# Reward Processing when Evaluating Goals: Insight into Hierarchical Reinforcement Learning

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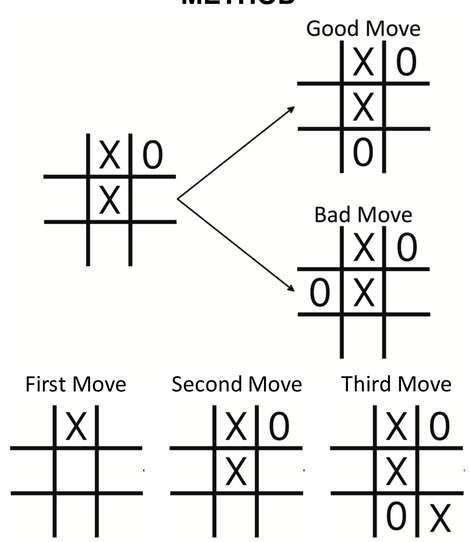
## INTRODUCTION

- Past research has demonstrated reward processing when observing the feedback of others
- Whether it occurs when observing the actions of another is still poorly understood
- Furthermore, it is unclear whether it is affected by goal proximity
- We hypothesized to see reward processing when perceiving the actions of a computer
- Furthermore, we hypothesized that it would scale to goal proximity

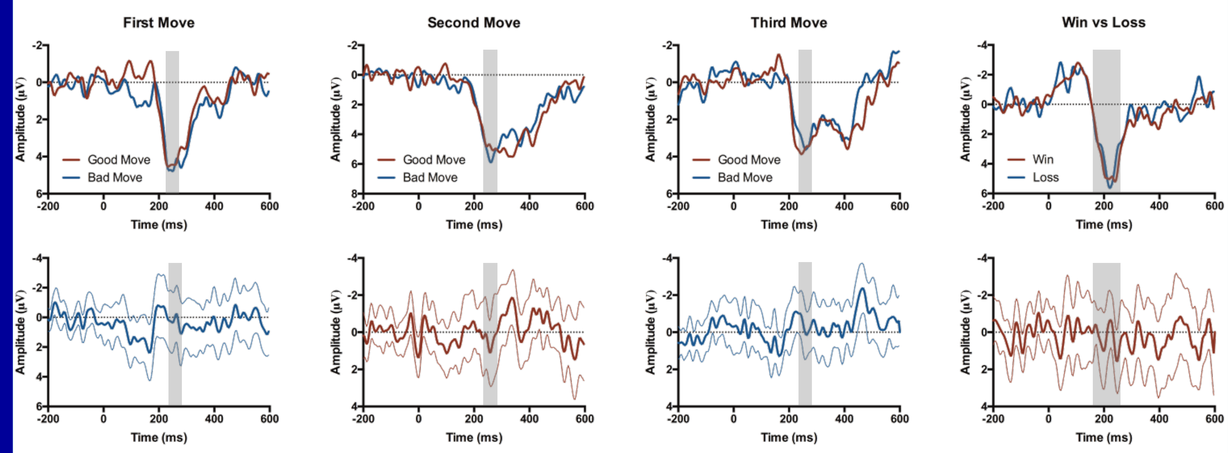
## METHOD




- 18 university students (M: 20 yrs, 14 Females)
- Played Tic Tac Toe against a computer
- Each game began within an ongoing game where it was either the computers first, second, or third move
- The computer played a good or bad move
- Neural underpinnings (e.g., reward positivity) were analyzed in response to these initial moves
- Good and bad moves were determined using a computational model that learned the values of game board states

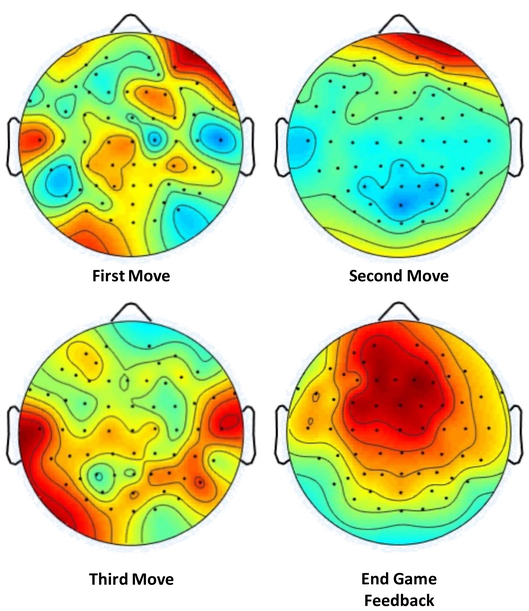
## RESULTS

### Conditional and Difference Waveforms (FCz)

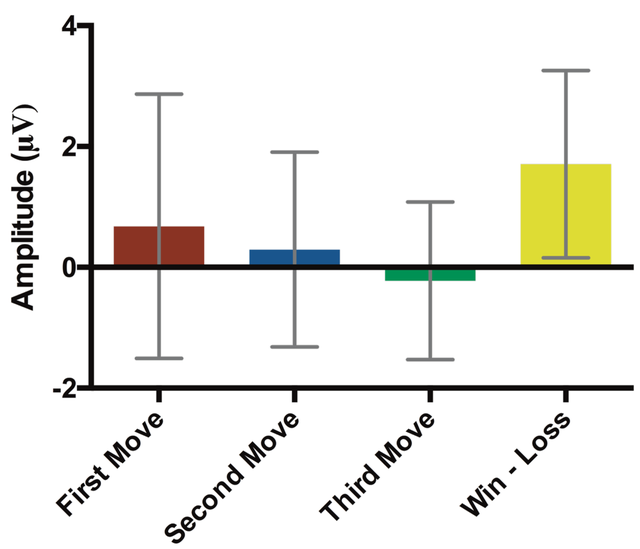



### Reward Positivity

#### Topographic Maps of Difference Waveforms




#### Difference Waveform Amplitudes




## CONCLUSIONS

- Prediction errors, as measured by the reward positivity, were not present in response to a computers actions
- Consequently, we were unable to examine whether reward processing scaled to goal proximity
- Interestingly, we found a reward positivity to the outcome of games
- This indicated that higher level reward processing occurred to sequences of behaviours that led to task goals
- This research is in support of hierarchical reinforcement learning

## REFERENCES

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