

The N400: EEG insights into Semantic Categorization through Visual Perceptual Learning

Grace Veugelers, Nas Khodaeian, Kiera Ludlow, Dr. Eric Mah, Dr. Jim Tanaka
Different Minds Lab, Department of Psychology, University of Victoria, Canada

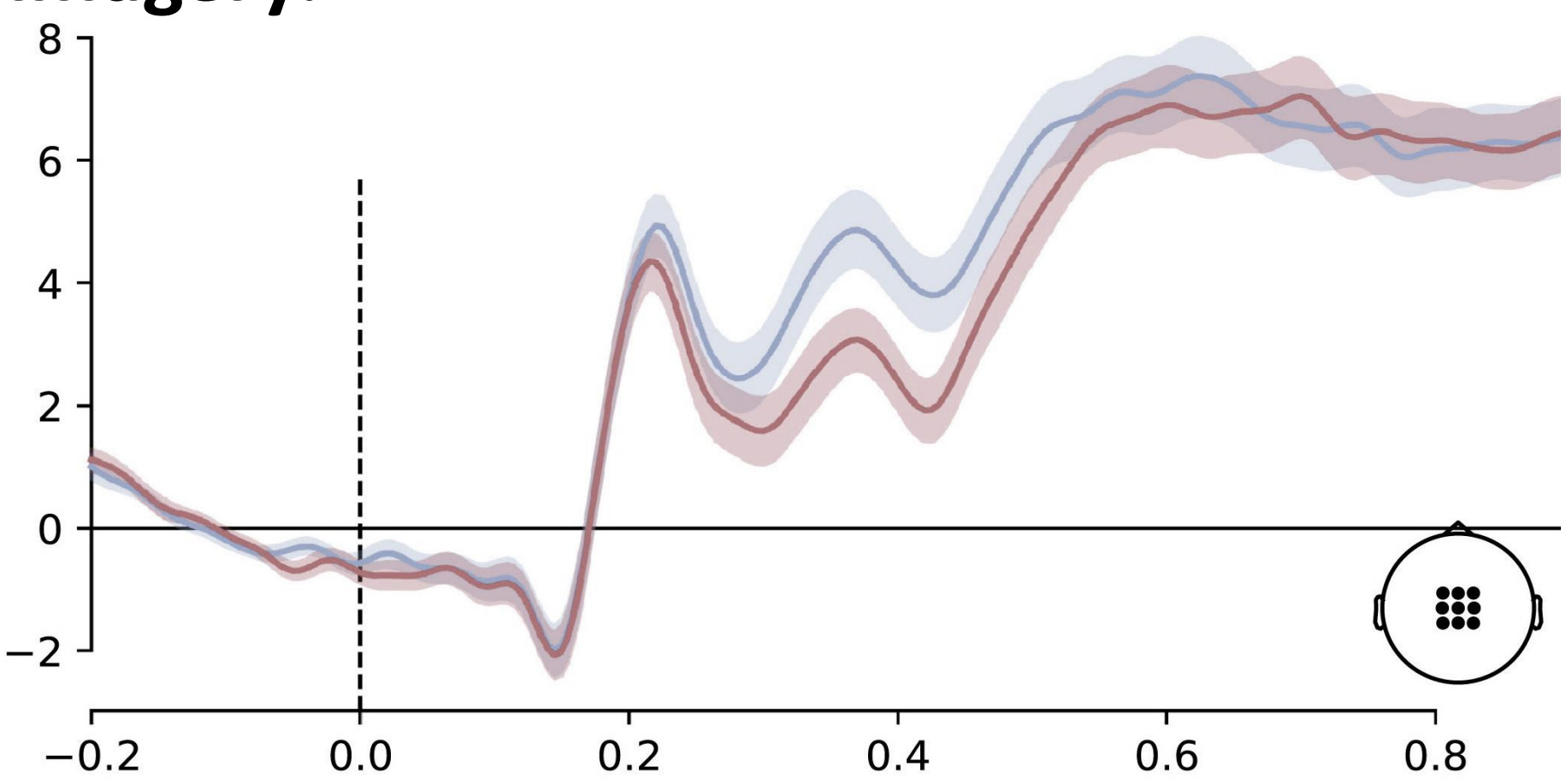


INTRODUCTION

N400

The **N400** is an ERP of *relatively* negative activity around 400ms after a stimulus presentation that indicates semantic processing.

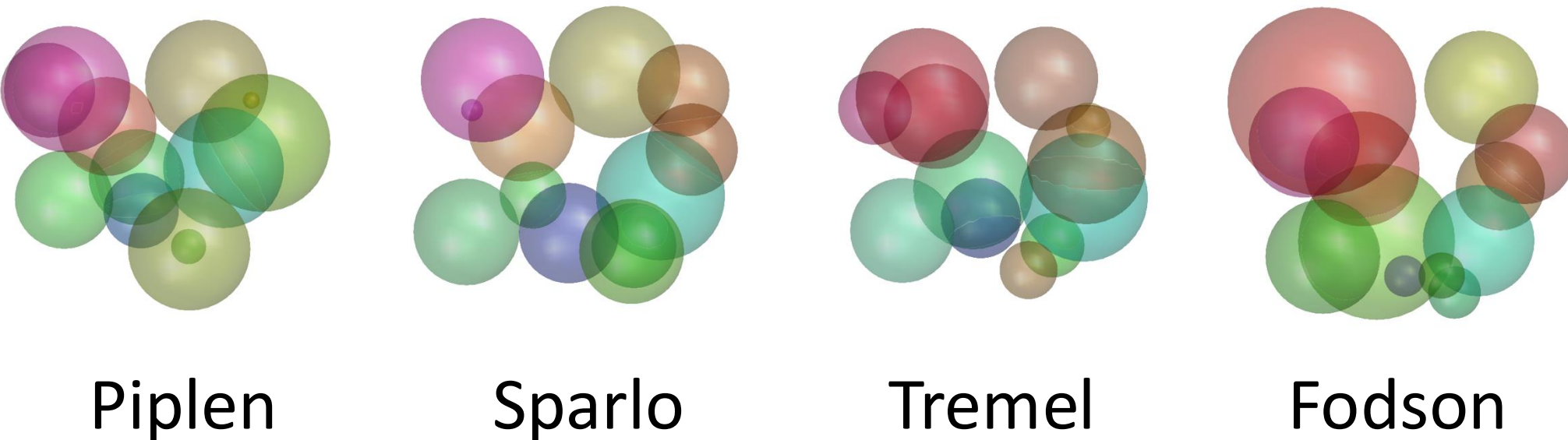
- Though most commonly studied with language paradigms, it can also be elicited by visual imagery.



RUBubbles

RUBubbles is a novel stimulus set of coloured bubbles that are differentiated into four species.

- Each species was assigned a name to encourage semantic association as participants learned to recognize them.



This research aims to investigate the *relevance* of the **N400 ERP** in *visual perceptual learning* of novel, non-linguistic stimuli.

HYPOTHESIS

1

Participants will display a **more pronounced N400** following a training session in which they learn to categorize and label the different species.

2

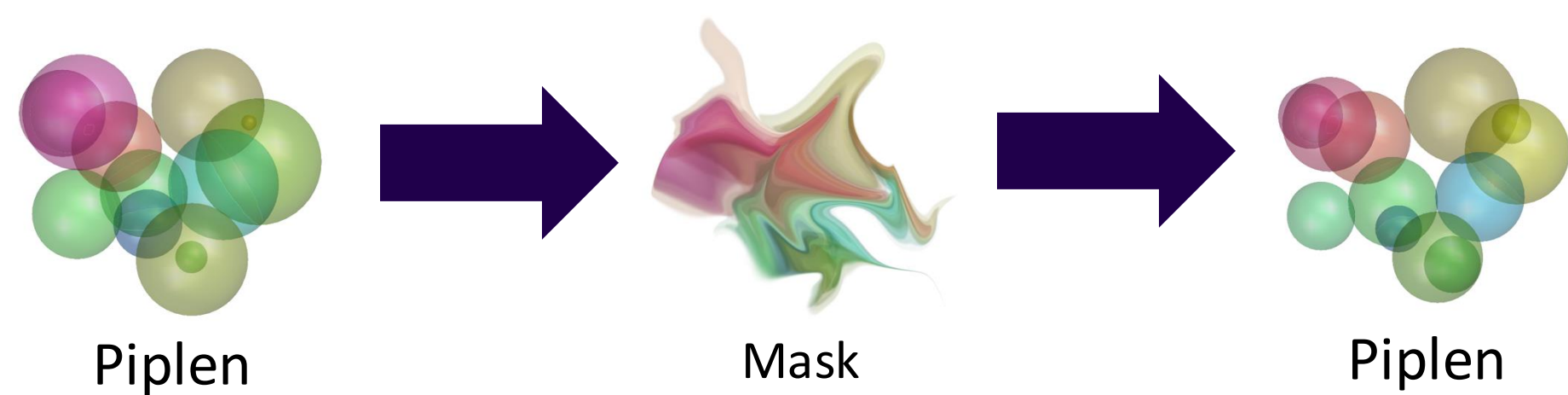
The **N400** elicited by *different* trials on the same/different task will be **more pronounced** than the **N400** from *same* trials.

METHODS

Participants' (n = 22; Ps) species categorization was evaluated through a same/different task.

- 24 trials (12 same, 12 different)

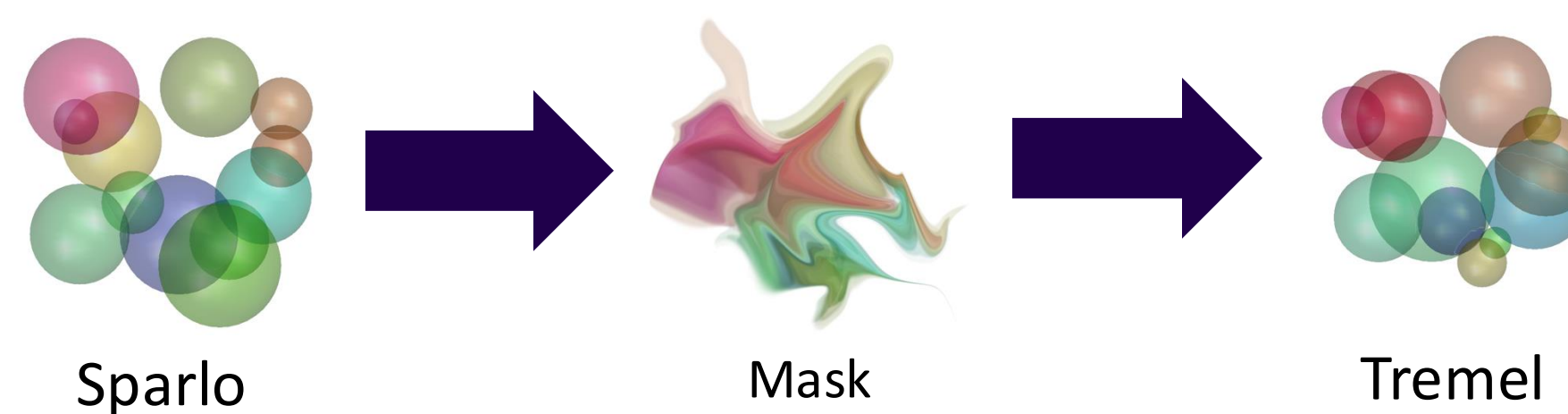
Same trial:



Session 1a

Ps completed the same/different task with **no prior exposure** to the RUBubbles stimuli.

Different trial:



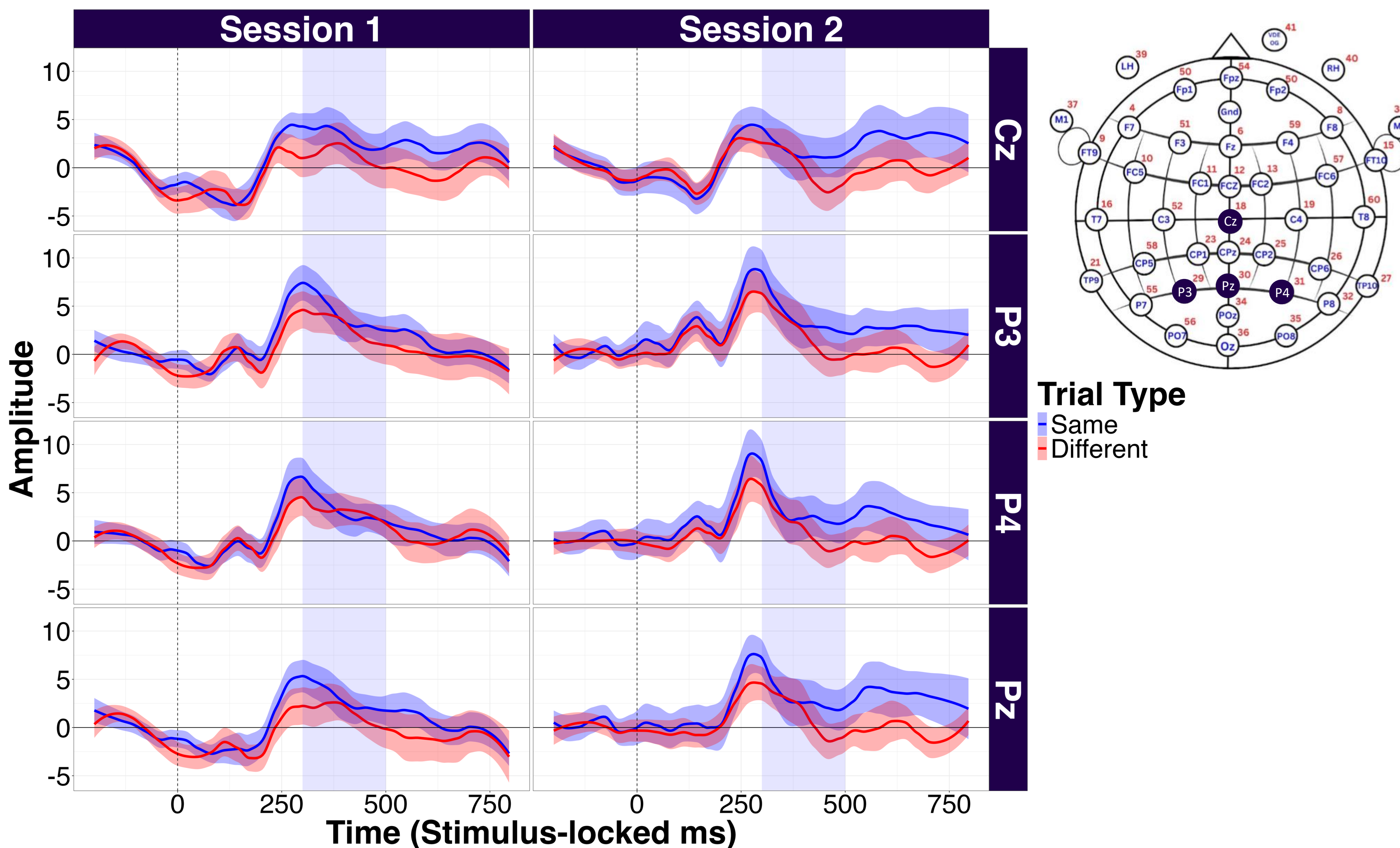
Session 1b

Ps underwent a **feedback-based training session** where they learned species label mappings.

Session 2

Ps completed a second block of same/different trials **one week after** the initial testing and training.

EEG RESULTS



- The **N400** was **more negative** in **Session 2** after species categorization training than in **Session 1**, prior to training ($\chi^2(1) = 137.28, p < .001$).
- Within each session, **amplitude was more negative for different trials** than for *same* trials ($\chi^2(1) = 14.81, p < .001$).

BEHAVIOURAL RESULTS

Task **performance accuracy** was **not significantly different** across sessions ($p = .1922$).

Session 1 Acc.

$M = 0.75$ ($SD = .08$)

Session 2 Acc.

$M = 0.78$ ($SD = .09$)

- Semantic engagement may be differentiable from processing for accurate species categorization.

DISCUSSION

Key Findings

The **N400** is implicated in the categorization of novel, non-linguistic stimuli.

- Participants demonstrate an **increased semantic engagement** in categorization of stimuli **after visual perceptual training**.
- The *different* task elicits more semantic processing than the *same* task.

Implications

Semantic associations to novel visual imagery can **develop through increased exposures**, though it may not increase accuracy in explicit categorization.

Future Research

- To investigate **long-term stability** of semantic recruitments to novel stimulus identification.
- To consider the **influence of categorization strategies** applied by participants.

ACKNOWLEDGEMENTS

This project was directed and supported by Dr. Jim Tanaka and the Different Minds Lab at the University of Victoria. Special thanks to Kiera Ludlow, Anna Lawrance, and Dr. Eric Mah for their major contributions in all aspects of this project.

References

