

Neural Auditory Attention Profiles Across Autism-Associated Monogenic Groups

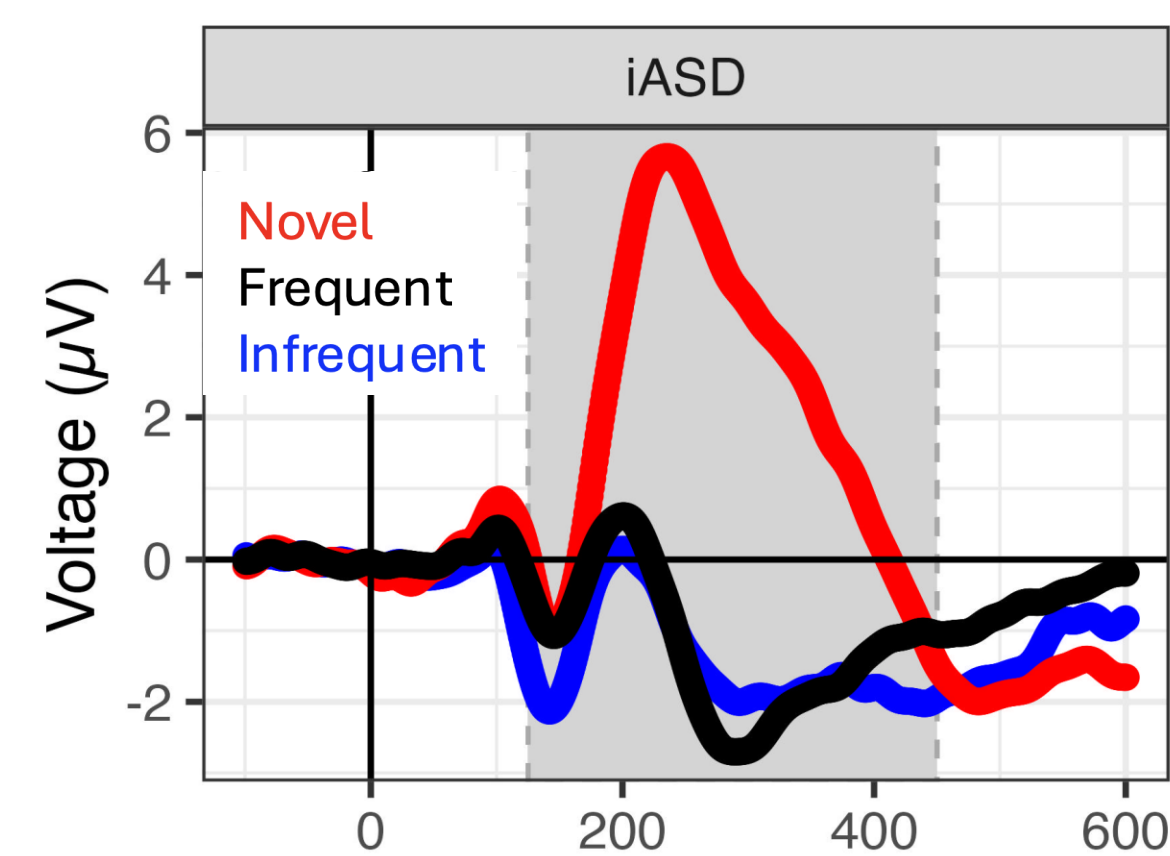
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Background

- Some monogenic conditions linked to **autism** show differences in sensory processing and attention (1,2,3,4).
- Attentional orienting** is the brain's automatic response to new or important sounds, reflected in an early brain response (called P3) to novel stimuli (5).
 - This process supports everyday communication and social engagement.
- Language and communication challenges are common in autism.
- It is unclear whether attention differs when auditory changes involve **speech** versus **non-speech tones** (6).



Objectives

- Examine neural responses to auditory novelty in **speech and tone contexts**
- Compare attentional orienting across autism-associated **monogenic groups**

Methods

- Participants:** 45 individuals with monogenic variants
 - GRIN2B*, *MED13L*, *SCN2A*, and *SETBP1*
- Task:** Passive auditory oddball paradigm
 - Speech and tone contexts (5)
- Measure:** EEG P3 amplitude (125-450 ms)
 - A marker of attentional orienting
- Analysis:**
 - Compared responses to **novel versus frequent** sounds
 - Compared responses across speech and tone contexts and gene groups

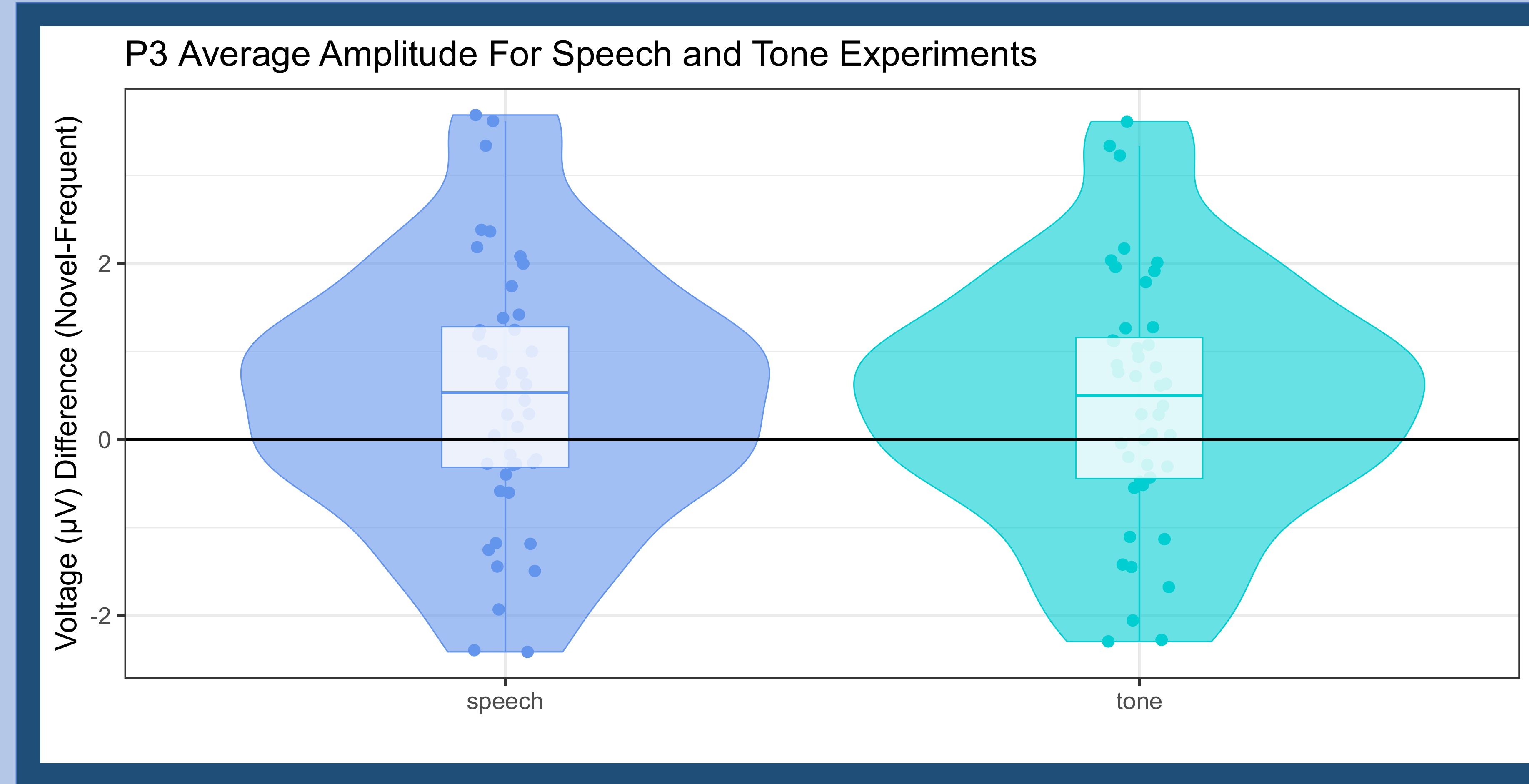
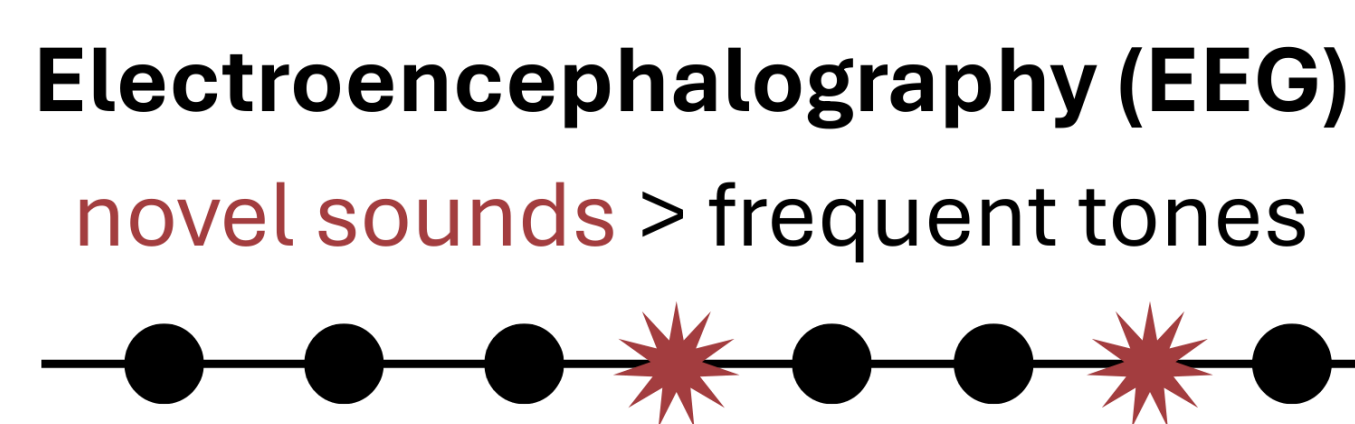


Figure 1. P3 Average Amplitude For Speech and Tone Experiments.

- A linear mixed-effects model indicated P3 amplitude was higher for novel sounds than for frequent sounds across participants
 - The auditory oddball task reliably reflects early attention to sound changes.
- A significant main effect of condition was observed ($F(1, 23503) = 9.25, p = 0.002$).
 - This effect was consistent across speech and tone tasks.
- No differences in P3 amplitude were observed between speech and tone tasks ($ps > 0.05$).
 - Attentional responses were similar across speech and non-speech sounds.

P3 Average Amplitude Across Genetic Groups.

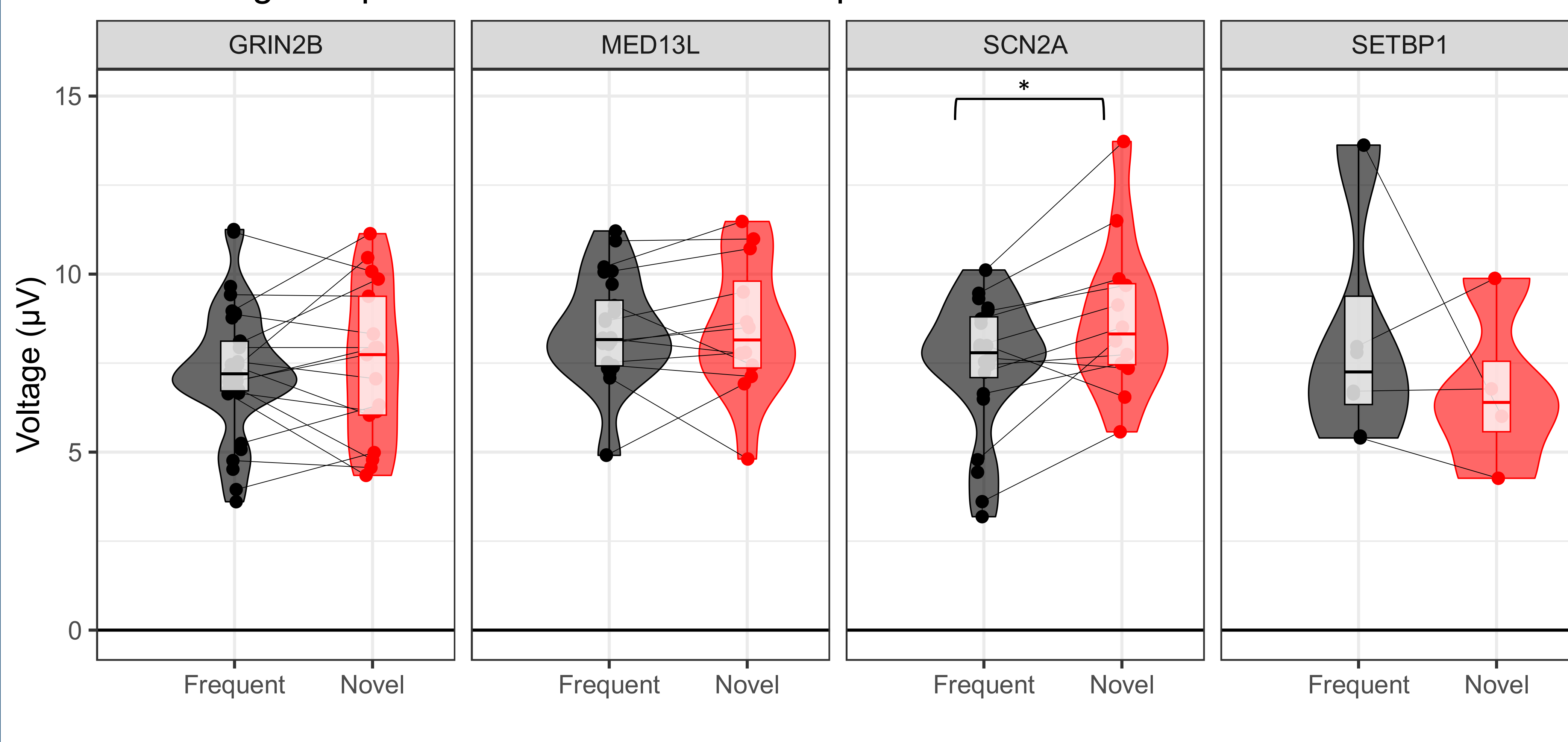


Figure 2. P3 Average Amplitude Across Genetic Groups.

- A linear mixed-effects model showed a condition by gene group interaction ($F(3,23503) = 3.08, p = 0.03$)
- SCN2A* showed the strongest difference across conditions ($B = -1.13, p = 0.001$)
 - Exploratory analyses indicate that novelty effects may be primarily driven by the *SCN2A* group.
- No other gene groups showed significant condition-related differences

Main Takeaways:

Early attention to new sounds, which supports communication, learning, and adaptive behavior, differs across genetic backgrounds in autism.

- Responses to new sounds were consistent across speech and non-speech contexts, indicating a general attention process.
- Exploratory results suggest that *SCN2A* may show stronger differences in early attentional responses compared to other genetic groups.

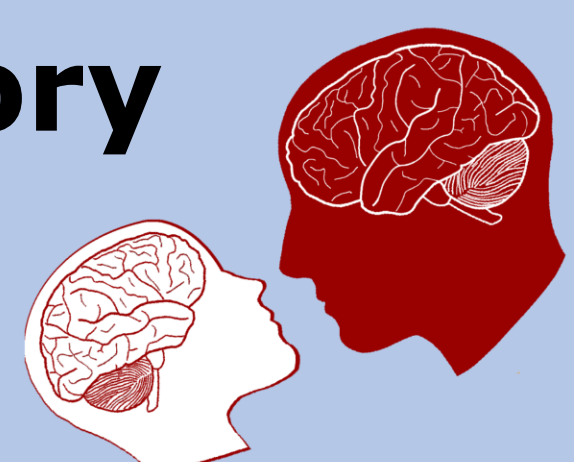
Understanding early attention processes may help connect genetics, brain function, and everyday communication, and inform future gene-informed research approaches.

Gene	Encodes For...	Total	Age Range
GRIN2B	GluN2B protein	17	4-25 years
MED13L	Transcription regulation	12	1-23 years
SCN2A	Na _v 1.2 (sodium channel)	12	3-19 years
SETBP1	Binding proteins and transcription factors	4	5-38 years



Brain Research Across Development Laboratory

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