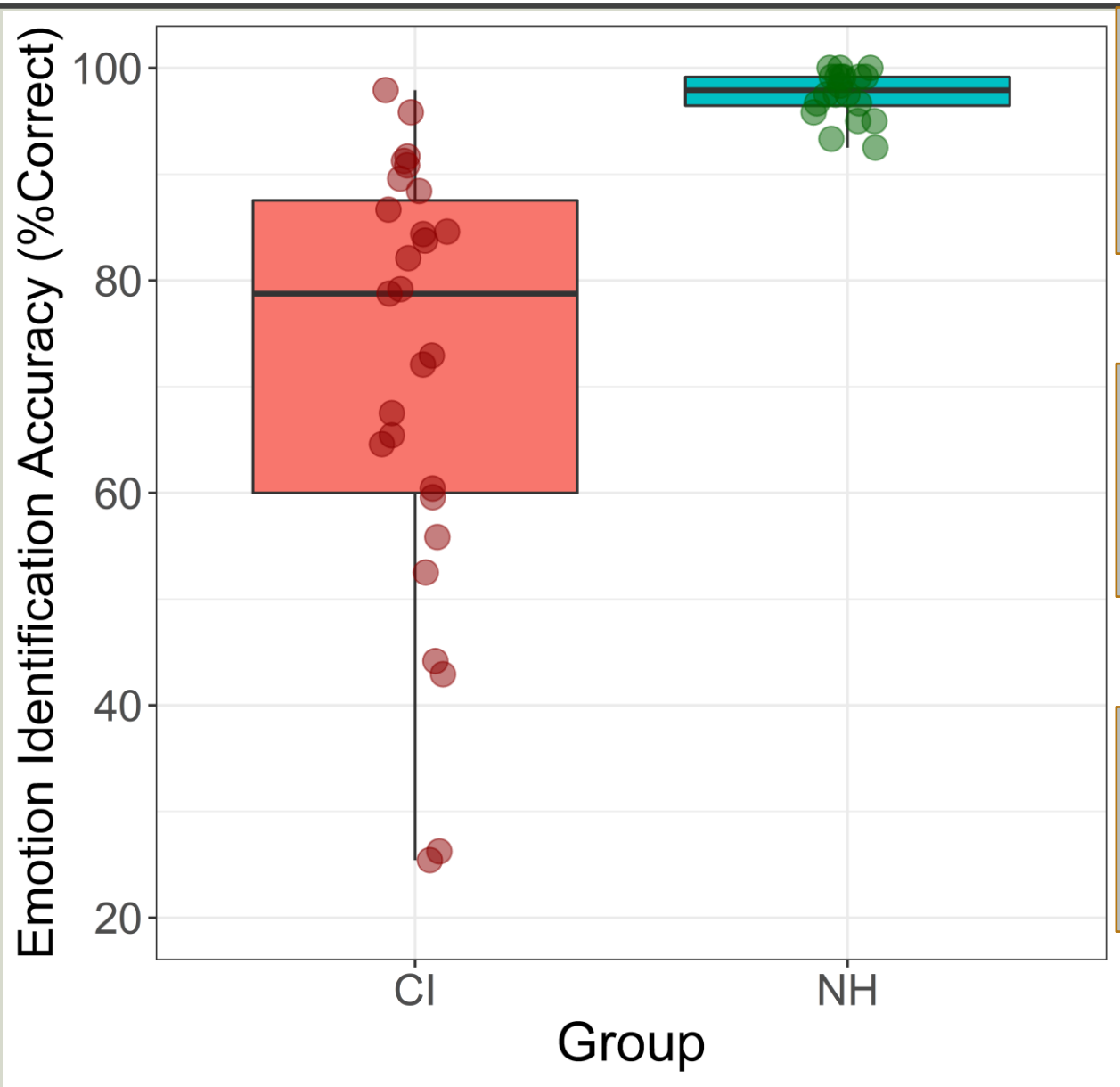
Danielle Zion
UMD/ Walter Reed



- 12 sentences, 5 emotion each: *happy, angry, sad, neutral, scared (child-directed speech)*
- *1 female and 1 male talker (selected from pilot with 4 talkers)*

Happy Angry Neutral Sad Scared

PERCEPTION OF EMOTIONAL PROSODY WITH THE CI: AN OVERALL DEFICIT, WITH HIGH INDIVIDUAL VARIABILITY



How we say it > what we say (Emotional prosody)

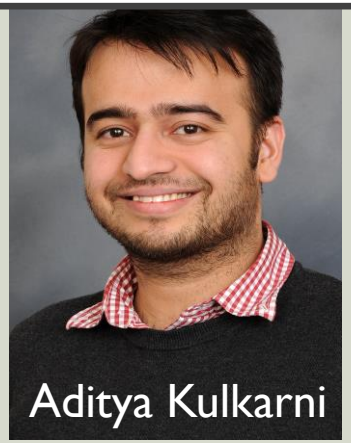
Voice pitch is a primary cue to emotional prosody but not well represented via CIs

Links between QoL and emotion recognition by children and adults with CIs

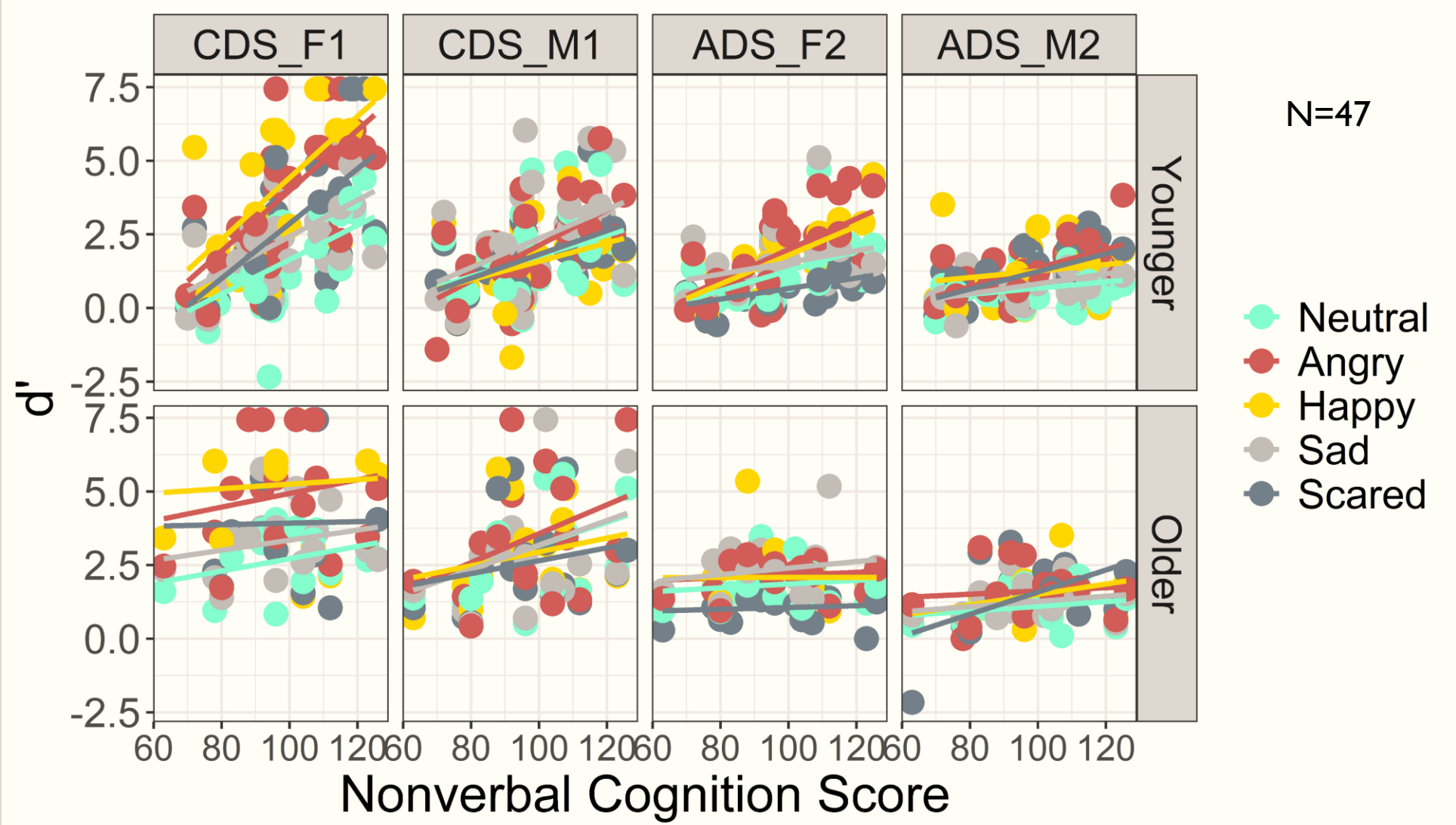
PREDICTORS OF INDIVIDUAL VARIABILITY IN CHILDREN WITH COCHLEAR IMPLANTS

- Sensitivity to static and dynamic changes in F0
- Age, duration of experience with device
- Speaking style: exaggerated prosody, regular prosody
- Nonverbal cognition
- Age at implantation
- Socio-economic status

[Barrett et al., 2020, Ear & Hearing; Chatterjee et al., 2022 In Review]

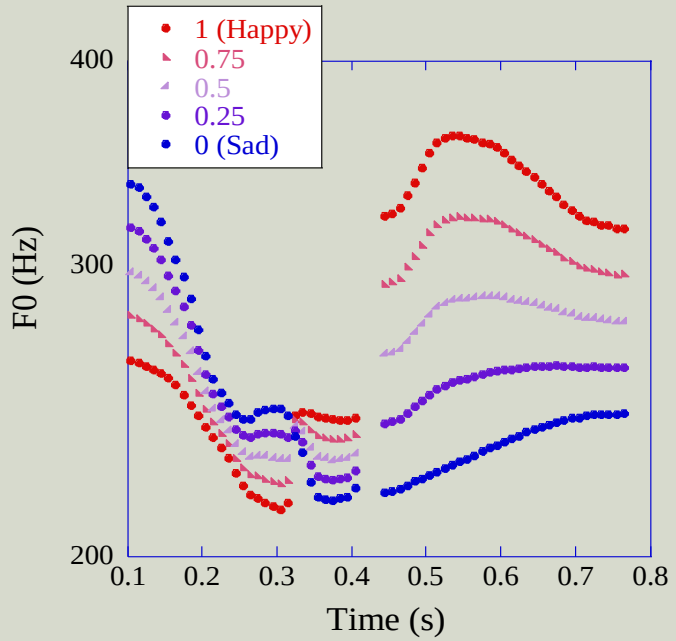


INTERACTIONS BETWEEN HEARING AGE (DEVICE EXPERIENCE), COGNITIVE STATUS, TALKER, EMOTION



HOW WELL CAN AN INDIVIDUAL PATIENT UTILIZE A SPECIFIC CUE TO DISTINGUISH EMOTIONS?

5 Manipulated contours



X

5 Manipulated durations

- 0.50s
- 0.789s [natural happy]
- 1.00s
- 1.16s [natural sad]
- 1.25s

X

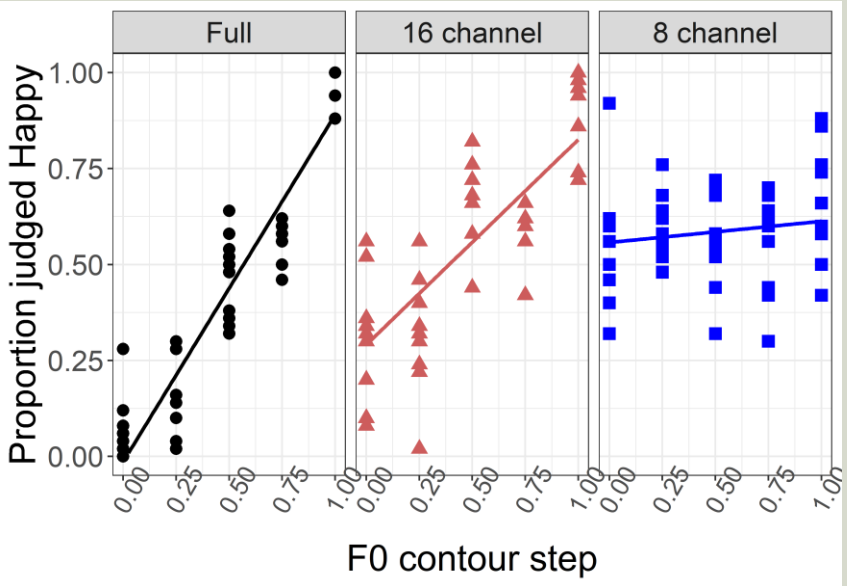
5 Manipulated intensities

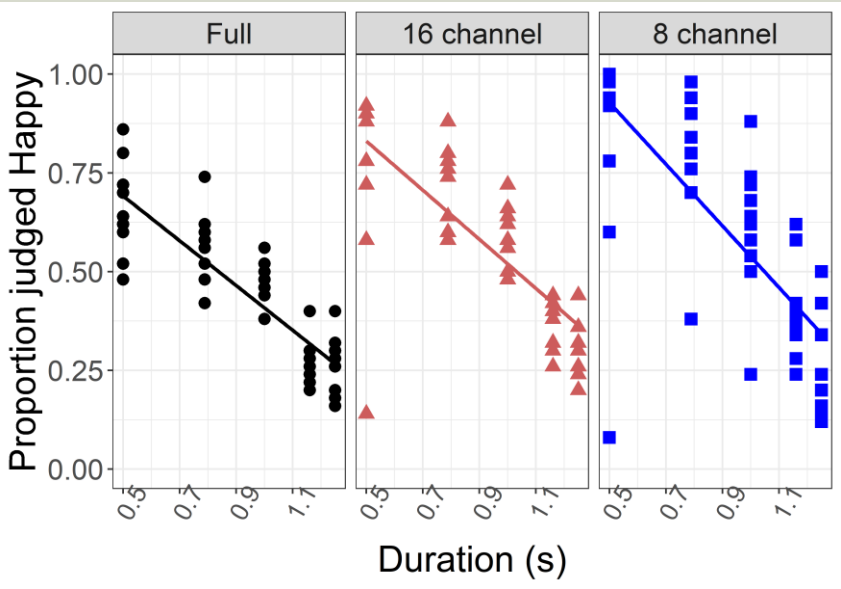
- 75 dB SPL
- 70 dB SPL
- 65 dB SPL
- 60 dB SPL
- 55 dB SPL

= 125 stimuli

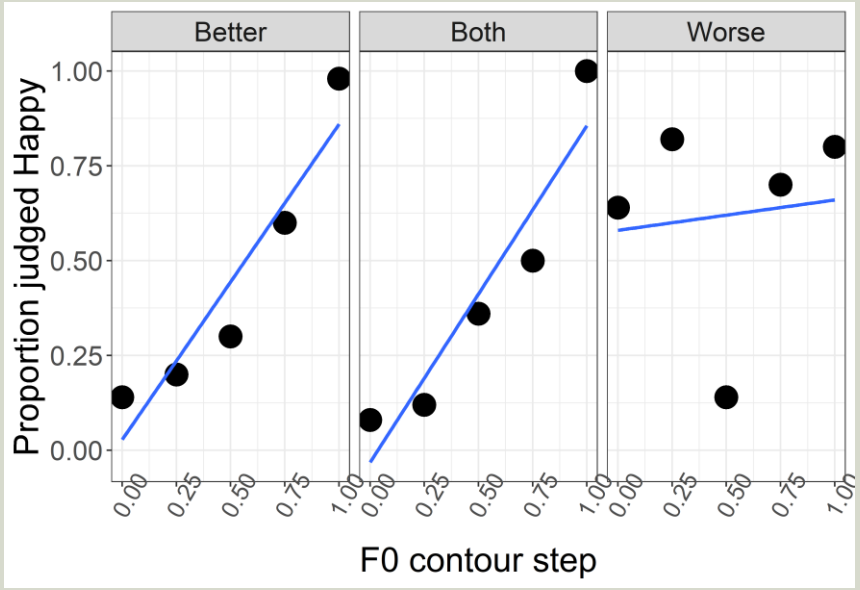
INDIVIDUAL ACCESS TO ACOUSTIC CUES

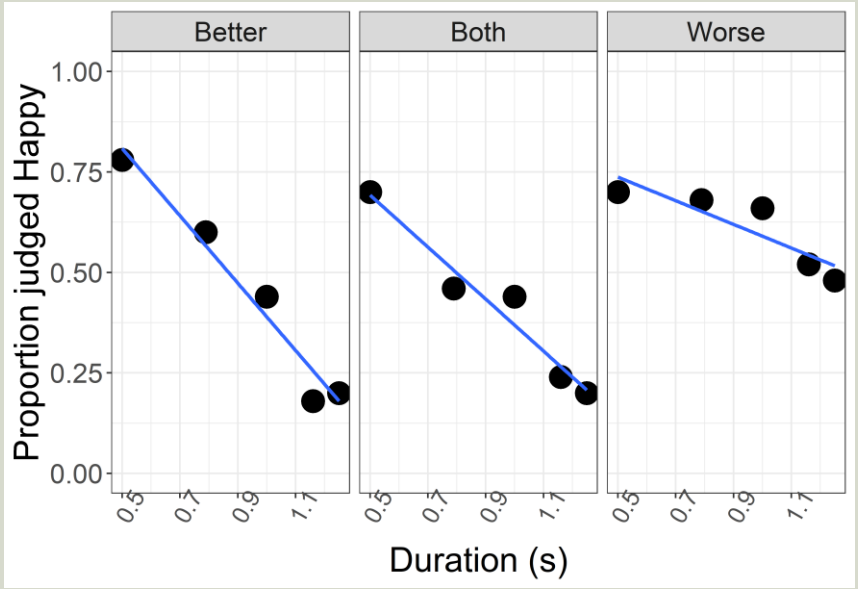
Normally hearing listeners





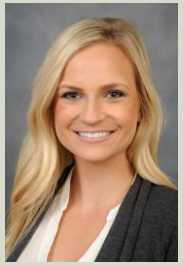
Bilateral CI listener





EMOTIONAL PRODUCTIONS: HEARING AT BIRTH MATTERS

Sara Damm Jenni Sis Rizwan Siddiqui Aditya M Kulkarni Julie Christensen


Happy (red) and sad (blue) F0 contours

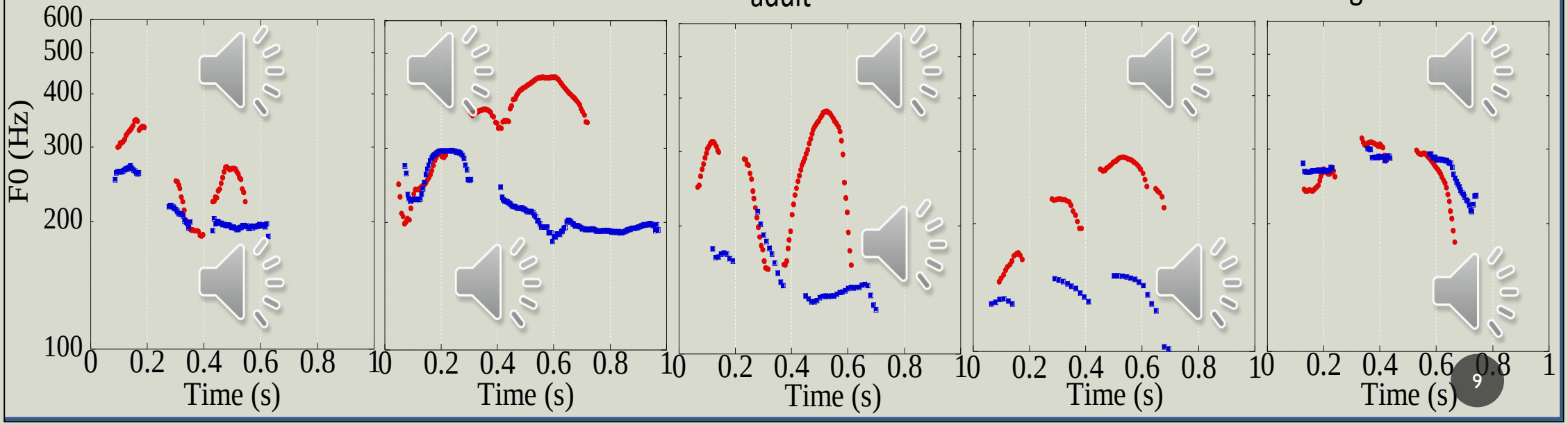
NHCH03
NH child (11 yrs)

A41
NH adult

N5
Post-lingually deaf CI adult

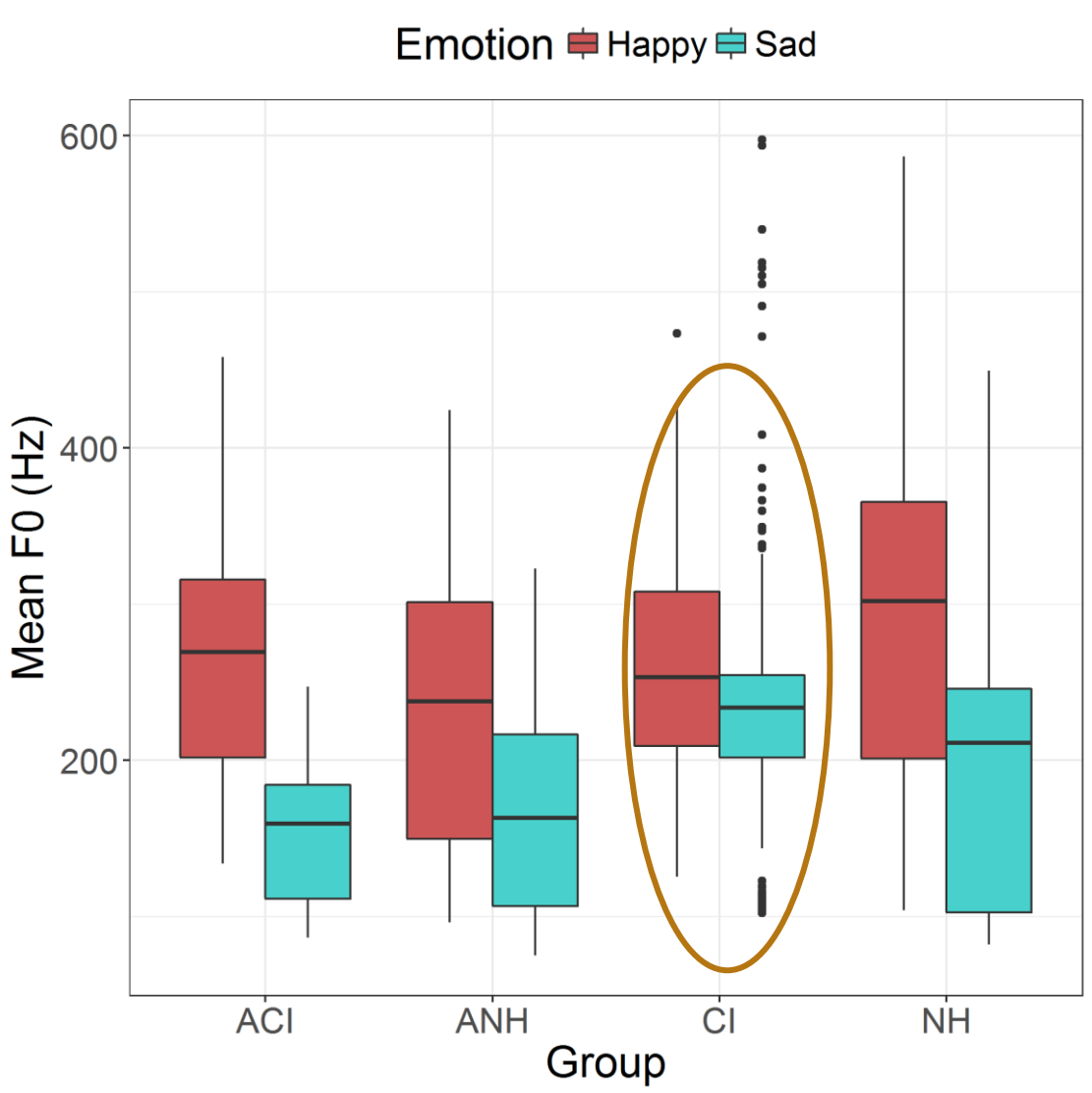
CICH04
18-year old CI child with early hearing implanted at age 6

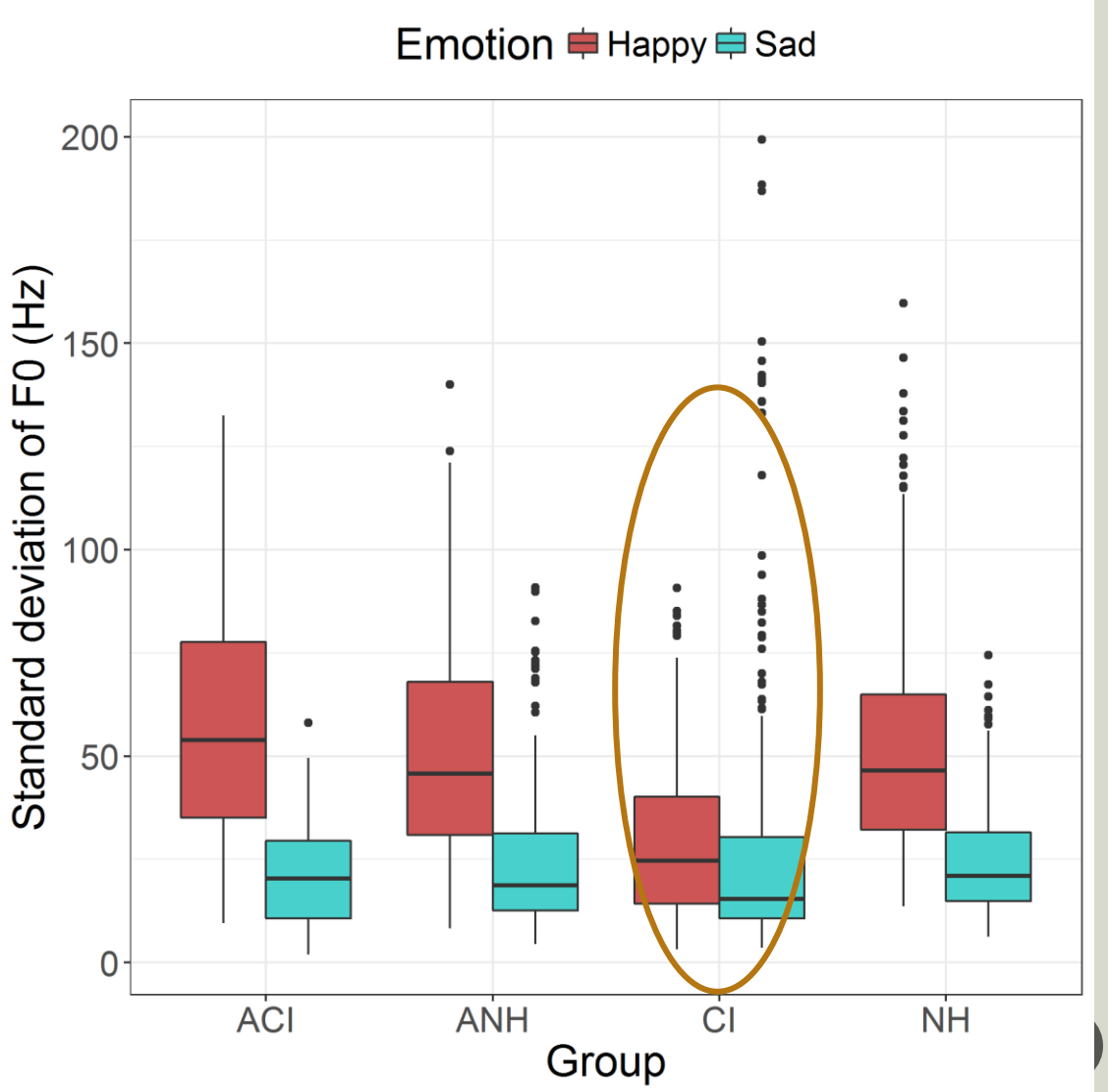
CICH03
11-year old congenitally deaf CI child implanted at age 1.5



CHILDREN WITH COCHLEAR IMPLANTS SHOW SMALLER ACOUSTIC CONTRASTS THAN PEERS WITH NH

Chatterjee et al., Front. Neurosc. 2019

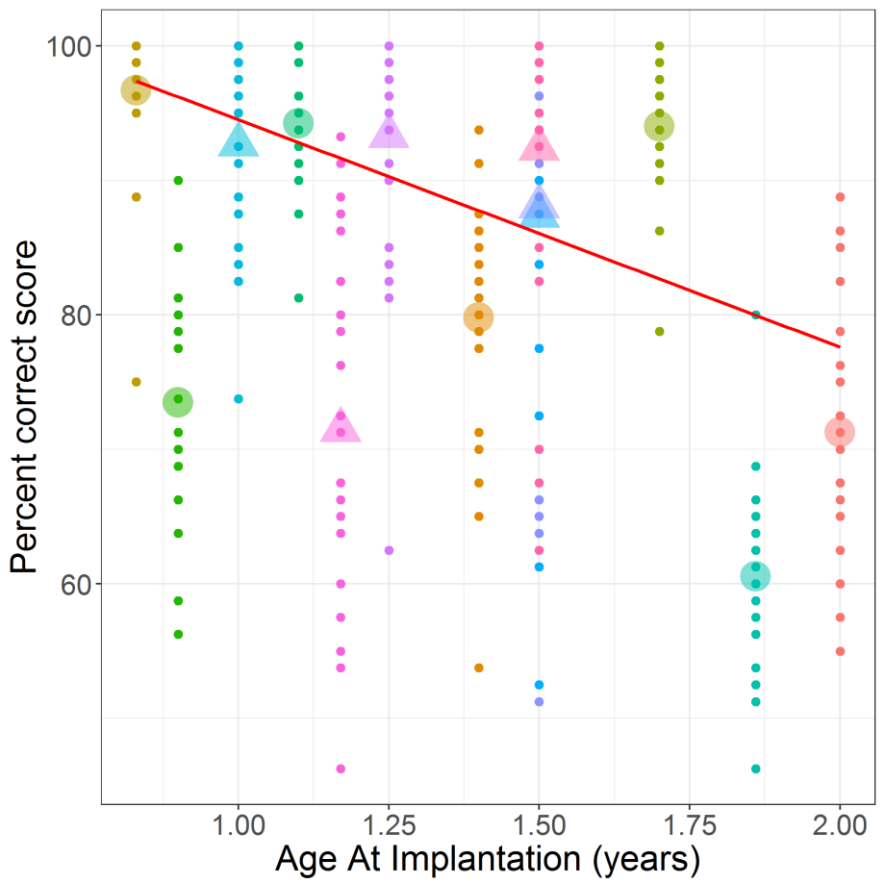




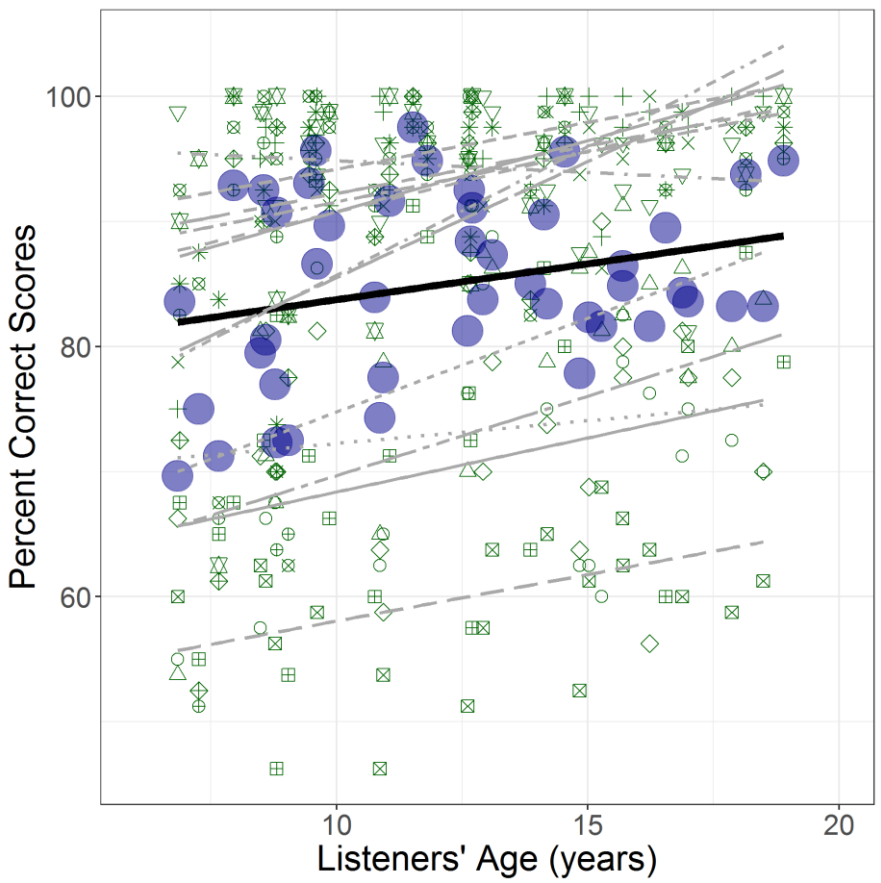
Predictors of how well Child CI Talkers' Intended Emotions are Understood by Peers

Damm et al., JSLHR 2019

The Child CI Talker's Age at Implantation Matters



The NH Child Listener's Age Matters

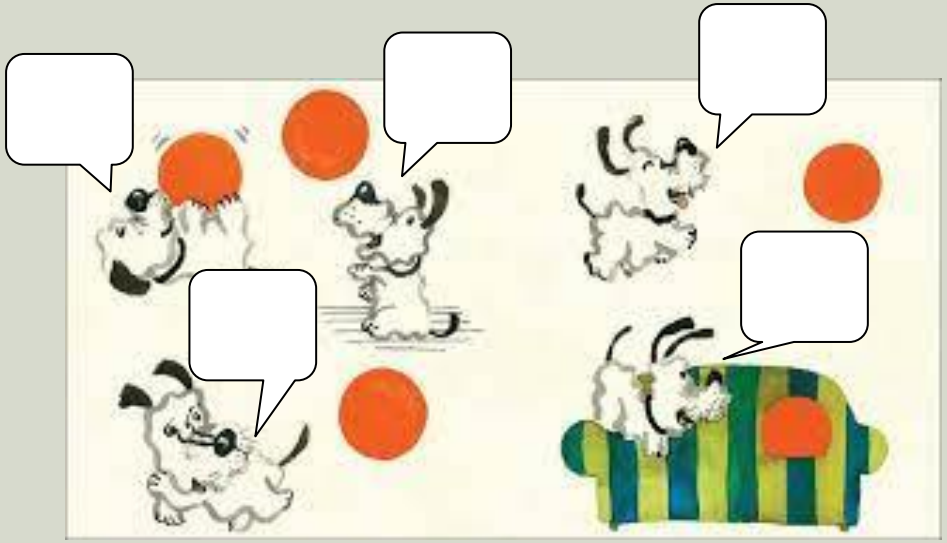


New Directions

Conversations with SLPs

NEW METHODS TO ELICIT EMOTIONAL SPEECH

-- An attempt to develop a more naturalistic way of eliciting emotional speech in children
[Sophie Ambrose, Kayla Skaggs, Sarah Al-Salim, Aditya Kulkarni, Ava Feller, John J Galvin]

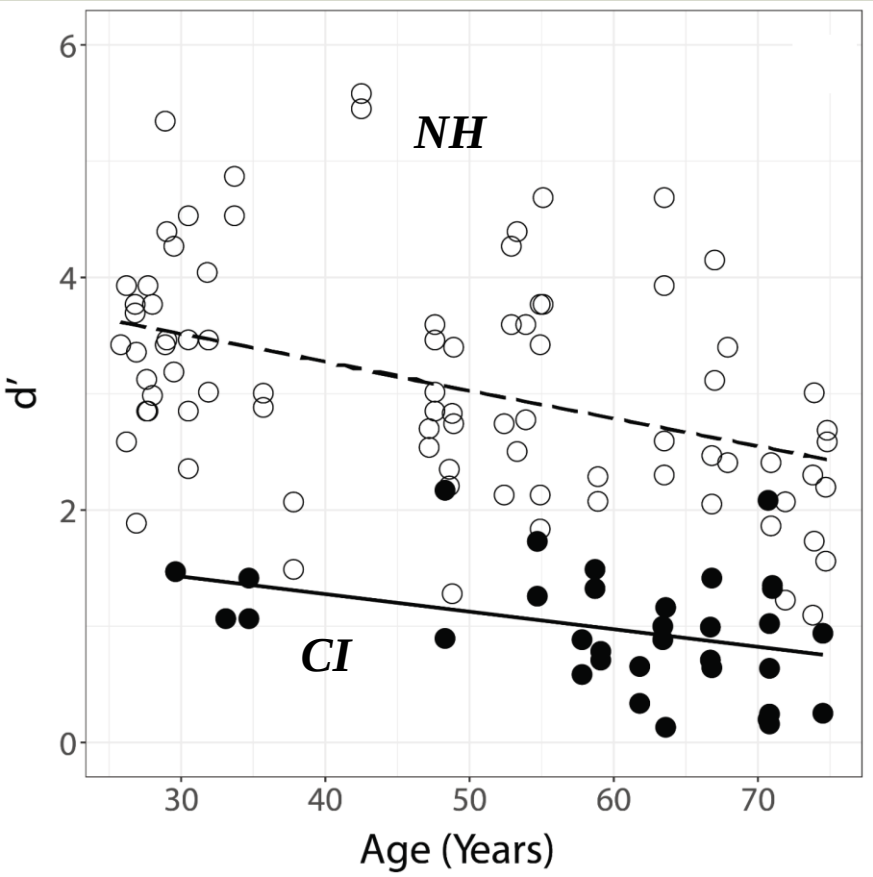


Positive

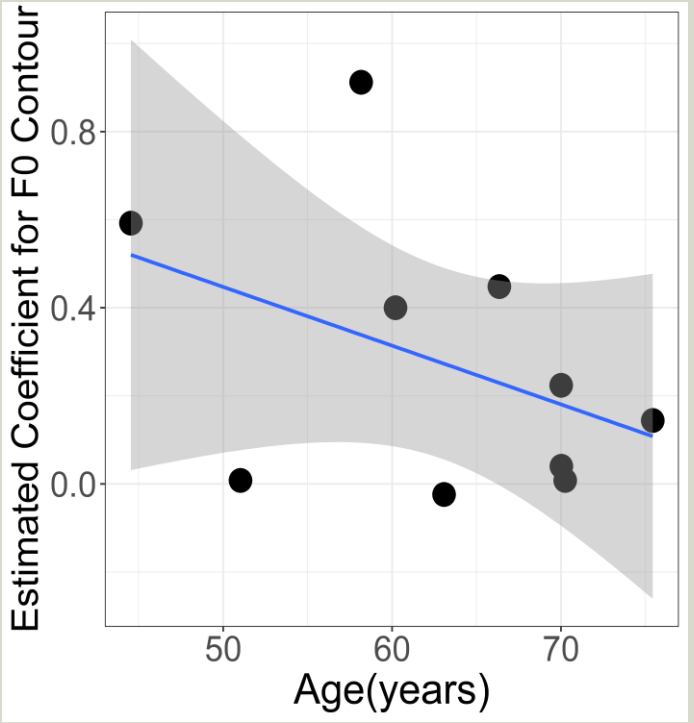
Negative

ADULTS SHOW AGE-RELATED DECLINE IN EMOTION PERCEPTION

Cannon & Chatterjee, 2022, Ear & Hearing

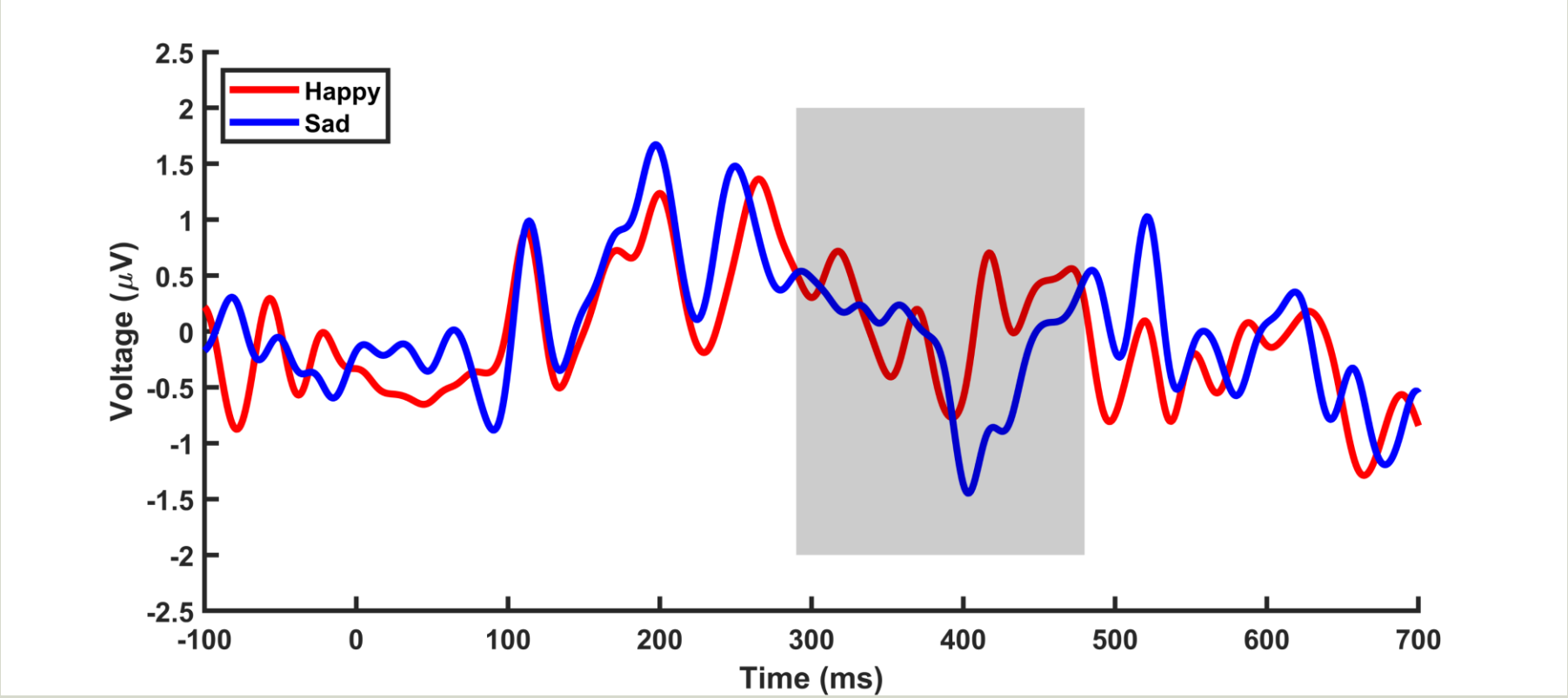



Shauntelle Cannon

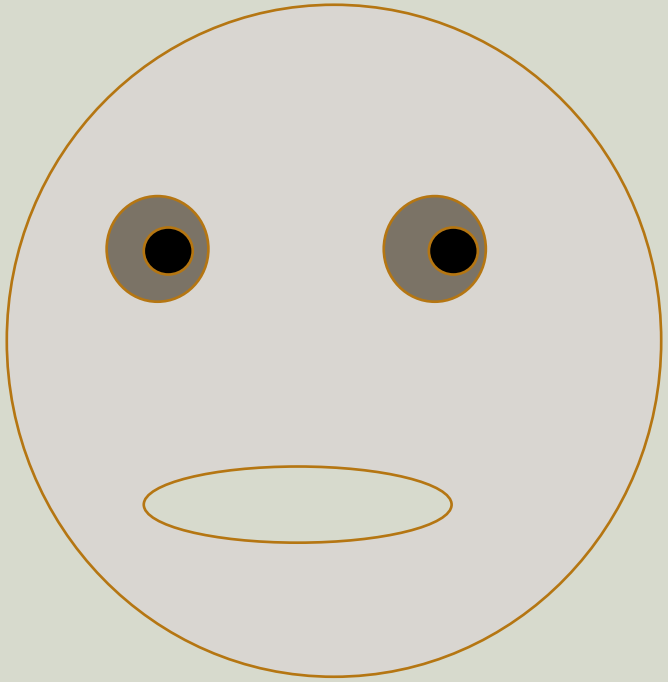



Aditya Kulkarni

Collaboration with Dr. Shuman He (OSU) and Dr. Zilong Xie (Florida State University)



Audiovisual Integration of Emotional Speech



Dr. Kaylah Lalonde, PI
Grace Dwyer, RA

Audiovisual Speech Processing Lab
Boys Town National Research Hospital

COLLABORATORS AND FUNDING SOURCES

BTNRH

- Aditya Kulkarni
- Julie Christensen
- Shauntelle Cannon
- Gretta Richter
- Sara Damm
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T35 trainees

- Danielle Zion
- Alison Goren
- Anna Tinnemore
- Shauntelle Cannon
- Harley Wheeler
- Gretta Richter
- Alyssa Wciorka
- Jessica Combs

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- Meredith Caldwell
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