

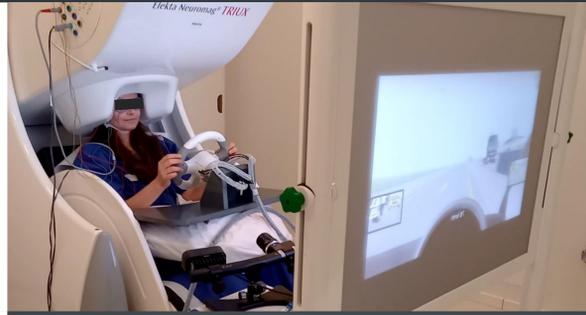
Caught Between the Road and Rumours

Brain Oscillations of Auditory Emotional Speech Processing and Visuo-spatial Attention During Simulated Driving

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Research Question

How do **valence of auditory emotional speech** and concurrent **cognitive load level** modulate brain oscillations, gaze-related, and behavioural signatures during driving?



Magnetoencephalography Eyetracking Study

48 subjects ($M_{age} = 25.25 \pm 4.01$) participated in the two-factorial within-subject block design:

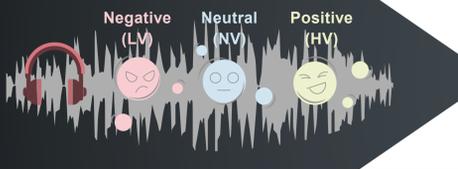


Emotional Speech x Workload during Driving



Visuo-Spatial Attention & Cognitive Load

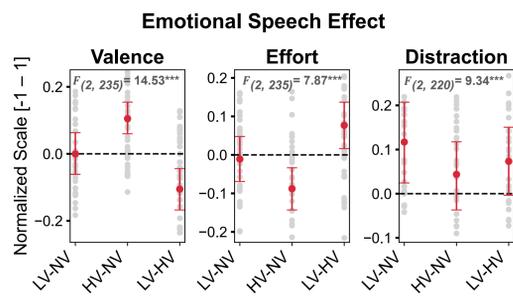
Emotional Speech Processing



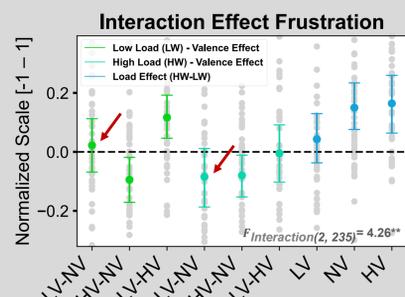
Cognitive Resources & Attentional Control

Saliency Bottom-Up
Executive Functions Top-Down

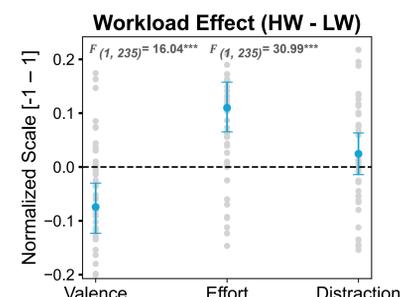
Subjective Ratings



($\text{sad} = \text{neutral}$) < (happy) ($\text{sad} = \text{neutral}$) > (happy) (sad) > (neutral) > (happy)

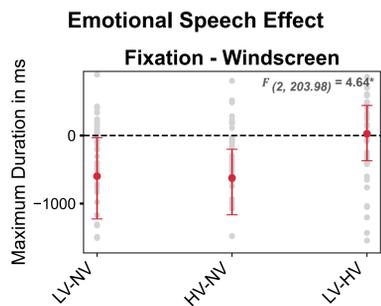


↑ for neutral during HW

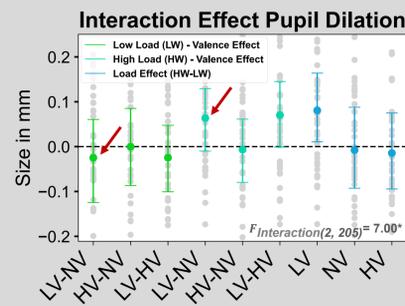


↓ ↑ for HW

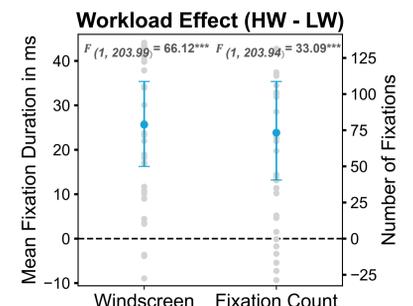
Gaze Behaviour



↓ Dynamic gaze behaviour for neutral



↑ for sad during HW
 ↑ cognitive demand possibly due to triggered regulatory mechanisms



↓ Dynamic gaze behaviour for HW

Oscillatory Power Mapping DICS



Conclusion

Emotional speech likely optimises information processing with lower cognitive demands through

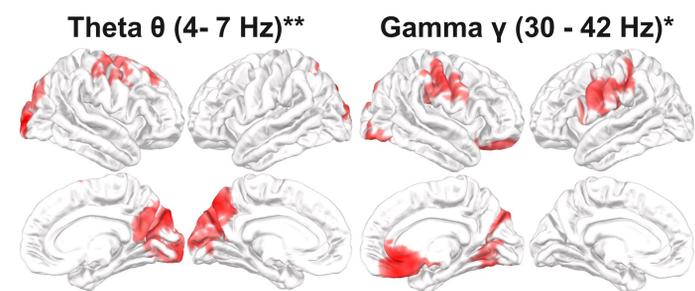
- ↓ θ / γ in prefrontal & auditory regions
- α -based gating mechanisms & right lateralized emotion processing

When **cognitive resources** are **available**, task-irrelevant **emotional speech** seems less demanding than neutral speech as it may contain **valuable social information**.

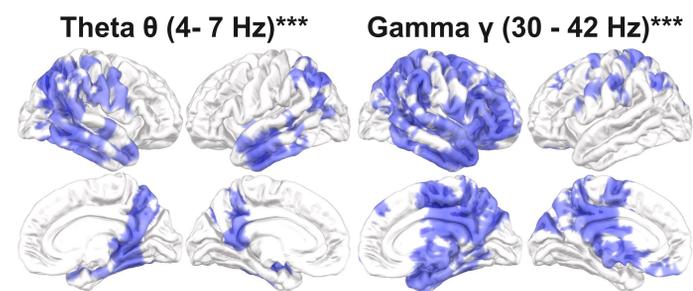
When resources are scarce, emotional negative speech is down-regulated, increasing cognitive strain.

Multimodal measures facilitate inference about cognitive processes in naturalistic (less controlled) scenarios.

HW - LW



Averaged t-values of the permutation-based clustering



Alpha α (8-12 Hz)***

