

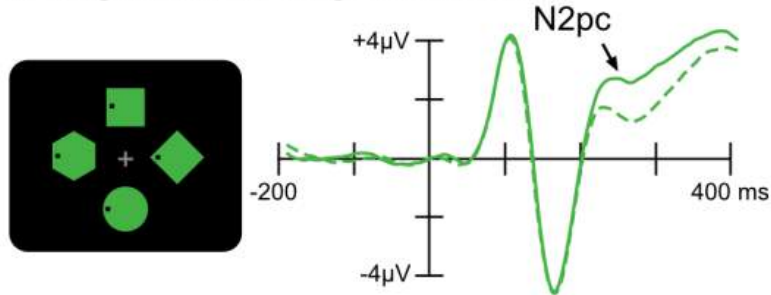
MARKERS OF ATTENTIONAL SELECTION IN THE HUMAN EEG

EINAT RASHAL
DEPARTMENT OF EXPERIMENTAL PSYCHOLOGY ,
GHENT UNIVERSITY

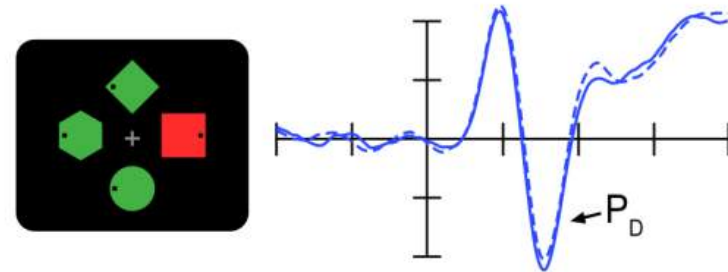
WHY EEG?

- Lateralized activity associated with visual selective attention:
 - **N2pc** – attention to the target is reflected in greater negativity over contralateral than ipsilateral hemisphere, around 200-300 ms from stimulus onset
 - **Pd** – inhibition or suppression of a distractor is reflected in greater positivity over contralateral than ipsilateral hemisphere, around 300 ms from stimulus onset

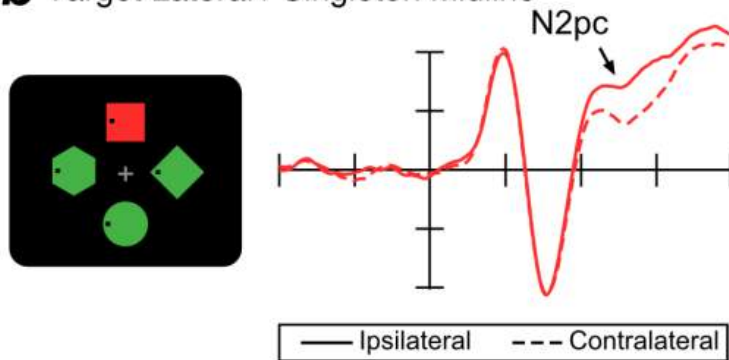
a Target Lateral / Singleton Absent



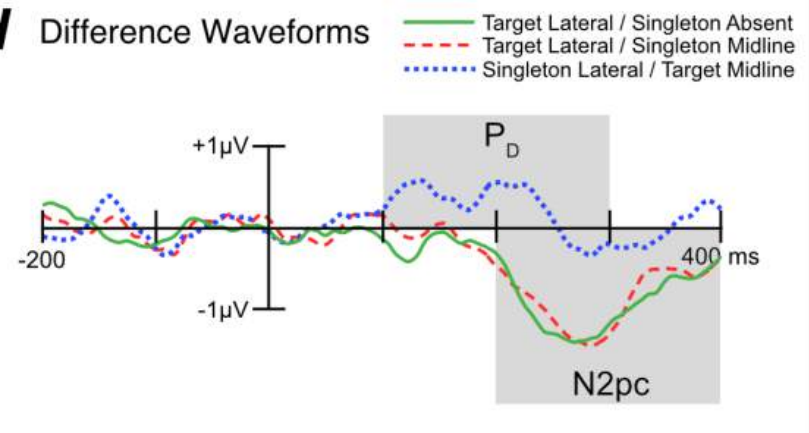
c Singleton Lateral / Target Midline



b Target Lateral / Singleton Midline

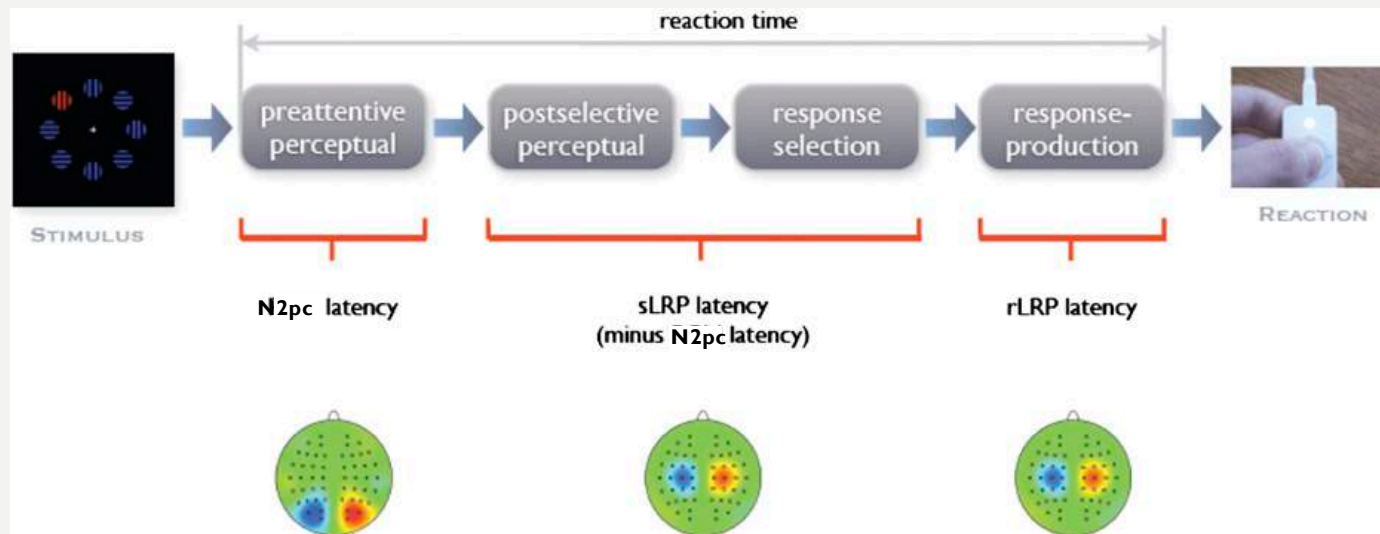


d Difference Waveforms



Gaspelin & Luck (2018), Journal of Cognitive Neuroscience

- High temporal resolution will allow for better investigation of the temporal progression through different stages of the visuo-motor integration process under multiple priority signals



Tollner et al. (2012), PNAS

WIDER PROCESSING CONTEXT

- Examining the **cue-target interval** can reveal preparatory effects initiated by the cue
- Attentional effects on **visuo-motor integration** can be examined with the **s-LRP** (stimulus locked lateralized response readiness) – greater negativity over contralateral than ipsilateral hemisphere, relative to response hand
- **Lateralized alpha oscillations** – allocation of attention is thought to be reflected in decreased alpha oscillations, while inhibition of distracting stimuli is reflected in increased alpha oscillations

CUEING AND TARGET SALIENCE

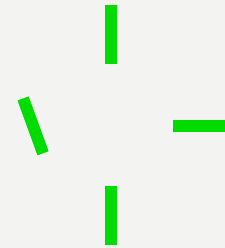
**MAC-
BRAIN,
STUDY I**

PRIORITY SIGNALS

- Integration of bottom-up and top-down control of attention
- Comparing different signals
- In EEG - modulation of components and/or temporal processing leading to prioritization

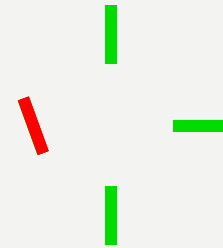
METHODS

- Visual search task in combination with a cue to the target location
- 4 conditions:
 - No salient distractor



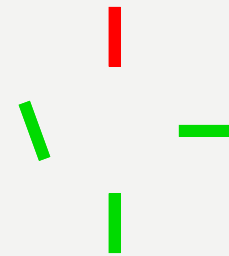
METHODS

- Visual search task in combination with a cue to the target location
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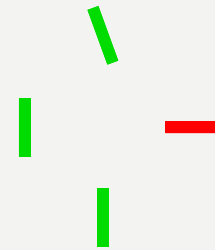
METHODS

- Visual search task in combination with a cue to the target location
- 4 conditions:
 - No salient distractor
 - Salient target
 - Salient distractor present:
 - Target on horizontal and salient distractor on vertical meridians



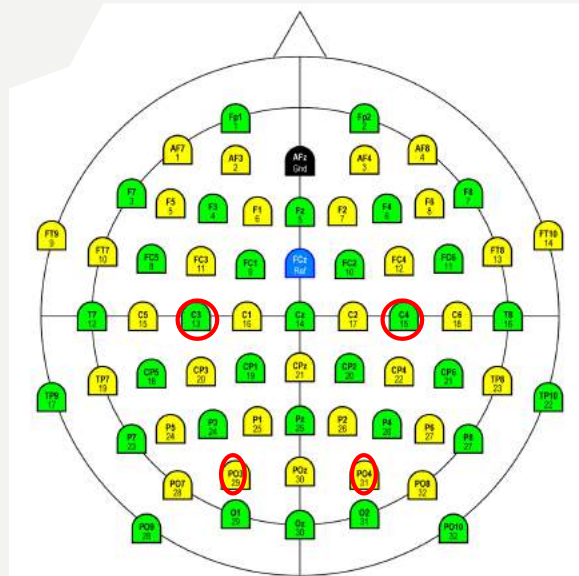
METHODS

- Visual search task in combination with a cue to the target location
- 4 conditions:
 - No salient distractor
 - Salient target
 - Salient distractor present:
 - Target on horizontal and salient distractor on vertical meridians
 - Target on vertical and salient distractor on horizontal meridians



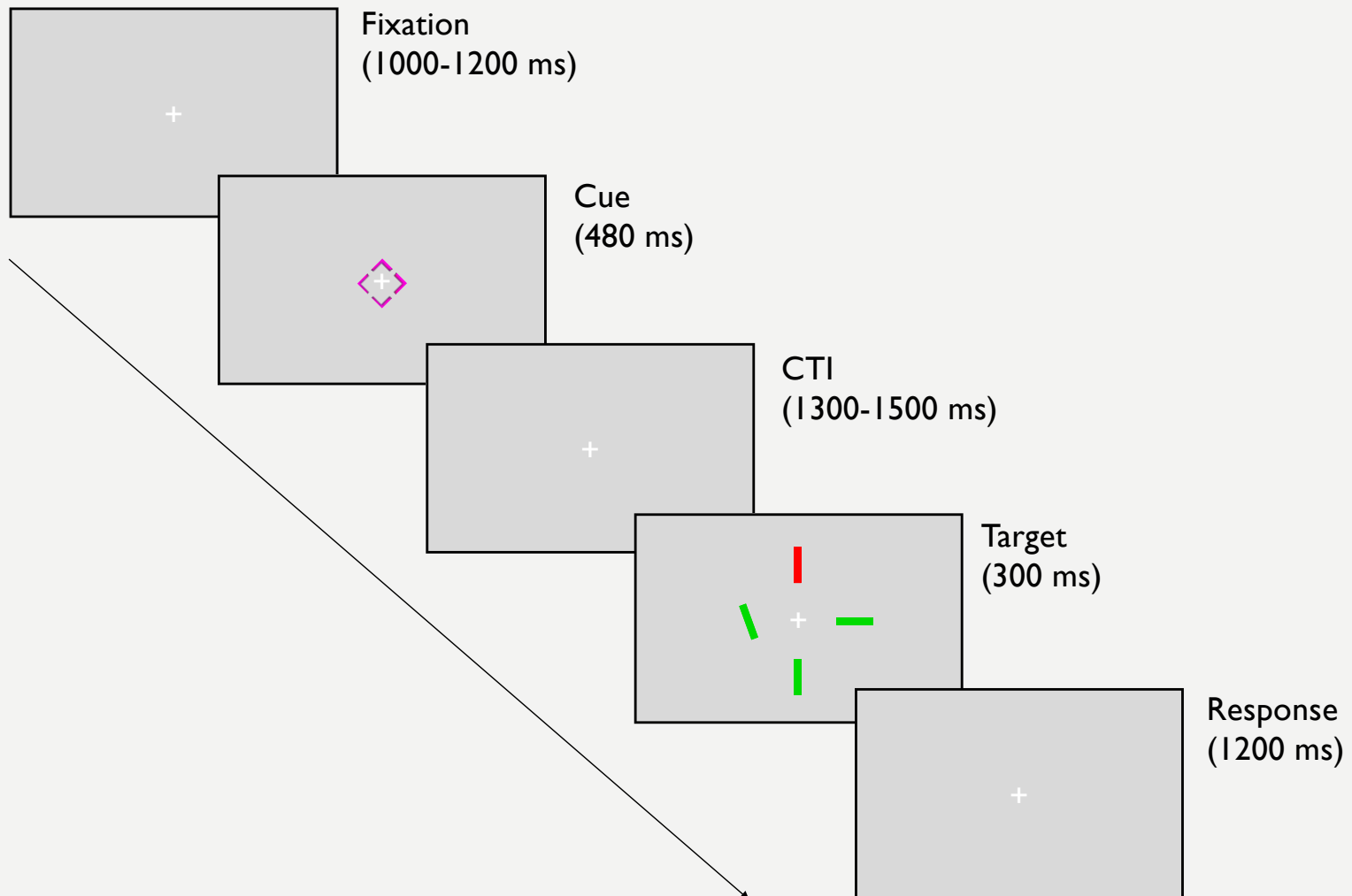
METHODS

- actiCHamp 64 channels

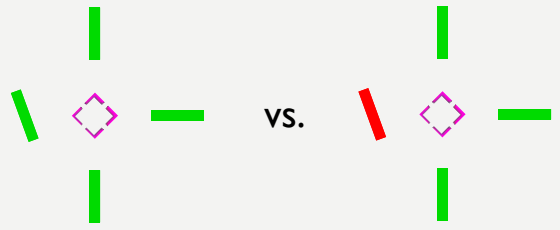


- Lateral posterior electrodes for N2pc and Pd
- Lateral central electrodes for sLRP/rLRP

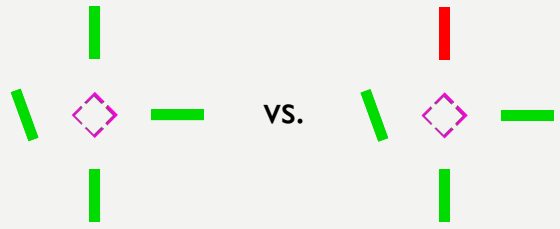
METHODS



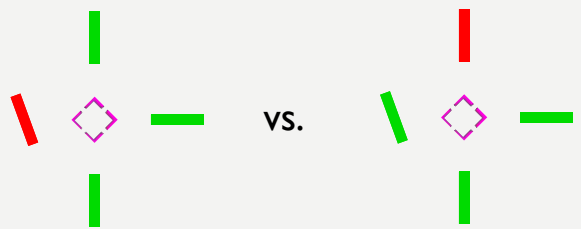
SALIENCY



Target saliency effect on target selection

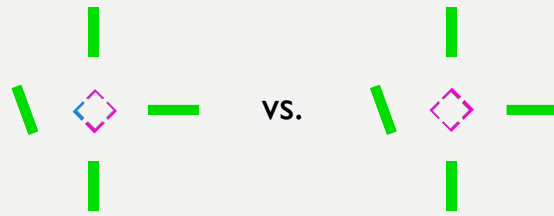


Distractor saliency effect on target selection

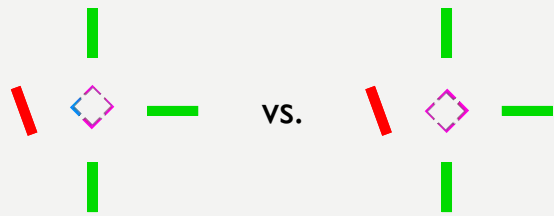


Comparing target and distractor saliency effects

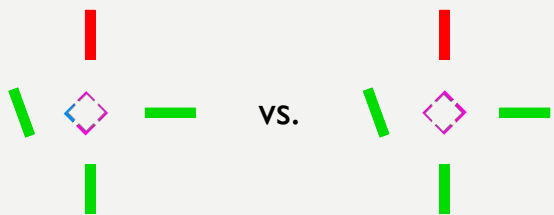
CUEING



Effect of cueing on target selection



Effect of cueing on salient target selection



Effect of cueing on target selection during distractor presence



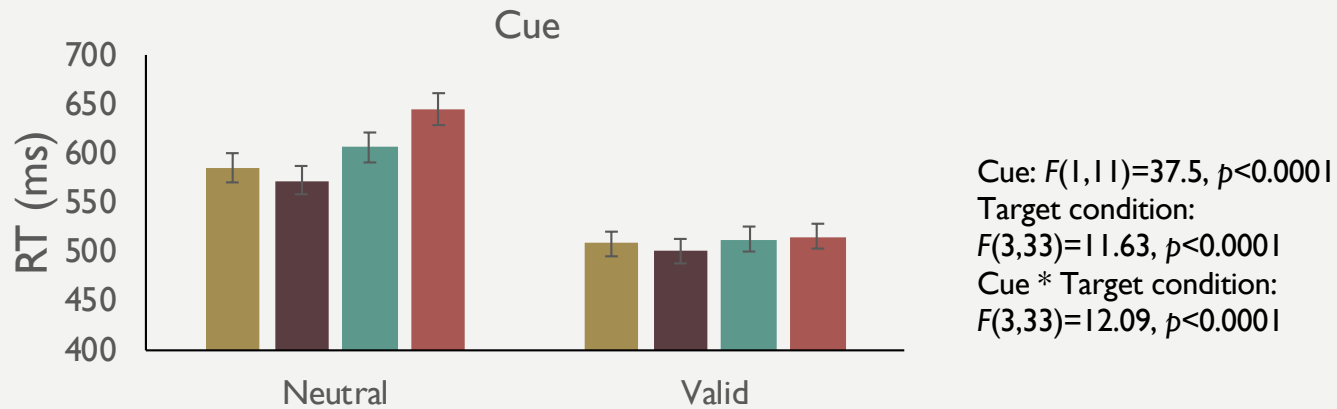
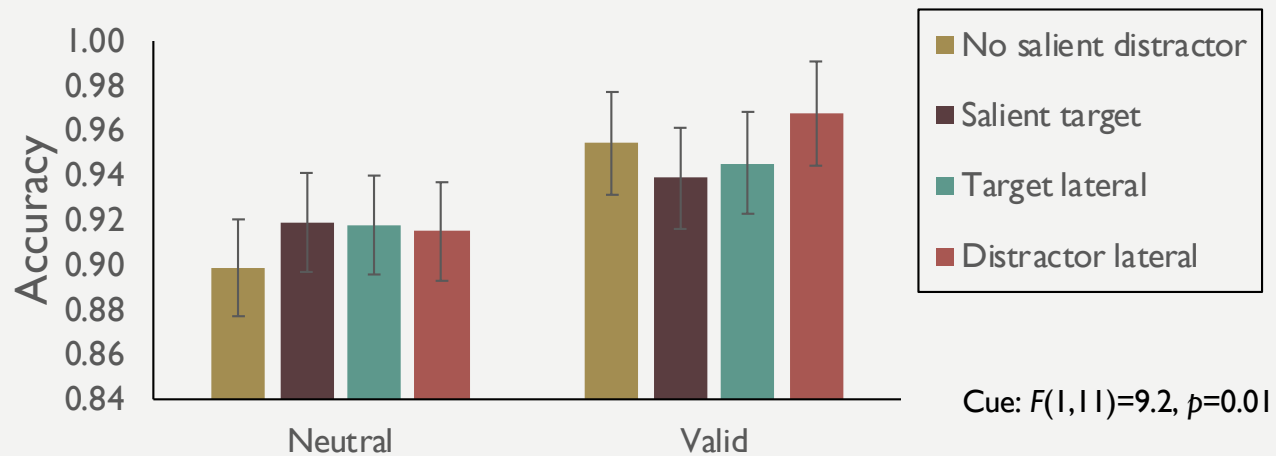
Effect of cueing on distractor suppression

- Possible effects on attentional related components in our paradigm:
 - Cueing the target location may result in shorter latencies of N2pc due to an earlier allocation of attention to that location
 - Cueing a salient target may result in additional facilitation, reflected in a higher amplitude and shorter latency for N2pc
 - Cueing the target when a salient distractor is present may result in shorter latencies for Pd due to earlier processing of the target

RESULTS

Behavioral measurements

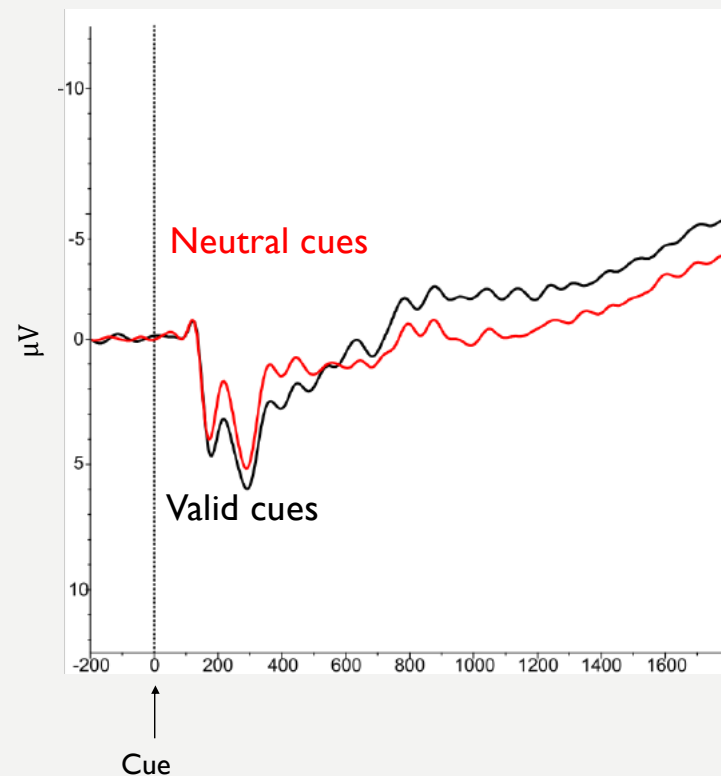
- Valid cues facilitate performance



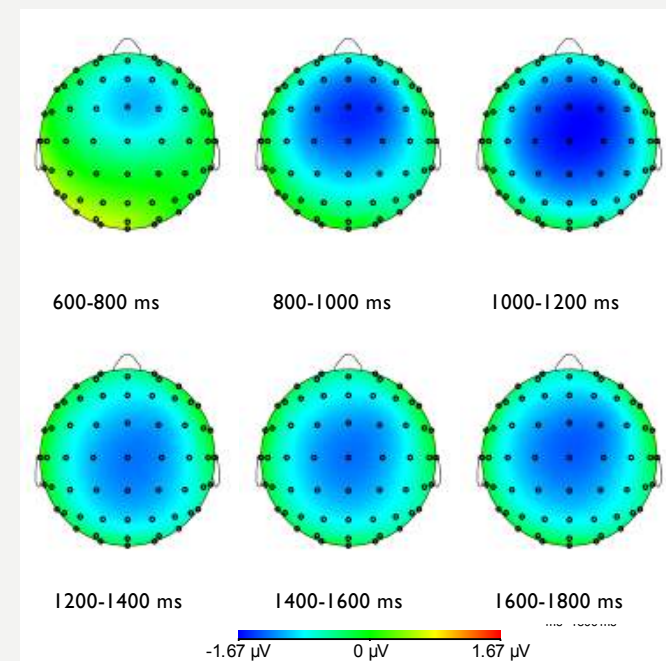
n=12

RESULTS EEG - Cueing effect on CNV (contingent Negativity Variation)

- On average, participants prepare more for the target following a valid cue



n=13

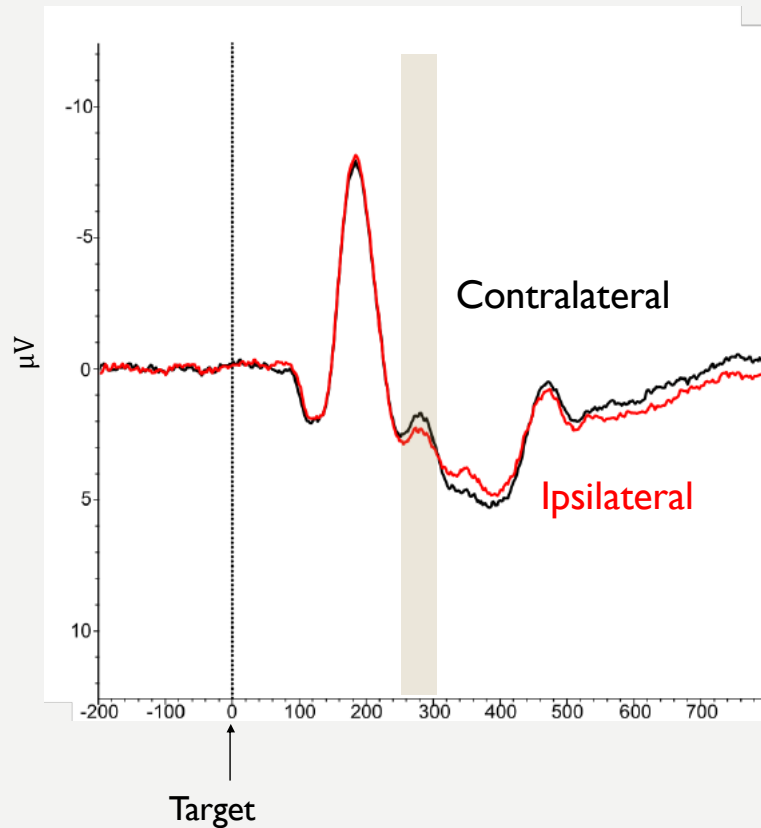


RESULTS

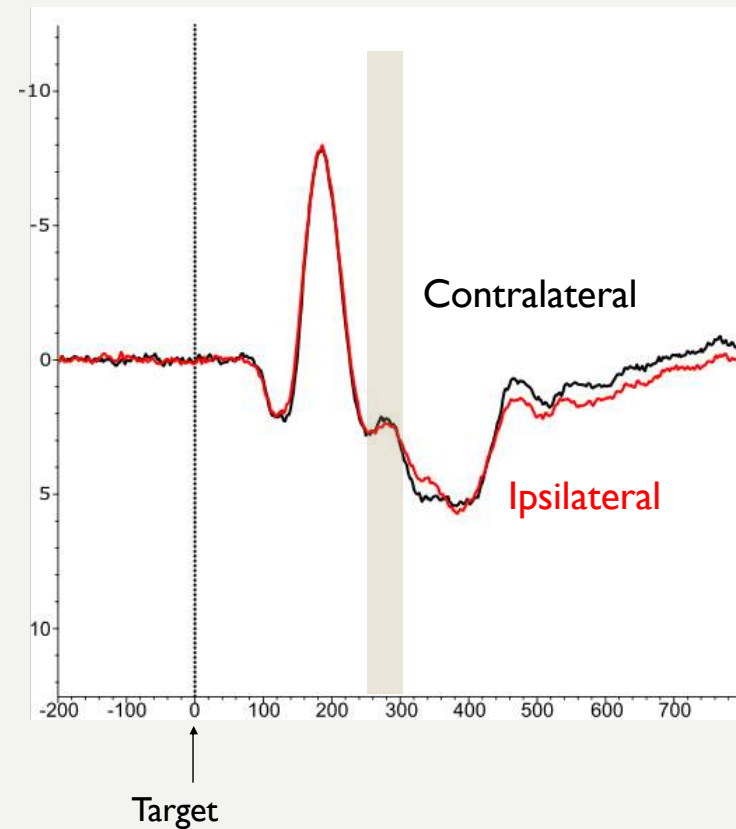
EEG - N2pc

- N2pc only with neutral cues

Neutral Cues



Valid Cues

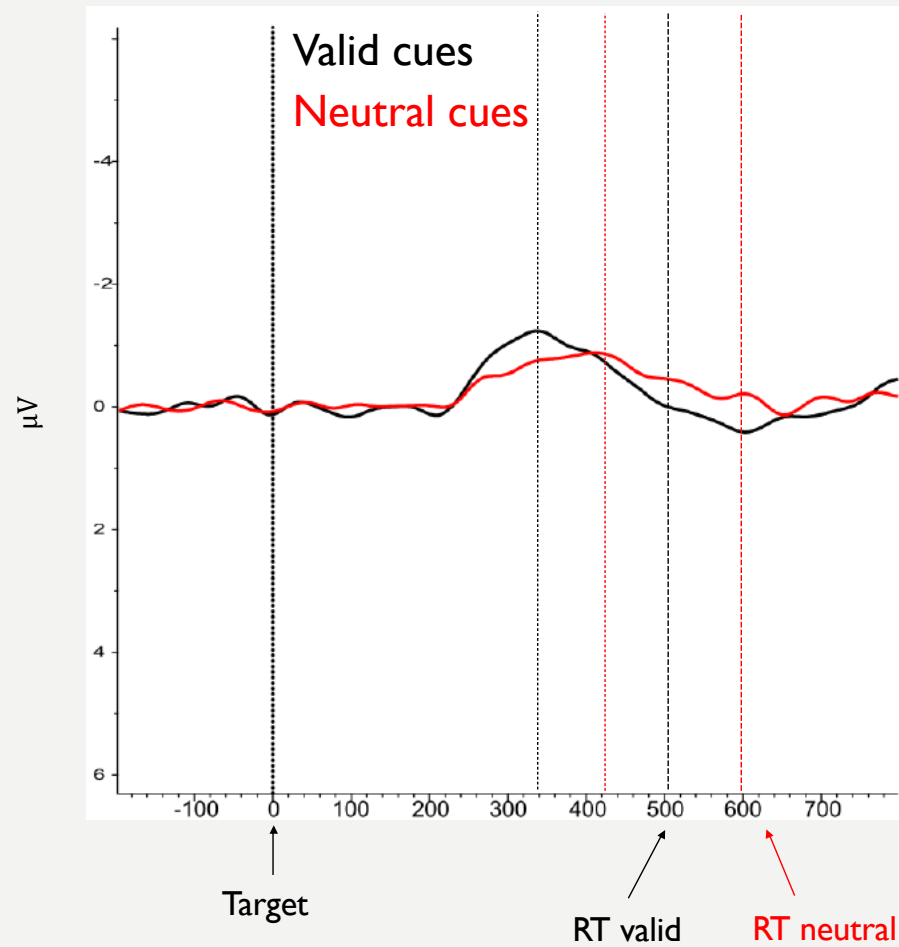


n=13

RESULTS

EEG - sLRP

- sLRP shows faster and stronger responses after valid cues



n=13

SUMMARY

- Cueing effects were found on N2pc and sLRP
- No clear evidence of Pd nor for the interaction between cueing and saliency
- Data collection is not yet complete
- The lack of N2pc for targets preceded by a valid cue suggests the task may not require additional attentional resources

COMING SOON...

- Combinations of:
 - Cueing
 - Saliency
 - Task relevance
 - Statistical learning
 - Reward

**Thank you
for your
attention!**

