

Radboudumc



Reaction times capture temporal interactions in electrical hearing

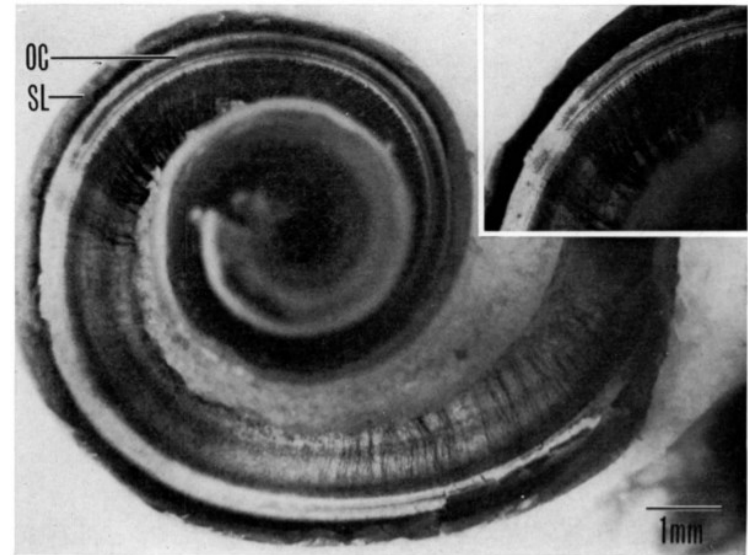
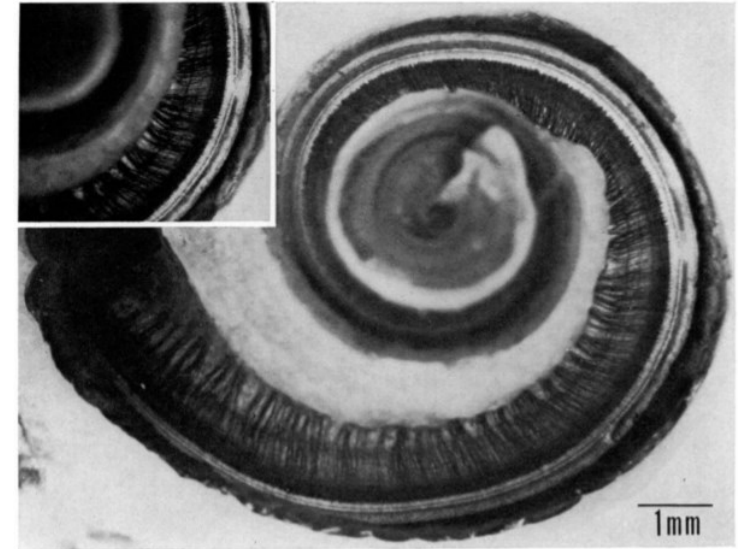
Ignacio Calderon De Palma, Andy J. Beynon, A. John van Opstal, Joerg Pesch, Emmanuel A. M. Mylanus, Marc M. van Wanrooij



Introduction

It's about time

- How does **timing between pulses affect perception** for cochlear implant users?
 - What can this tell us about the auditory periphery?
- How to **improve measurement efficiency**?
 - Reaction times?

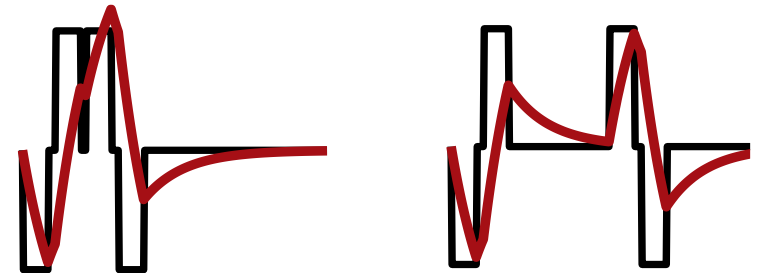
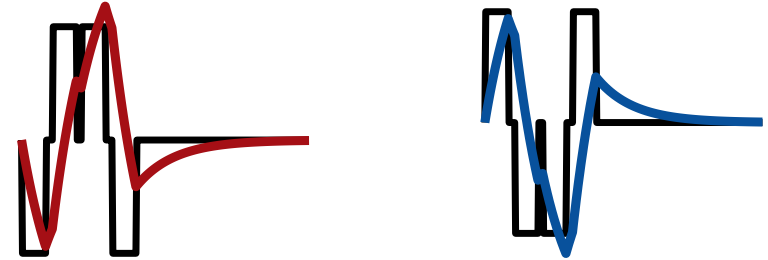




Interactions between pulses: Why?

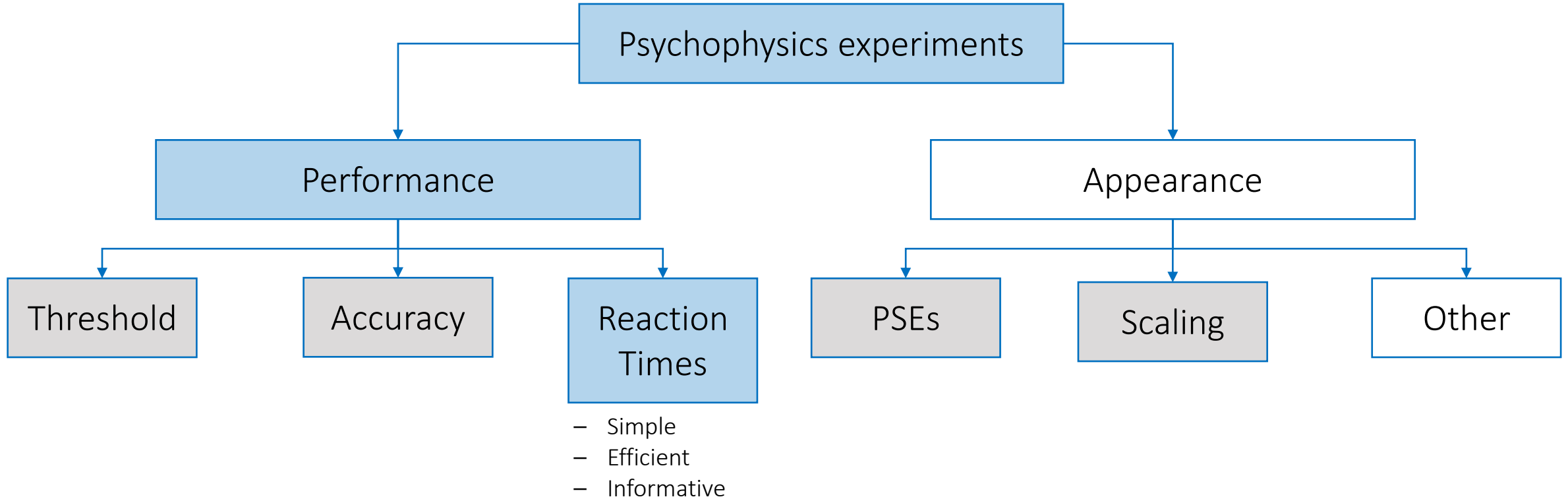
- **Polarity sensitivity**
 - Differential sensitivity to a phase of the stimulus.

- **Temporal integration**
 - Passive membrane properties of neurons.
 - Active mechanisms related to number of sodium channels



Behaviour

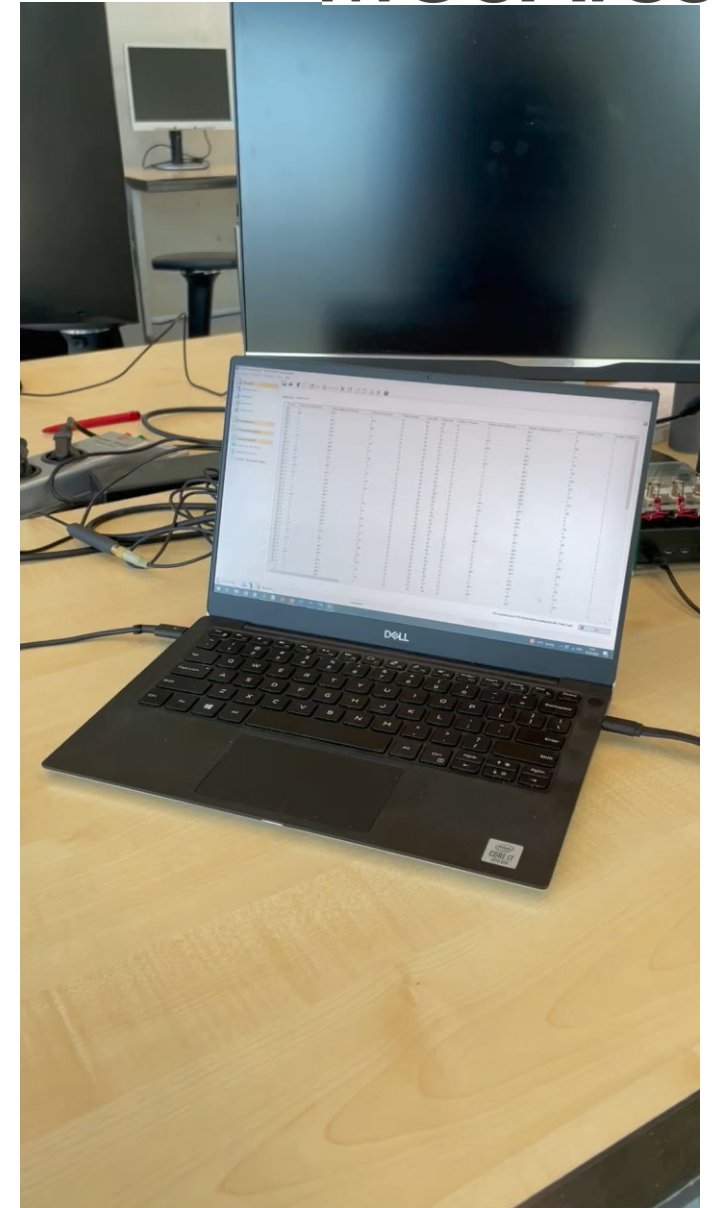
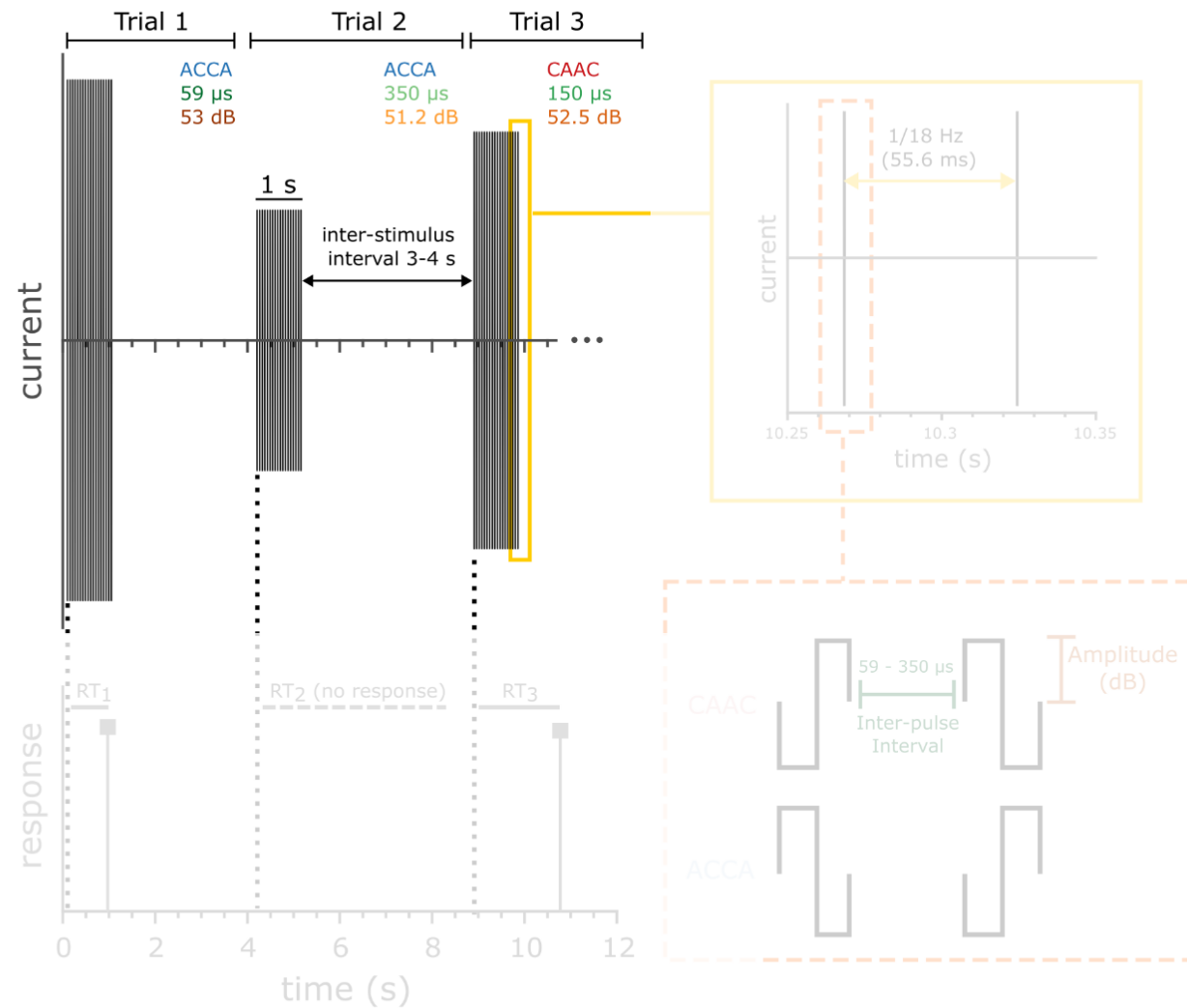
- Reaction time





Methods

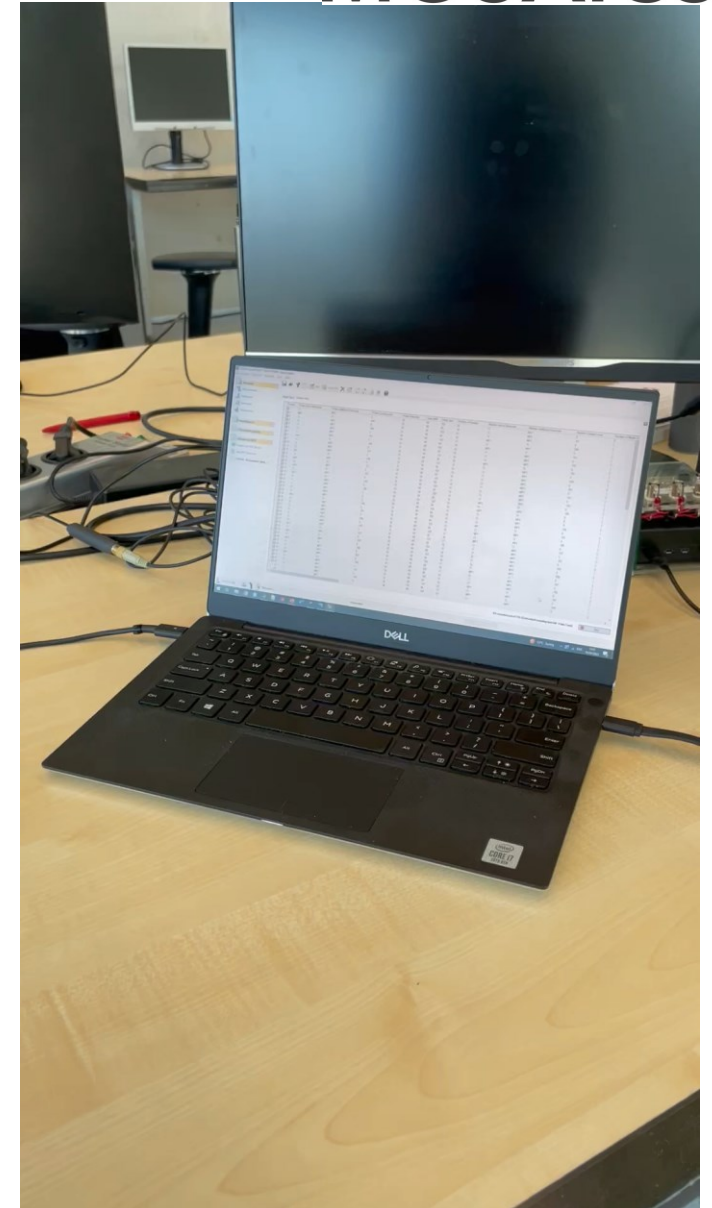
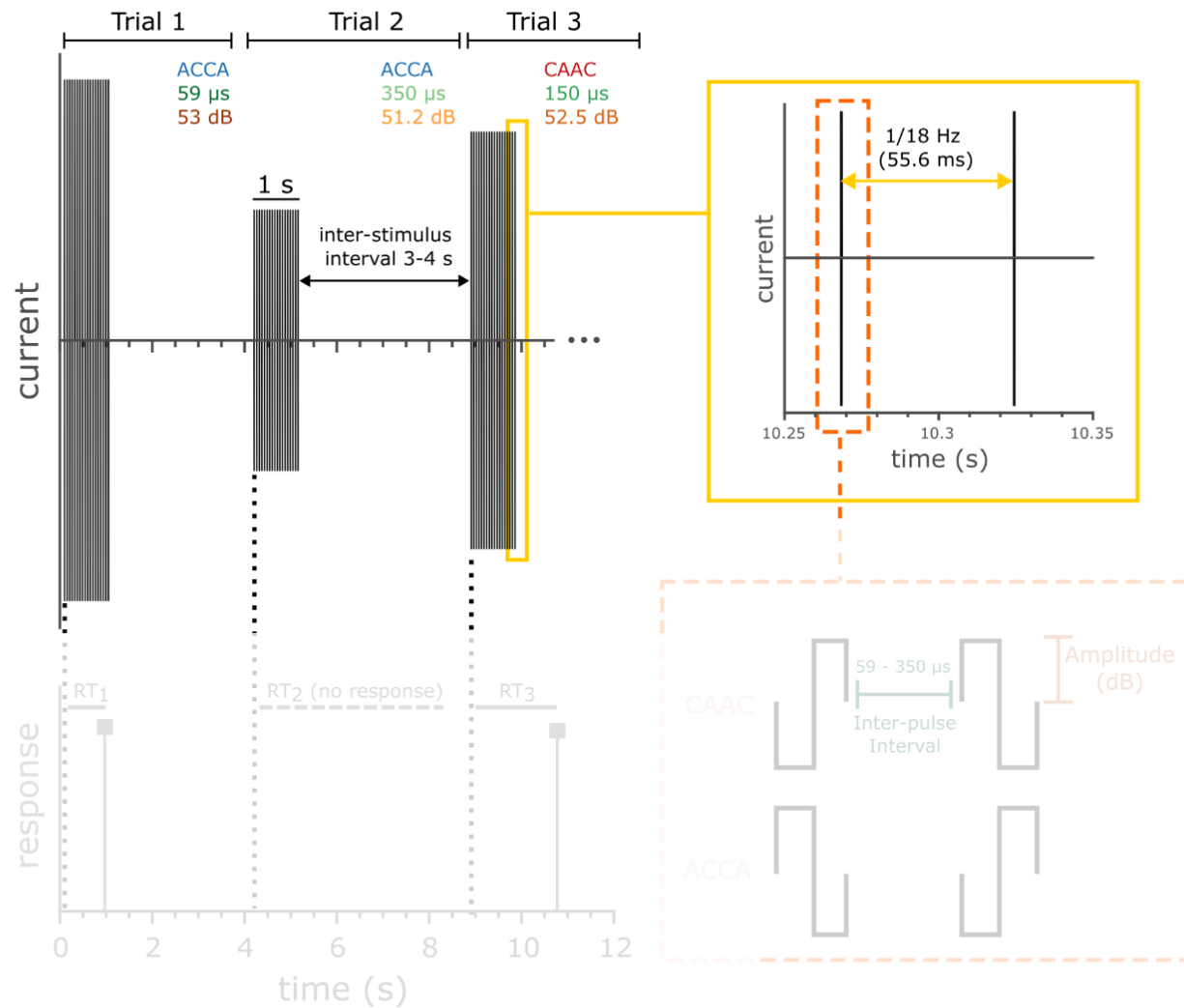
Reaction times - Setup





Methods

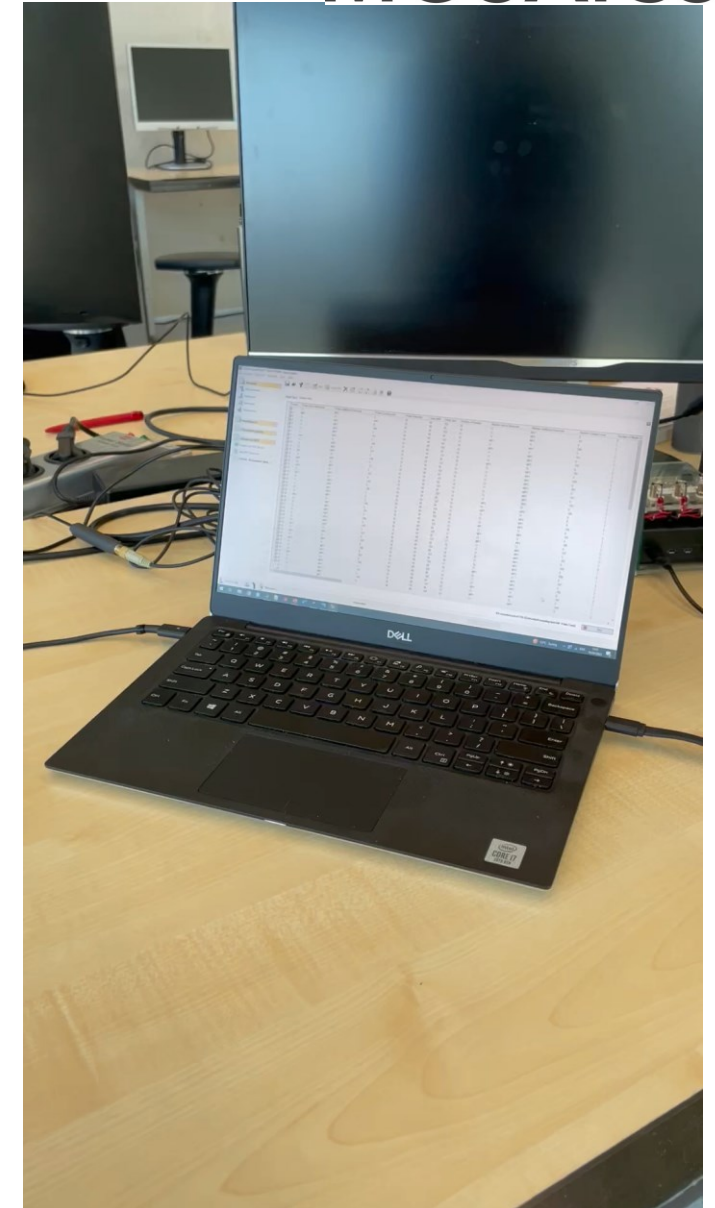
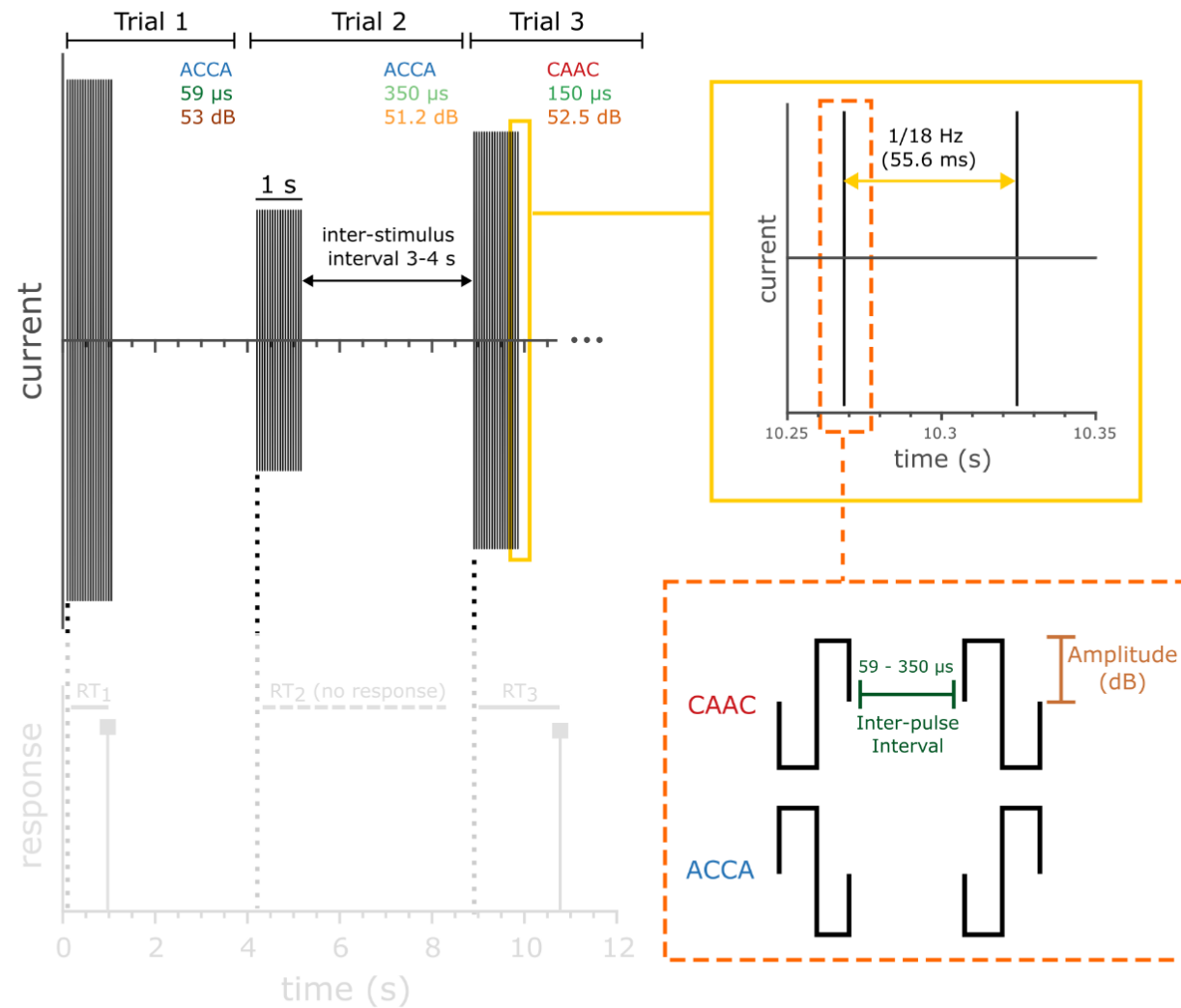
Reaction times - Setup





Methods

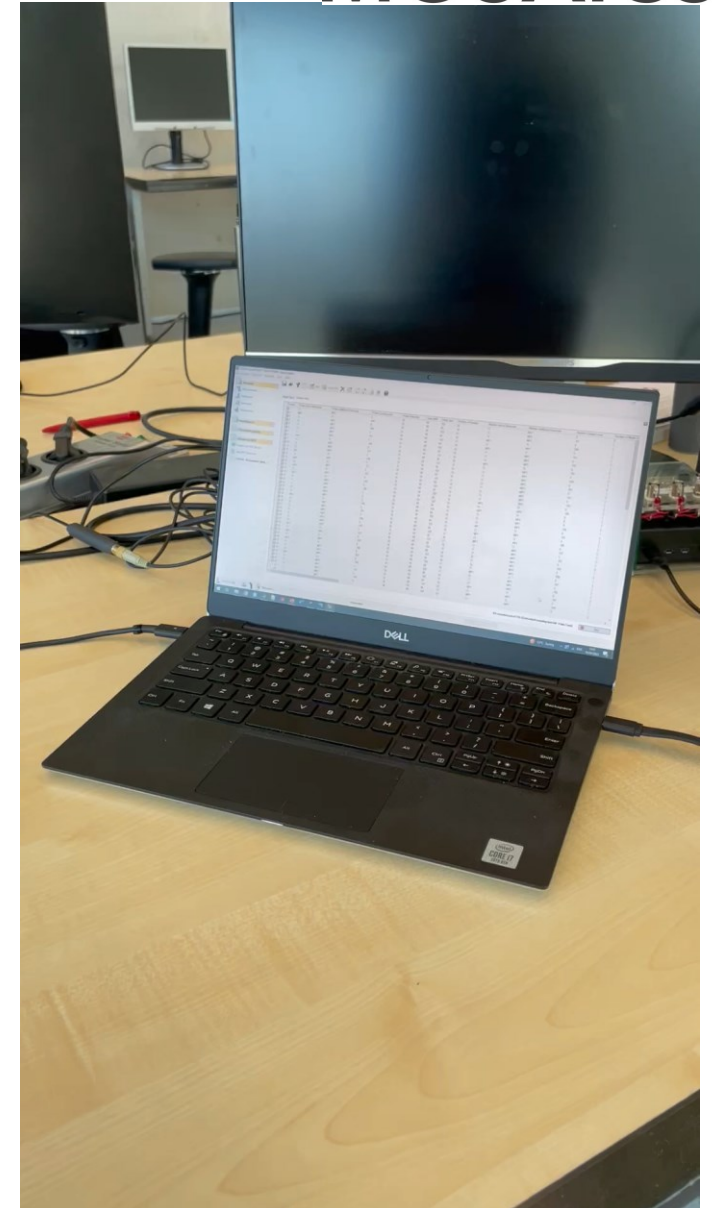
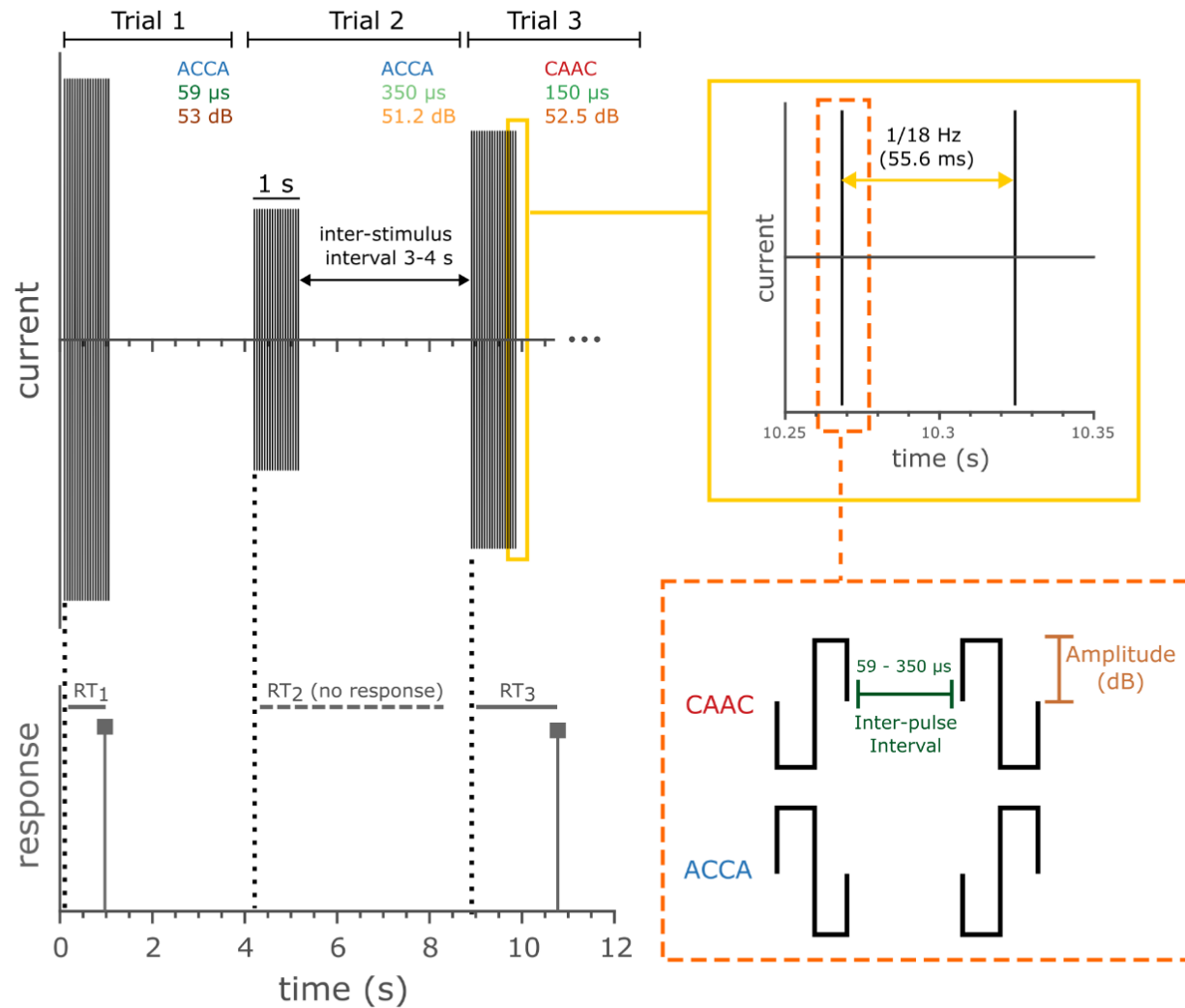
Reaction times - Setup





Methods

Reaction times - Setup

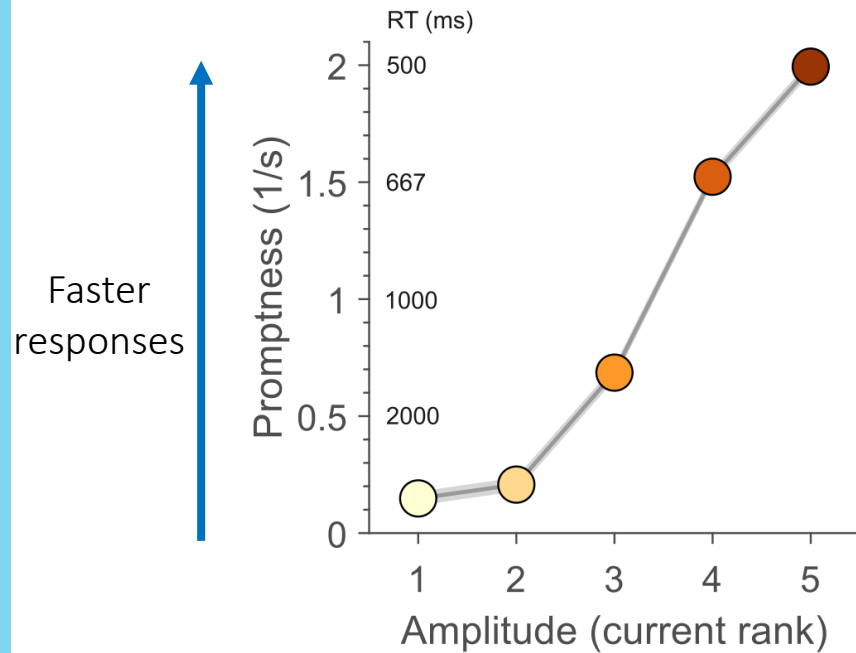




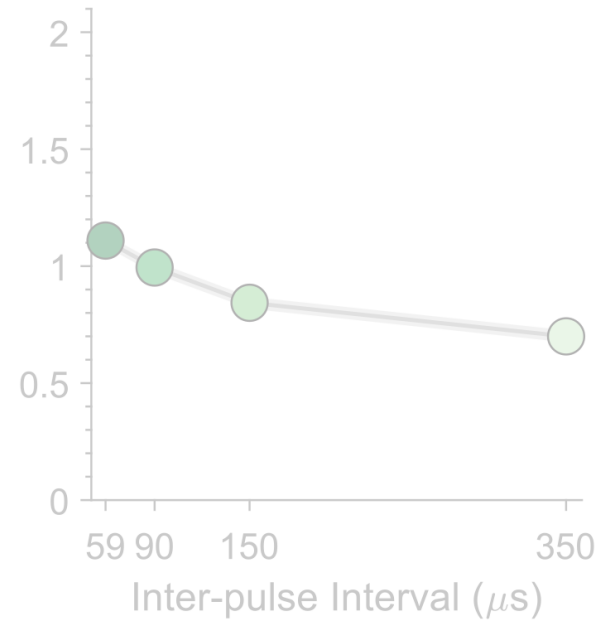
Group data (N = 14 Adults)

CI users become:

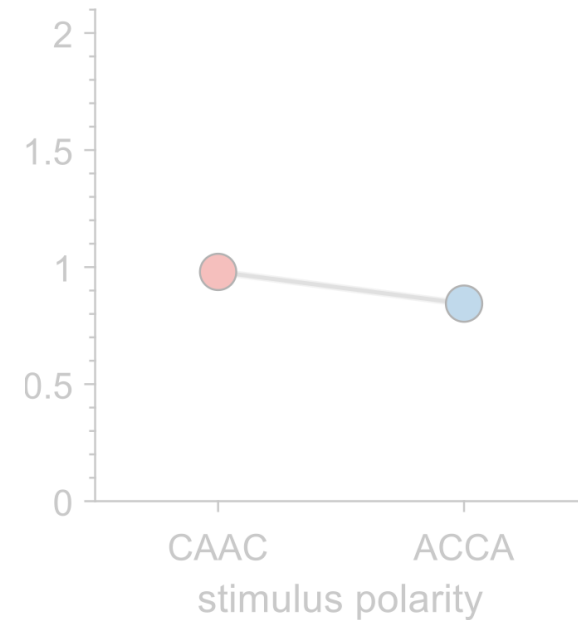
Faster with increasing amplitude



Faster with decreasing inter-pulse interval



Faster for anodic consecutive phases



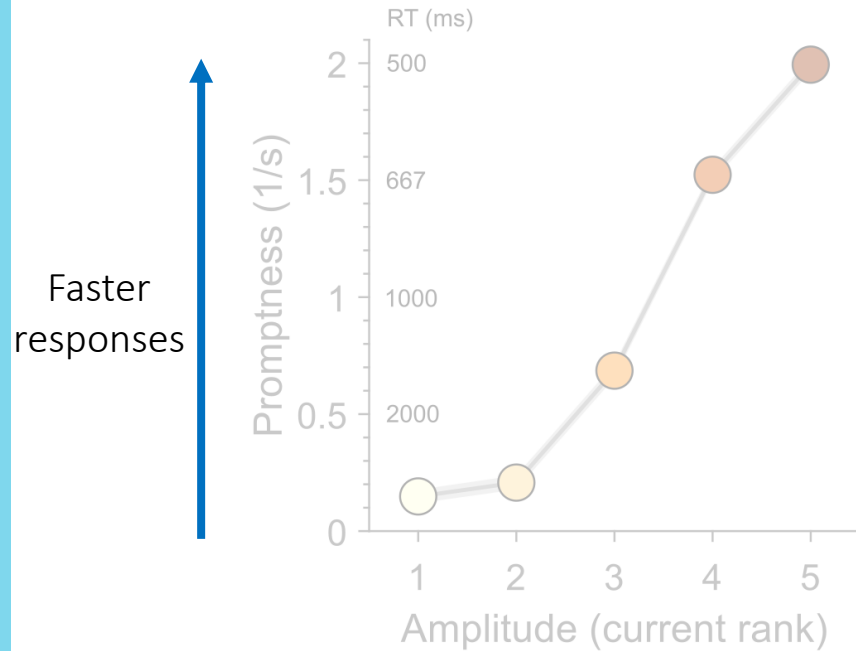
ANOVA
N=14 (Adults, single medial electrode)
Mean ± 95% highest density intervals (shaded region)



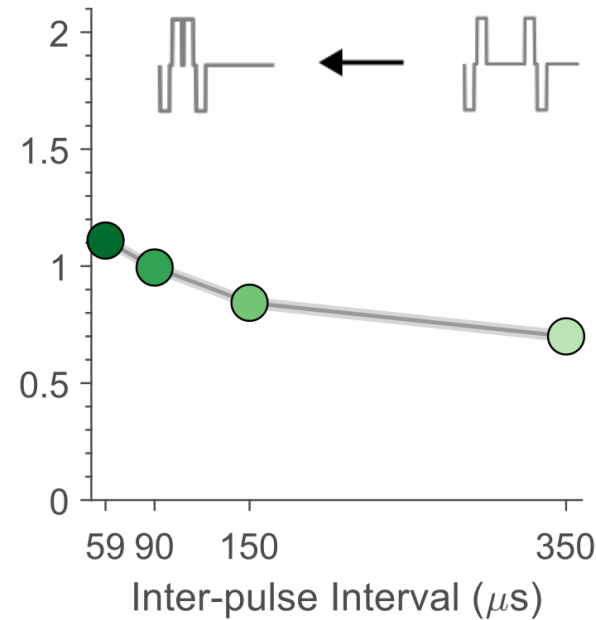
Group data (N = 14 Adults)

CI users become:

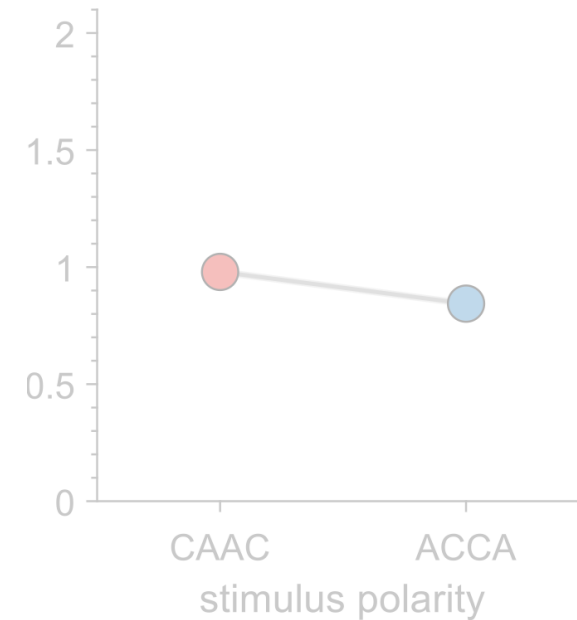
Faster with increasing amplitude



Faster with decreasing inter-pulse interval



Faster for anodic consecutive phases



ANOVA
N=14 (Adults, single medial electrode)
Mean \pm 95% highest density intervals

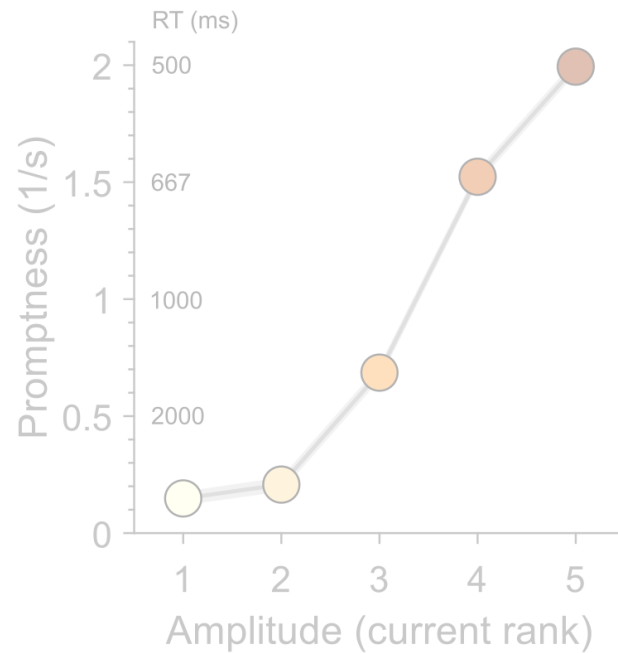


Group data (N = 14 Adults)

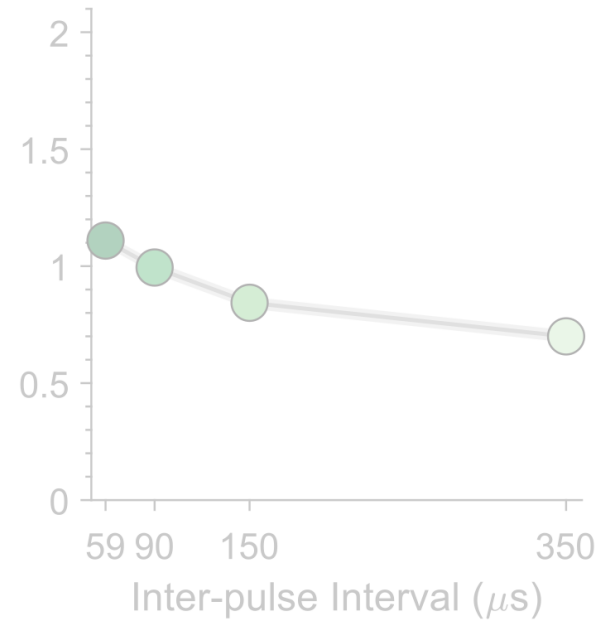
CI users become:

Faster with increasing amplitude

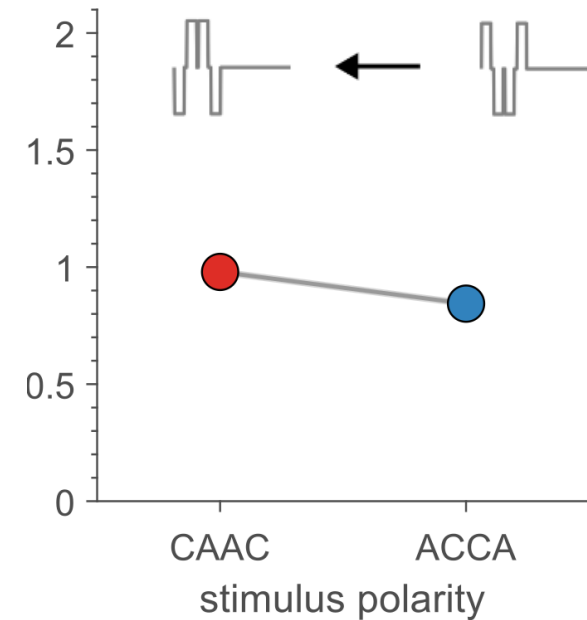
Faster responses



Faster with decreasing inter-pulse interval



Faster for consecutive anodic phases



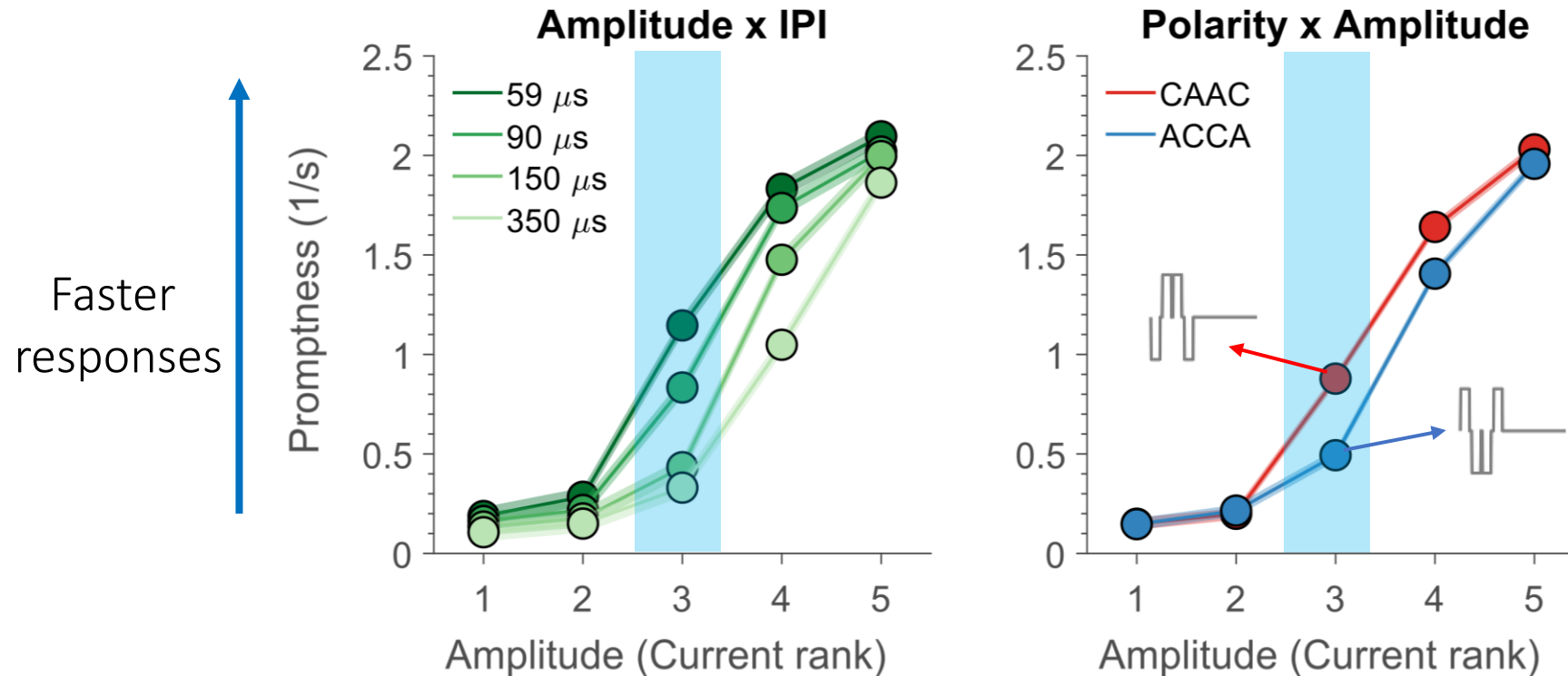
ANOVA
N=14 (Adults, single medial electrode)
Mean ± 95% highest density intervals



Group data (N = 14 Adults) - Interactions

Polarity sensitivity and temporal interactions captured with reaction times

- Dependence on stimulation amplitude
 - Saturation of chronometric function



Closing

Take home messages

- Reaction times provide us a **reliable measure of temporal interactions** for cochlear implant users.



Closing

Take home messages

– Reaction times provide us a **reliable measure of temporal interactions** for cochlear implant users.

What does this mean for clinical practice?

- **Efficient measures**
- Extend to populations **beyond adults**.
- **Relate behaviour to electrophysiology** (e.g. eCAPs).

MOSAICS



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The University of Dublin



Amsterdam UMC
University Medical Centers



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Also thanks to Gunther Windau and Ruurd Lof for the Digital Event Recorder

I recycle, re-use grocery bags, only take public transport and cycle, keep a (beautiful) small garden.