

Understanding the Psychophysiological Mechanisms Underlying Context-Dependent Gains and Losses Among Smokers

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Introduction

Tobacco use is the leading cause of preventable cancers. Nicotine is the highly addictive, psychoactive compound found in tobacco products. Nicotine interferes with the brain's reward mechanisms. The goal of this study was to evaluate the feasibility of using event-related potentials (ERPs, a direct measure of brain activity) to assess brain responses to monetary gains and losses in smokers.

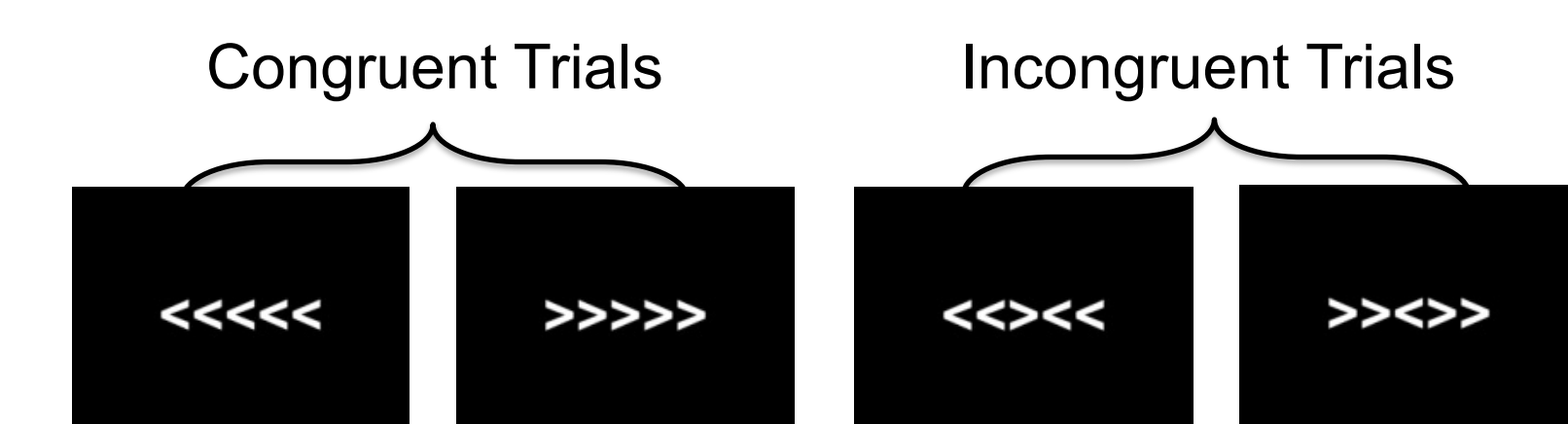
Identifying the psychophysiological mechanisms underlying reward responses may contribute to the development of treatments to reduce reward deficits and vulnerability to relapse among smokers attempting to quit.

Methods

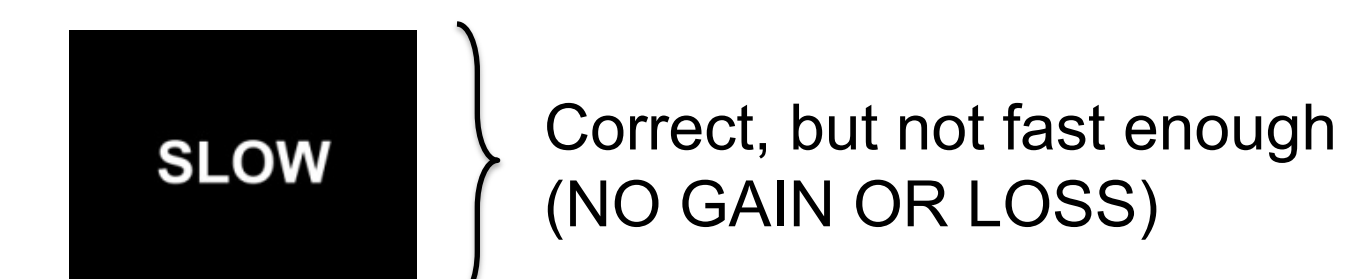
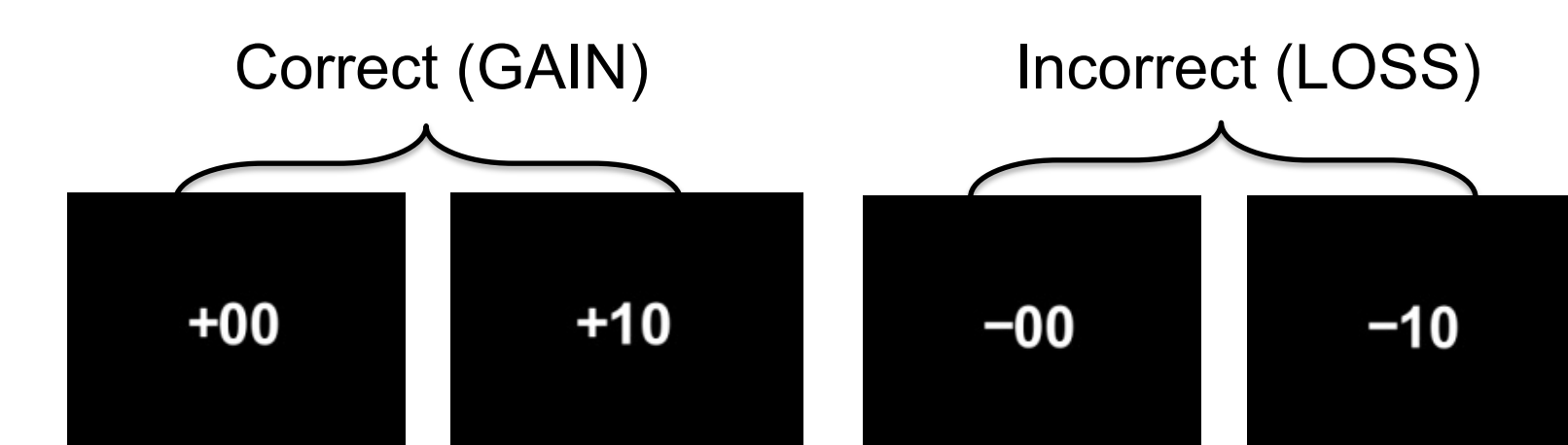
70 smokers interested in quitting were enrolled in this study and asked to perform a reaction time task, while ERPs were recorded using a 129-channel sensor array.

The task required pressing one of two buttons to identify a central target among distractors. Participants had the potential to gain or lose money, depending on if their answers were correct or incorrect. If their response was too slow, they receive feedback informing them that no gains or losses were made.

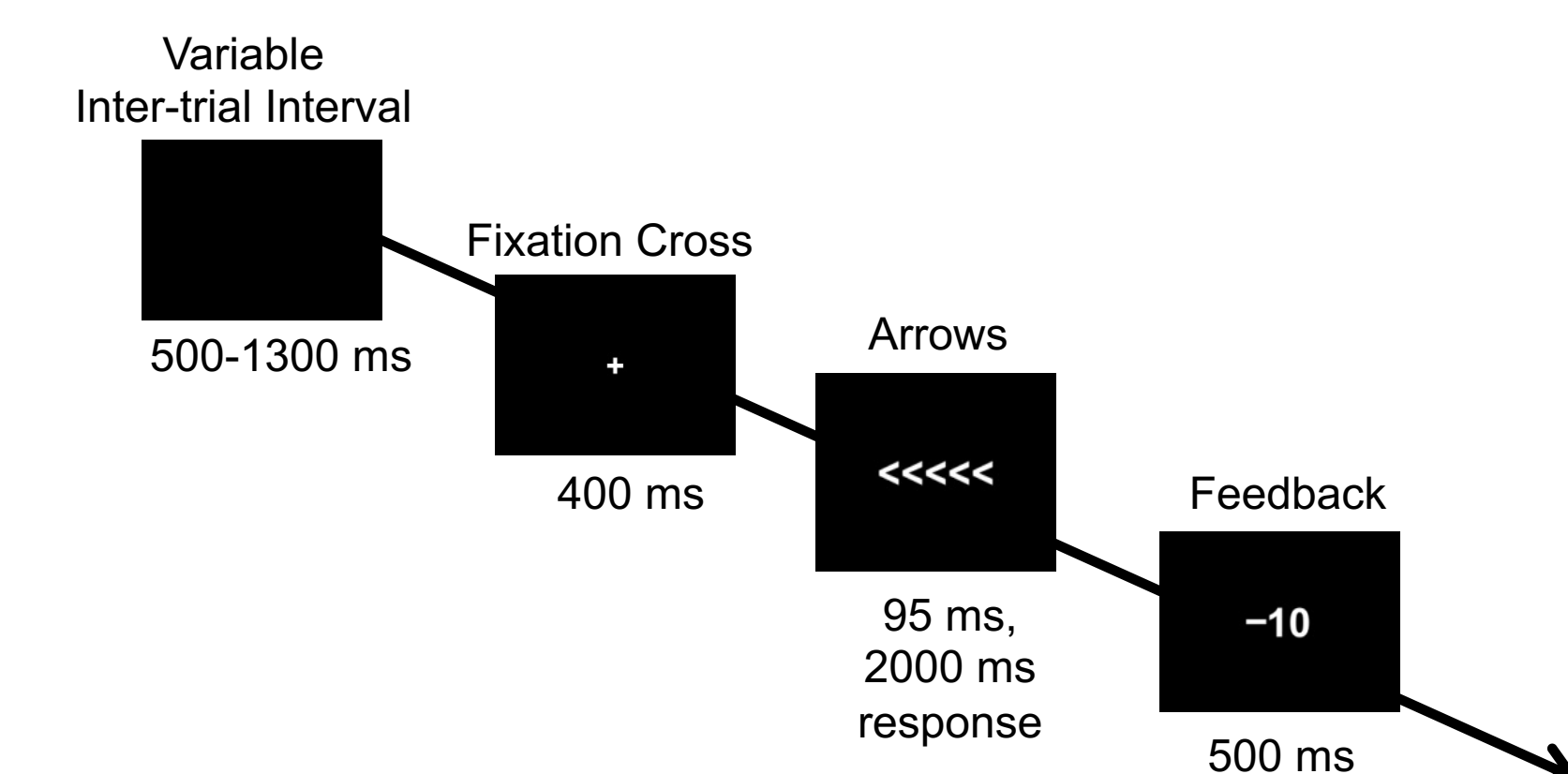
Flanker Task



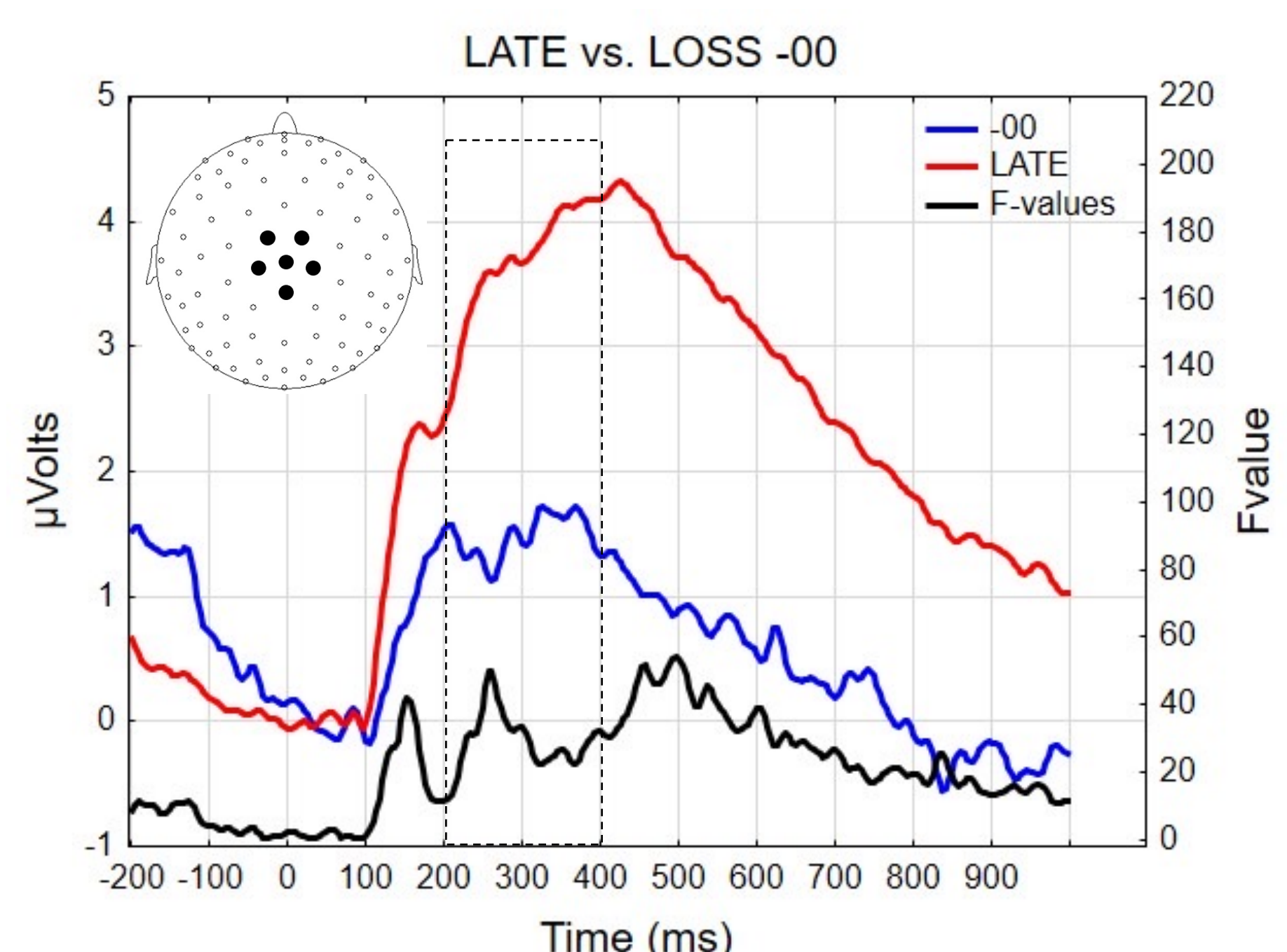
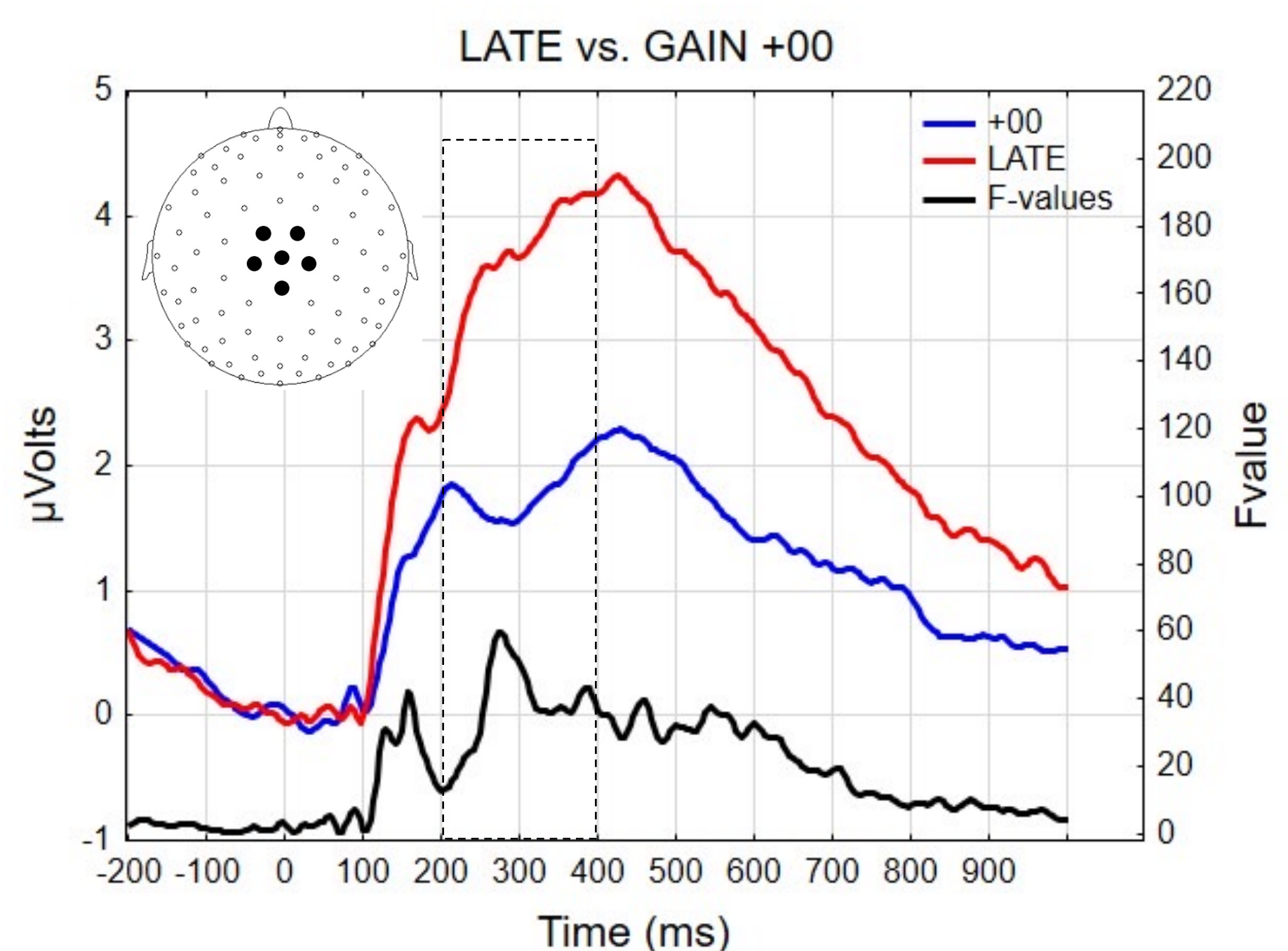
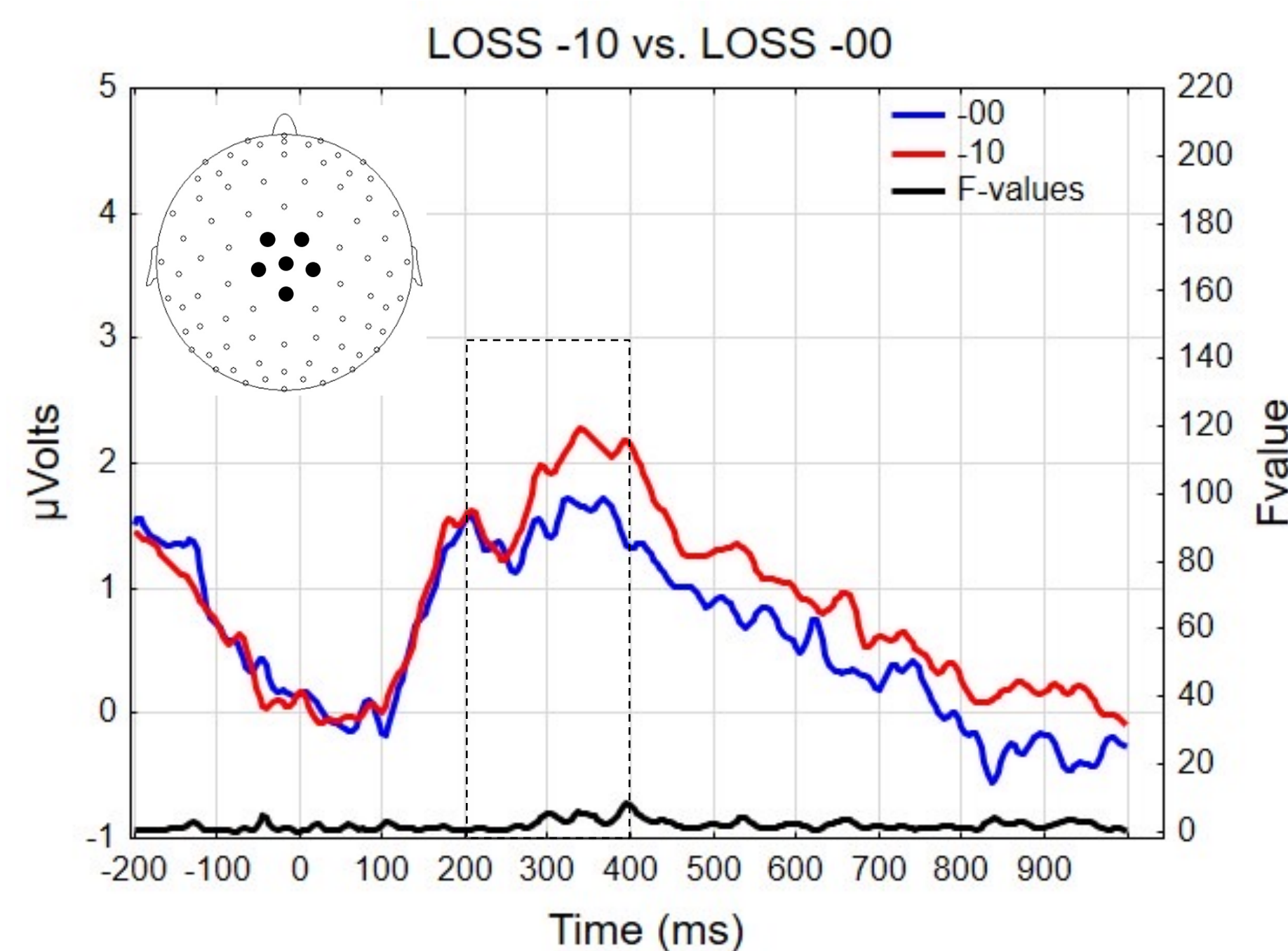
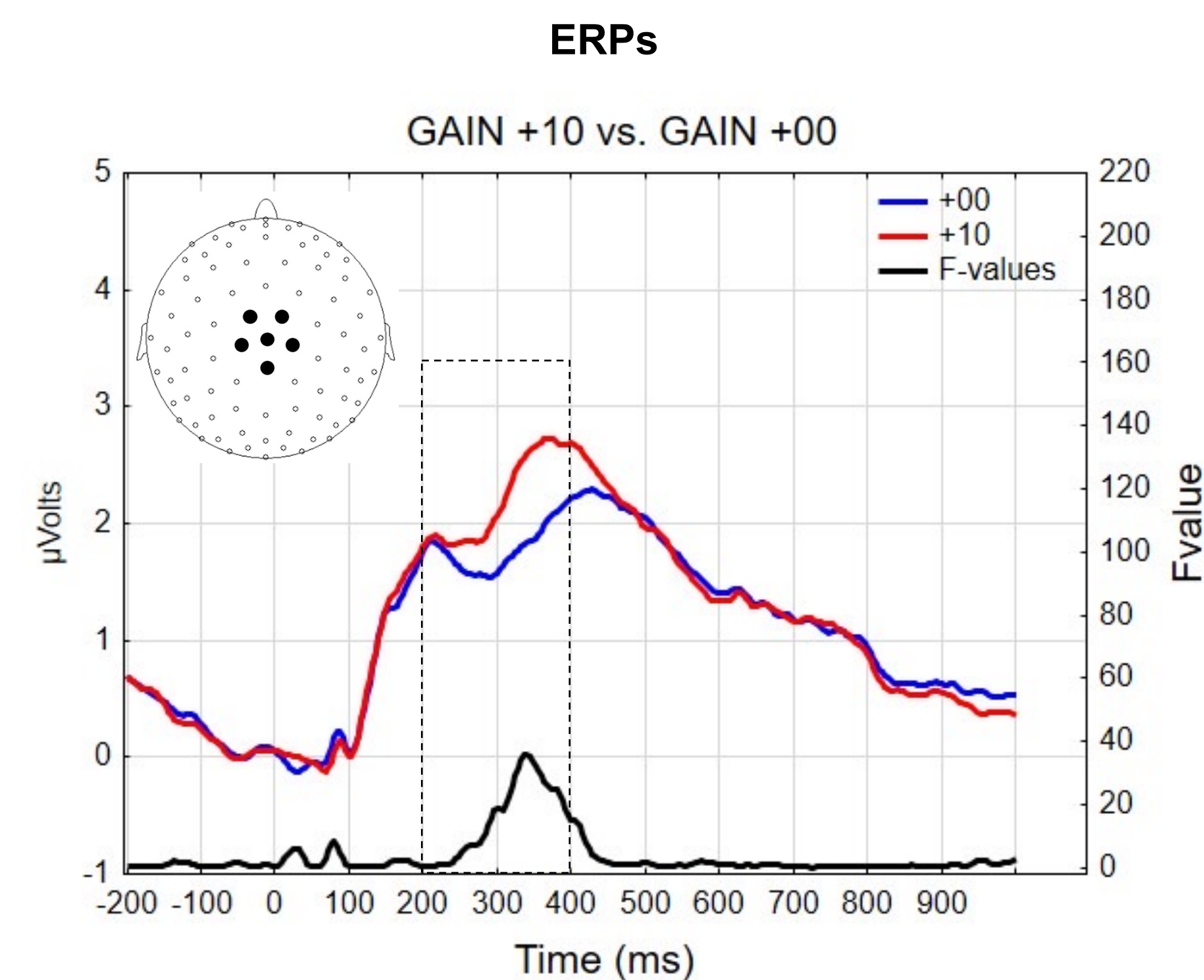
Feedback



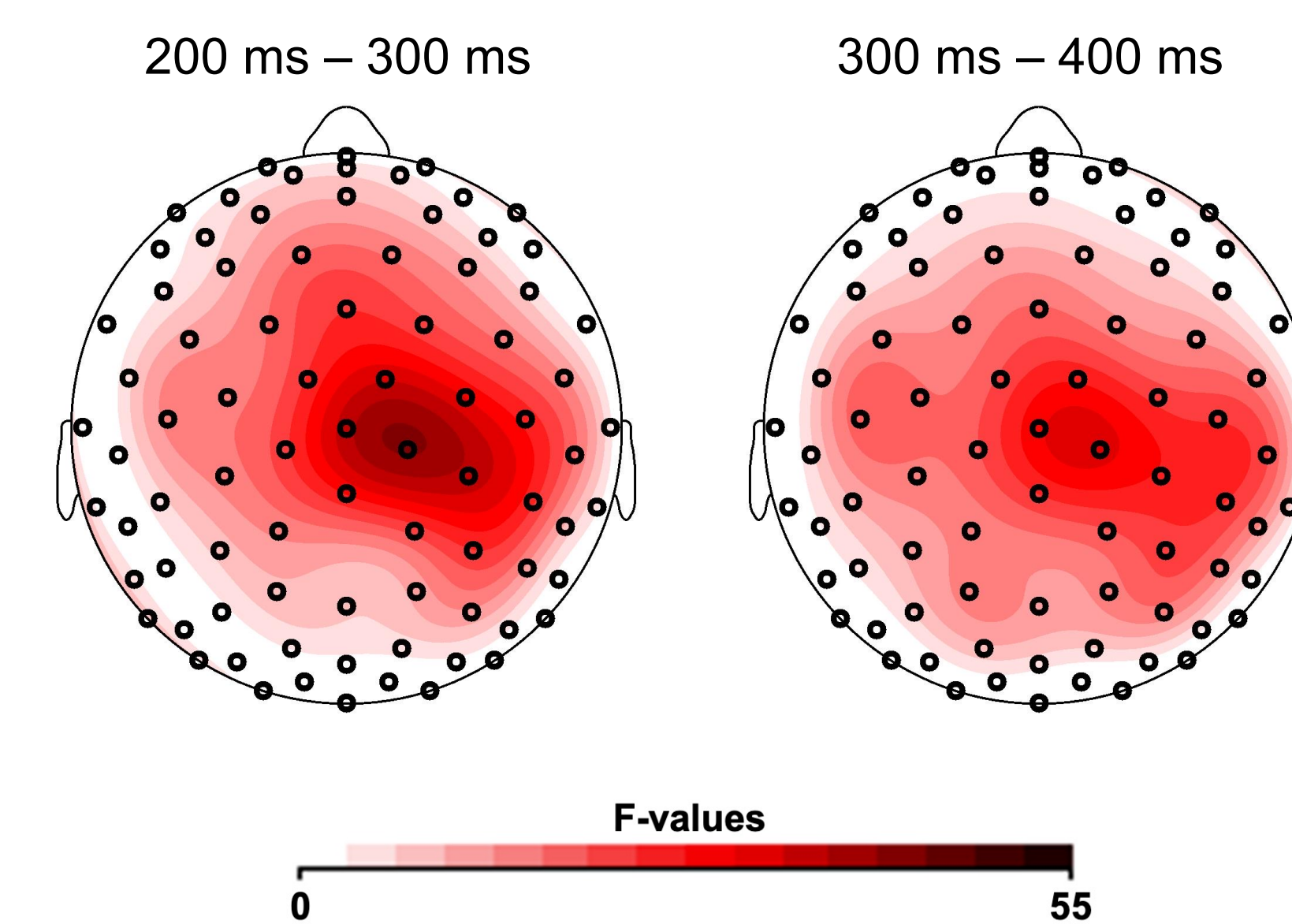
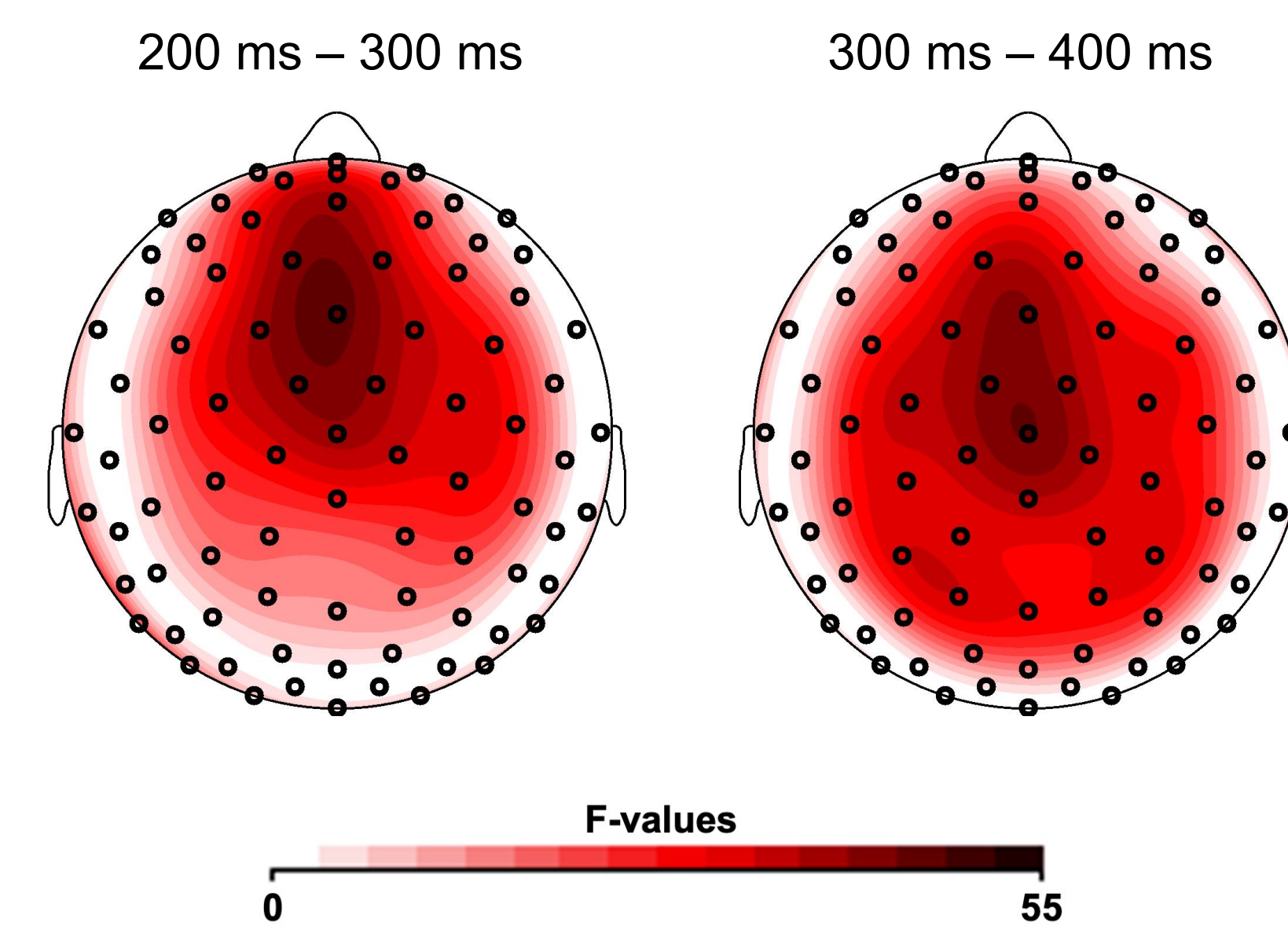
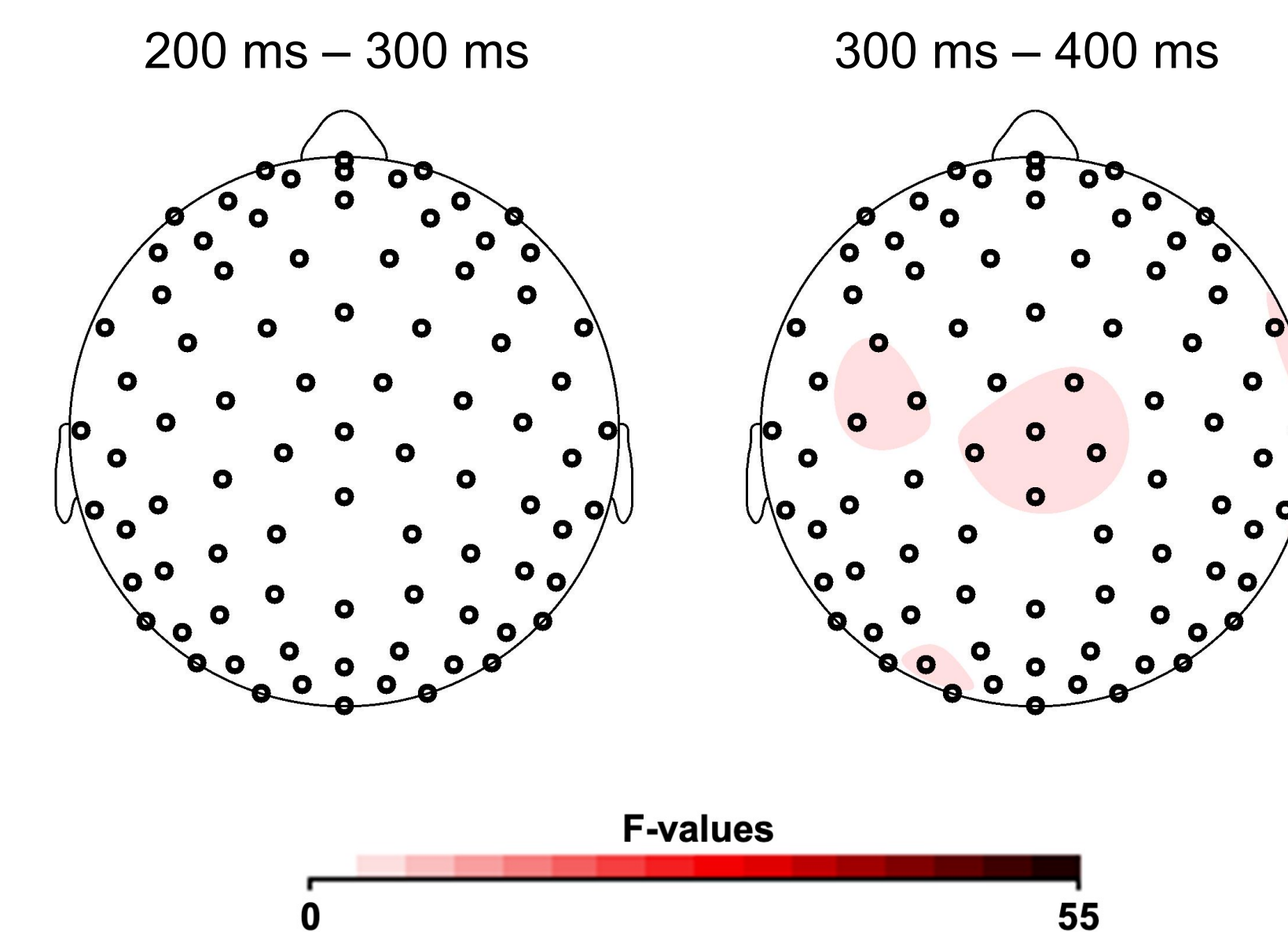
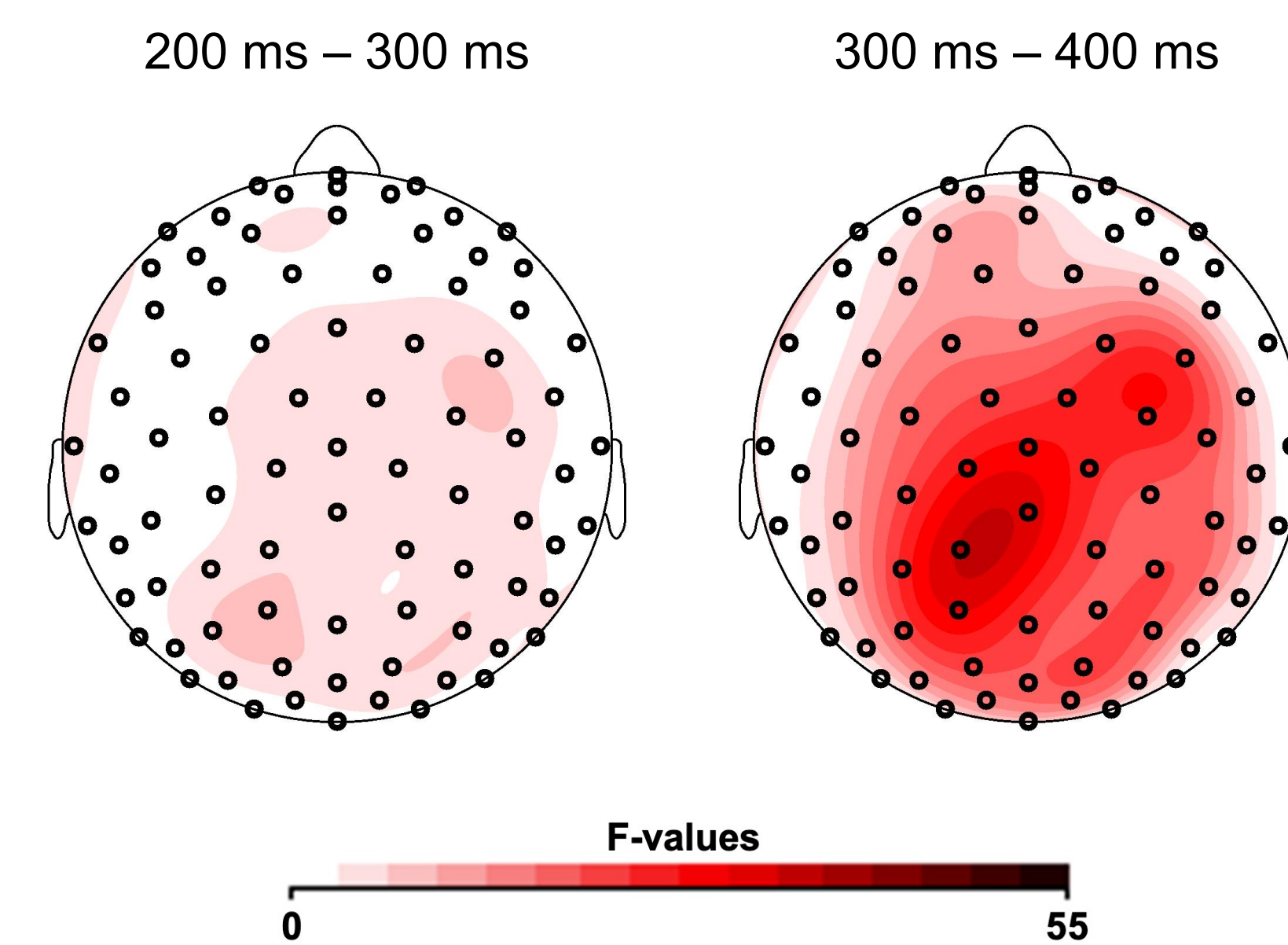
Stimulus Presentation



Results



Statistical Parametric Mapping



Analyses

- Receiving larger rewards (e.g., 10 cents) prompted greater positivity 200-400ms after the onset of feedback, than receiving smaller rewards (e.g., 0 cents).
- There were no significant differences between large and small losses.
- The unexpected outcome of no reward or loss, following a late response, produced a greater cortical positivity than was observed for receiving larger rewards.

Conclusions

- We have isolated ERP components that are sensitive to both the processing of rewards' magnitude and to unexpected outcomes.
- These findings represent the first step towards a better understanding of how nicotine and nicotine withdrawal alter our reward responses.
- Future studies will seek to explore how smoking cessation medications may alter these ERP components.

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