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Impact of moderate prematurity on early speech perception and language acquisition in infants, a longitudinal planned study

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Introduction

During the first year of life, human infants become progressively attuned to the phonological properties of their native language (Kuhl et al., 2008; Maurer & Werker, 2014).

Moderate or late preterms (32-36 weeks of gestational age) show lower neurodevelopmental outcomes at age 2 (De Jong et al., 2015; Shah et al., 2016) and an increased risk of lower educational achievement at age 5 (Quigley et al., 2012).

The aim of this study is (i) to explore the role of cortical and subcortical brain structures in the encoding of native phonetic contrasts during early development, (ii) to determine the impact of moderate preterm birth.

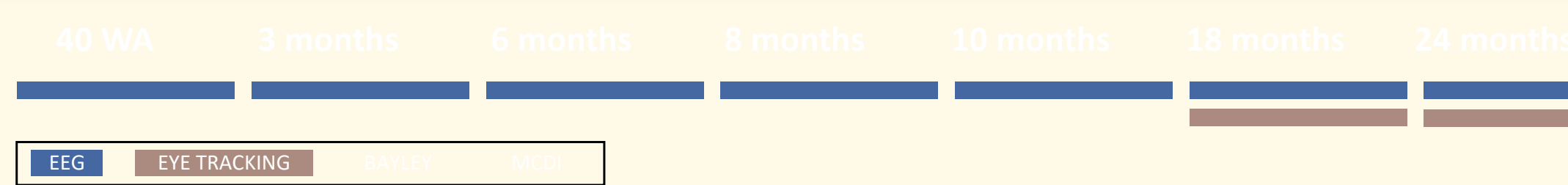
This longitudinal study will enable us to follow the development of children, whether born at term or with moderate prematurity, from birth to the age of two. We adapted the method of Bidelman (2015) to simultaneously record brain responses to CV syllables at cortical and subcortical levels.

Aims

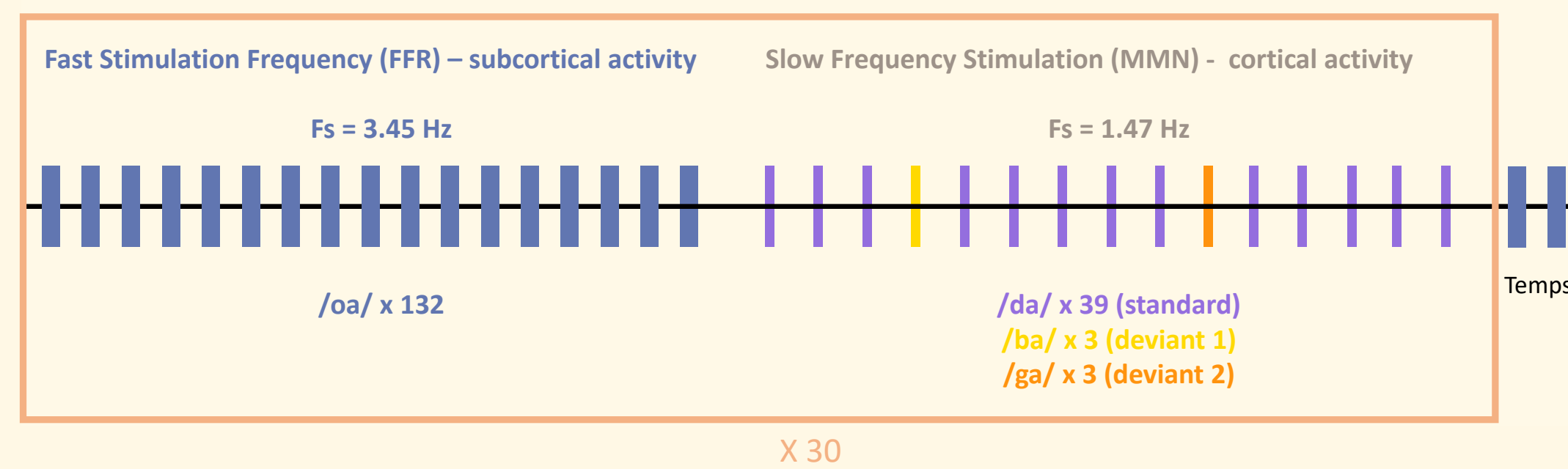
- To understand how the encoding of speech features evolves over the first year of life, in both typically and atypically developing children, by examining the impact of auditory pathway immaturity and early environment on native phonetic contrasts.
- Assess whether neuroplasticity mechanisms that enhance native language encoding in young children can predict the later development of lexical skills.
- To highlight the importance of phonetic boundary refinement in the early years of life in predicting later ability to learn new words.

Experimental design and procedure

Longitudinal design with infants

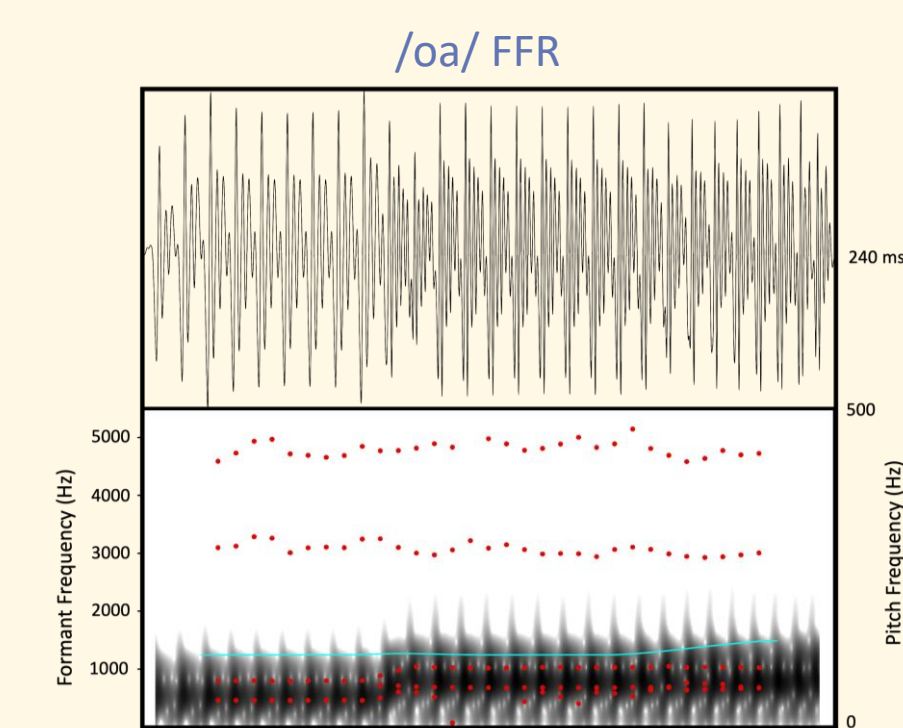


Passive listening paradigm

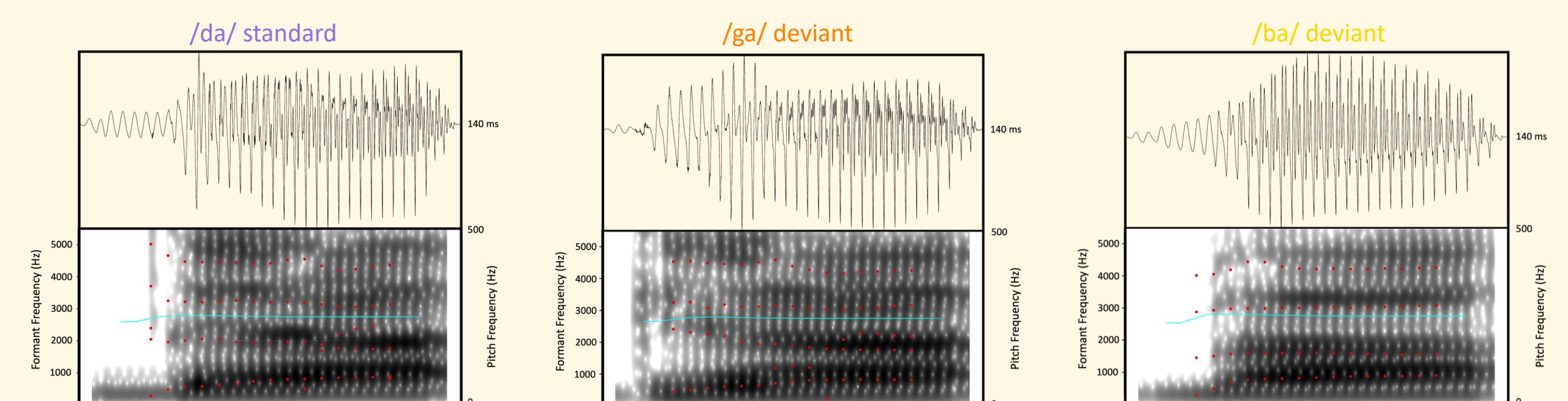


EEG recordings with simultaneous cortical and subcortical responses during a passive listening task (Bidelman, 2015).

Synthetic CV syllable for FFR: /oa/ duration 240 ms (Gorina-Careta et al., 2022)



Semi-synthetic CV syllables for MMN: /da/, /ba/ and /ga/ duration 140 ms.

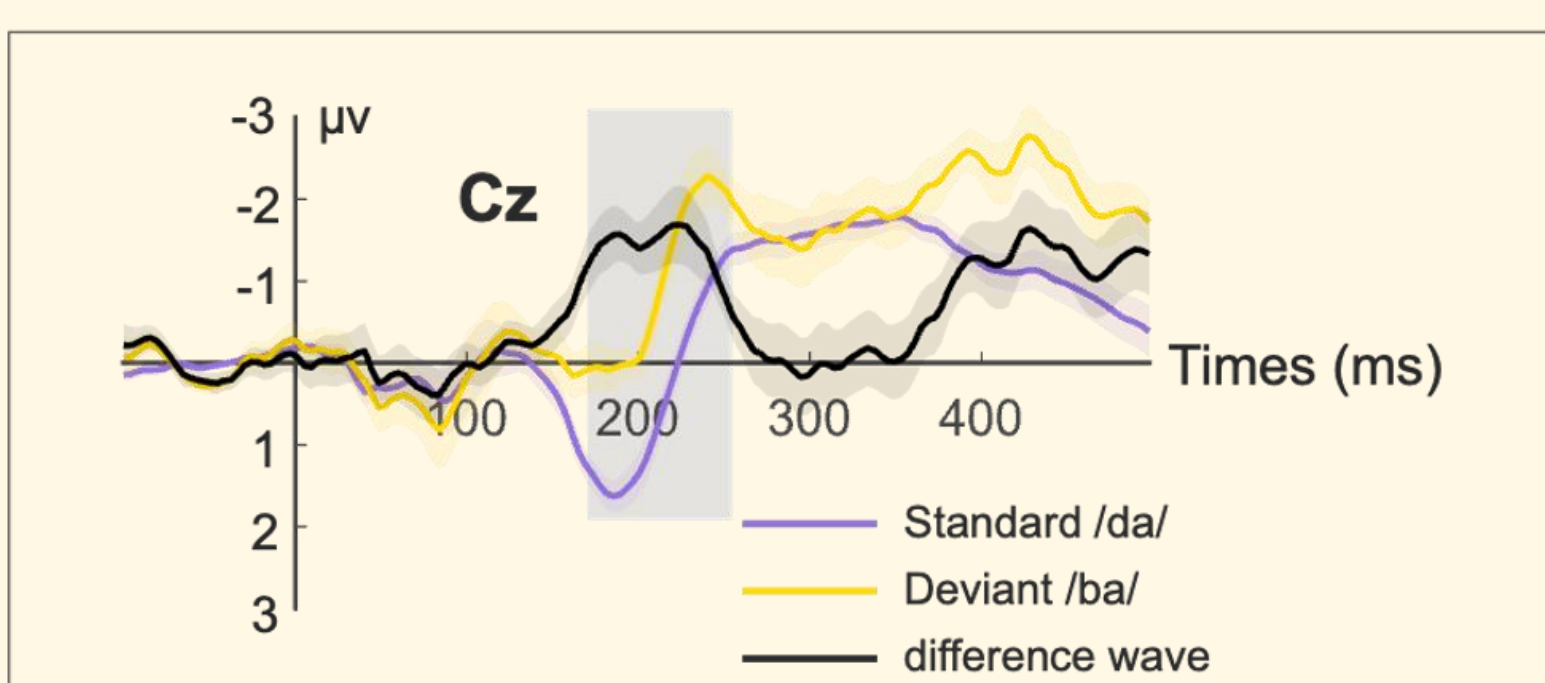


Preliminary results in adults

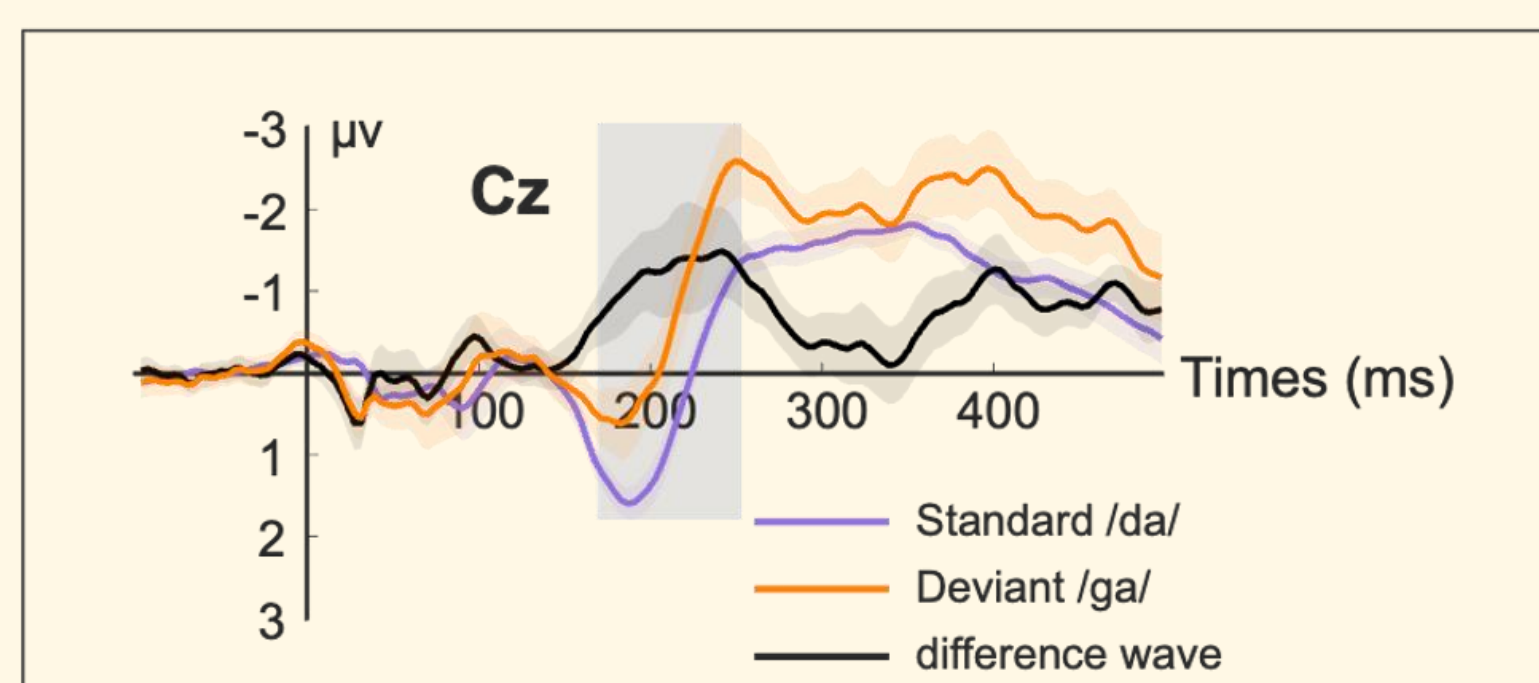
Grand average across participants (N=13), age range = 18 – 35 years

Event-related brain Potentials:

A) Response to deviant /ba/ (yellow) vs standard syllable /da/ (purple), MMN (black)

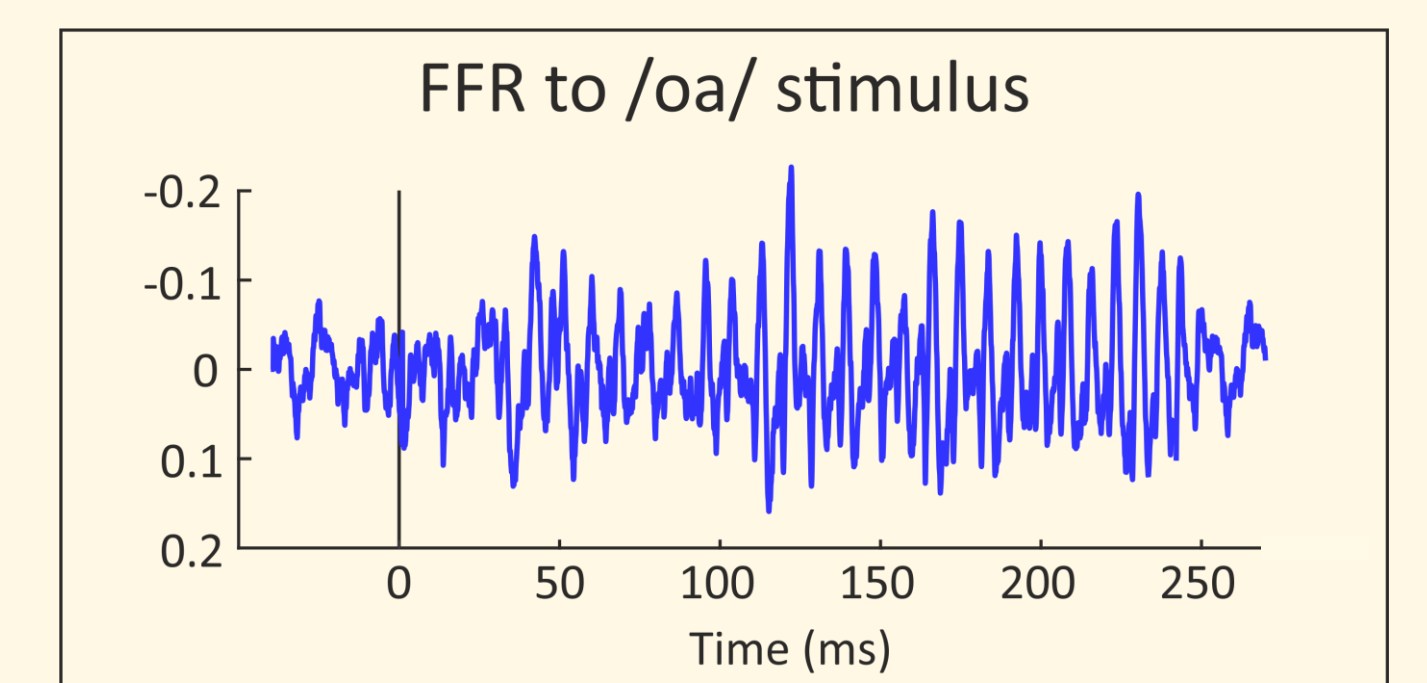


B) Response to deviant /ga/ (orange) vs standard syllable /da/ (purple), MMN (black)



Subcortical activity to /oa/ syllable:

Time Domain



Perspectives

- Specify the neuro-plastic mechanisms underlying the refinement of native speech sound encoding in infancy .
- Examine the impact of moderate preterm birth on the complex relationship between early speech perception and vocabulary acquisition.
- Identify early biomarkers of language delay.

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