

Informative cue on stimulus frequency determines criterion in near-threshold somatosensory detection

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Introduction

Stimulus expectations have been shown to influence what we see by changing the decision criterion [1], whether this holds true in the somatosensory domain has not been investigated yet [2, 3]

The phase of the cardiac cycle determines perception of weak somatosensory stimuli [4, 5]

Research questions:

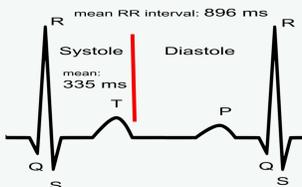
Do participants adapt their **decision criterion** in a **somatosensory near-threshold detection** task based on stimulus expectations?

Does **confidence** depend on the stimulus expectation condition?

Is there an **interaction between stimulus expectations and the cardiac cycle effect** on somatosensory perception?

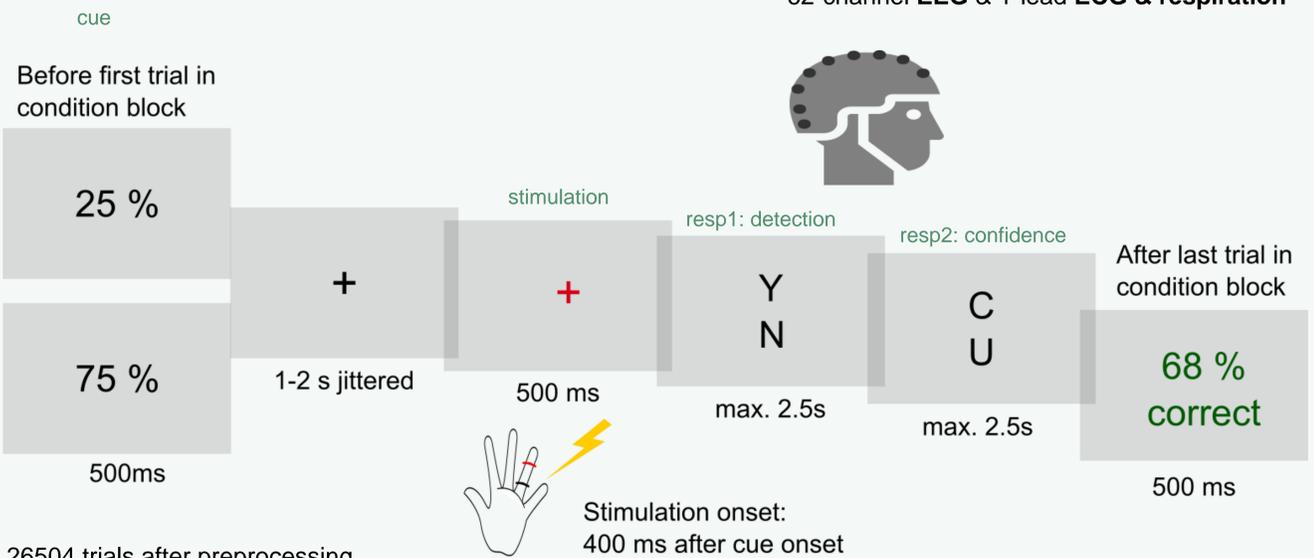
cardiac cycle effect in perception:

higher sensitivity in diastole



Methods

42 young, healthy participants
62-channel EEG & 1-lead ECG & respiration



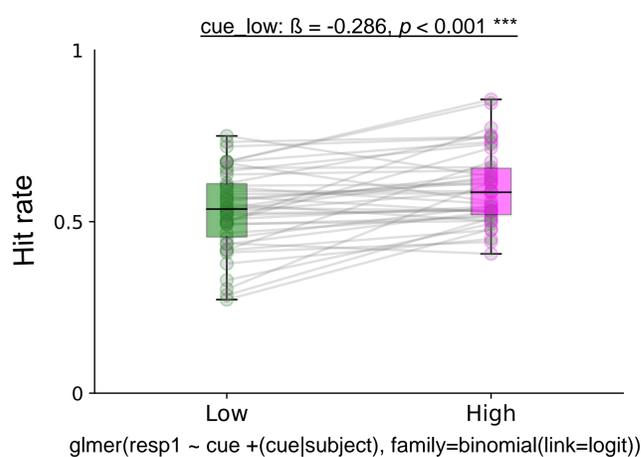
26504 trials after preprocessing

Independent variable: cue (low/high expectations), stimulation (signal/noise), cardiac cycle phase (four 200 ms time bins post R peak), congruency (cue == low & resp1 == no | cue == high & resp1 == yes)

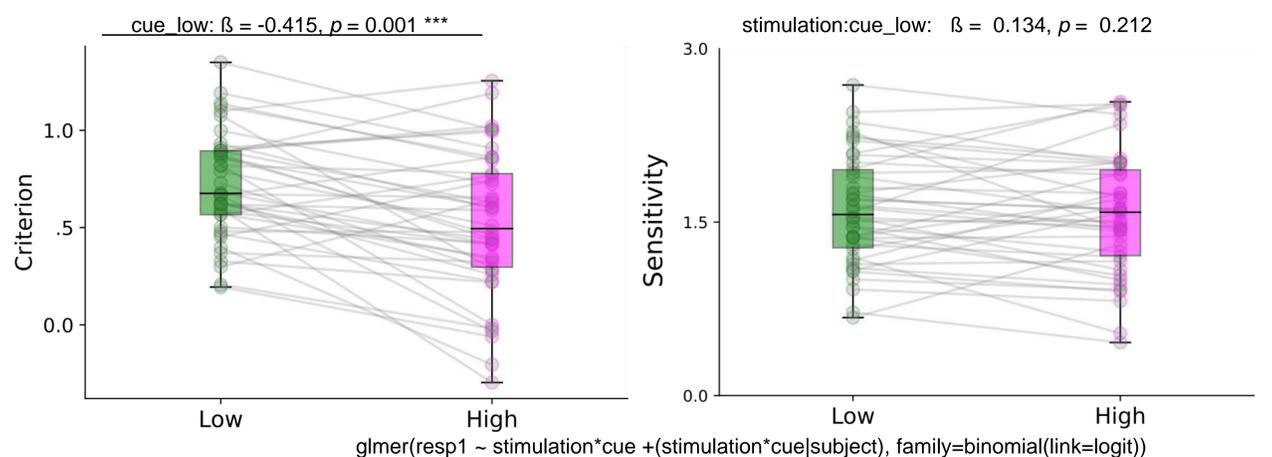
Dependent variable: detection (yes/no), confidence (confident/unconfident), reaction times

Results: behavioral

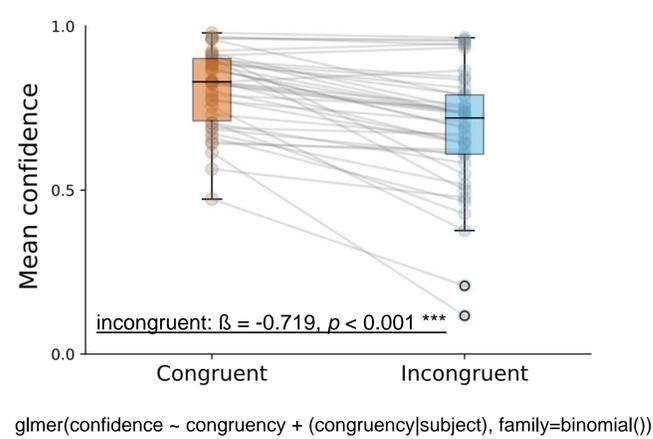
1 Higher hitrate in high expectation condition



2 Signal detection theory: more conservative criterion in low expectation condition

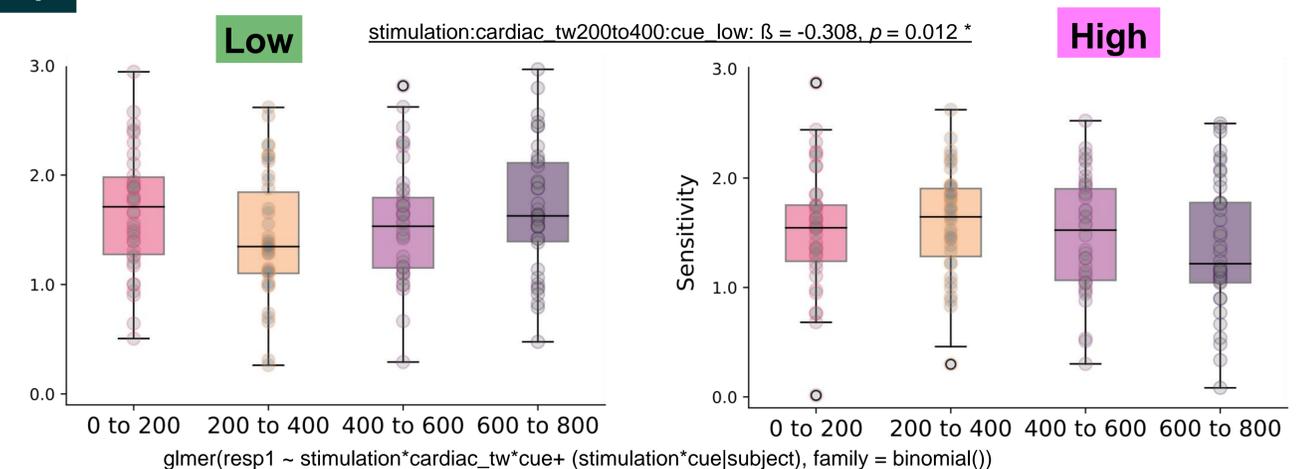


3 Higher mean confidence in congruent trials



4 cardiac cycle

Interaction between cardiac cycle and expectation condition:
Cardiac cycle effect on perceptual sensitivity only in low expectation condition



Discussion

Summary:

- Participants use information about stimulus probabilities for somatosensory perception

=> reflected in changes in decision criterion and confidence

- Expectations shift the attentional focus from internal to external and interact with unconscious predictive coding

=> interaction effect of expectation condition and the timing of stimulus onset within cardiac cycle on perceptual sensitivity

Open questions:

- Neural correlates of a change in decision criterion
- Differences in the heartbeat evoked potential between expectation conditions?



References:

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