

Helping children with autism tune into voices

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Meet The Scientist Webinar

Brain & Behavior Research Foundation (BBRF)

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Career background and path to neuroscience

Music



Sound
Production



Loudspeaker
Design



Acoustics



Auditory
Neuroscience



From studying sound to studying
how the brain understands voices

Why voices matter

Connectedness

Reward

Communication

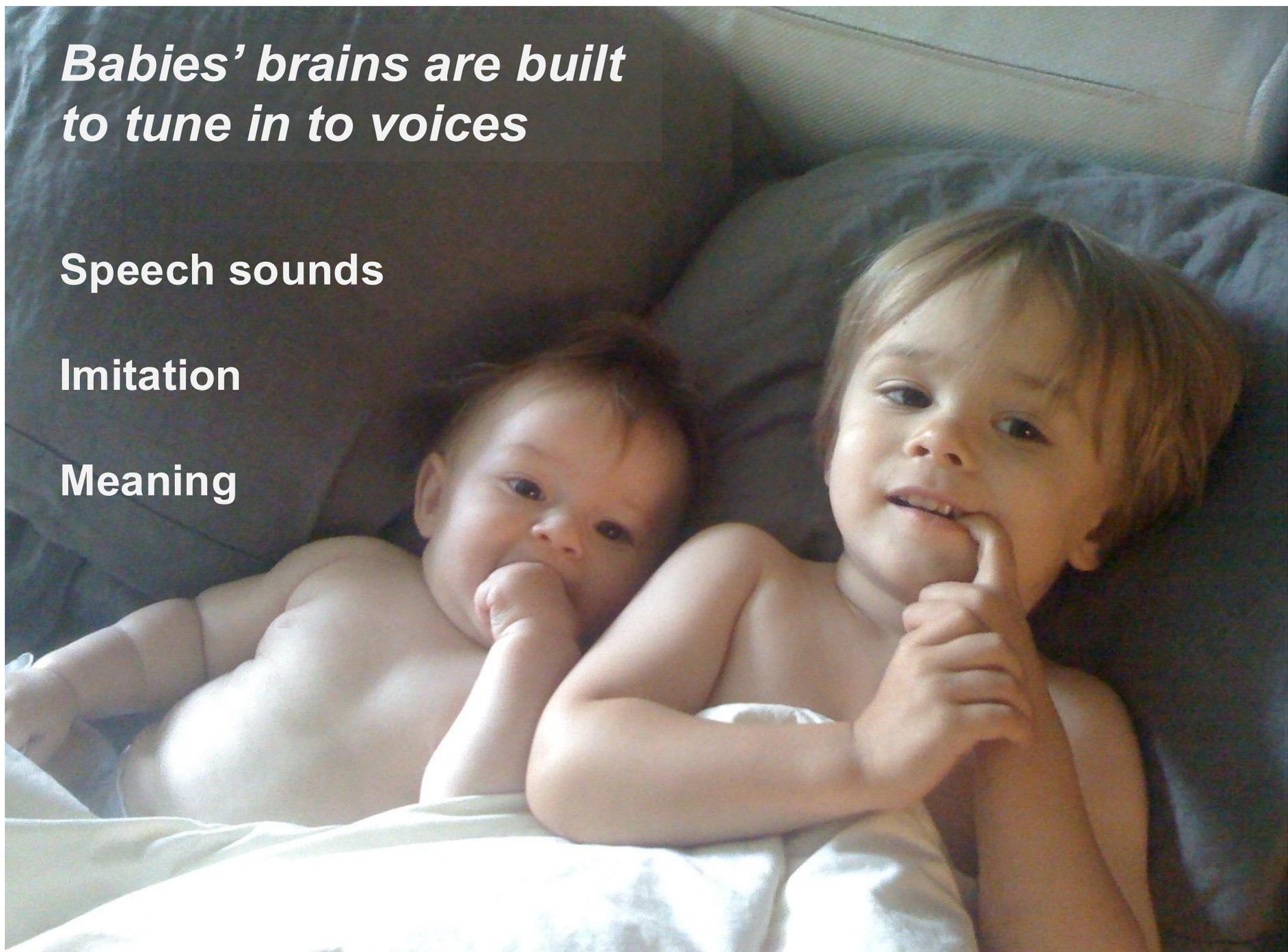


***Babies' brains are built
to tune in to voices***

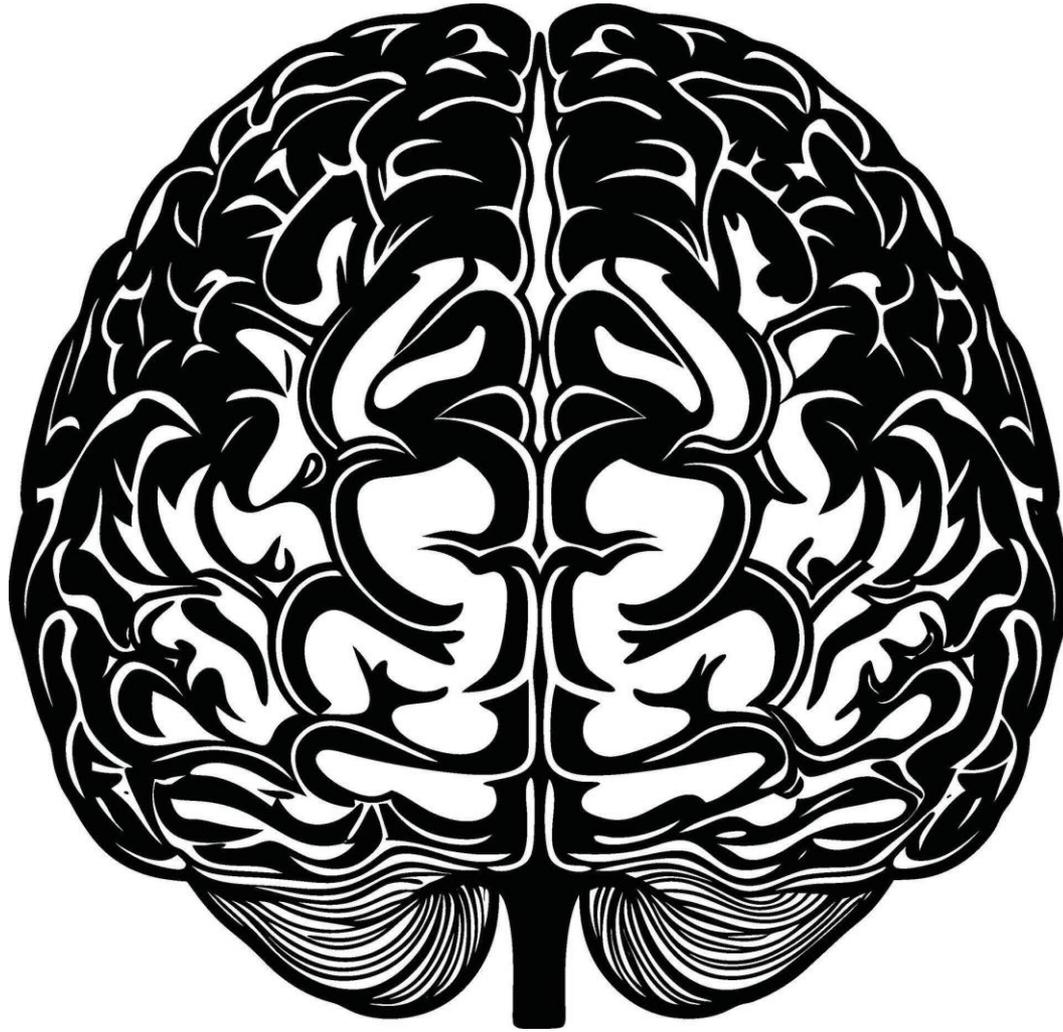
Speech sounds

Imitation

Meaning



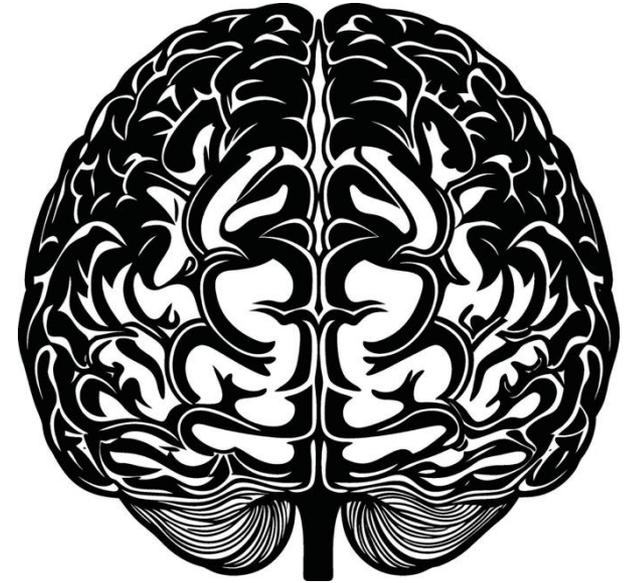
How does the brain understand voices?



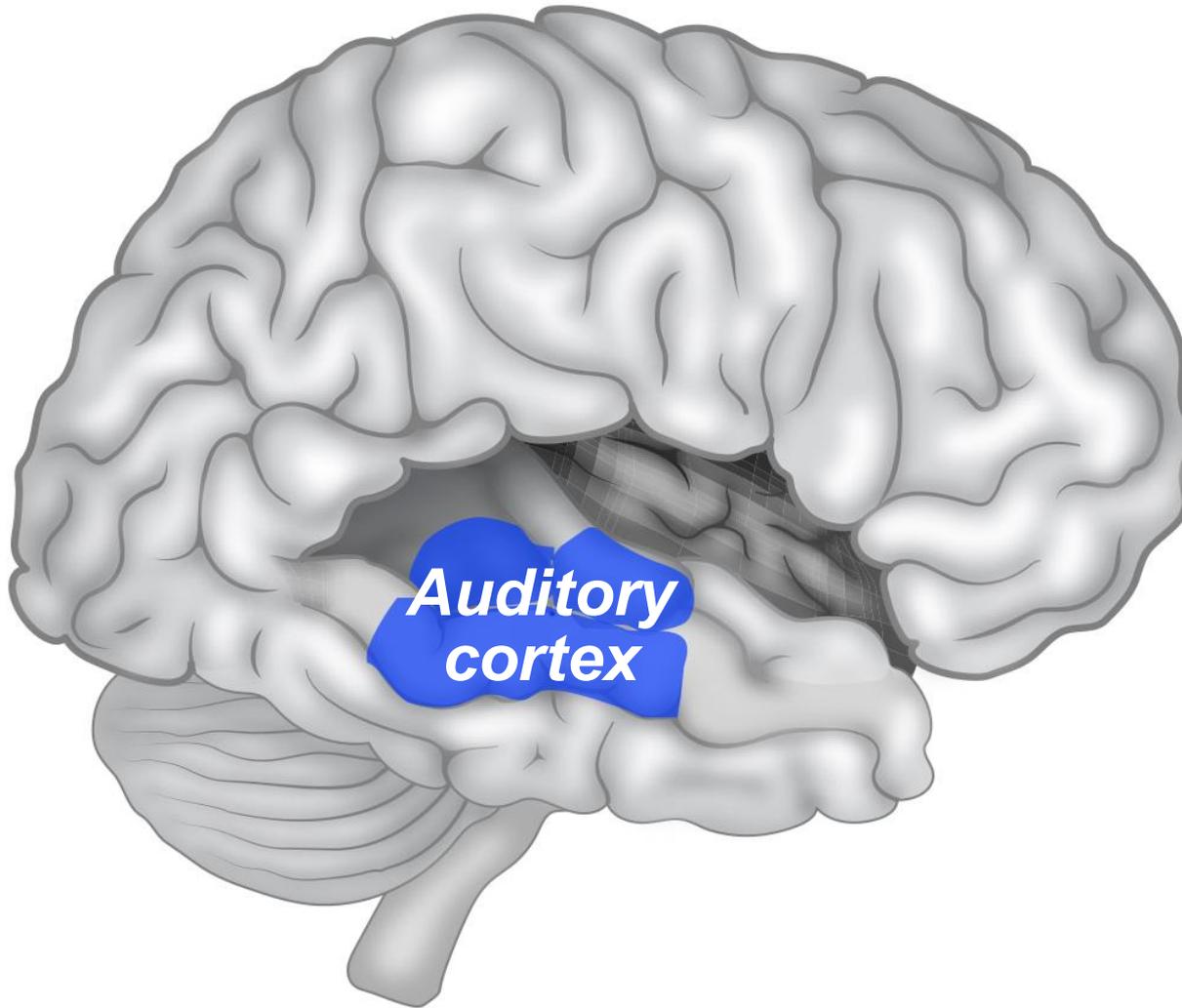
And how might this work differently in autistic children?

Why studying voices matters

- *Understand how the brain supports speech and social connection*
- *Identify brain systems that may shape communication differences in autism*
- *Help guide future approaches to support communication and social connection.*

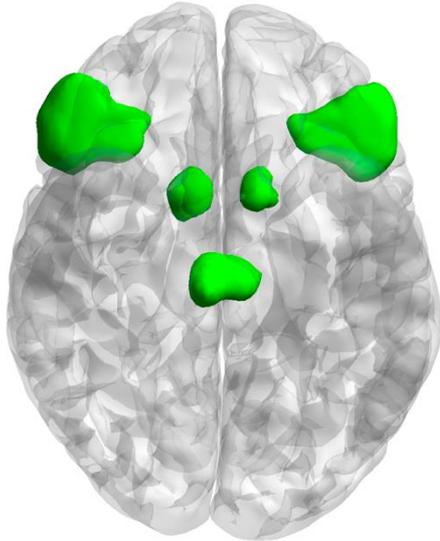


The hearing brain

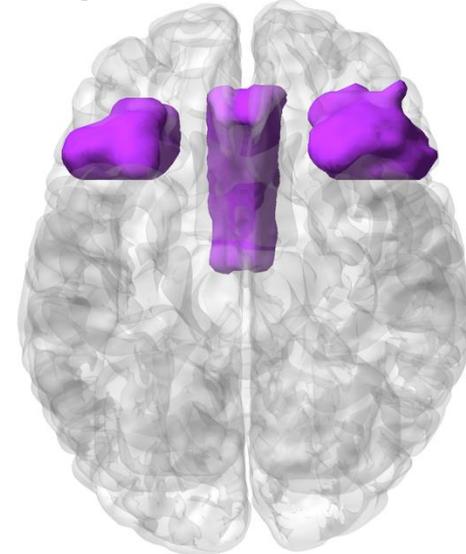


Brain Systems Supporting Social Interactions

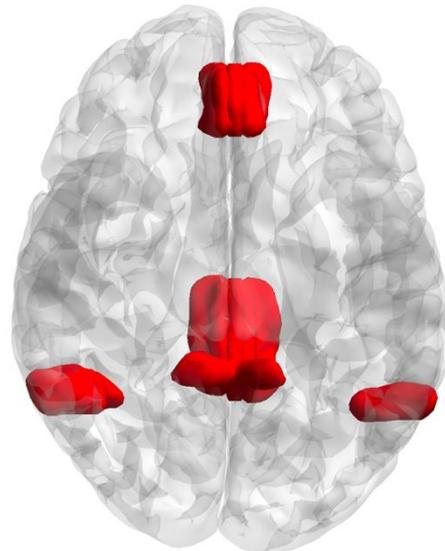
Reward



Detection of important social cues

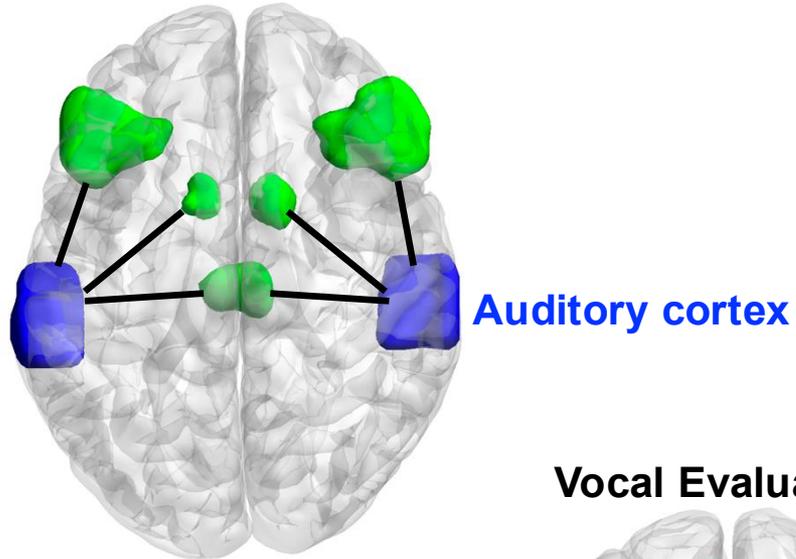


Social Evaluation

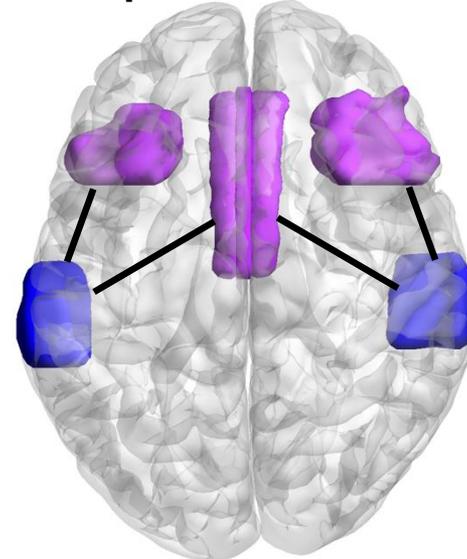


Auditory-Social Brain Interactions

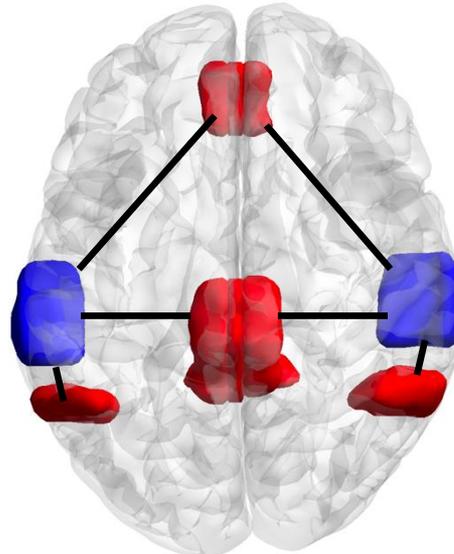
Vocal Reward



Detection of important voices



Vocal Evaluation



How does a child's brain recognize a mother's voice?

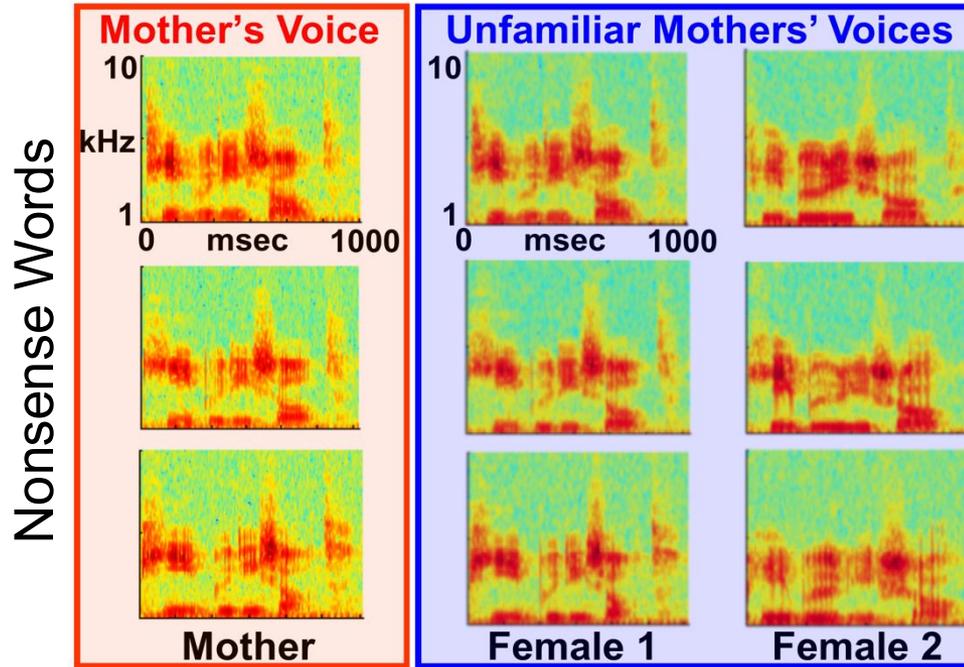
Children listened to:

Mother's Voice *vs.* *Unfamiliar Voices*

Brain activity measured with fMRI

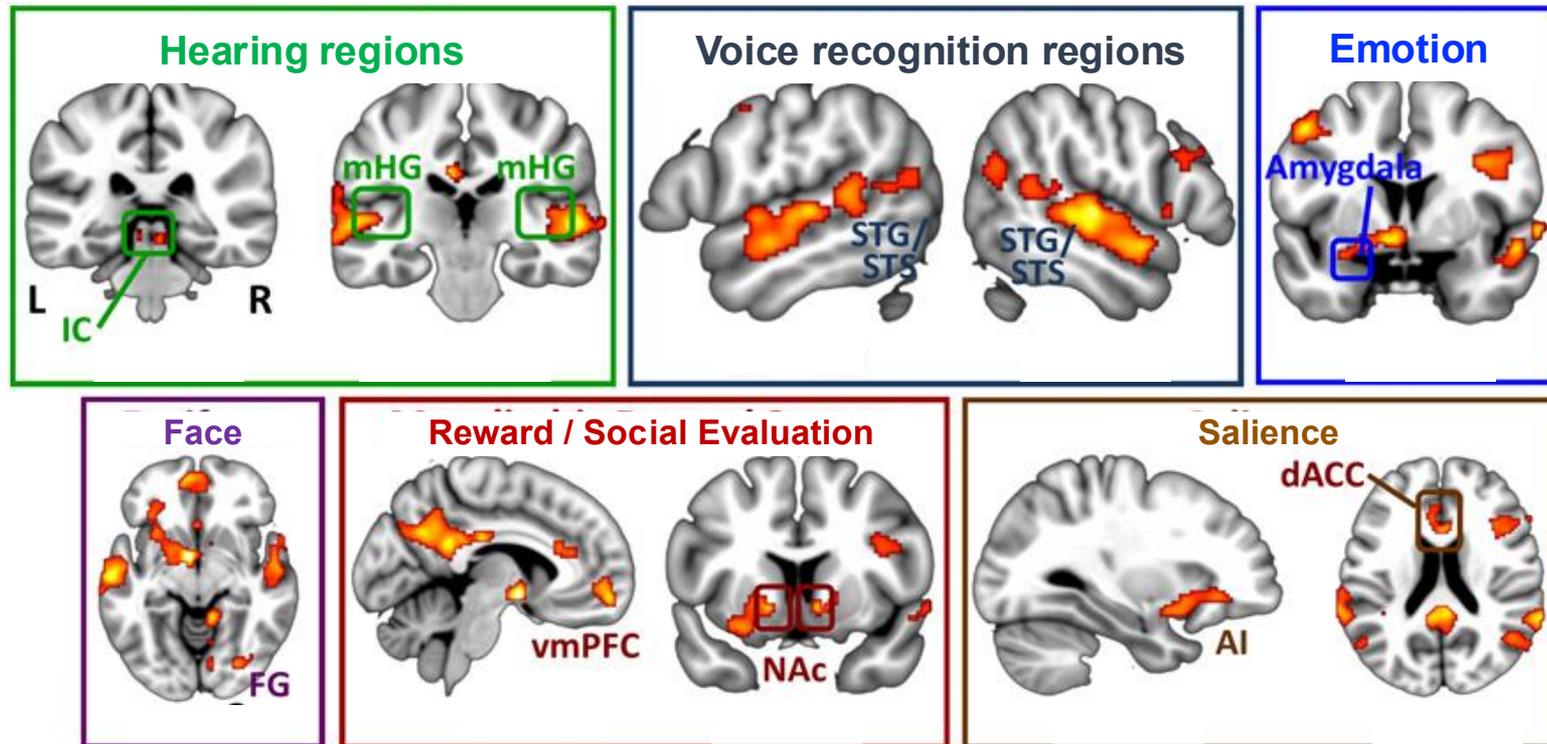
Vocal Stimuli

Mothers voice vs. Unfamiliar voices



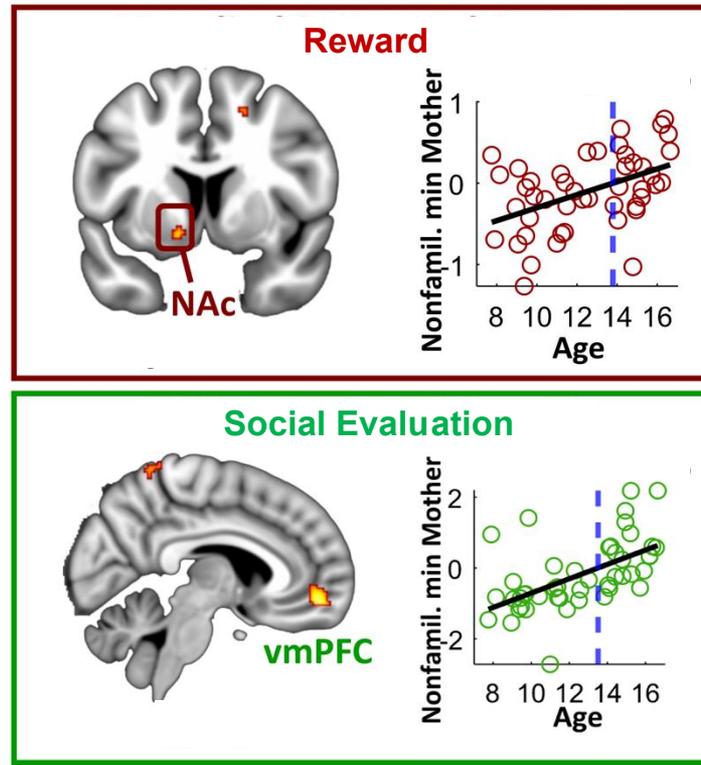
fMRI Results: Neurotypical children

Mother's voice activates social and reward networks



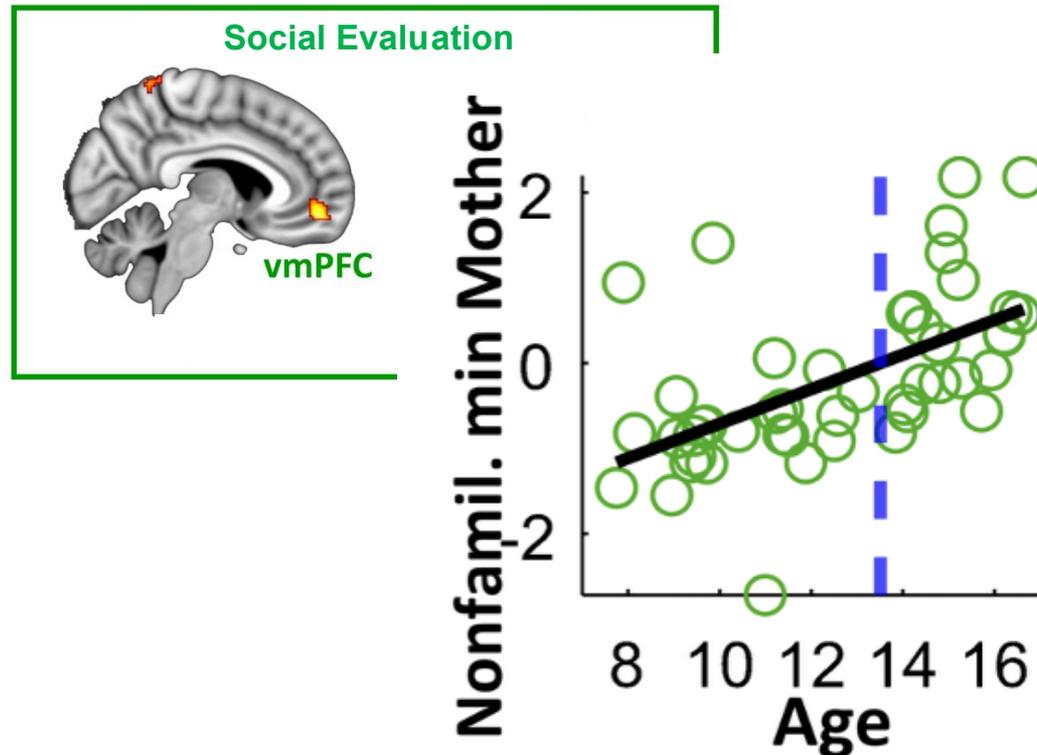
fMRI Results: Neurotypical adolescents

Adolescence: the brain shifts from mother's voice → new voices



fMRI Results: Neurotypical adolescents

Adolescence: the brain shifts from mother's voice → new voices



fMRI Study: Children with Autism

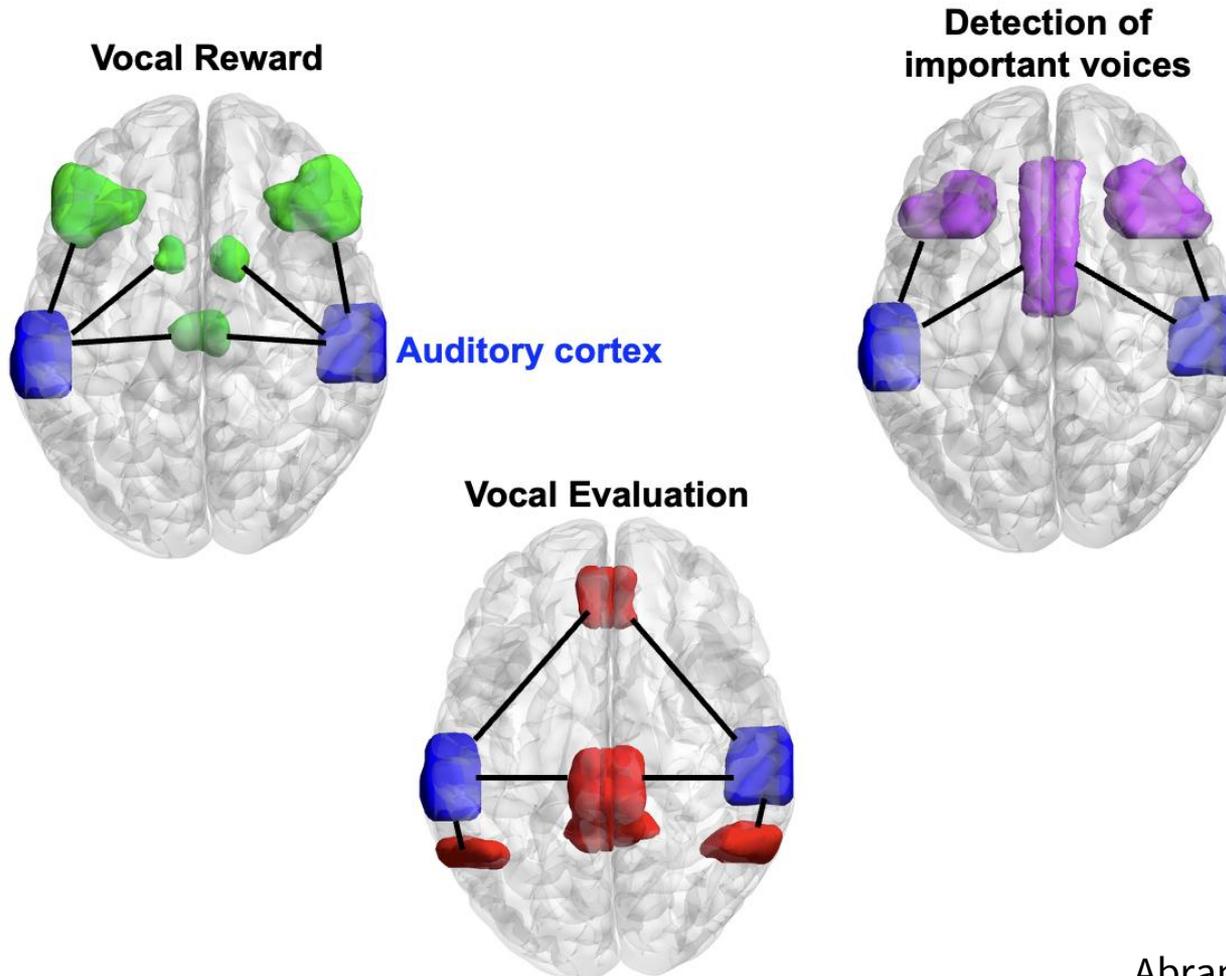
How does the autistic brain respond to a mother's voice?

Children listened to:

Mother's Voice *vs.* *Unfamiliar Voices*

fMRI Results: Children with Autism

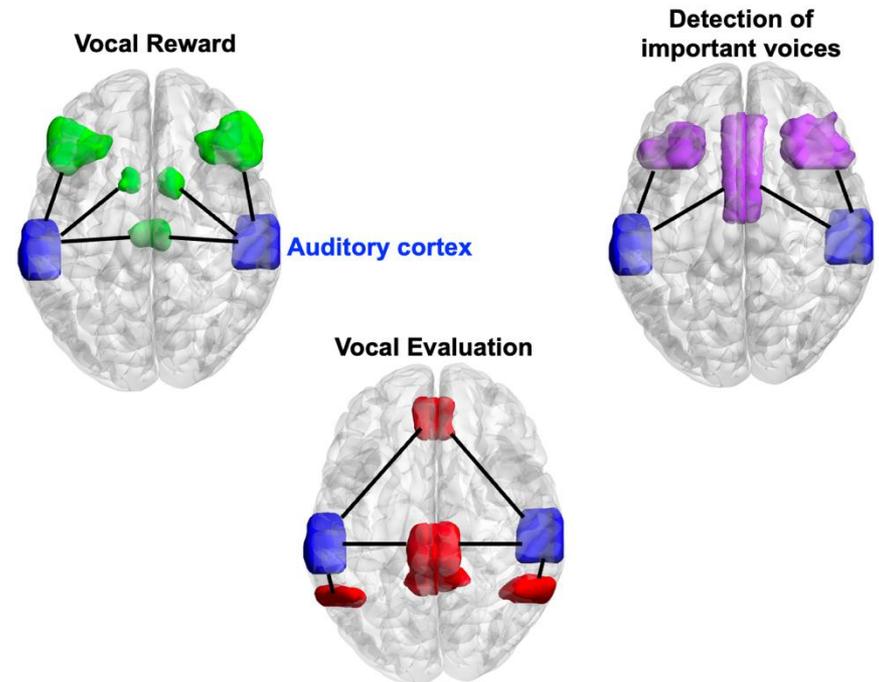
Voice processing differences were linked to interactions between auditory cortex and multiple social brain systems



fMRI Results: Children with Autism

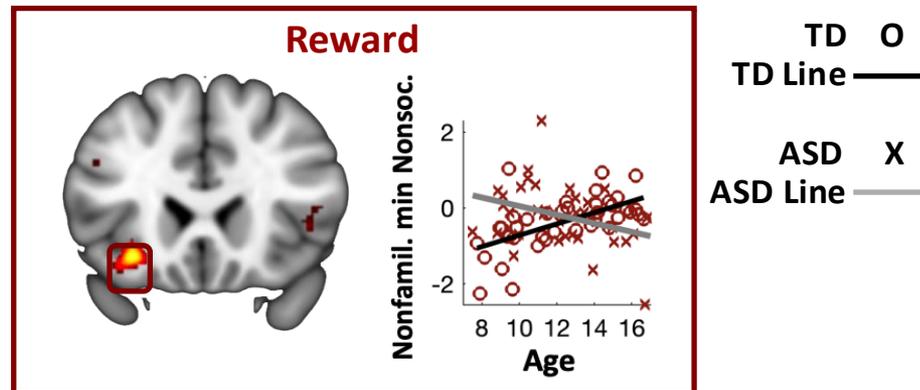
Voice processing differences were linked to interactions between auditory cortex and multiple social brain systems

- *Distinguish ASD from neurotypical children*
- *Predict social communication ability within ASD*



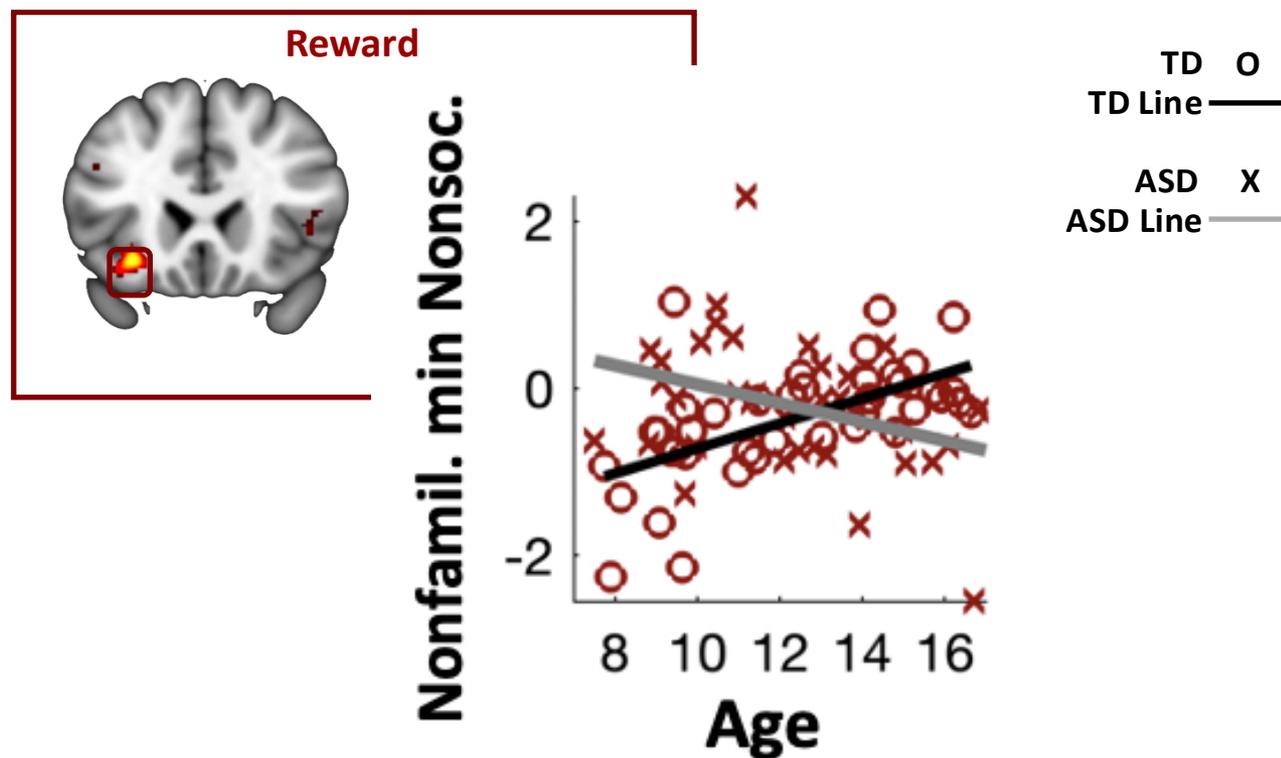
Preliminary fMRI Results: Adolescents with ASD

The developmental shift toward new voices appears altered in ASD



Preliminary fMRI Results: Adolescents with ASD

The developmental shift toward new voices appears altered in ASD



New Research Direction: Integrating Speech Over Time

- *Speech unfolds over multiple words and sentences*
- *The brain must integrate information across time to understand meaning*
- *We are studying how these processes work in neurotypical and autistic children*

fMRI Study: Autistic Children

How does the autistic brain integrate speech over time?

Children listened to:

Meaningful Stories
(coherent narrative)

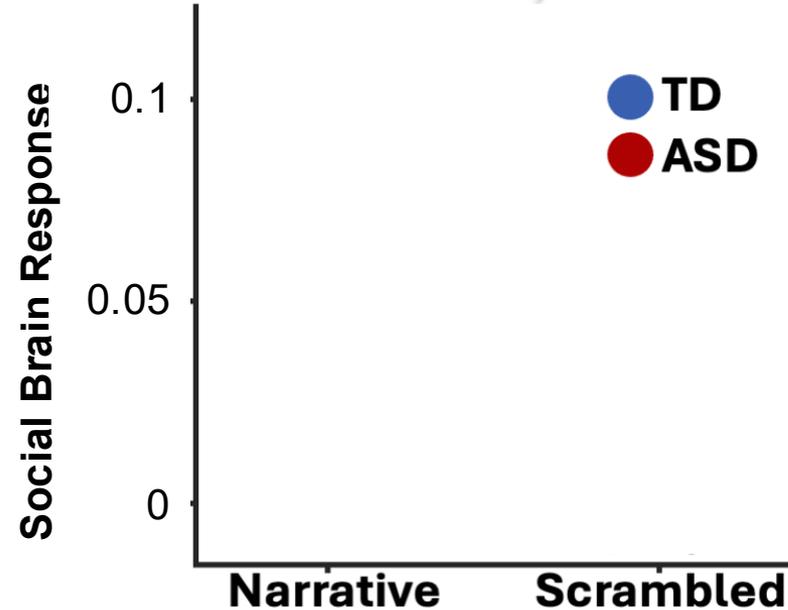
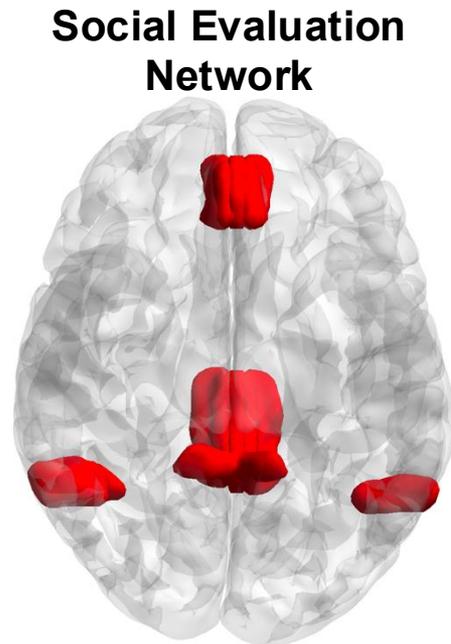
vs.

Scrambled Speech
(same words, no story)

This allows us to identify brain regions that integrate speech information across longer timescales.

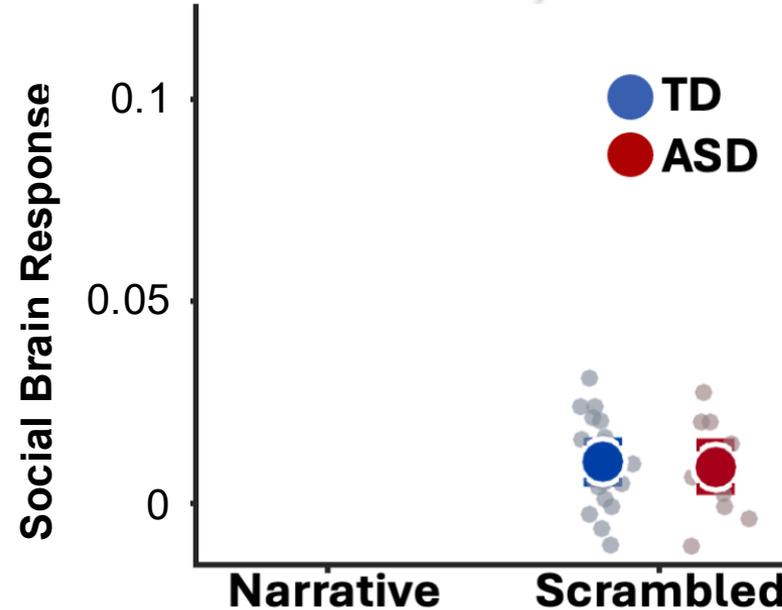
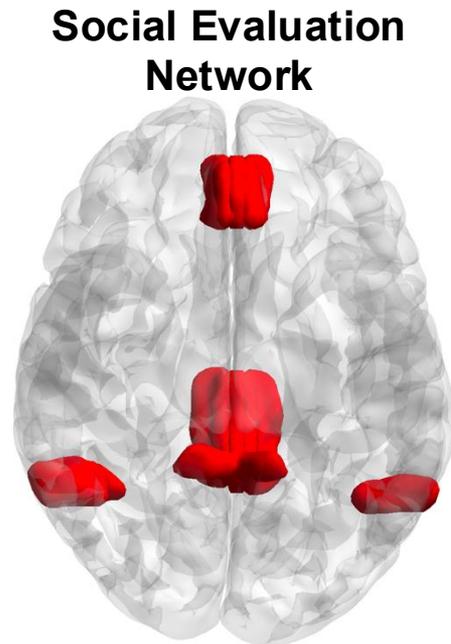
Preliminary fMRI Results:

Children with autism show reduced integration of speech across time



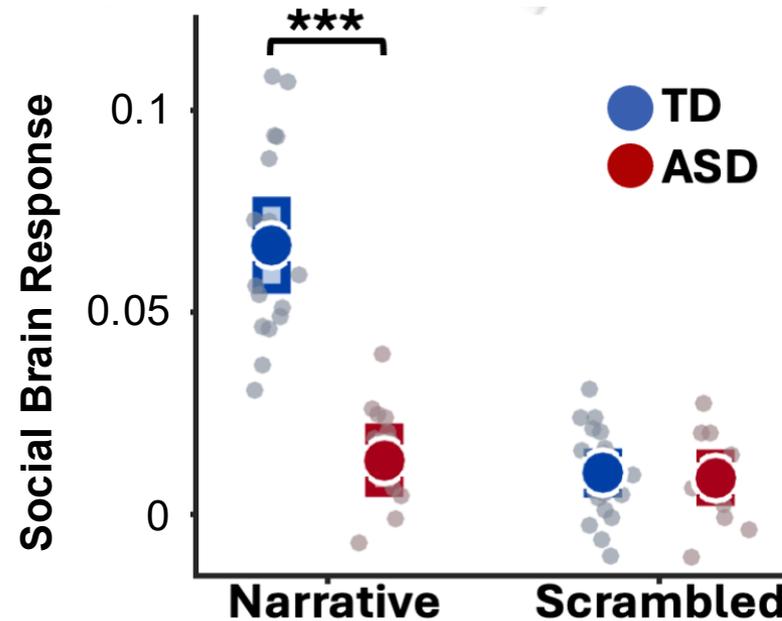
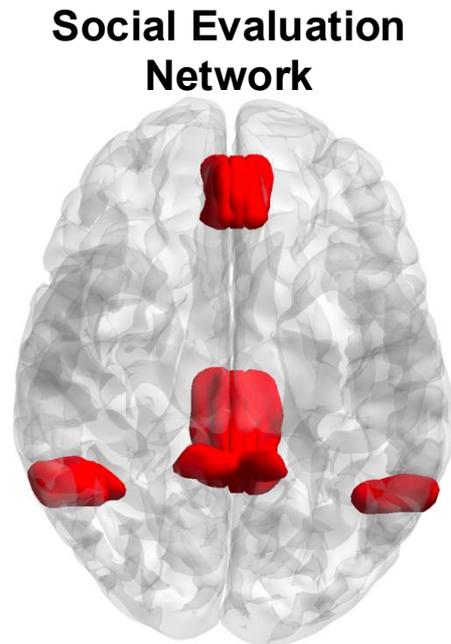
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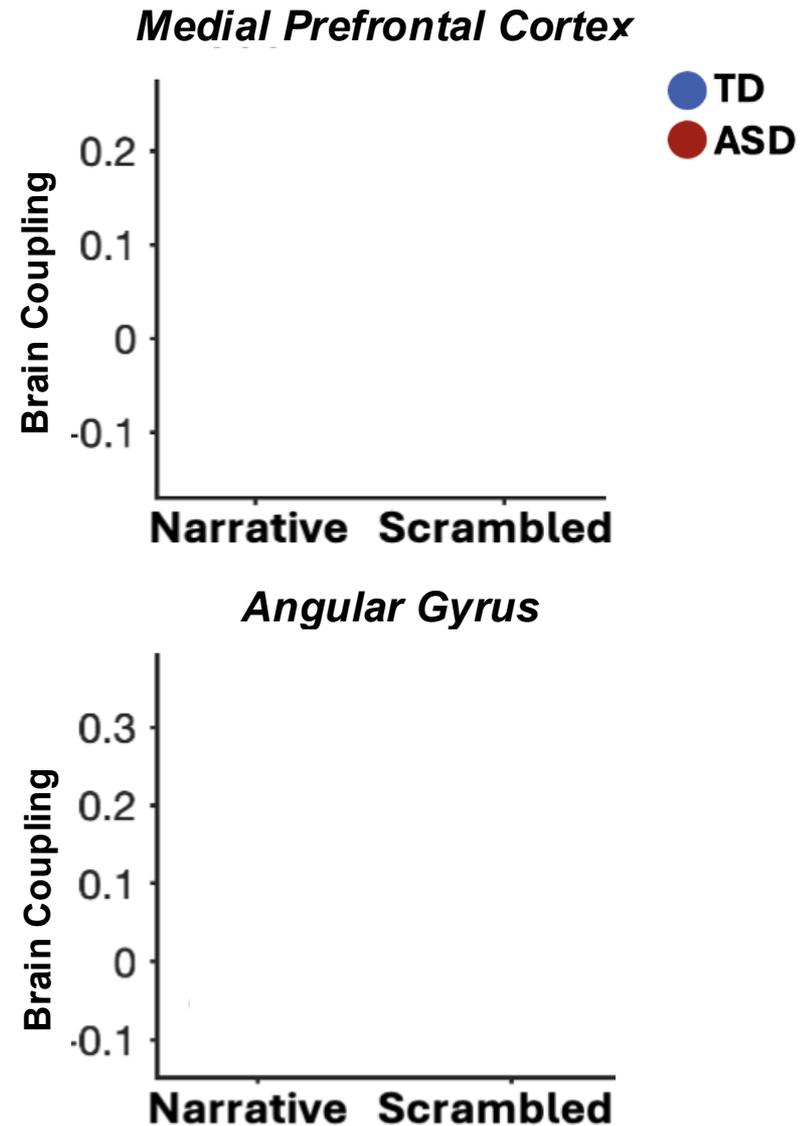
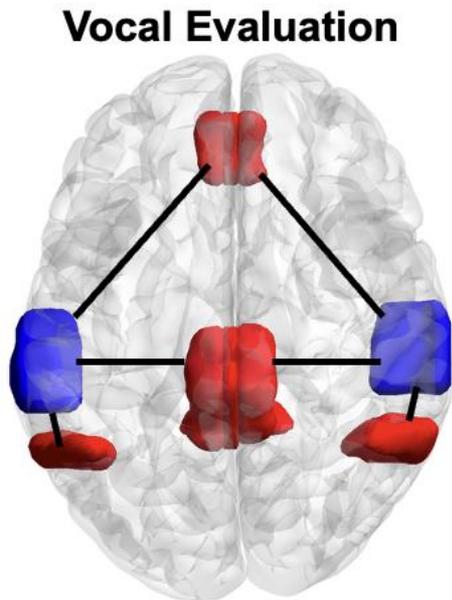
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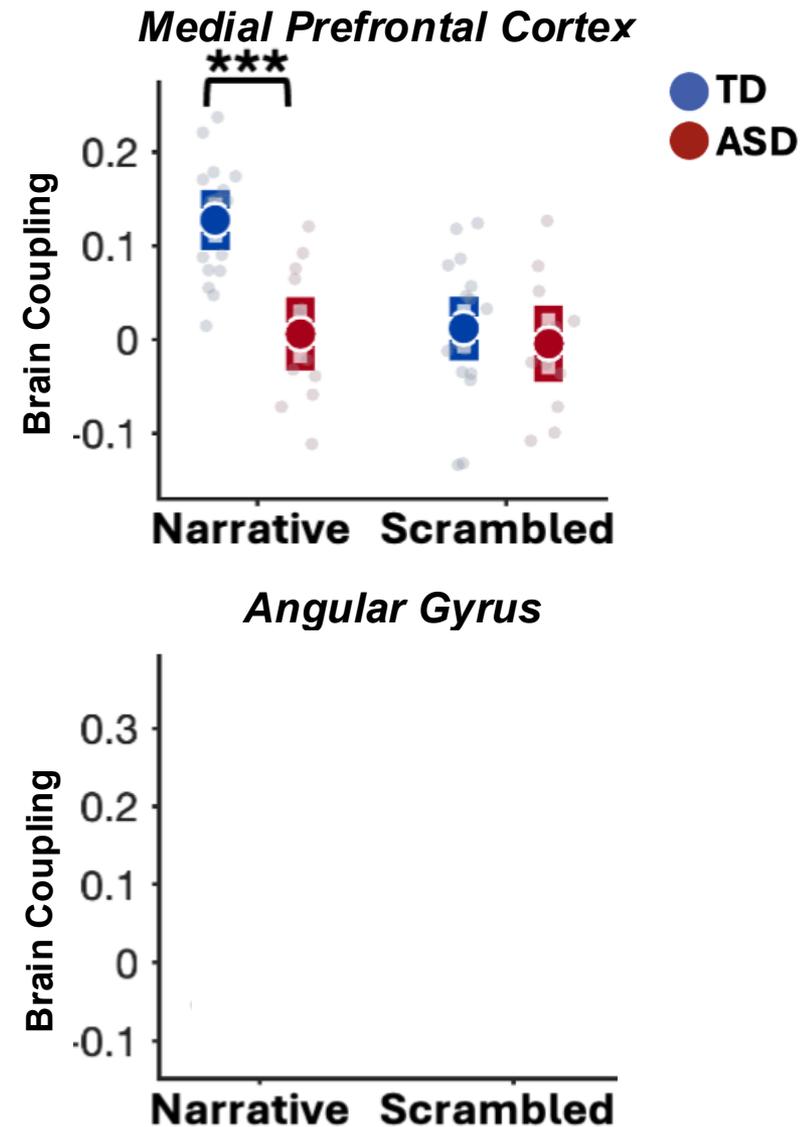
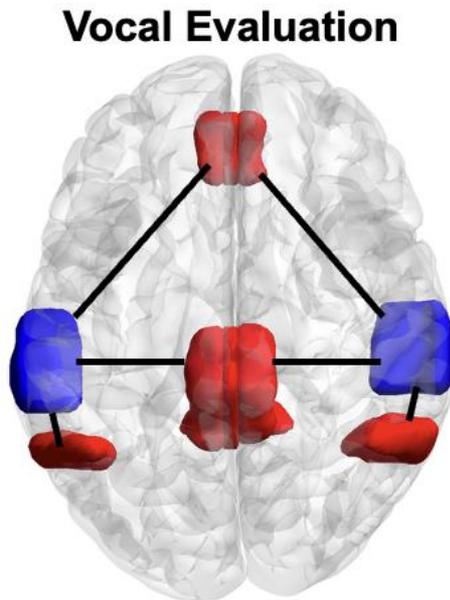
Preliminary fMRI Results:

Reduced coupling between auditory cortex and social brain systems in autism



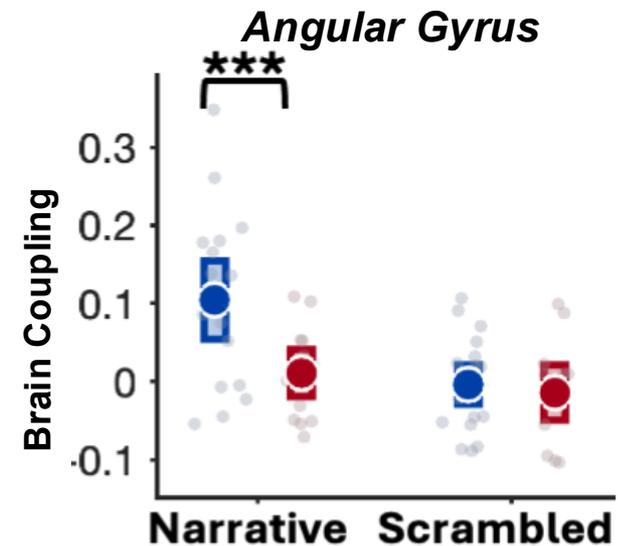
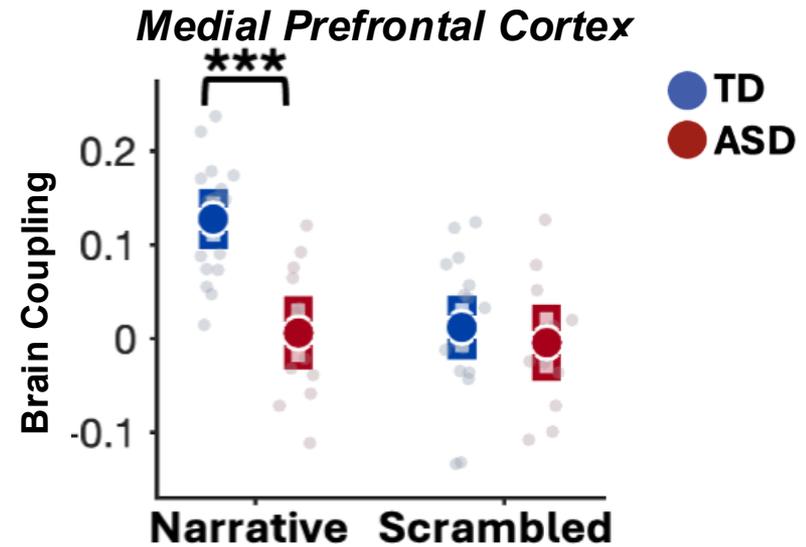
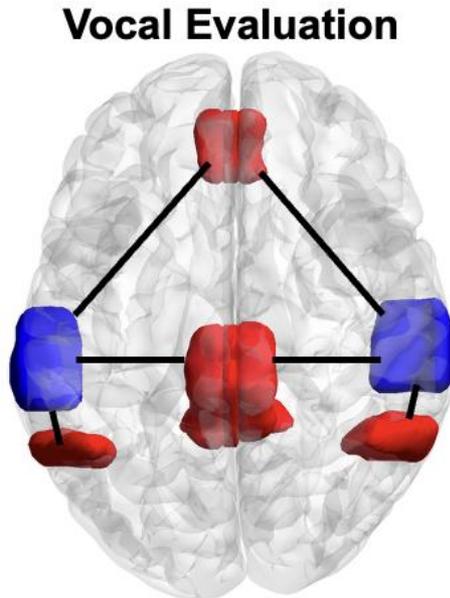
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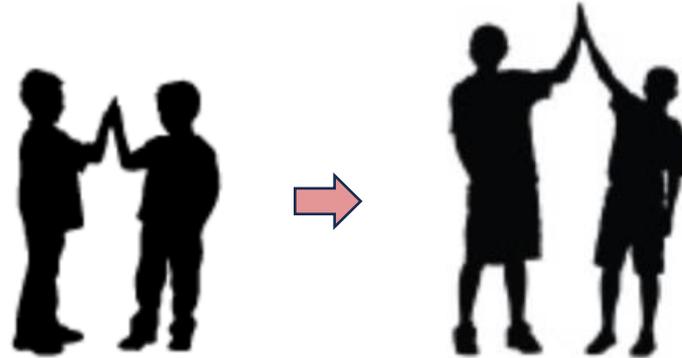
Reduced coupling between auditory cortex and social brain systems in autism



What we learned about voice processing in autism

- 1. Voice processing differences involve interactions between auditory cortex and social brain systems**
 - Brain systems involved in **reward and social evaluation** appear particularly important
- 2. These brain systems change across development**
- 3. Integration of speech across time in social brain regions is reduced in autistic children**
- 4. These findings suggest specific neural targets for future research and intervention**

Where this research is headed



- 1. Following children over time (longitudinal research)**
- 2. Studying communication in real-world conversations**
- 3. Understanding brain plasticity associated with social interventions**

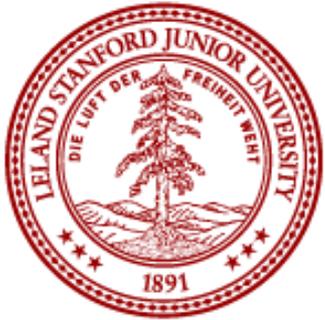
Conclusions:

Helping children with autism tune into voices

- 1. Voices are powerful signals for social connection**
- 2. Differences in how the brain processes voices may shape social communication in autism**
- 3. Understanding these brain systems may help guide future approaches to support communication**

Acknowledgments

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 **BRAIN &
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RESEARCH FOUNDATION

SFARI

Thank you for your attention!!



Dan Abrams, Ph.D.

Email me with questions: daa@stanford.edu