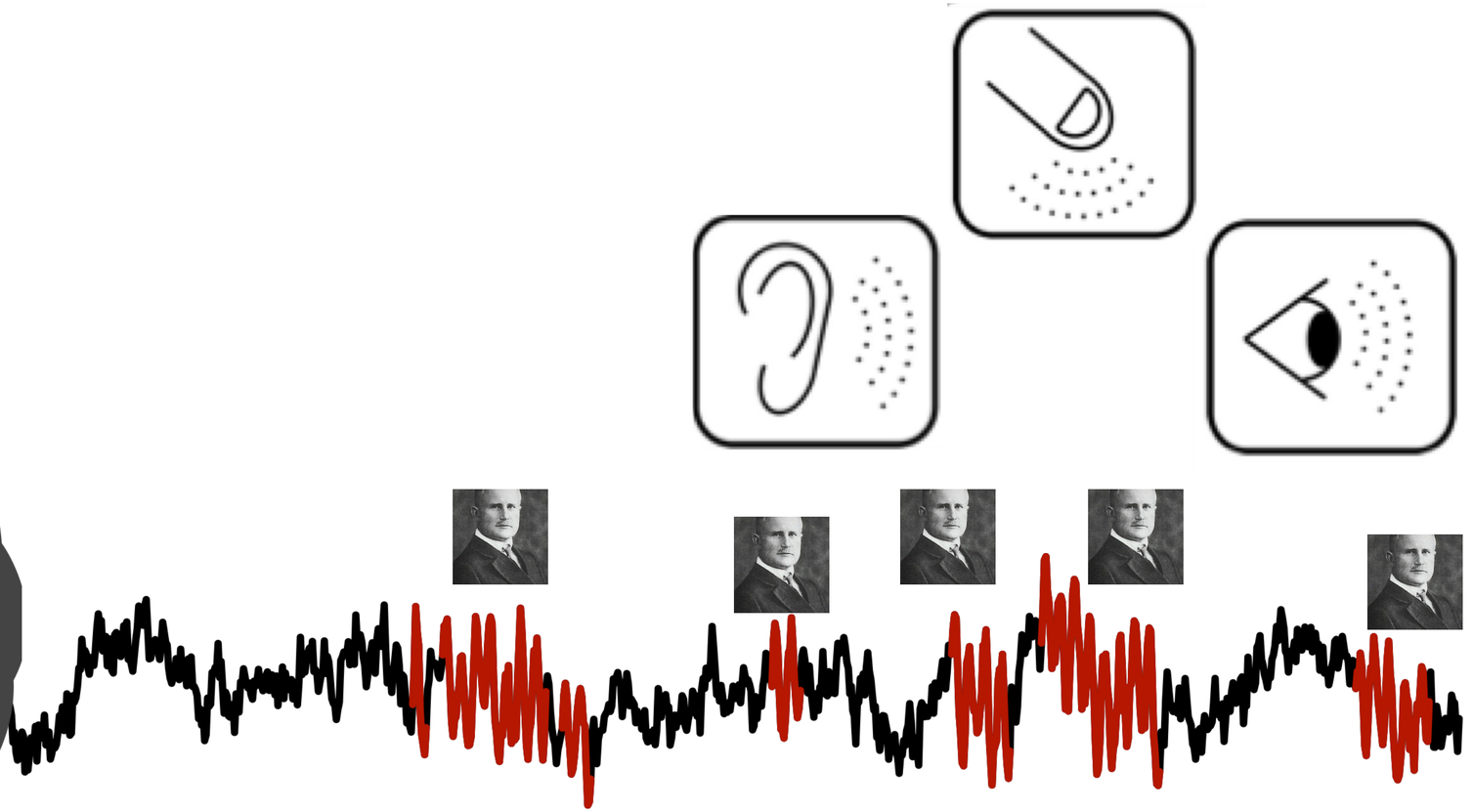
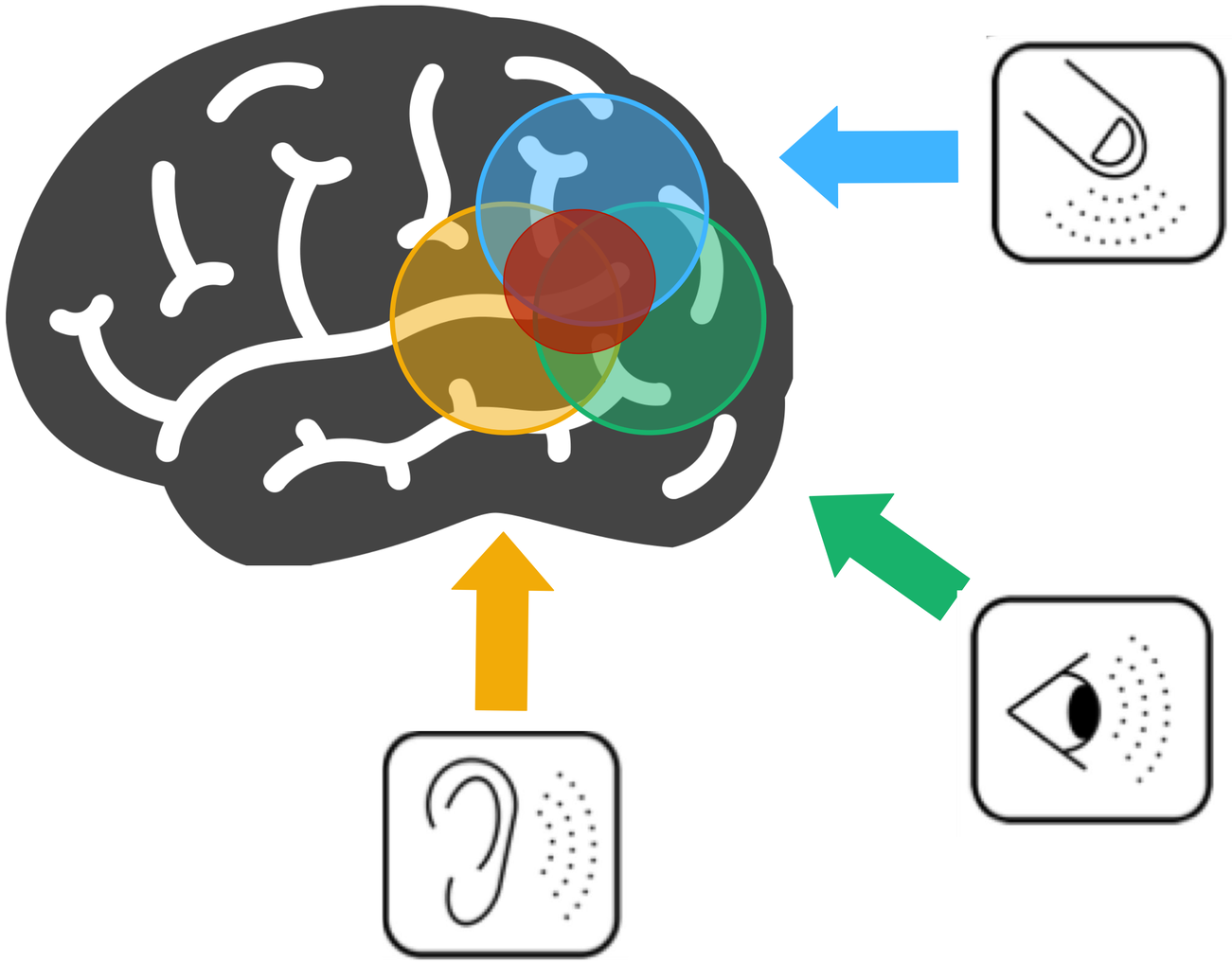


The role of alpha and beta bursts in supra-sensory perception

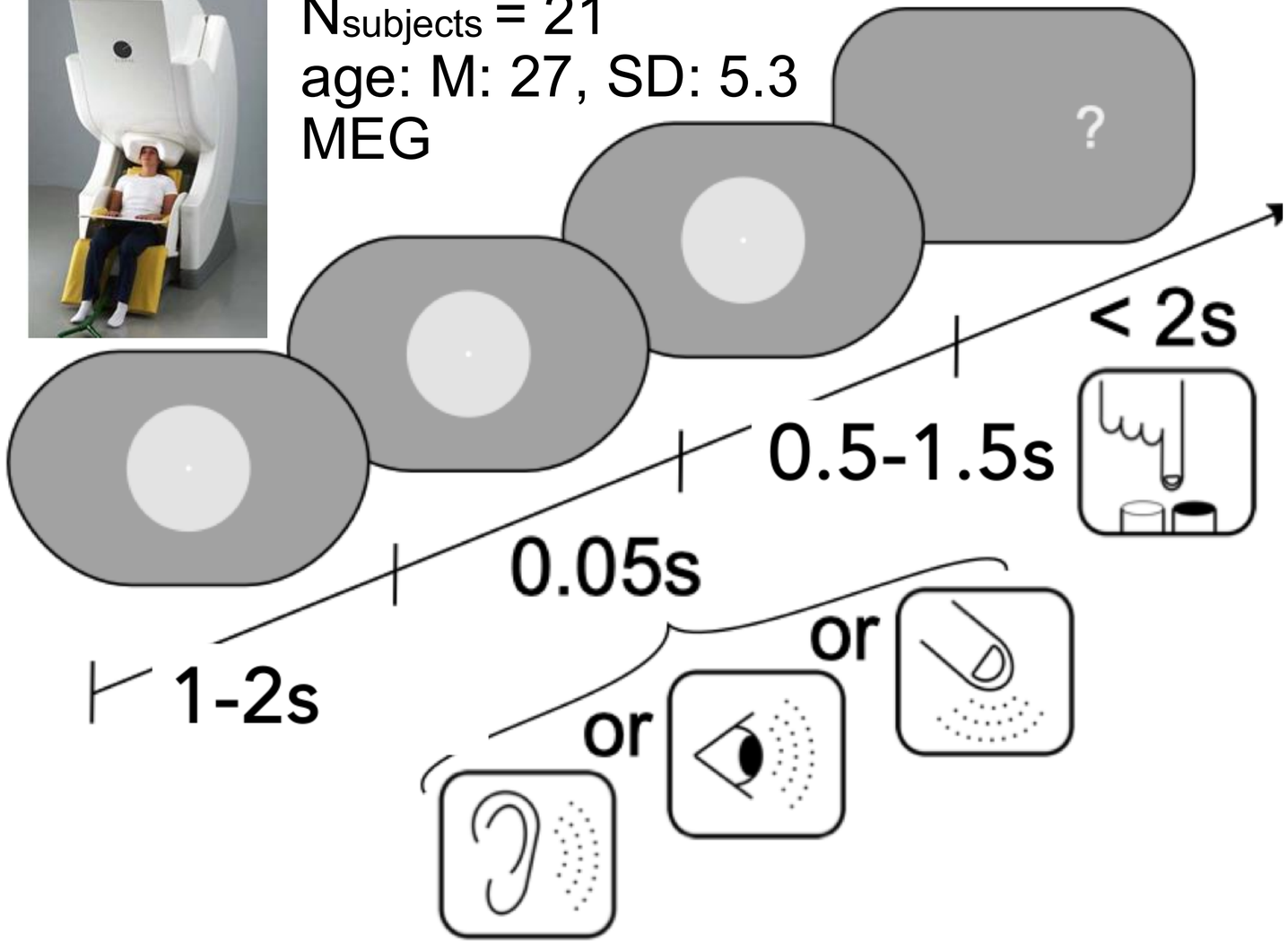
What is supra-sensory perception?

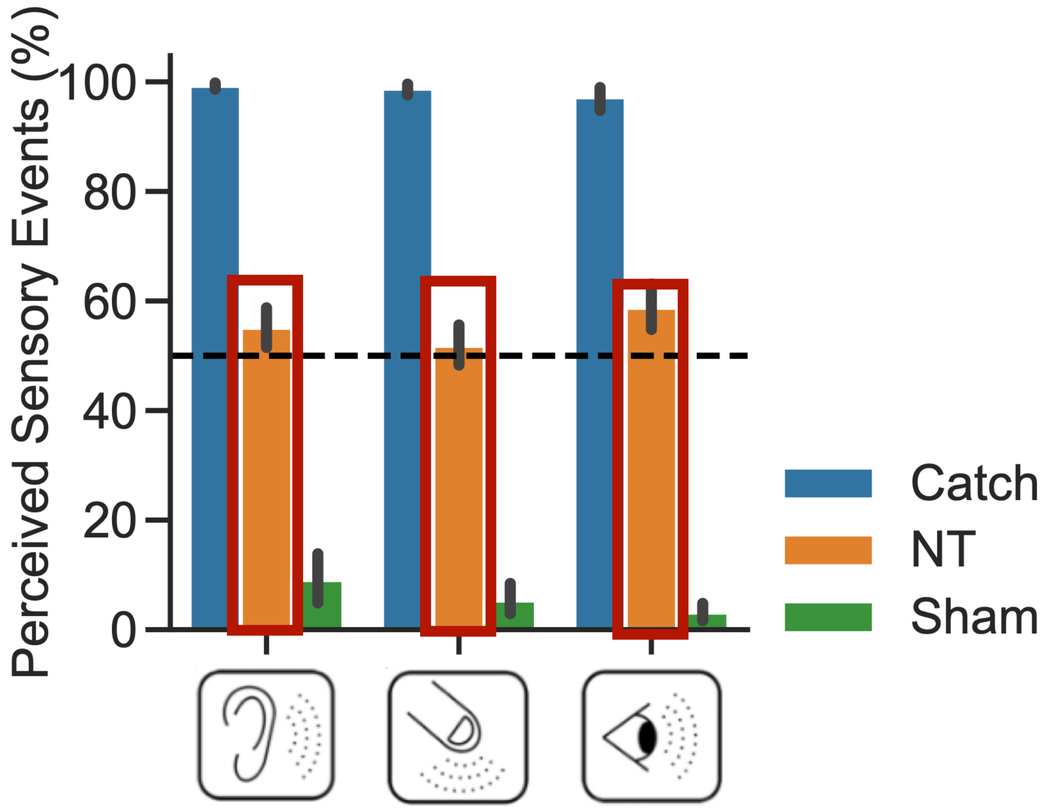
Is the **conscious** percept of hearing a sound, seeing a flash or feeling a touch linked to **one common core-brain activity pattern**?



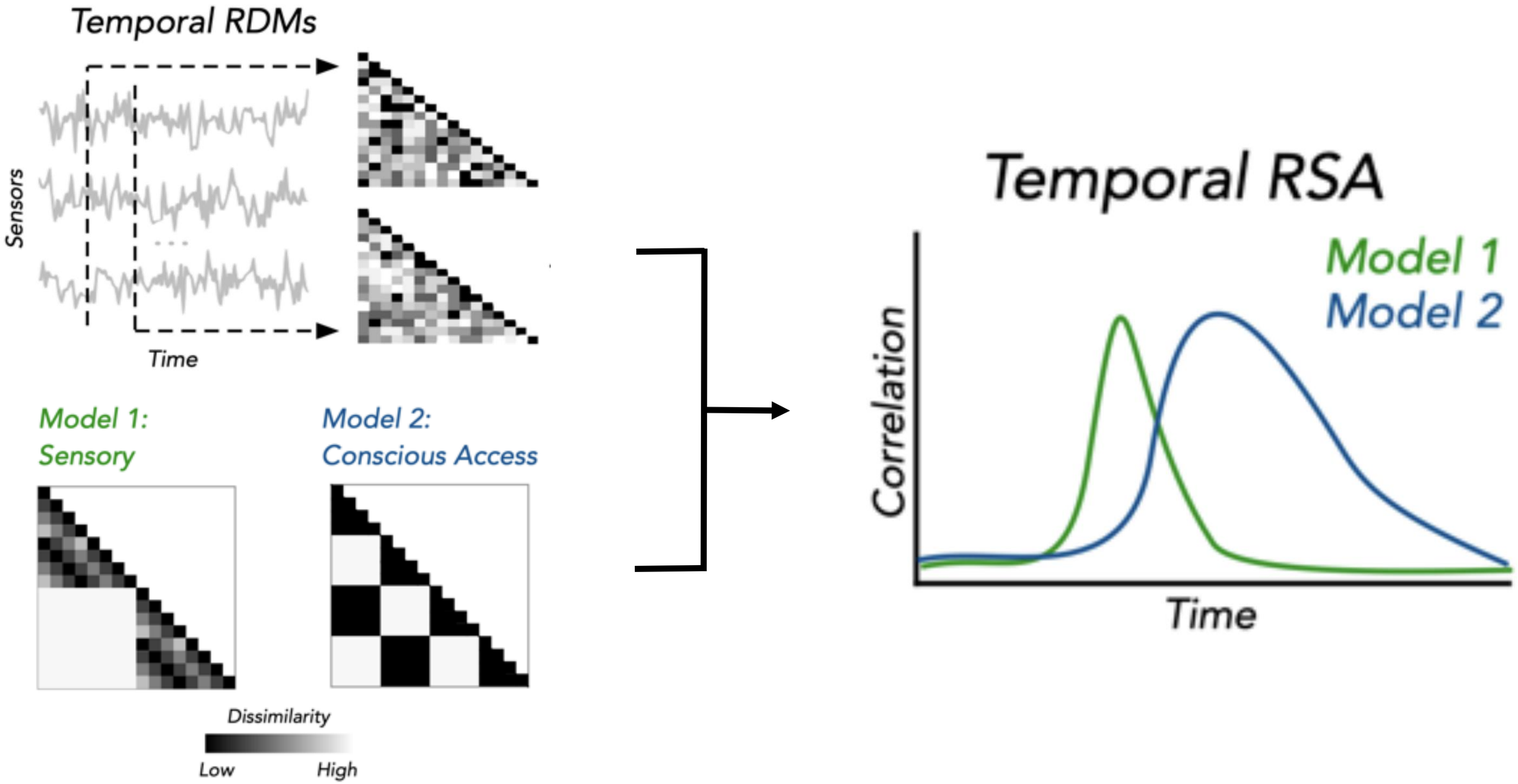
Distinguishing (un)-conscious percepts using multi-sensory near-threshold paradigm

$N_{subjects}$ = 21
age: M: 27, SD: 5.3
MEG



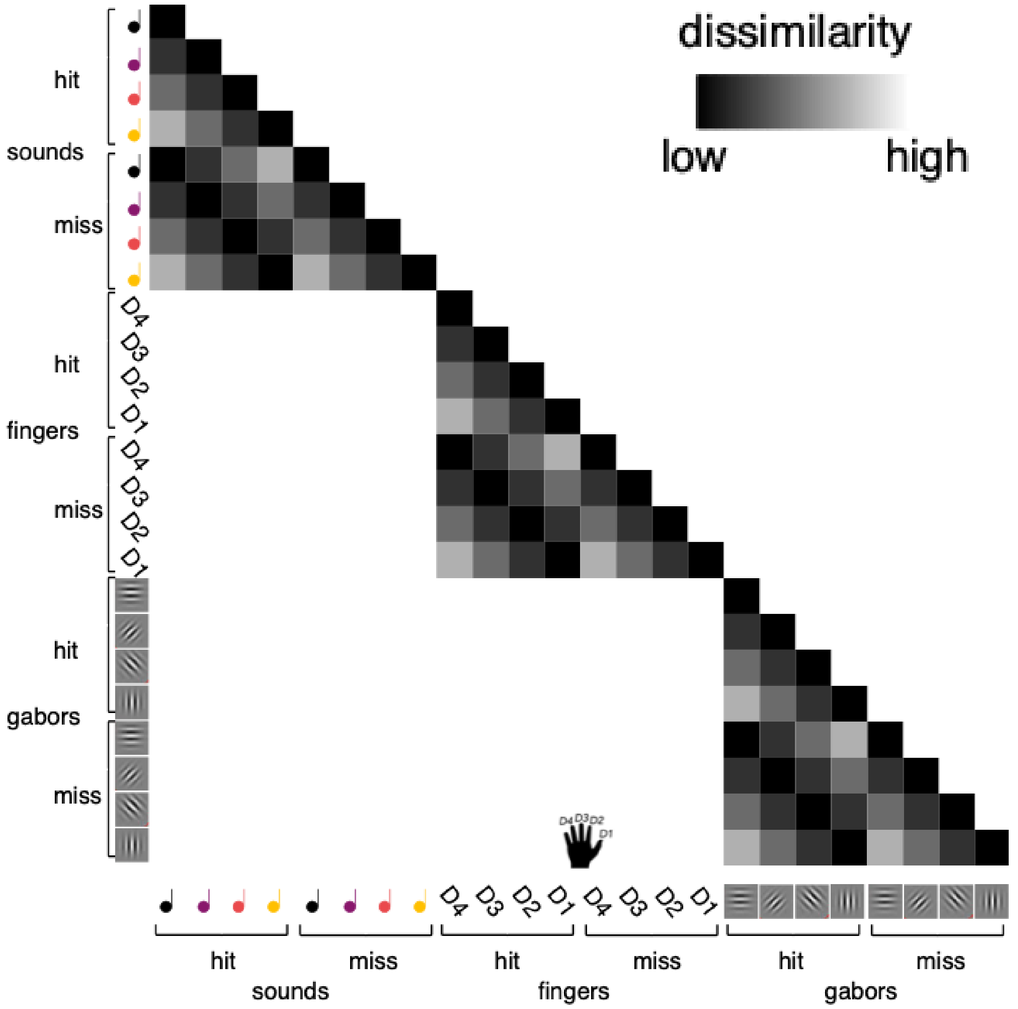


Assessing similarities across senses by computing dissimilarities over time

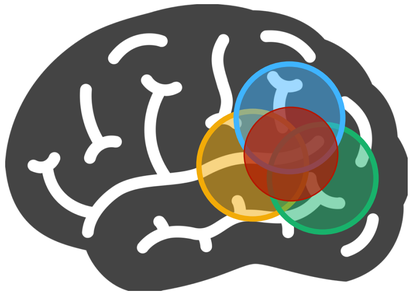


Sensory model of perception

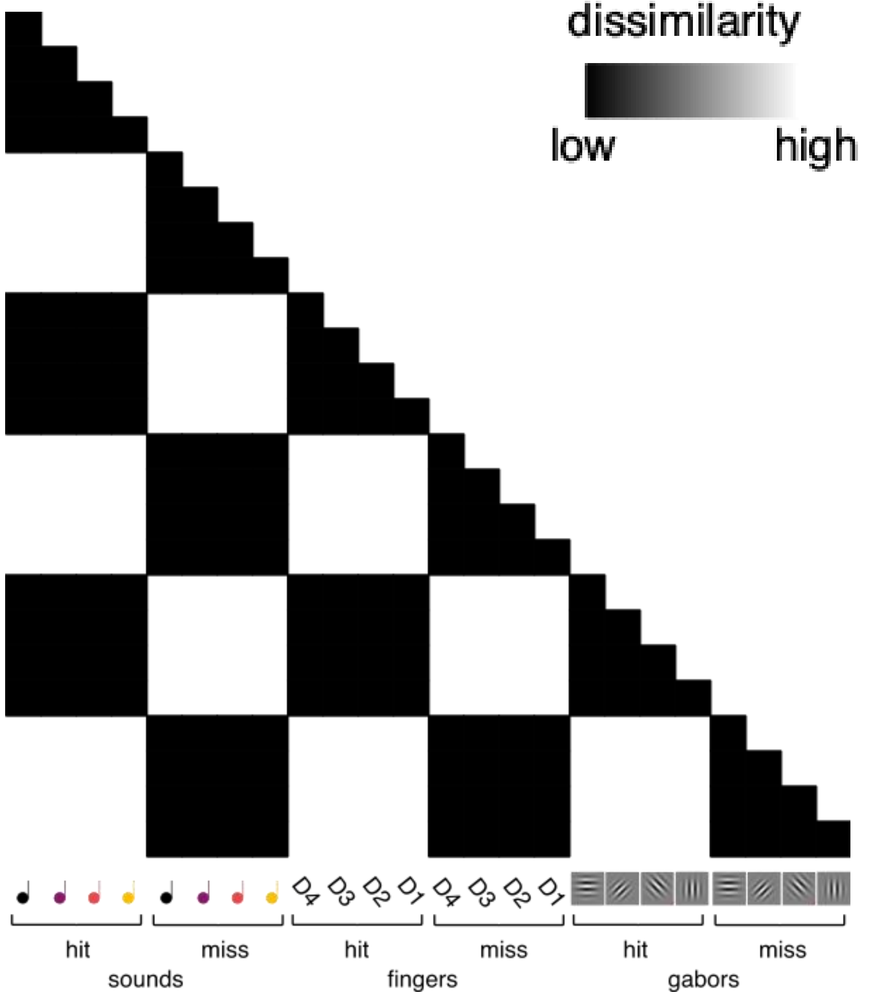
Sensory model means **similar** activity per percept, but **different** activity across the senses.

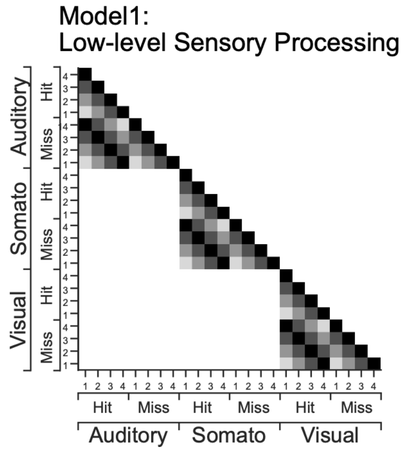


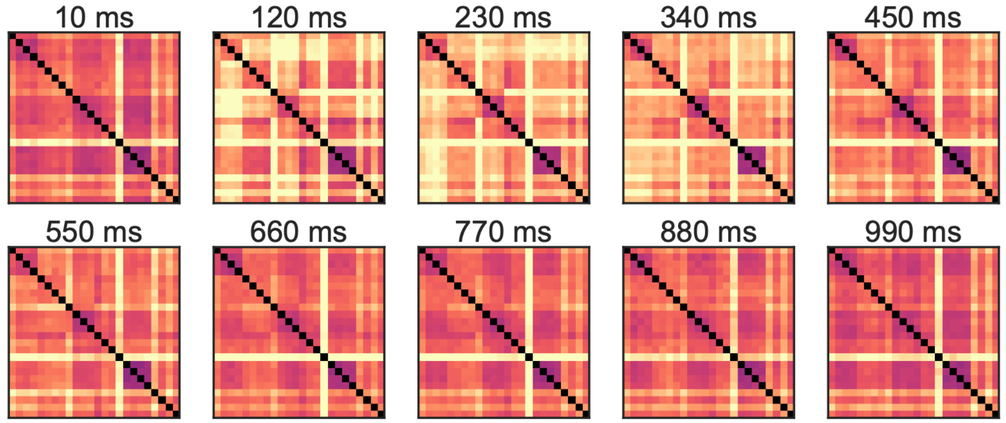
Supra-sensory model of perception



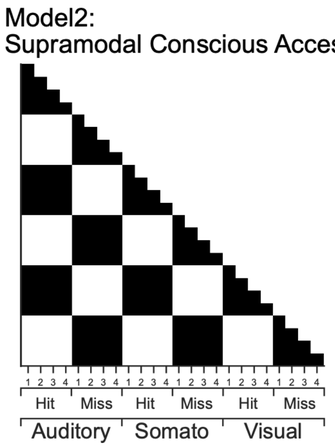
Supra-sensory model means **different** activity per percept, but **similar** activity across the senses.

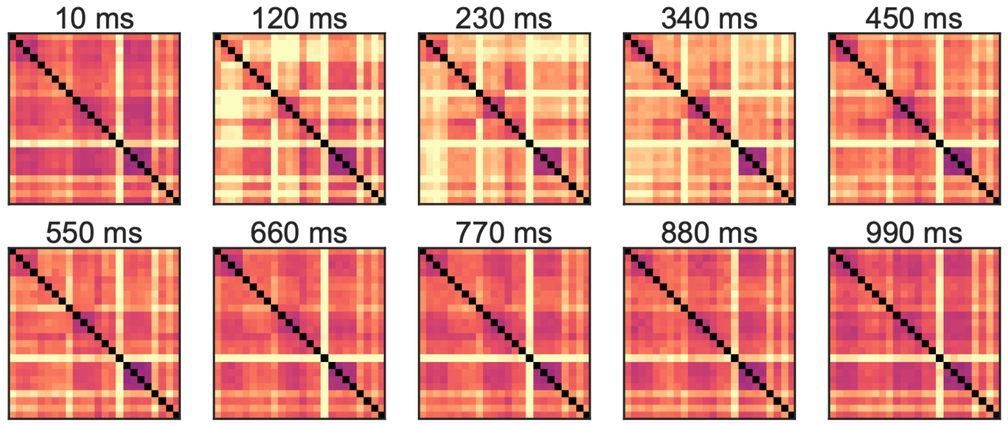






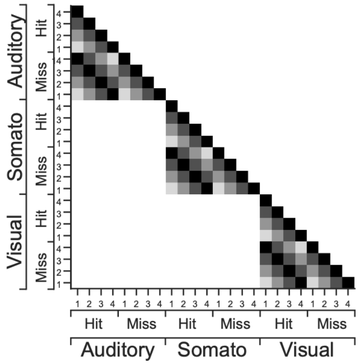
Sensory Model





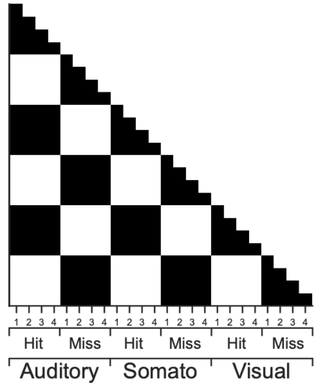
Supra-Sensory Model

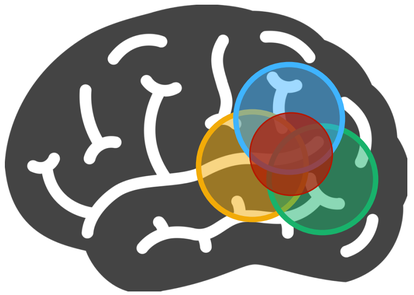
Model1:
Low-level Sensory Processing

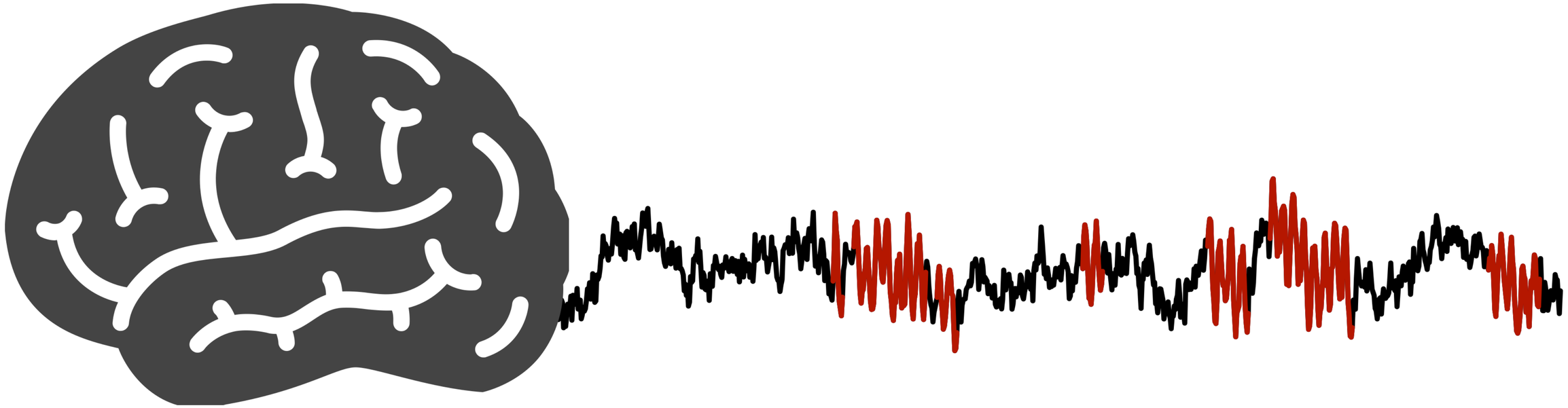


vs.

Model2:
Supramodal Conscious Access







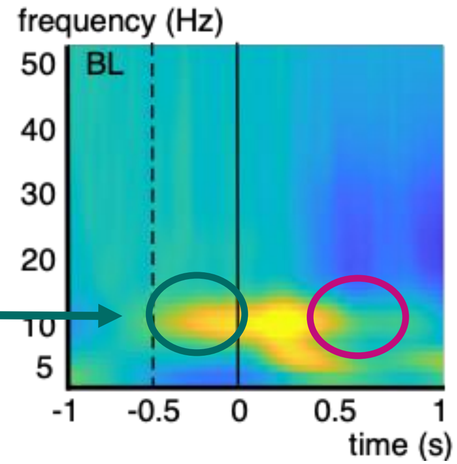
Are these patterns of supra-sensory perception related to specific patterns of brain activity?

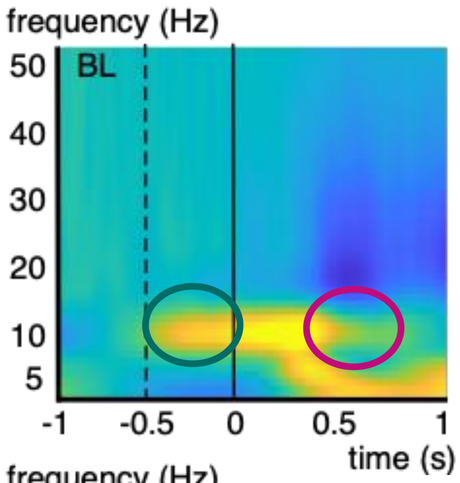
Similarities in perception related alpha band differences across senses

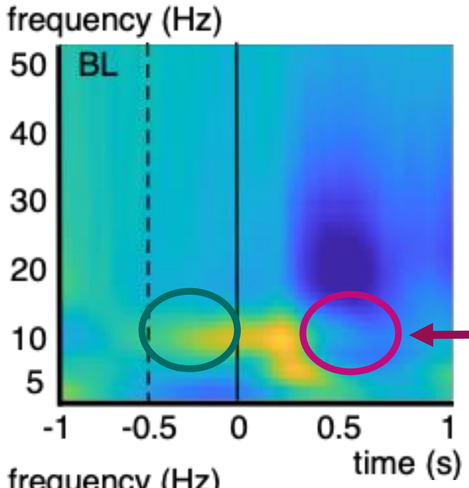
perceived

pre-stimulus alpha differences

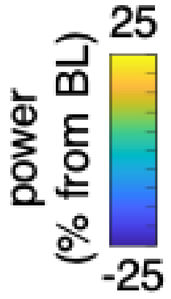
not perceived

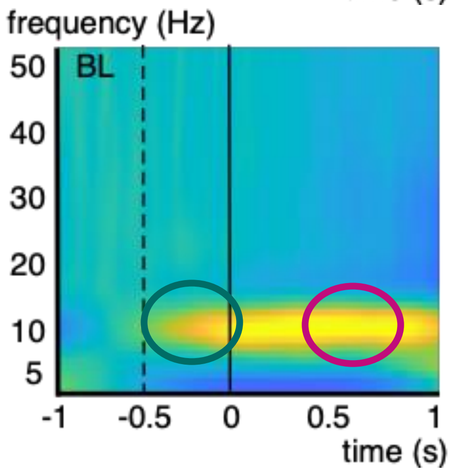


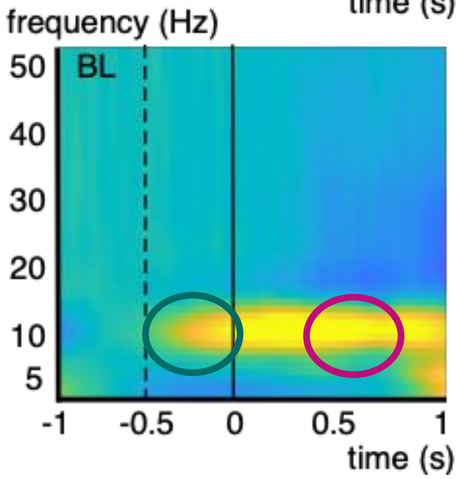


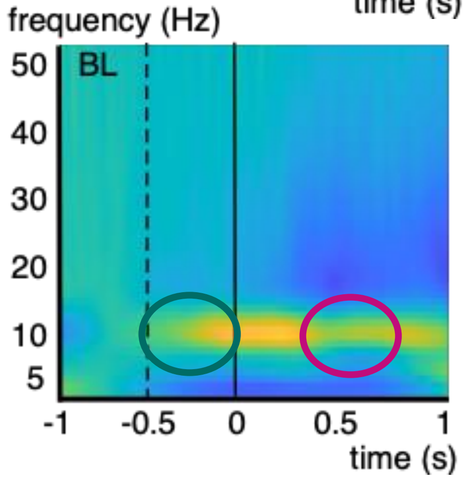


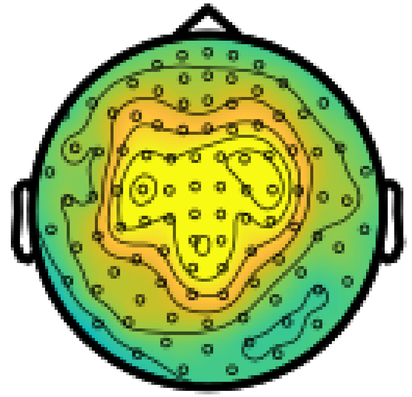
post-stimulus alpha differences











central-parietal channels

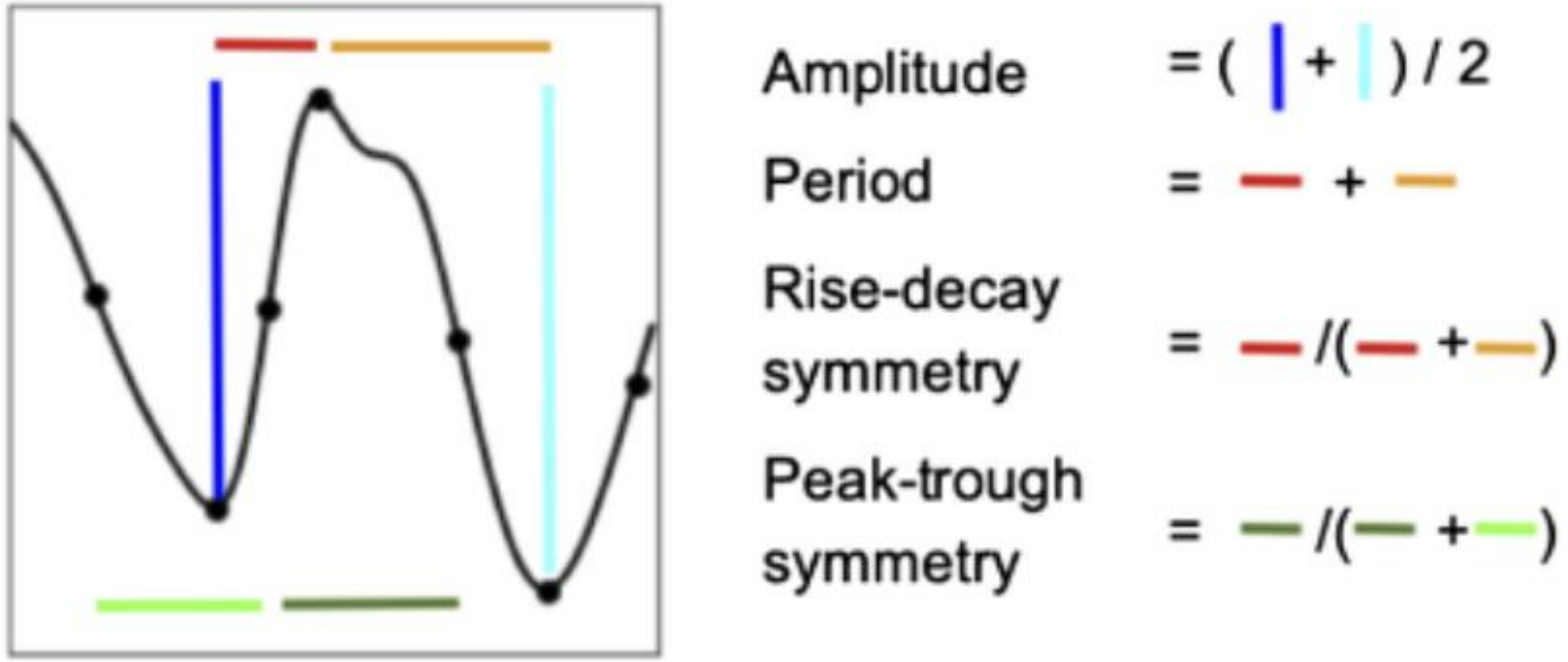
Parametrizing oscillatory activity in the alpha band (i.e. bursts)

Alpha burst rate differs between / increases in successfully perceived and not perceived trials

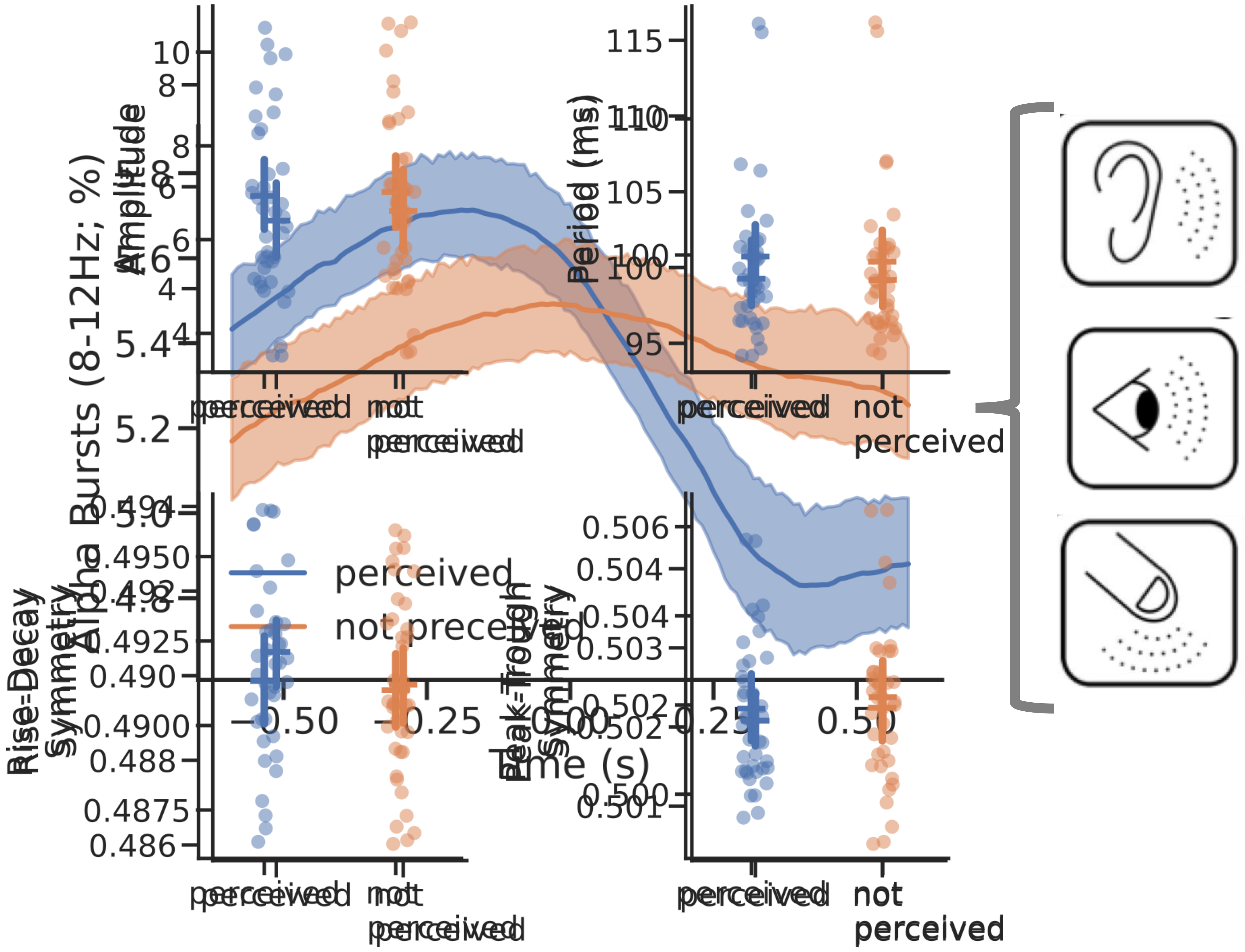
pre-stimulus differences in burst characteristics

post-stimulus differences in burst characteristics

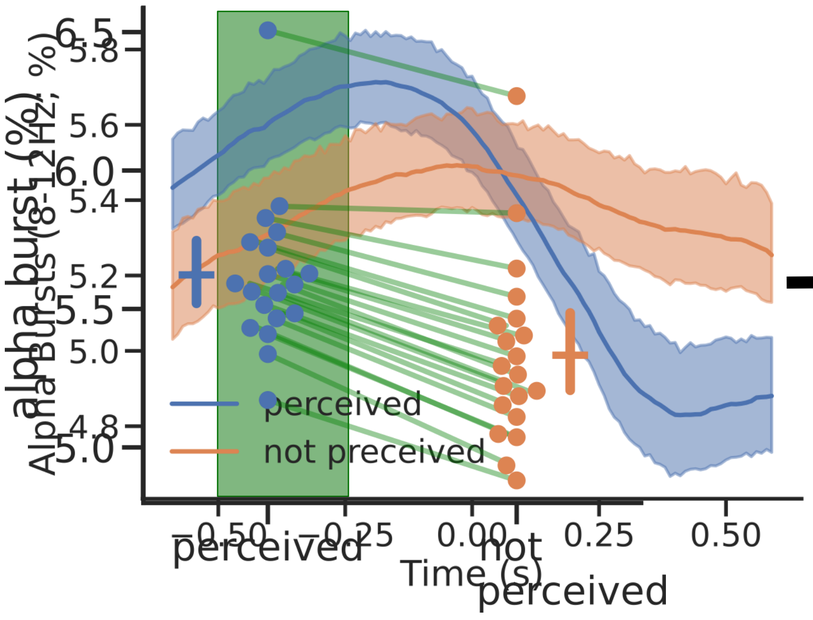
Cycle-by-cycle burst detection



Cole & Voytek, 2019



pre-stimulus alpha burst rate predicts supra-sensations



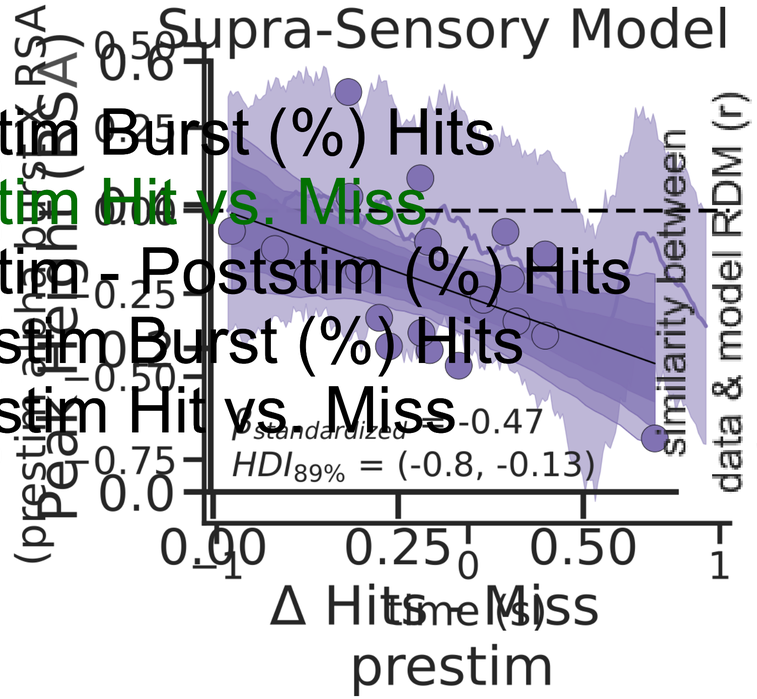
Prestim Burst (%) Hits

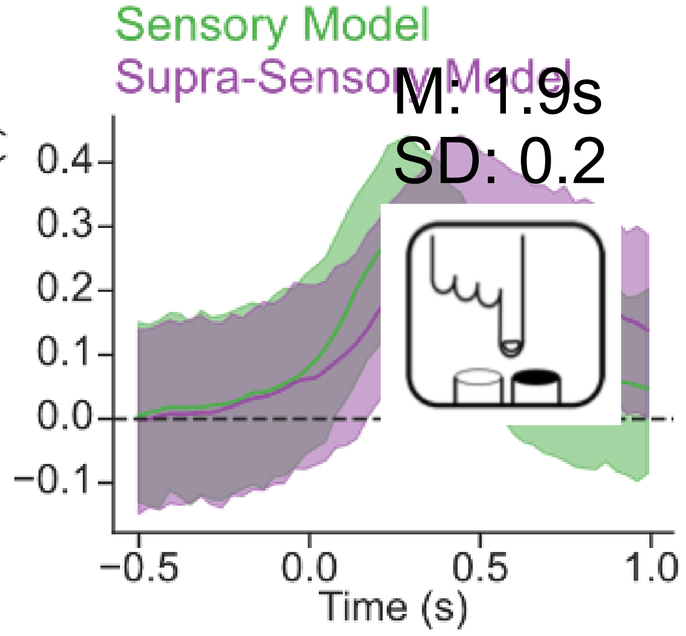
Prestim Hit vs. Miss

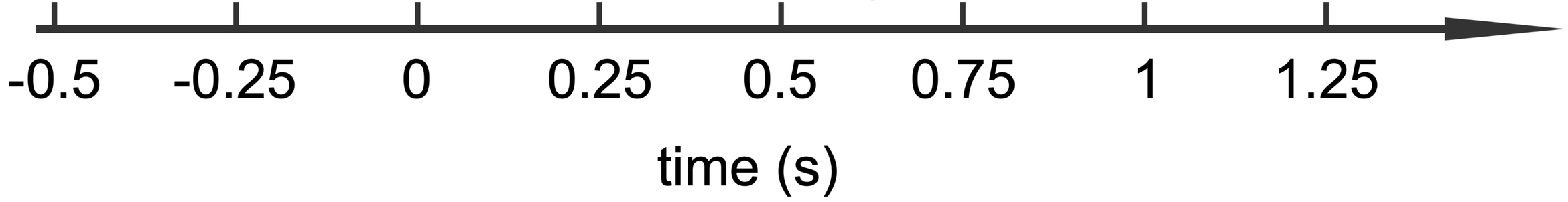
Prestim - Poststim (%) Hits

Poststim Burst (%) Hits

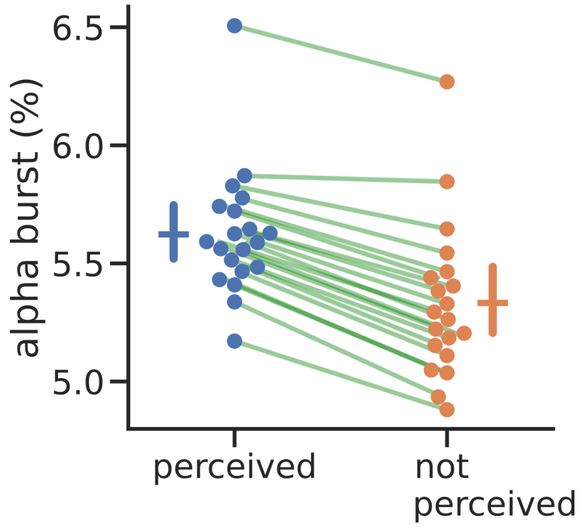
Poststim Hit vs. Miss

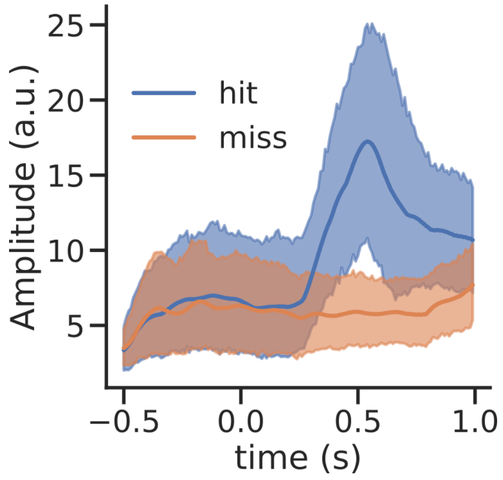


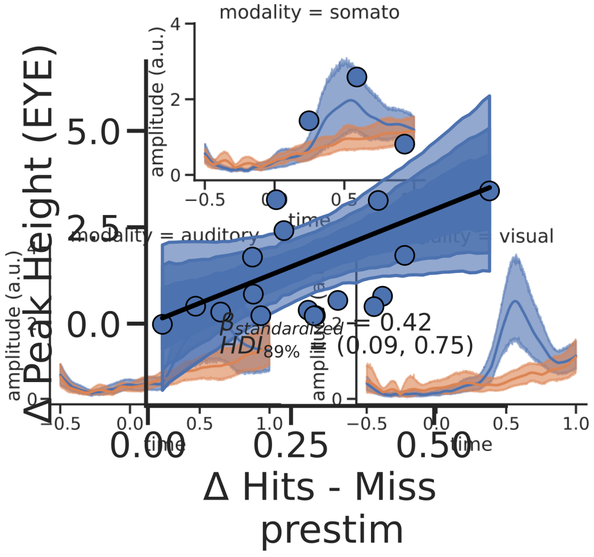




pre-stimulus alpha burst rate predicts post-stimulus oculomotor activity



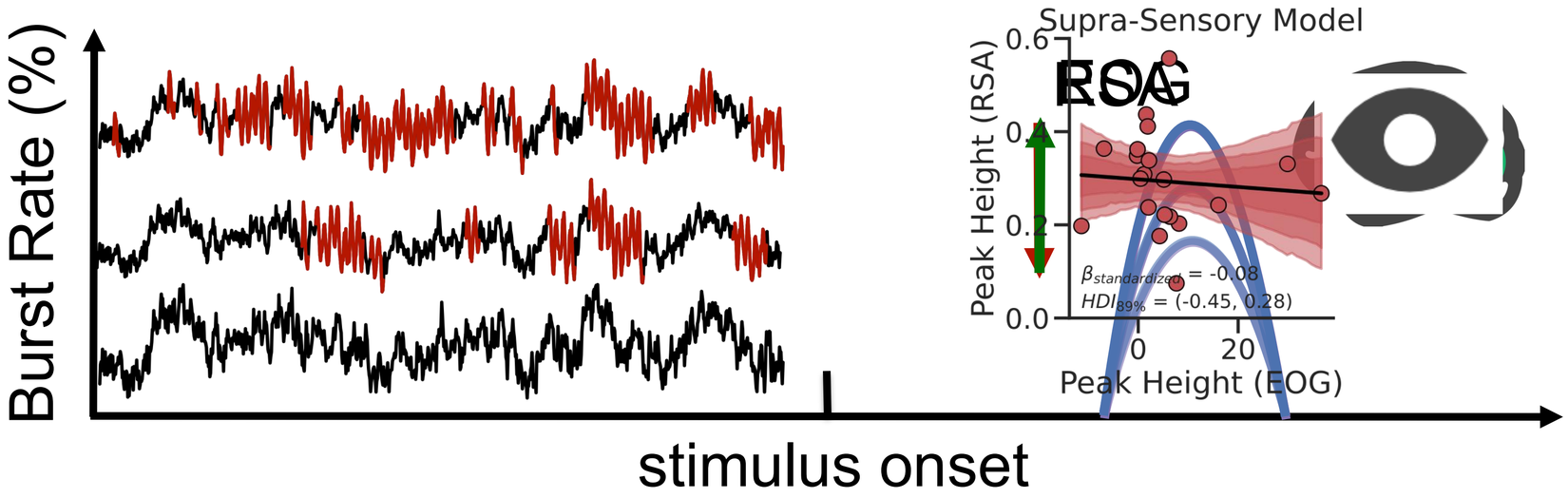




M: 1.9s
SD: 0.2

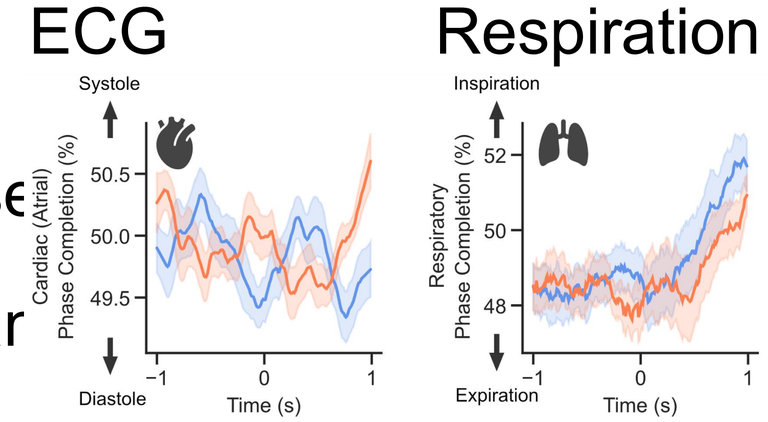
Summary

Alpha bursts **differently** predict neurophysiological and ocular responses associated with **conscious** supra-sensory near threshold perception



pre-stimulus alpha bursts.

- Next steps: are supra-sensations and **alpha bursts** modulated by ongoing state changes in the body?
- carry a **general** role for **conscious** perception across se
- potential differences in **cardiac** and **respiratory** predict temporally **overlapping**, but **unrelated** neural ar phase for successful perception across all senses.



Acknowledgements

FWF Österreichischer Wissenschaftsfonds

LAND SALZBURG

NumPy, SciPy, MNE, neurodsp, ByCycle, PyMC, pandas, Bambi, rsatoolbox

PARIS LODRON UNIVERSITY SALZBURG

CCNS
Centre for Cognitive Neuroscience