

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

Matthew Taing, B.S.¹, Francesco Versace, PhD¹

¹Department of Behavioral Science, Division of Cancer Prevention and Population Sciences

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.

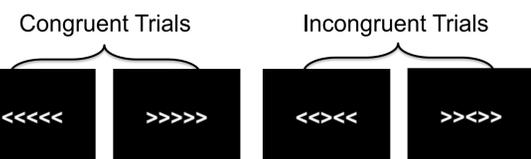
Identifying the psychophysiological mechanisms underlying reward responses may contribute to the development of treatments to reduce reward deficits and vulnerability to relapse among smokers attempting to quit.

Methods

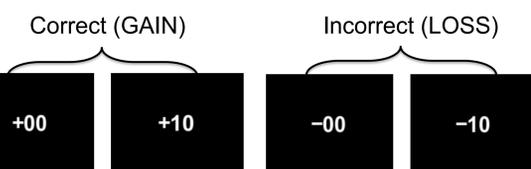
70 smokers interested in quitting were enrolled in this study and asked to perform a reaction time task, while ERPs were recorded using a 129-channel sensor array.

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

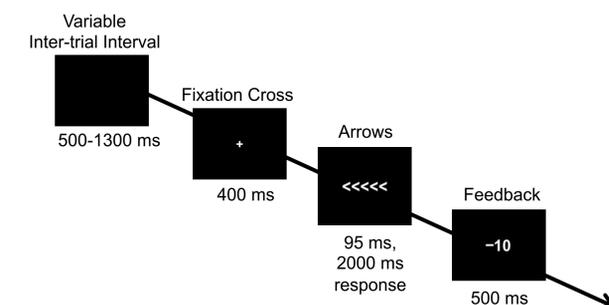


Feedback

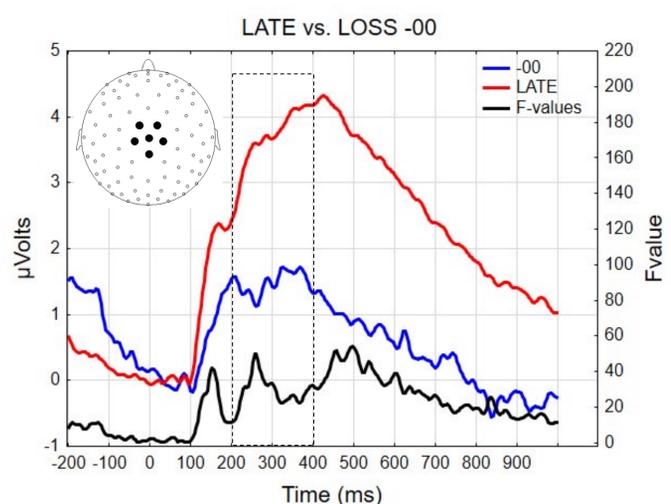
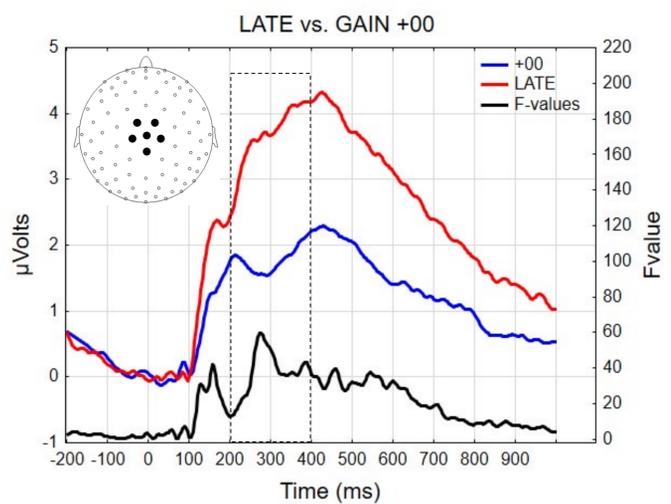
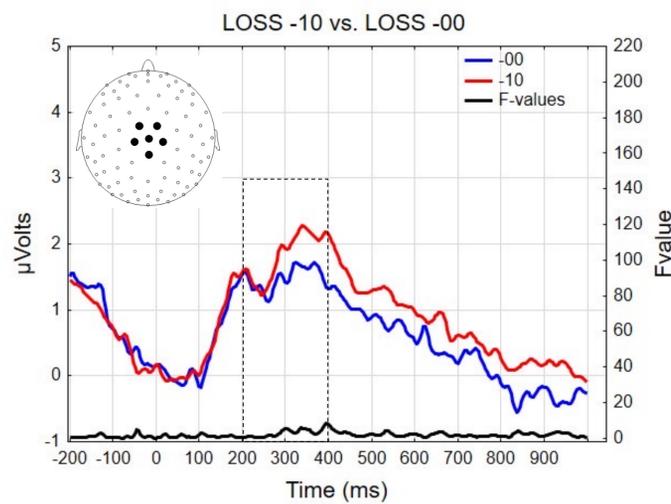
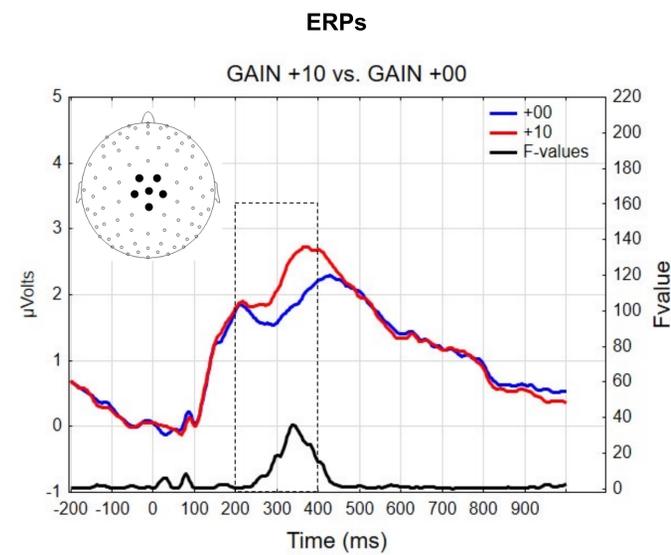


SLOW } Correct, but not fast enough (NO GAIN OR LOSS)

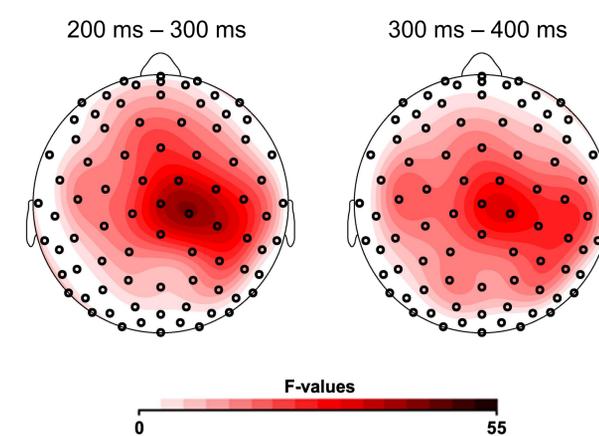
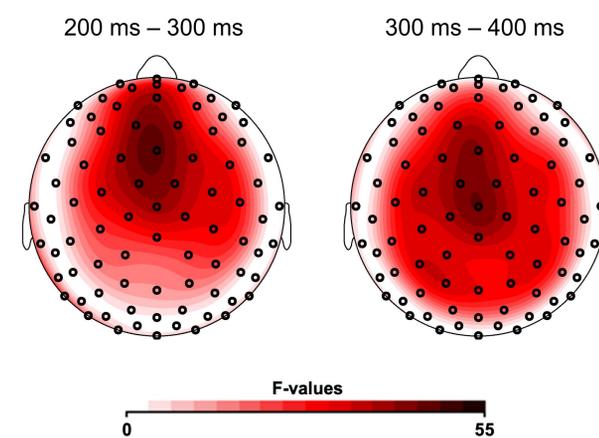
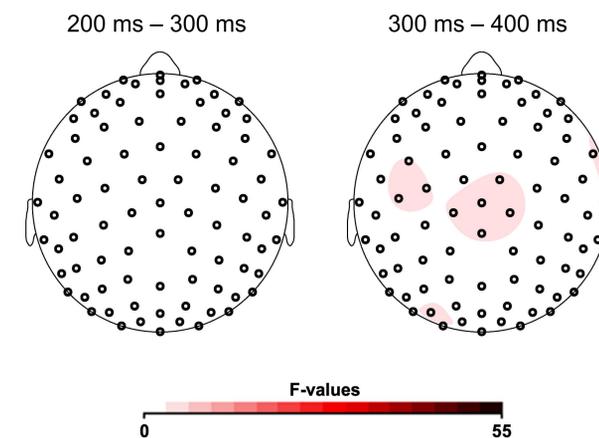
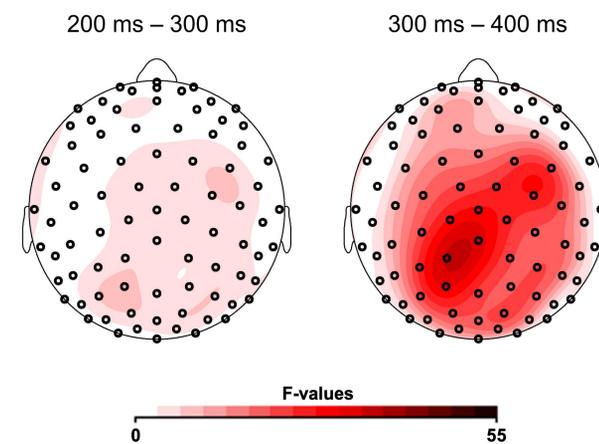
Stimulus Presentation



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.

Acknowledgements and Funding

This work was supported by funding provided by the National Cancer Institute grant R25CA056452 (to Dr. Shine Chang, Principal Investigator) on which Matthew Taing was supported as a trainee. Conclusions drawn in this work are solely the responsibility of the authors and do not necessarily represent the official views of the sponsoring organizations. Study procedures were approved by the Institutional Review Board (IRB) at the University of Texas MD Anderson Cancer Center to allow for the exploratory, secondary data analysis of an existing dataset.