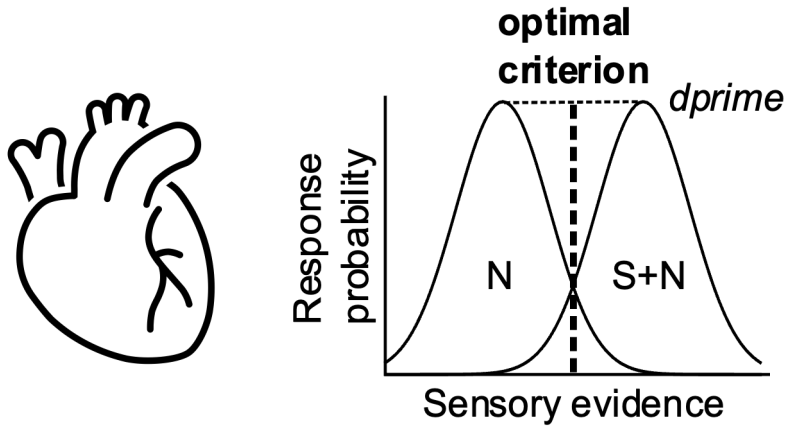
External vs. internal priors: investigating the influence of stimulus expectation and the cardiac cycle on somatosensory perception



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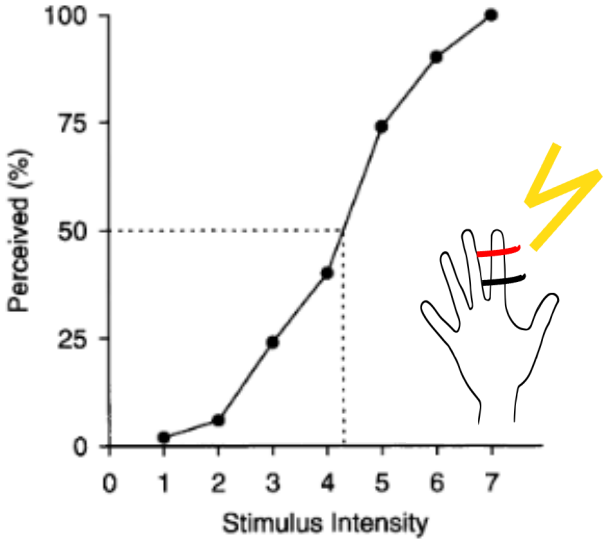
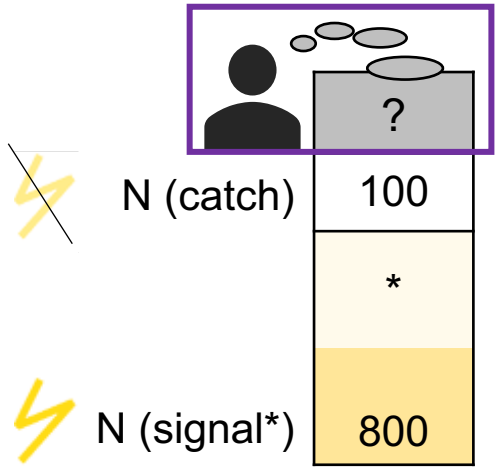
Detection of somatosensory near-threshold stimuli fluctuates across the cardiac cycle





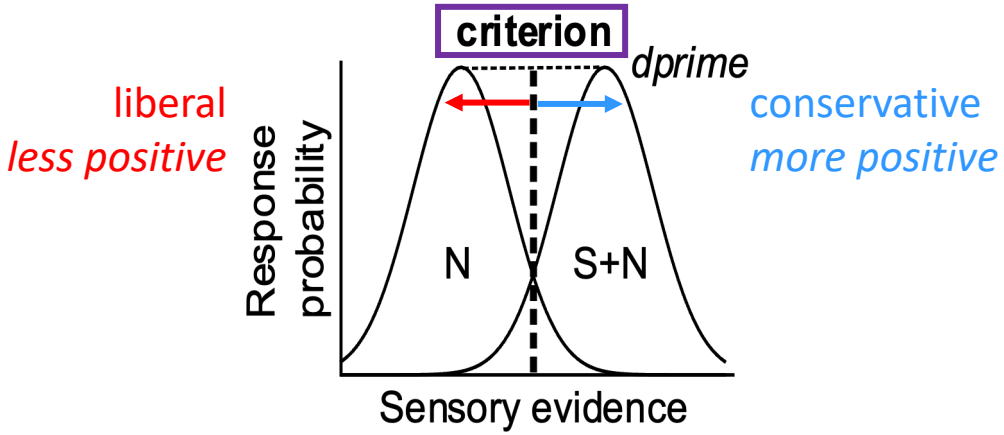
*50% detection prob.

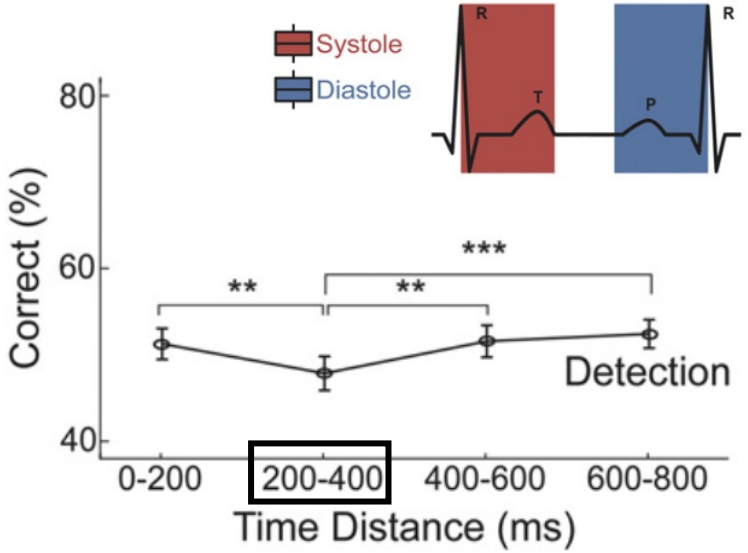
Systole:
Hit rate ↓
Detection sensitivity ↓
Criterion ↔

200-400 post Rpeak:
Hit rate ↓

Prior information shifts response criterion

Stim. expect. „75%!“ „25%!“

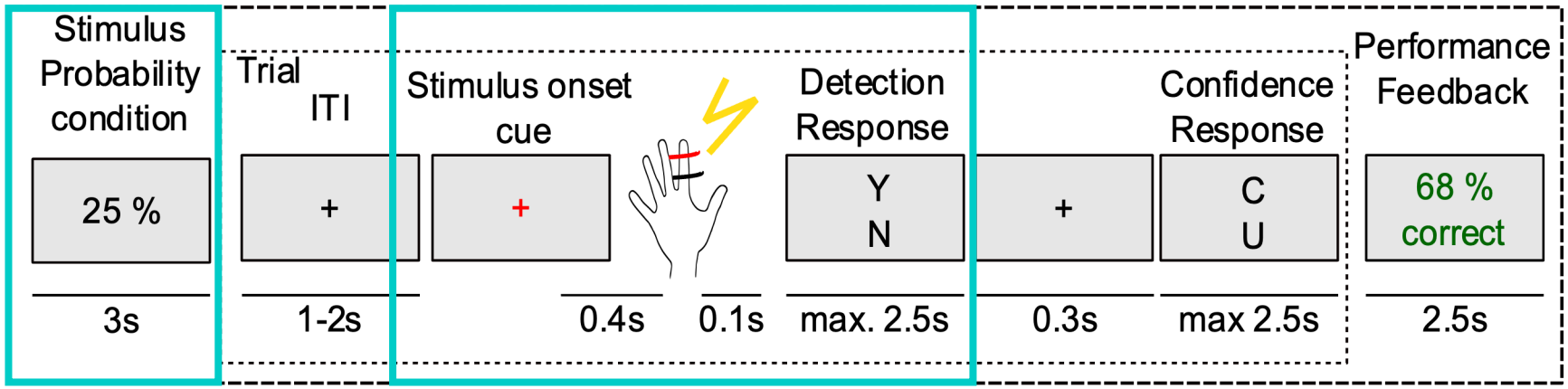


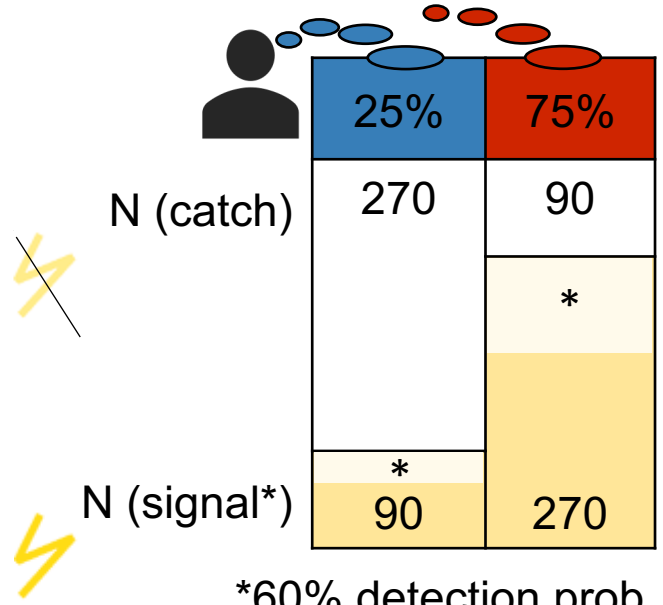


Al et al., *PNAS* 2020; Al et al., *Neuroimage* 2021; Ehrenstein & Ehrenstein, 1999; Motyka et al. *Psychophysiology* 2019

Paradigm

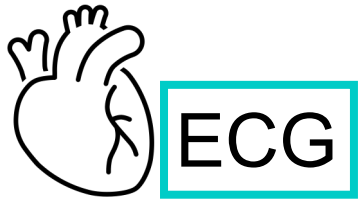
Miniblock





→ **Experimental block** (N = 5): 12 miniblocks [**cue25%**: 6; **cue75%**: 6], random.

N = 42 **Gender**: 21 F, 21 M, 0 D, **Age**: mean = 26.69 [min = 20, max = 35]



Hypotheses

Cue

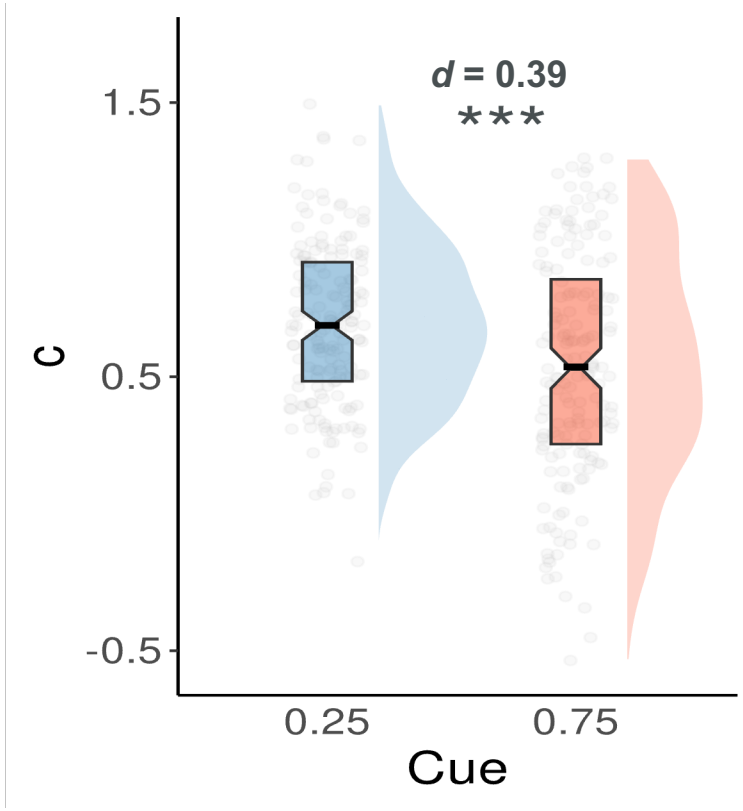
H1 **Stimulus expectation (cue) negatively modulates criterion**,

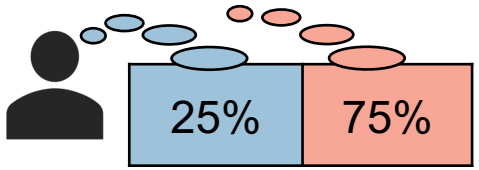
Cardiac

H2.1 **Hit rate and perceptual sensitivity decrease** at **200-400 ms post Rpeak**;

H2.2 **Criterion does not change**

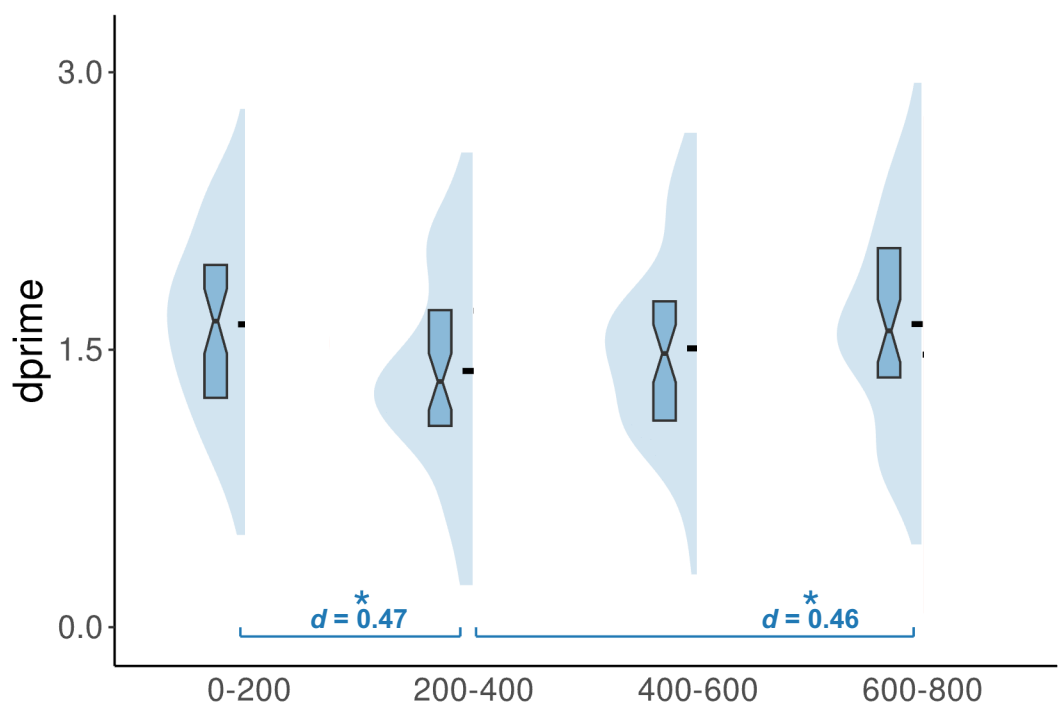
Criterion c



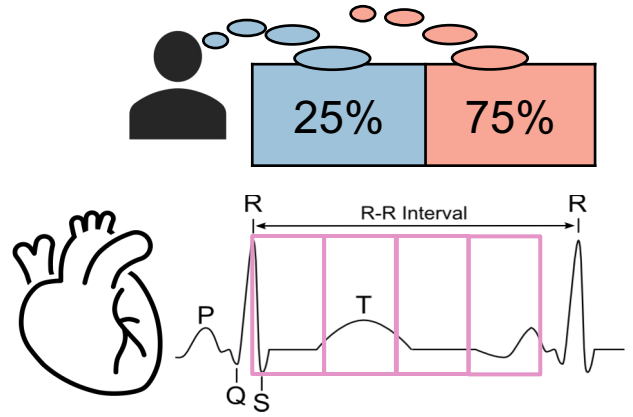


Prior information shifts response criterion,
i.e. the less signal I expect,
the more conservative my response behaviour

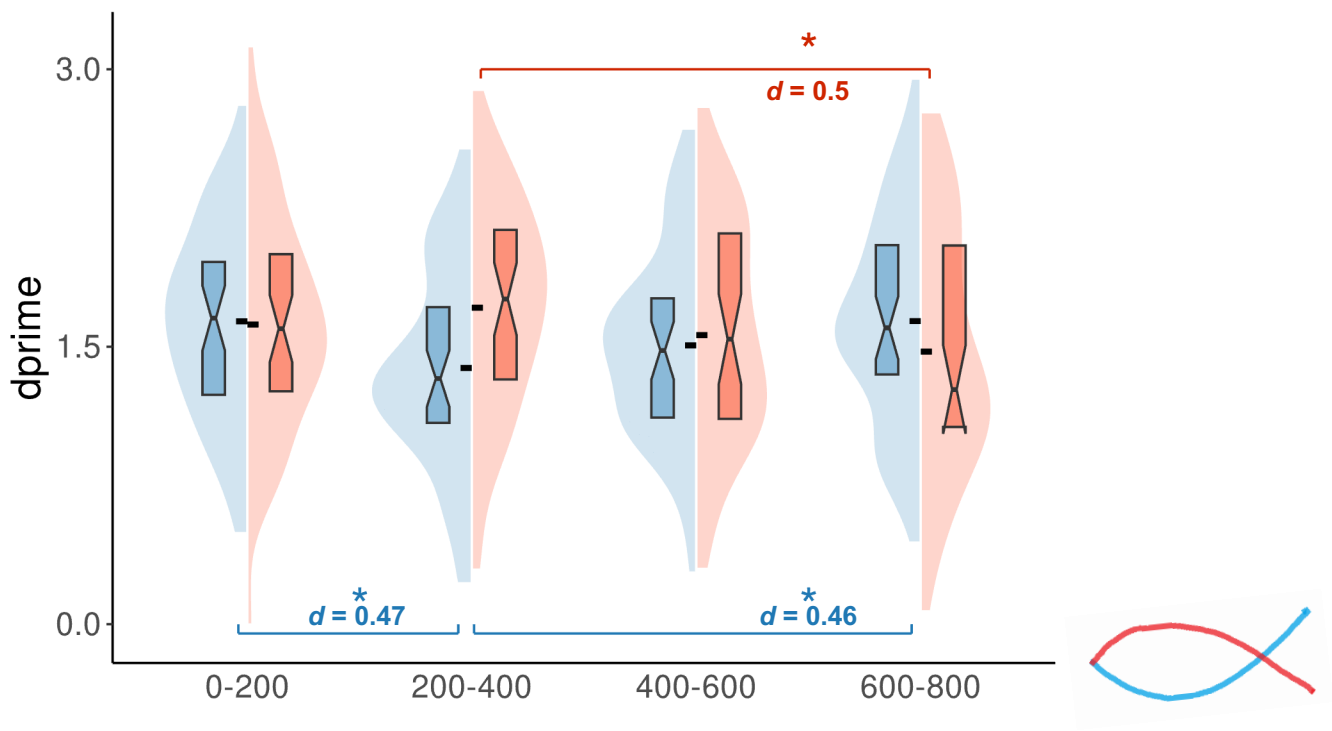
Sensitivity dprime



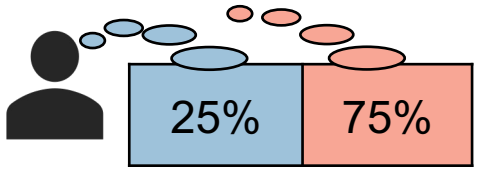
- **25% cue**: Sensitivity decreases at 200-400 ms post Rpeak

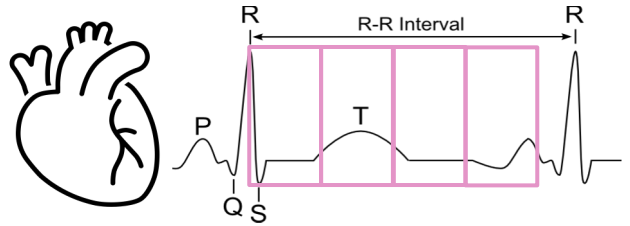


Sensitivity dprime

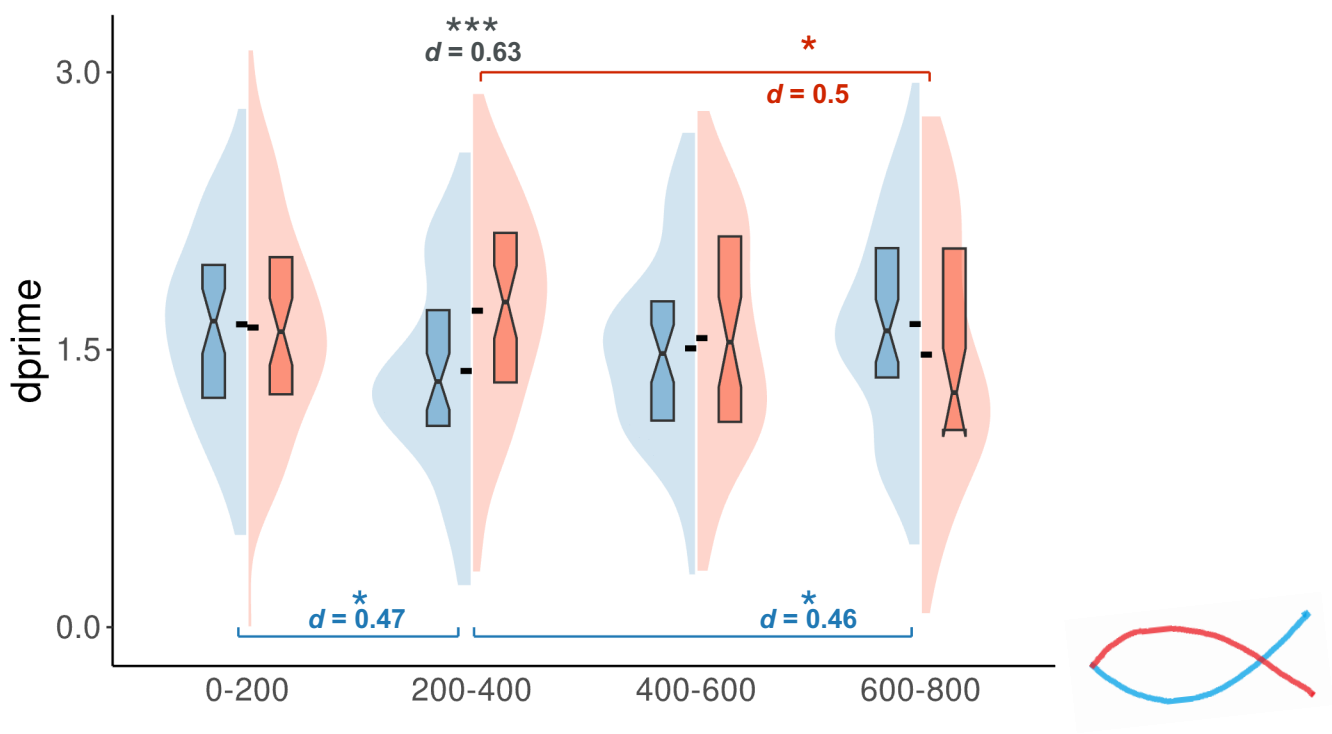


- **25% cue**: Sensitivity decreases at 200-400 ms post Rpeak
  - **75% cue**: not the case; trend (opposite direction)

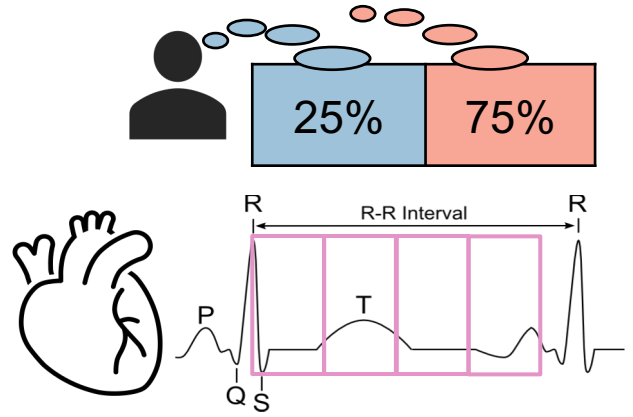




Sensitivity dprime



- **25% cue**: Sensitivity decreases at 200-400 ms post Rpeak
  - **75% cue**: not the case; trend (opposite direction)
- Sig. difference (sensitivity) between cue conditions



Conclusion

When we manipulate stimulus expectation…

Prior information shifts response criterion

Interaction of stimulus expectation and cardiac cycle on detection sensitivity

How?

- **Lower sensitivity at the end of systole***

Stimulation coincides with arrival of pulse wave at finger,
is being suppressed as predictable 'pulse-synchronous phenomenon'
however: only **when few signals are expected**

25% cue

- **Higher sensitivity at the end of systole***

when: **many signals are expected**

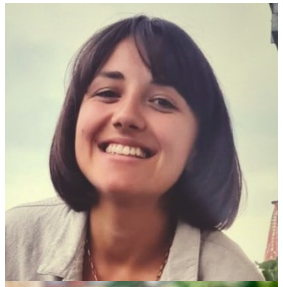
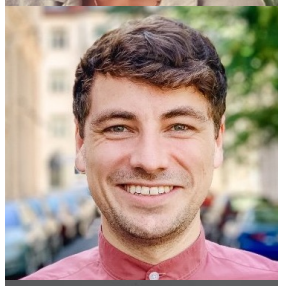
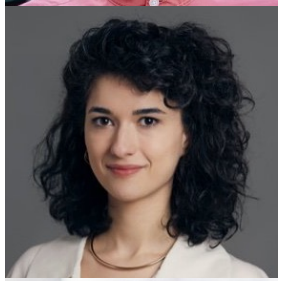
75% cue

→ Expected and frequent exposure to signal overwrites effect?

Limitation: In each condition, **expected trials also more frequent**

* 200-400 ms post Rpeak

Thank you!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