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Great, I found it: Evidence for the association of reward with spatial information following navigation

University of Victoria | Neuroeconomics Laboratory

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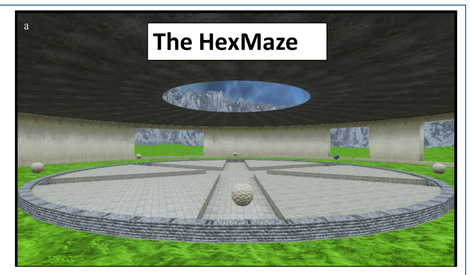
INTRODUCTION

- During navigation there are multiple available strategies:
  - **(1) Cognitive Map/Allocentric:** learning a constellation of cues
  - **(2) Egocentric-Cue:** learning a single cue association
  - **(3) Egocentric-Response:** learning a body-turn association
- Some research suggests that allocentric (allo) learning is different from egocentric learning, while other research suggests that allo follows reinforcement learning (RL) principals (like egocentric)
- Research has shown that the **reward positivity** (an indicator of RL) can be associated with choice states/cues
- **Goal:** To investigate the role of RL in navigation with a multi-strategy paradigm. This was done by presenting images of the navigational stimuli (following navigation) to determine if navigators learned to associate the stimuli in a rewarding manner

METHODS

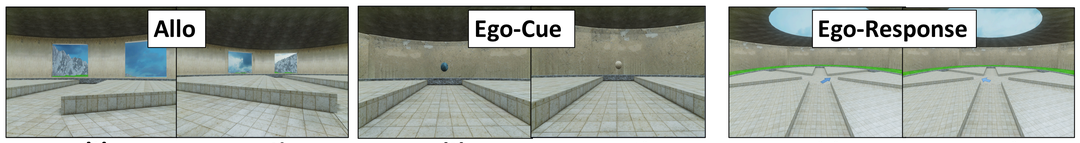
Navigation Portion

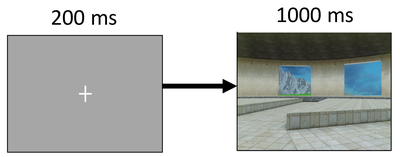
- **HexMaze** allows for all 3 strategies to be used (goal is to find a hidden platform)
- Performance was latency to find the platform on learning trials
- Strategy was determined by probe trials given throughout the task
- Allo=22, Ego-Cue = 5, Ego-Response = 3 **(only allo navigators were analyzed)**



EEG Portion

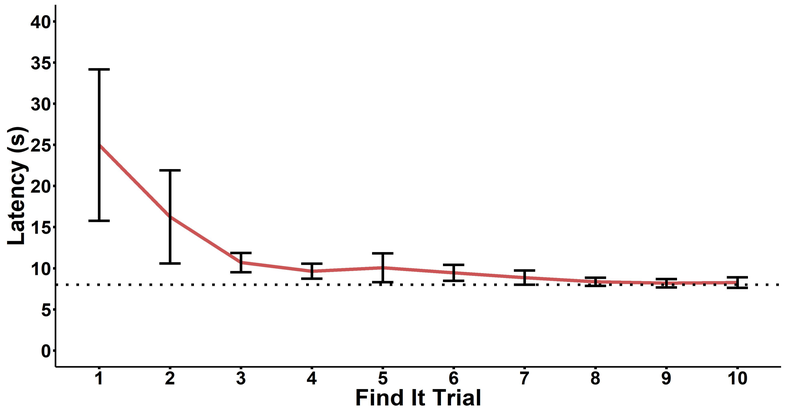
- After navigation, positive images (info that led to the platform) and negative images (info did not lead to the platform) were shown of all 3 strategies



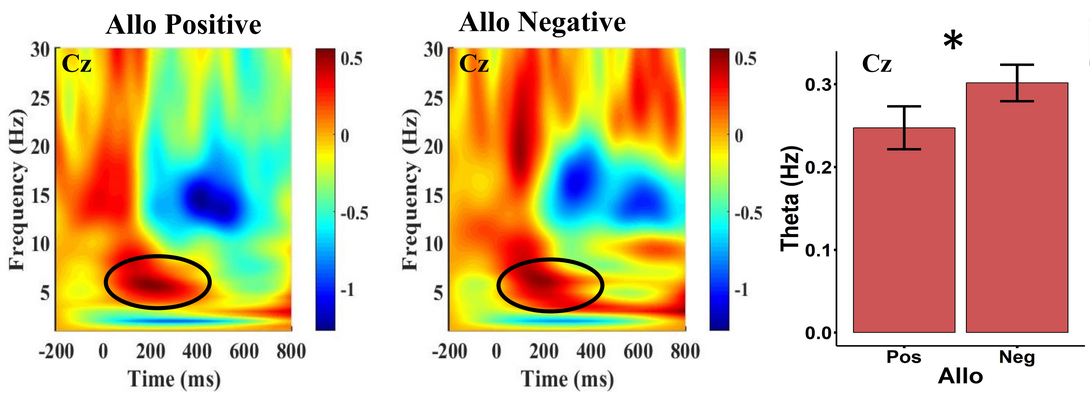


RESULTS

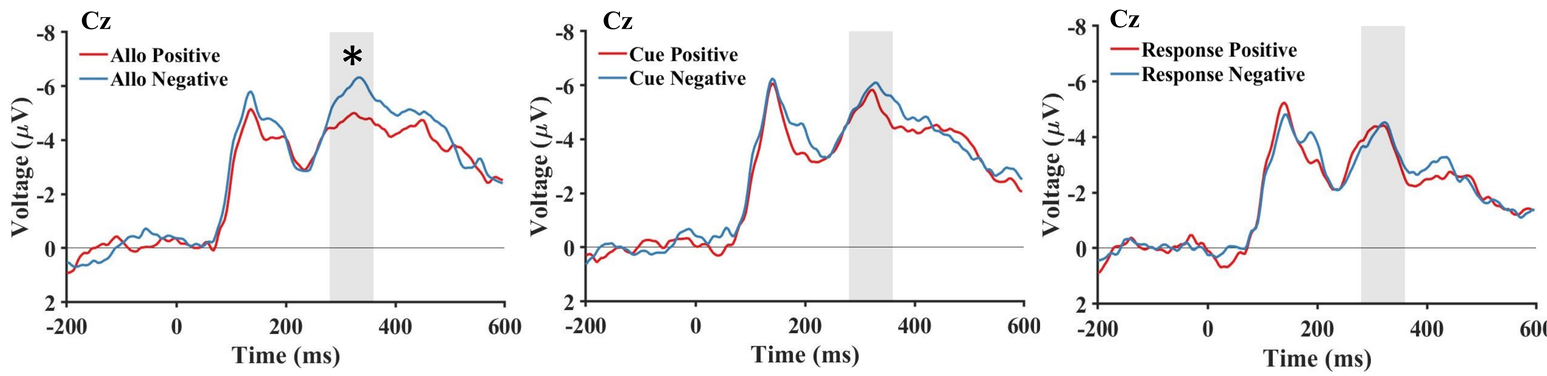
BEHAVIOURAL

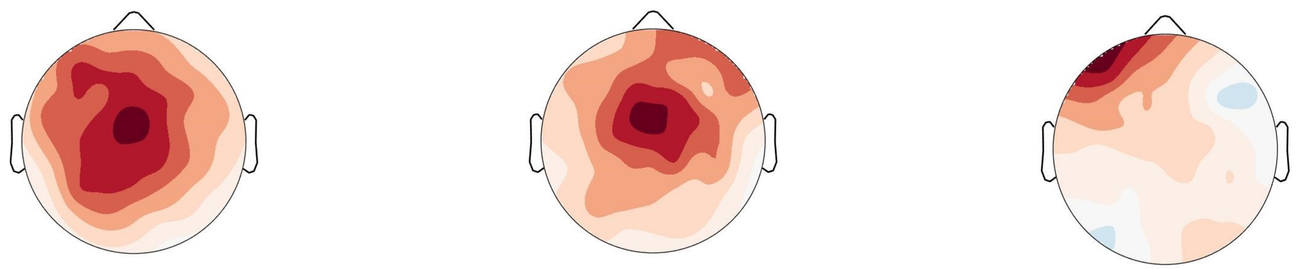


TIME-FREQUENCY



ERP – REWARD POSITIVITY





Conclusions

- **Behavioural:** Strong allocentric bias (22/30)**,** and allocentric navigators did learn the maze
- **ERP:** Allocentric images elicited a **reward positivity**, but the egocentric images did not
- **Time-frequency:** Increased frontal theta in response to allocentric negative images when compared to the positive images (frontal theta is linked to the reward positivity)
- In sum, there does seem to be a role of the RL system in allo navigation

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