

Caught Between Rumours and the Road

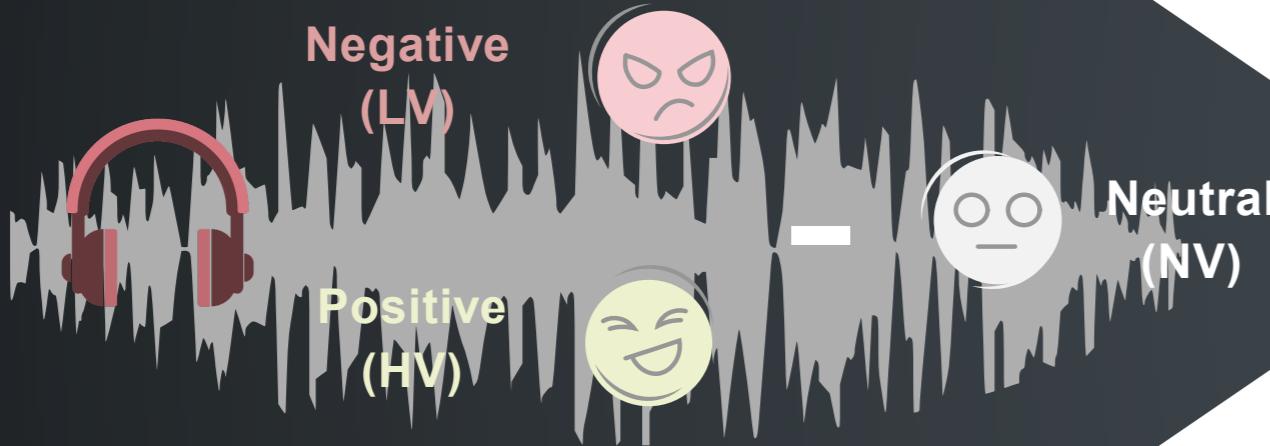
Internal and External Information Processing Modes of Emotional Speech Processing and Visuo-spatial Workload

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Research Question

How does **emotional speech** and **visuo-spatial workload** modulate **information processing**, indicated by gaze behaviour and neural oscillations?

Emotional Speech Processing



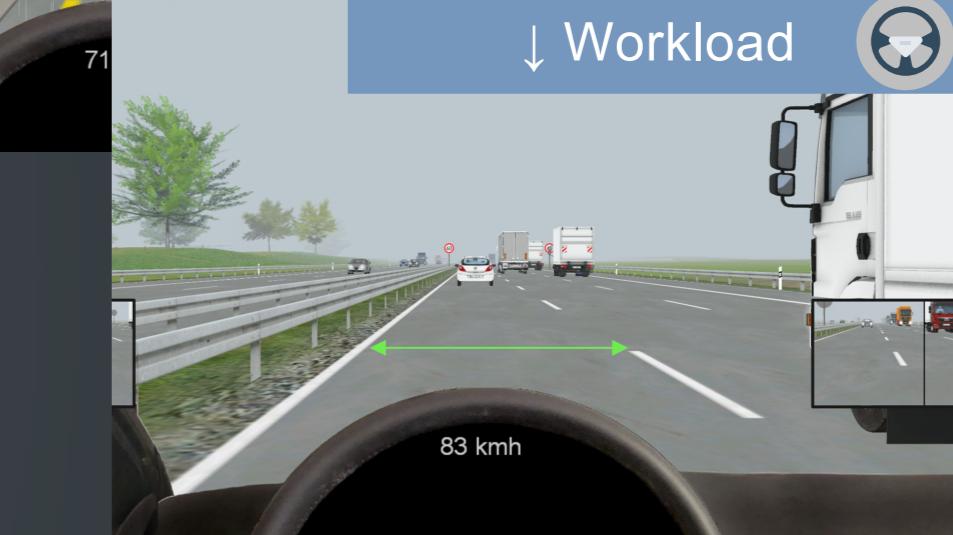
Two Processing Modes during Dual-Tasking

Magnetoencephalography Eyetracking Study

with 48 subjects ($M_{age} = 25.25$) and a within-subject block design with the factors:



Emotional Speech x Visual-Spatial Workload during Driving

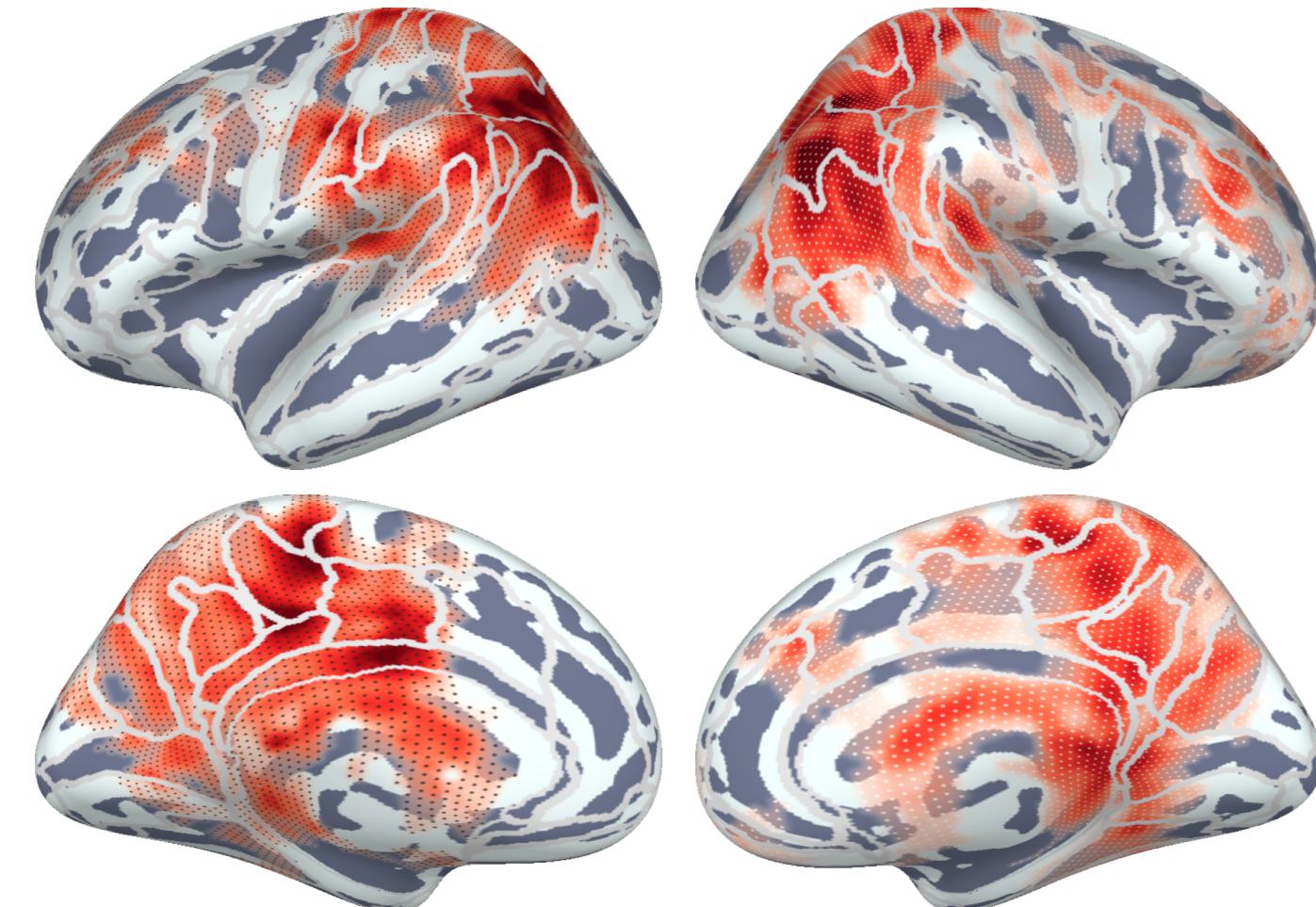


Visuo-Spatial Workload

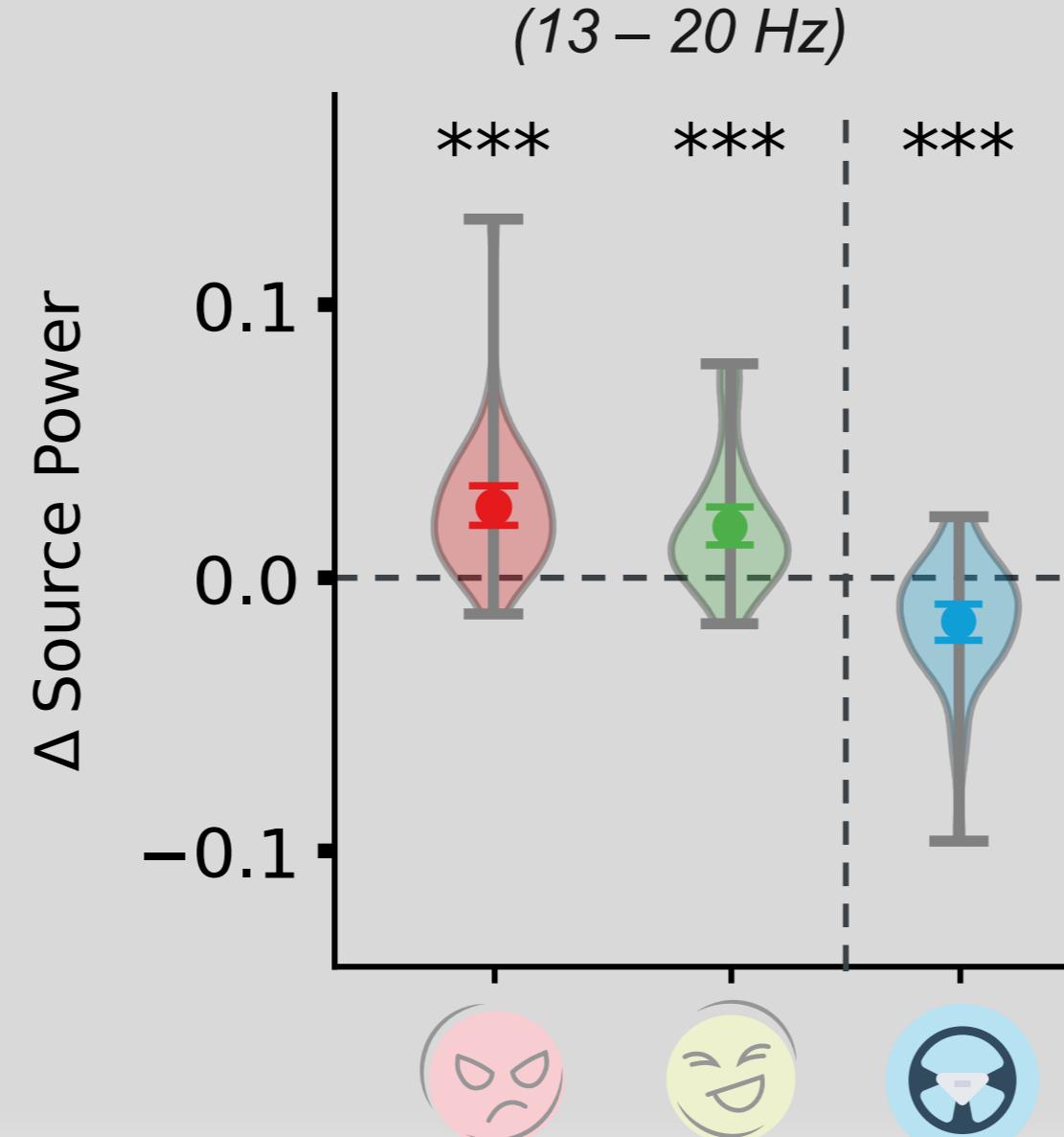
β

Social Cognition – Internal Mode

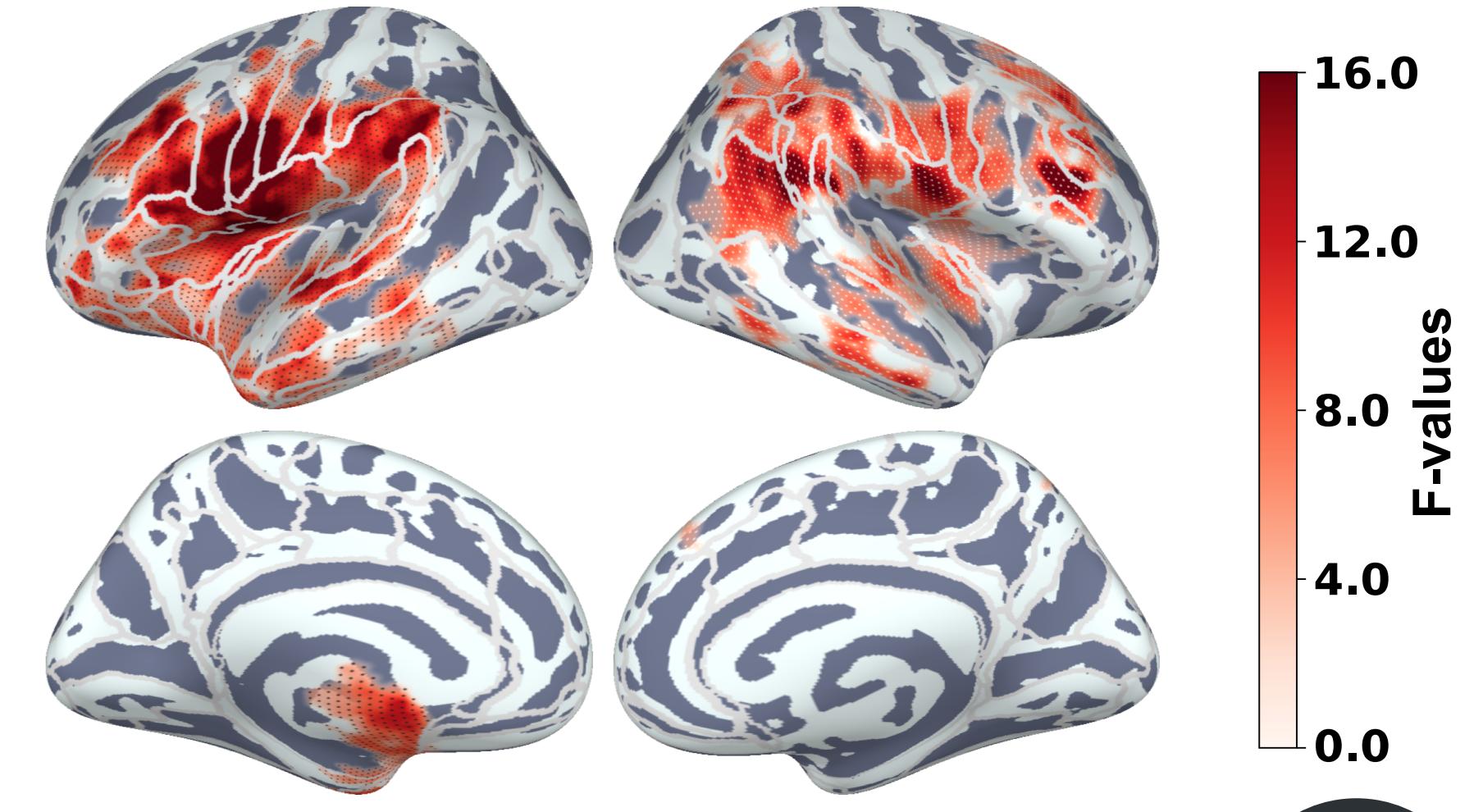
$\uparrow \beta^{***}$ in parietal regions indicates increased predictive listening



Beta Band Power (13 – 20 Hz)



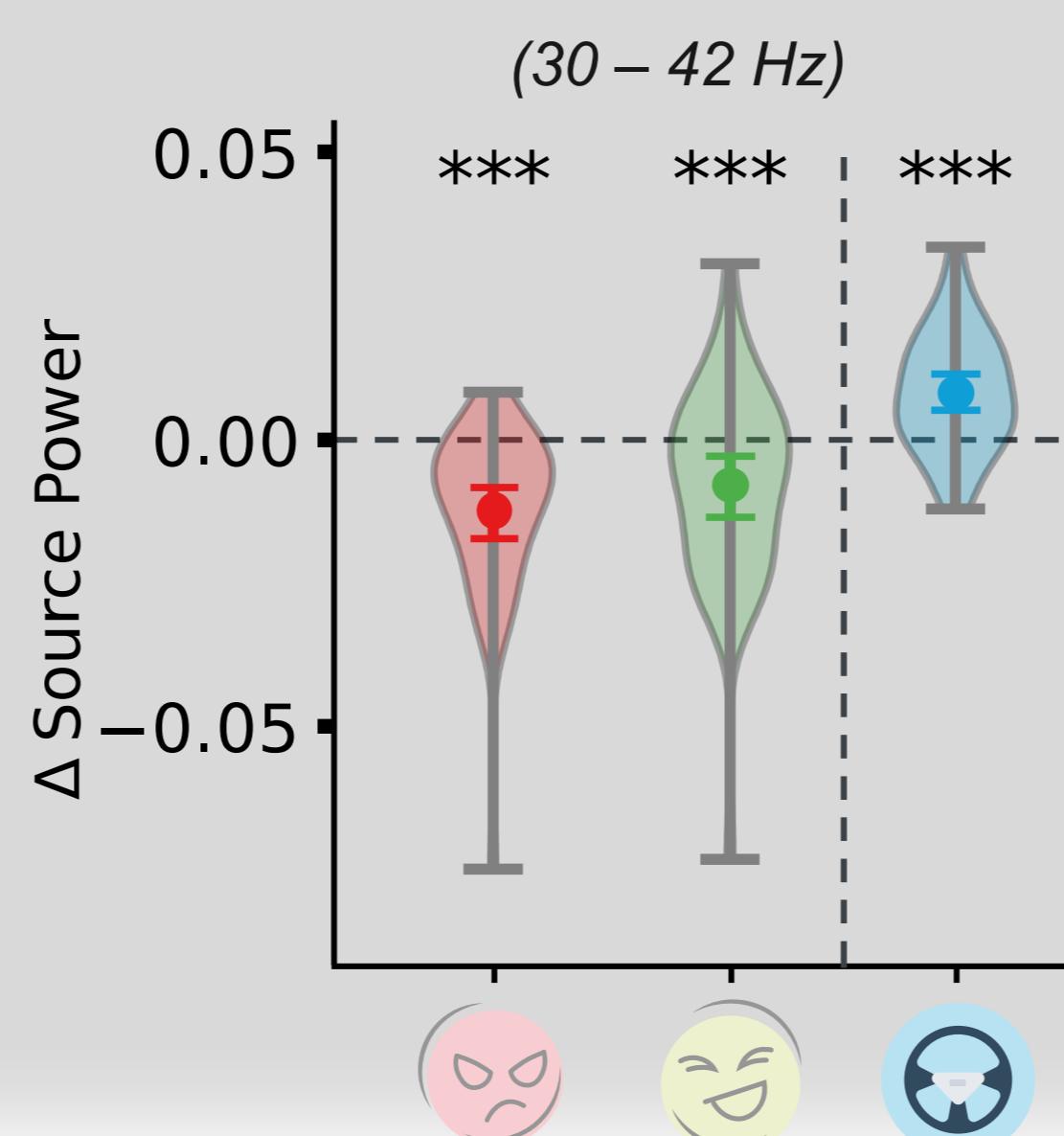
$\downarrow \beta^{**}$ in temporo-parietal regions indicates reduced social cognition



$\downarrow \gamma^{***}$ in parietal regions indicates reduced spatial cognition



Gamma Band Power (30 – 42 Hz)



External Mode – Spatial Cognition

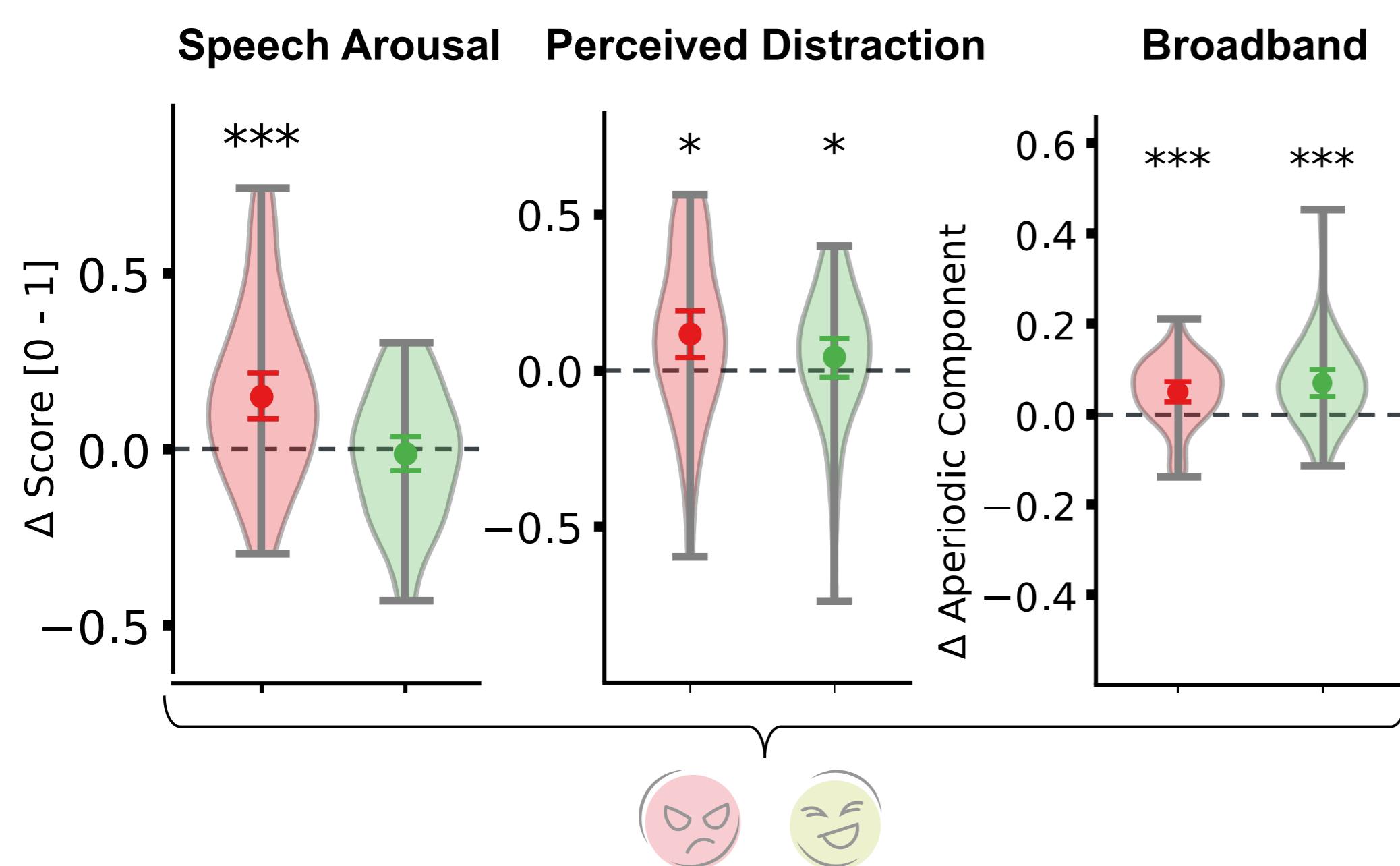
γ

$\uparrow \gamma^{***}$ in motor & prefrontal regions indicates increased driving and decision making

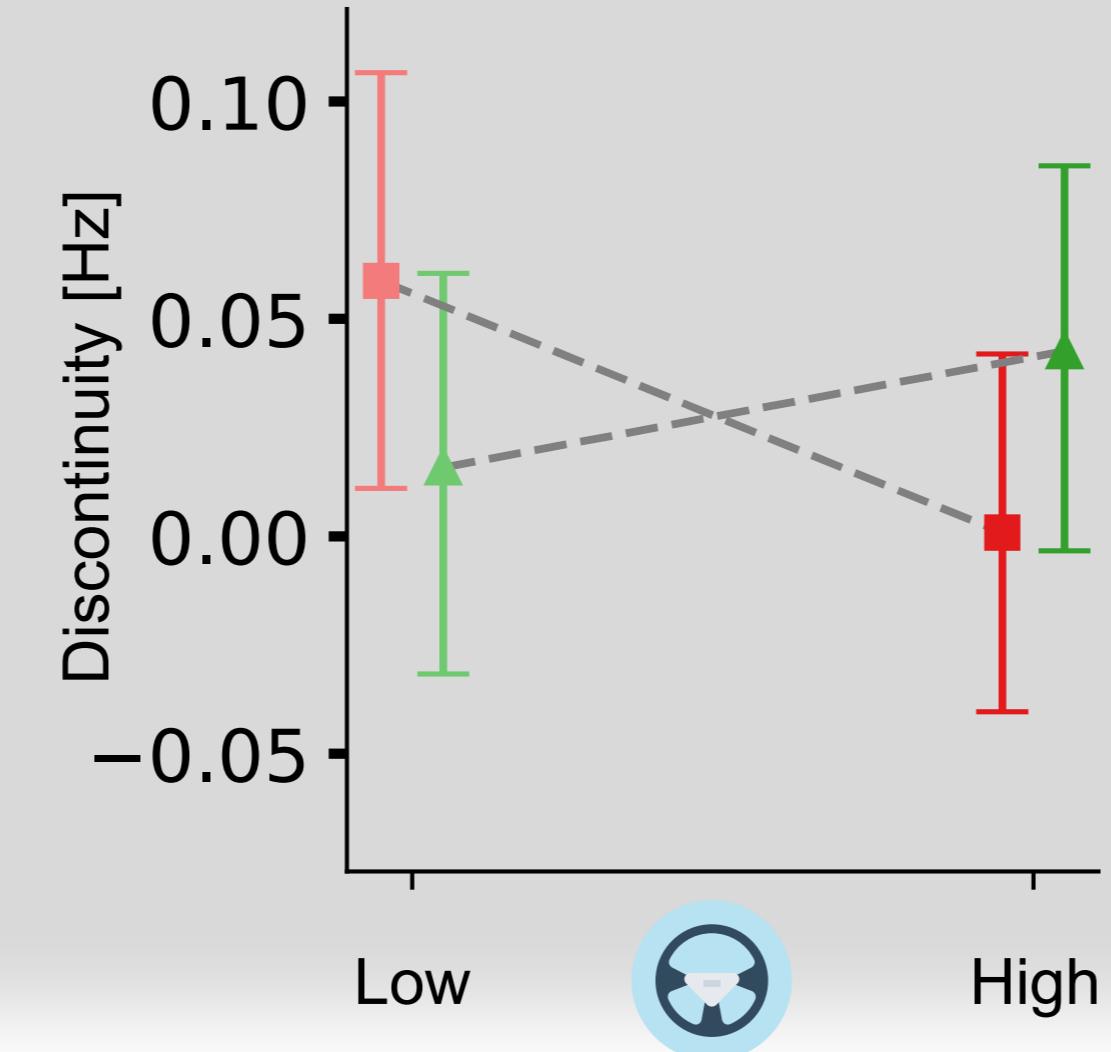


Multimodal Integration

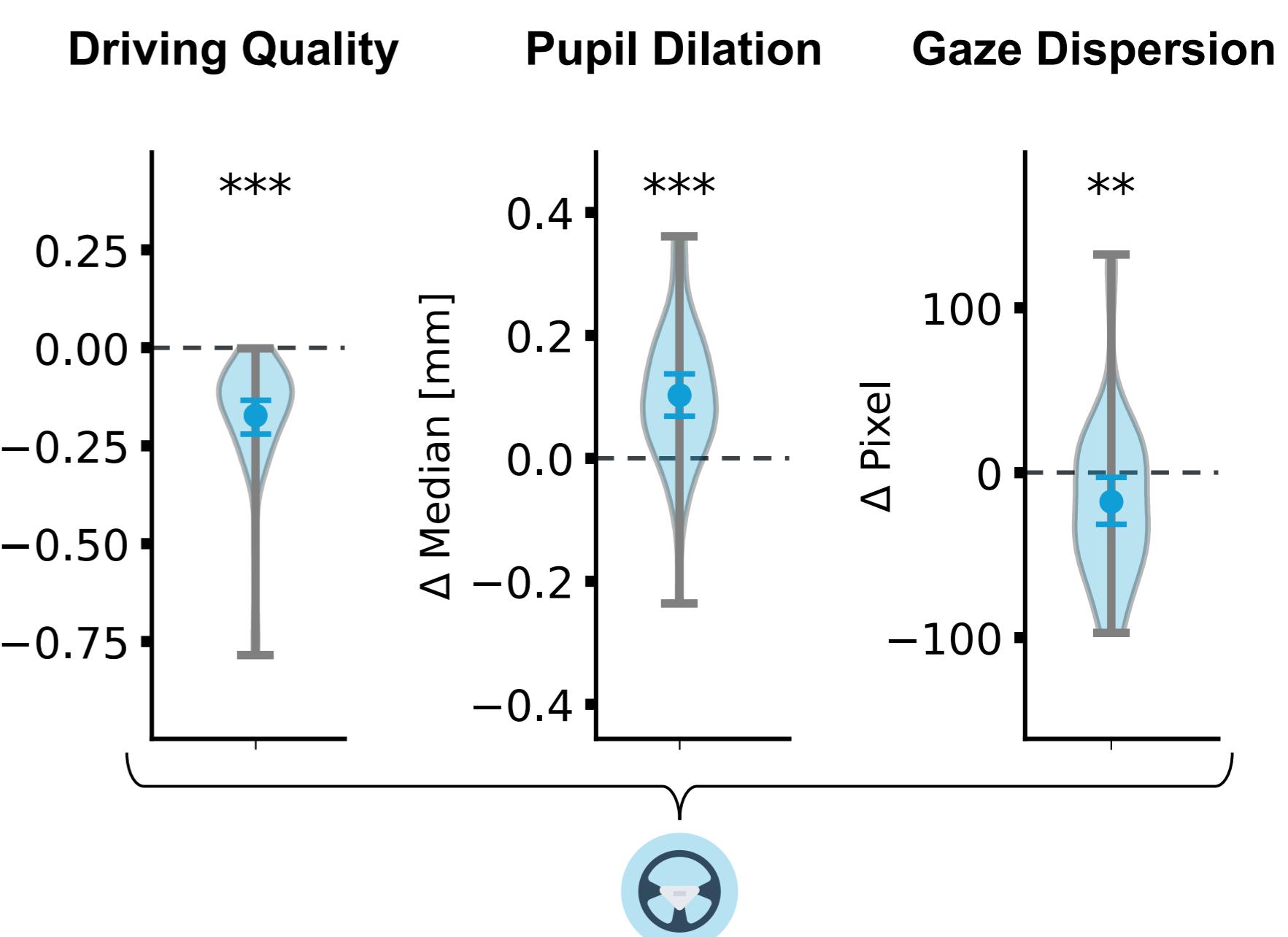
Top-down processing for emotional speech



Pupillary Oscillations Index of Pupillary Activity



Bottom-up processing for visuo-spatial cognition



Conclusion

Internalised processing during **emotional speech** is reflected in increased parietal beta band power, aperiodic broadband activity, and, to some extent, pupillary oscillations. This mode likely indicates anticipatory listening [1–3], socio-emotional cognition [3], and cognitive meta-control involved in dual-tasking [4]. Auditory engagement, as reflected in pupillary oscillations, was co-modulated by visuo-spatial workload.

Externalised processing during high **visuo-spatial workload** is reflected in increased driving-related gamma band power [5], pupil dilation, and visual tunnelling [6]. It indicates cognitive strain and the allocation of cognitive resources to accommodate driving-task demands [5–6].



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