

# Online ocular artifact detection and rejection

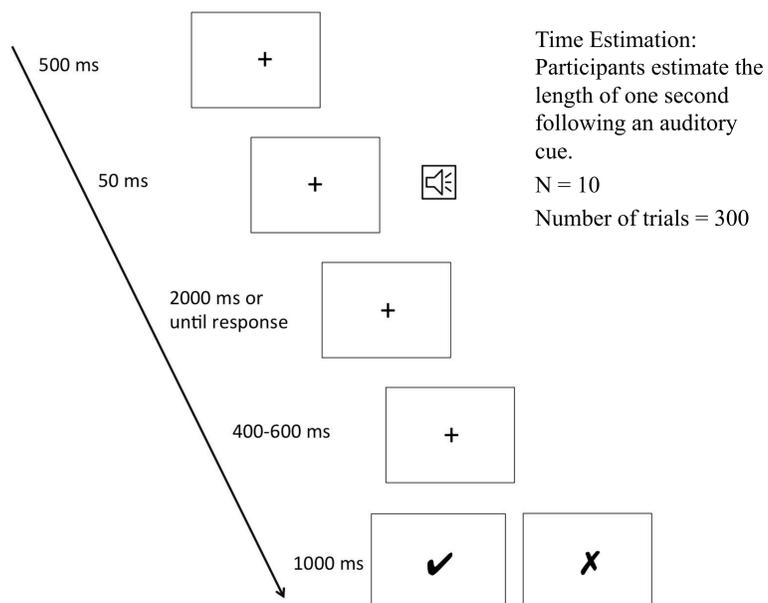
Cameron D. Hassall, Chelsey C. Michaud, and Olav E. Krigolson

Department of Psychology and Neuroscience, Dalhousie University

## INTRODUCTION

The muscular activity associated with eye movements creates electrical artifacts which interfere with electroencephalographic (EEG) recordings. Here, we tested a trial-rejection strategy while participants performed a time-estimation task. Research assistants monitored and accepted or rejected trials based on a visual inspection of a MATLAB-generated summary of epoched data. Our results suggest that while trial rejection is an effective strategy for reducing artifacts in this task, it may not lead to better EEG results over and above traditional ocular correction techniques when large trial numbers are used.

## METHOD



Participants must correctly estimate the length of one second to within a preset margin.

Following a correct response, the margin shrinks.

Following an incorrect response, the margin grows.

We tested two conditions (within design):

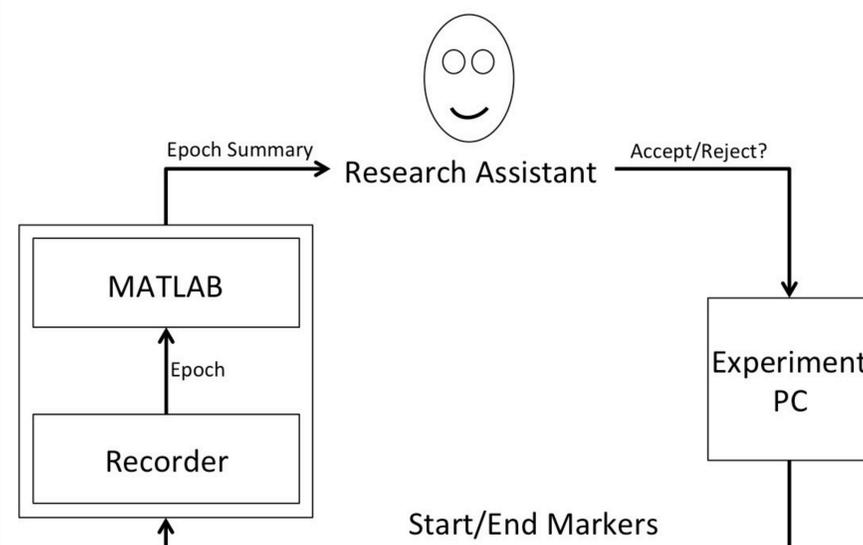
### With Rejection

- A research assistant accepted/rejected each trial
- Analyzed first 300 accepted trials.

### Without Rejection

- Control
- First 300 trials, regardless of accept/reject status
- Used regression (Gratton, Coles, and Donchin, 1983) to correct eye movements

## DESIGN

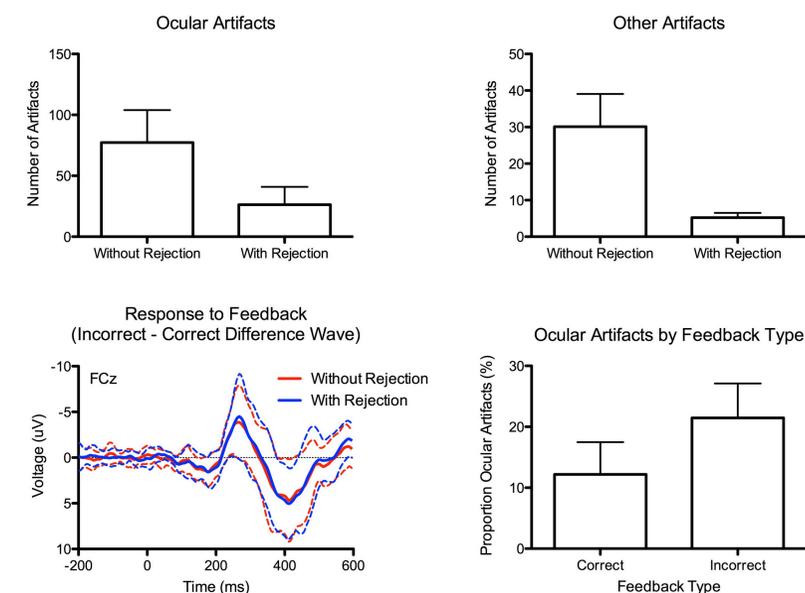


Screenshots showing a vertical eye movement.

Epochs are first low-pass filtered (25 Hz cutoff) and baseline corrected (-200 to 0 ms window).

1. Eye channels (LEOG, REOG, VEOG, FP2)
2. Slopes (criterion for violation: greater than 8  $\mu\text{V}$  per ms)
3. Total number of slope violations
4. Max-Min (criterion for violation: greater than 150  $\mu\text{V}$ )
5. Total number of Max-Min violations
6. "Flatness" (standard deviation) (criterion for violation: less than 1)
7. Total number of flat violations

## RESULTS



### Trial Rejection

- Fewer ocular artifacts
- Fewer "non-ocular" artifacts
- No difference in EEG results

Interestingly, participants made more eye movements following incorrect feedback compared to correct feedback.

## CONCLUSIONS

Trial rejection results in fewer artifacts in a time-estimation task, but may not lead to better EEG results provided many trials are used. Furthermore, trial rejection may not be appropriate for some experimental paradigms. More work is needed to determine the effectiveness of trial rejection when trial numbers are low.

MATLAB script available at [www.neuroeconlab.com](http://www.neuroeconlab.com)

## CONTACT

Cameron Hassall  
Department of Psychology and Neuroscience  
Dalhousie University  
Halifax, Nova Scotia, Canada

Email: [cameron.hassall@dal.ca](mailto:cameron.hassall@dal.ca)  
Web: [www.neuroeconlab.com](http://www.neuroeconlab.com)