



Incentive Value and Brain Electrophysiology in a Target/Nontarget Discrimination Task

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Background

- Event-Related Potential (ERPs): Electrical responses from the brain recorded from the EEG when a person perceives something and responds to it
- N1 component reflects early sensory processing; especially sensitive to stimulus discrimination tasks
 - Example: Black shirt vs. white shirt
- P3 component reflects later stimulus evaluation and categorization; maximized by stimuli that are infrequent, task-relevant, and/or motivationally salient
 - Example: A winning lottery ticket

Hypotheses

- Focus: How does motivation influence the neural basis of attention, specifically N1 and P3 components?
- Can manipulating points earned for correct responses to stimuli influence N1 and/or P3?
- We examined ERPs to targets in a Go/Nogo paradigm with no trial-by-trial cues or feedback
- Performance influenced odds of winning a gift card in a drawing to be held at the end of the study
- Prediction: Target N1 and P3 amplitude larger in higher incentive condition
- We also looked for incentive effects on target accuracy and self-reported motivation

Method

Participants: 23 UW-Eau Claire students (age 18-24; right-handed; 13 female). 2 excluded from all analyses due to extremely low response accuracy on some blocks. 2 more excluded from ERP analyses (only) due to poor EEG signal quality

Go/Nogo paradigm:

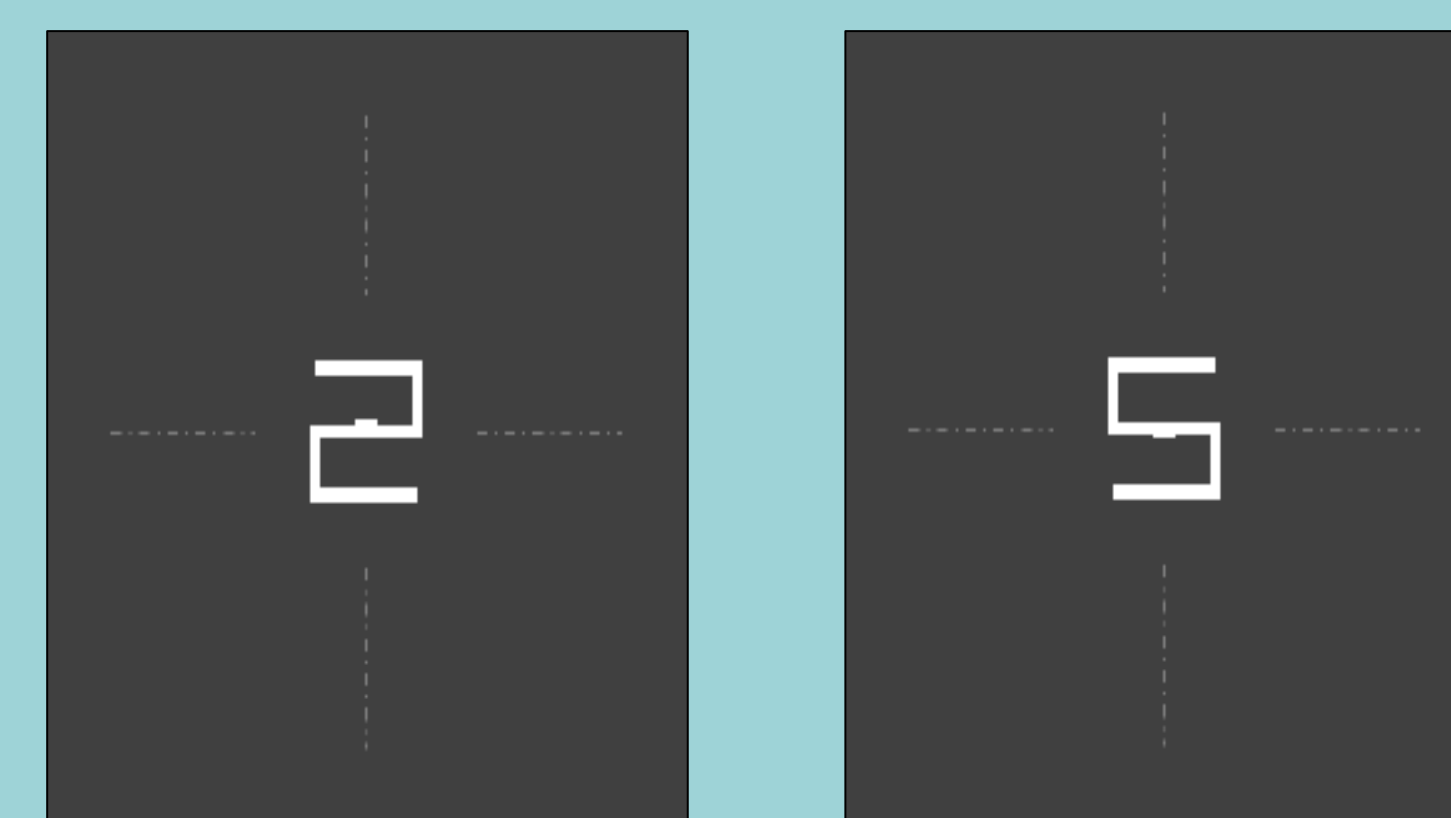
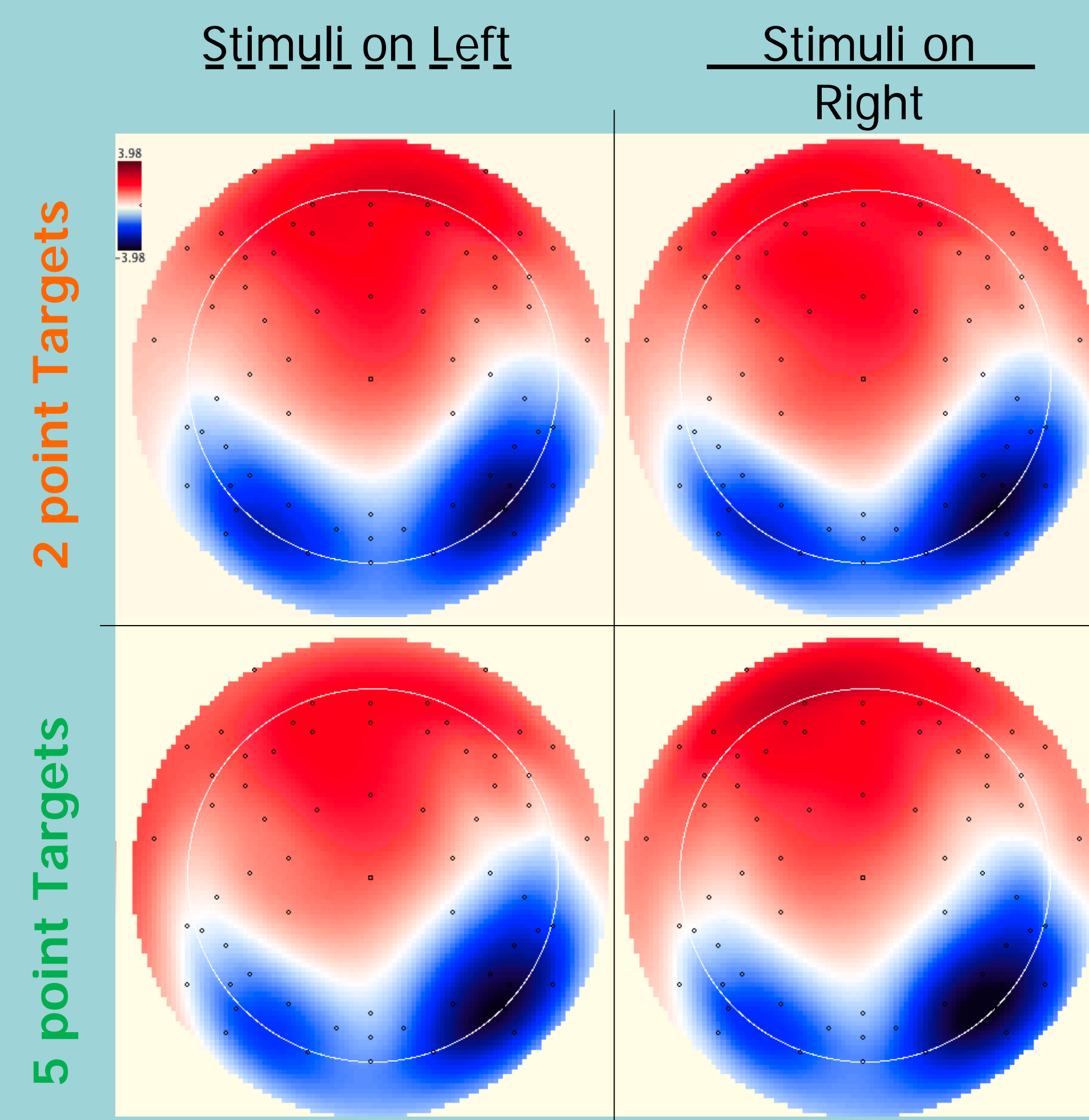
- Press on seeing Go stimuli (50%); NOT on seeing Nogo stimuli
- Incorrect responses earn no points but no penalty
- 16 fixed pseudorandomized blocks of 52 trials each
- ½ blocks: stimuli on left, ½ blocks: stimuli on right
- ½ blocks: **2 points** per trial, ½ blocks: **5 points** per trial

Self Reported Motivation: 1-10 scale (1="not at all"; 10 = "extremely") for 2-point and 5-point blocks

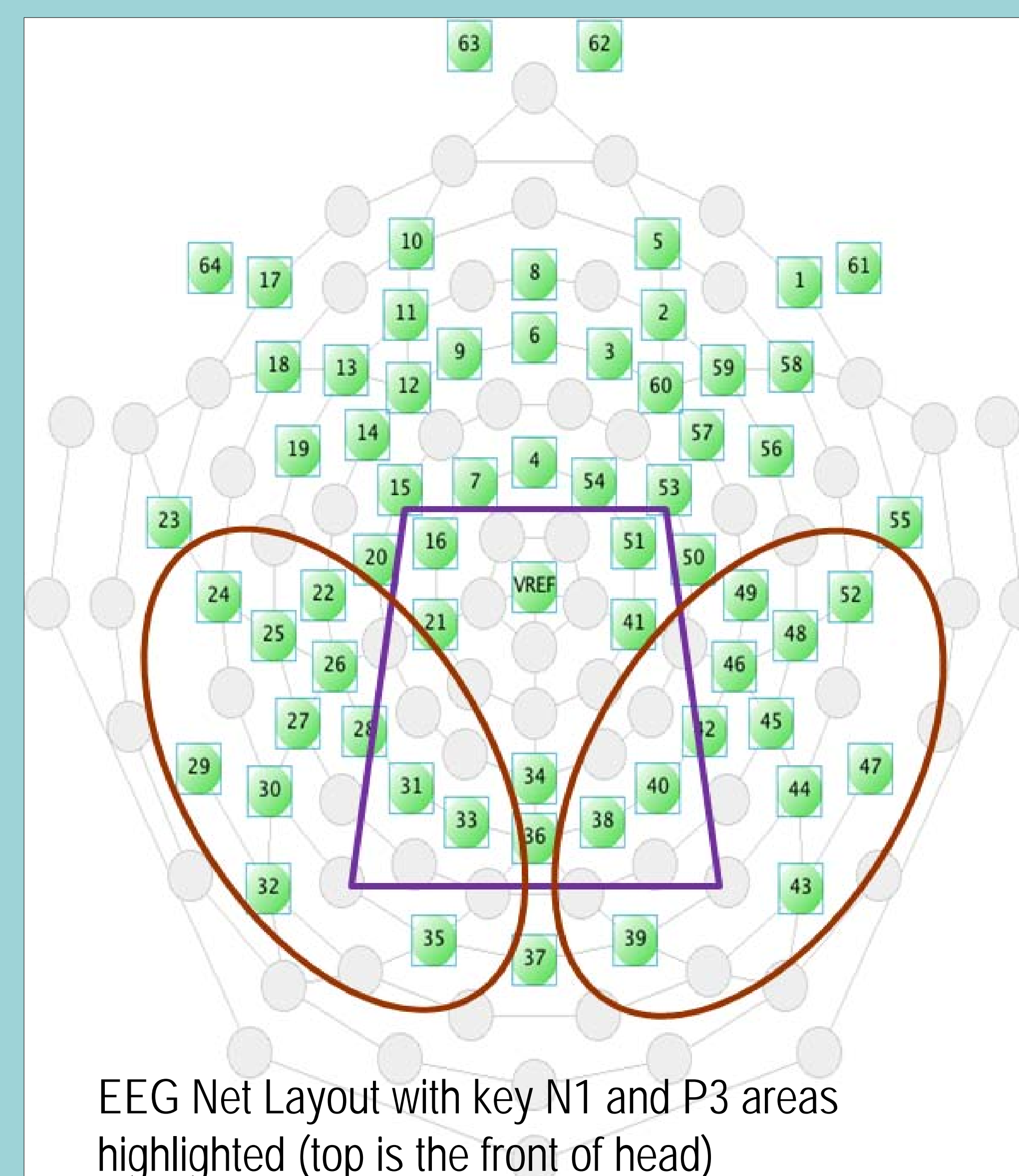
Electrophysiology:

- 64-electrode GSN (Electrical Geodesics Inc.)
- ERPs scored by mean amplitude (See EEG Net Layout)
 - P1: Most positive electrode in each cluster (120 – 200 ms)
 - P3: Most positive electrode in cluster (320 – 620 ms)

Topographic map 160 ms after target onset shows bilateral posterior distribution of N1



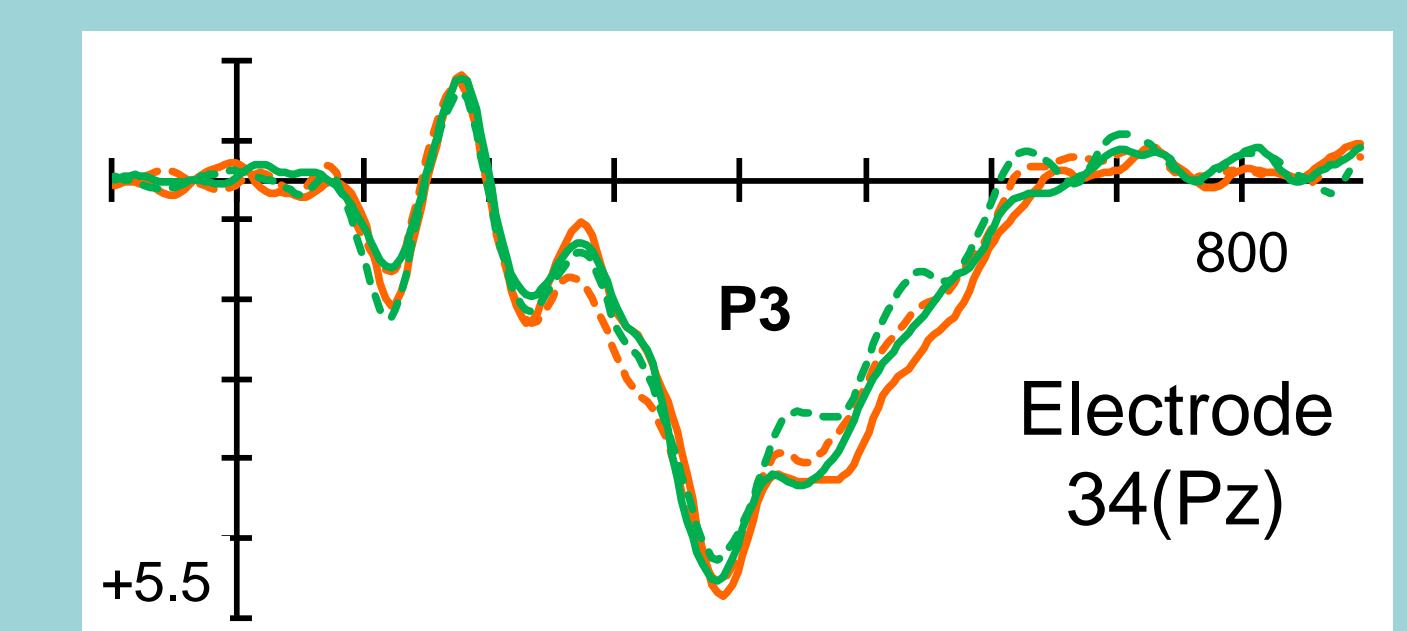
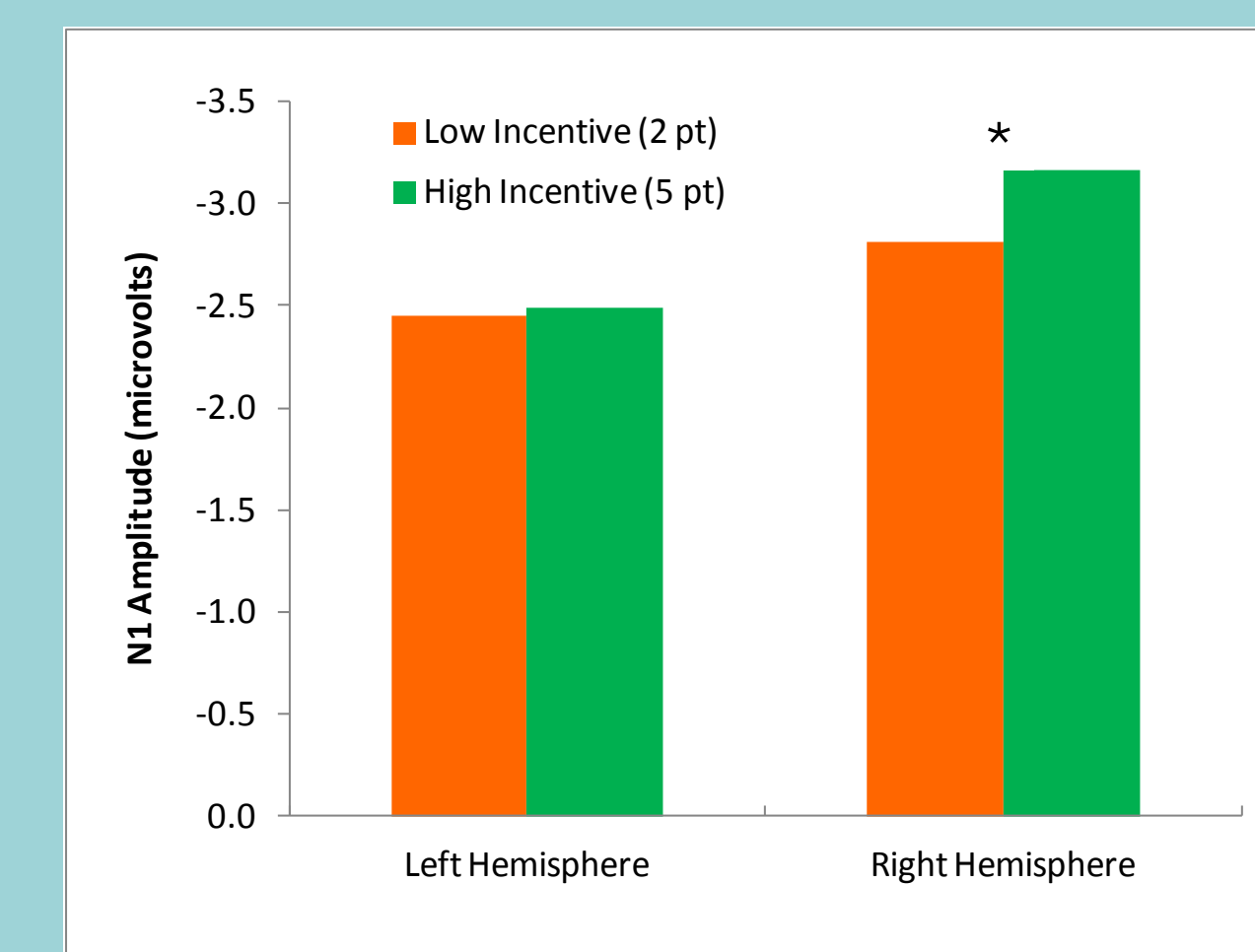
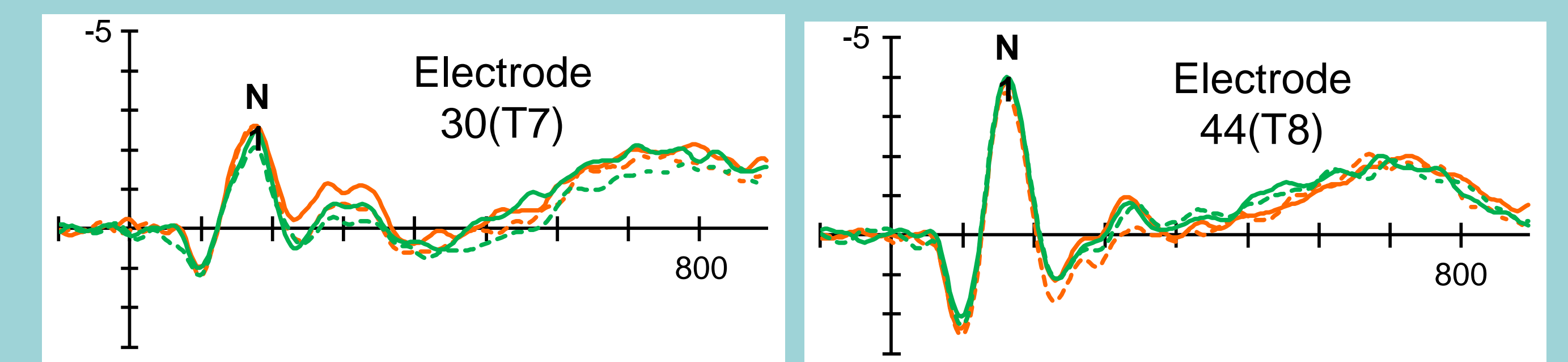
Sample Stimuli



EEG Net Layout with key N1 and P3 areas highlighted (top is the front of head)

Results

- EEG: Larger N1 in 5 pt condition than 2 pt condition*
- Interaction and follow-up tests indicate incentive difference holds over right but not left hemisphere*
- No incentive effects on P3, or response accuracy
- Behavioral: Higher reported motivation during 5 pt condition ($M = 8.45, SD = 1.28$) than 2 pt condition ($M = 7.70, SD = 1.81$)*



Conclusion

- N1 effect suggests higher incentive increased selective attention.
- No P3 effects because incentive difference too subtle
- No effect on accuracy but performance overall near ceiling (grand mean > 99%)

Future research

- Include looking at nontargets, which are matched in all respects with targets except for response
- Increasing salience of incentives overall
- Increasing point range in incentive conditions
- Decreasing frequency of targets.
- Focusing on N1 and incentive effects as a function of hemisphere

Acknowledgements

- Support provided by Student Bugold Commitment Differential Tuition funds through the University of Wisconsin-Eau Claire Summer Research Experiences for Undergraduates program.
- We also thank ORSP for our travel grant