UNIVERSITY OF BIRMINGHAM | CHBH CENTRE FOR HUMAN BRAIN HEALTH

Supramodal excitability shift in preparation of demanding tasks covaries with oscillatory alpha activity

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Sorry I can't be here! But feel free to listen to me guide you through our poster!

Introduction

Can we listen to sound and not watch?

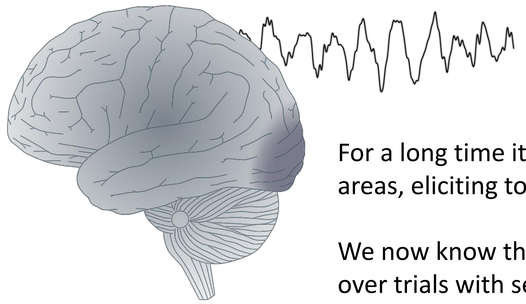
1: yes. sensory processing between modalities can be increased or decreased in line with attention[1,2]

2: no. sensory processing is supramodal, it can only be modulated over all modalities simultaneously [3]

3: sometimes. sensory processing can by separated between modalities to a certain degree, under unidentified circumstances [4]

There is conflicting evidence!

How is neuronal activity is involved in this process?

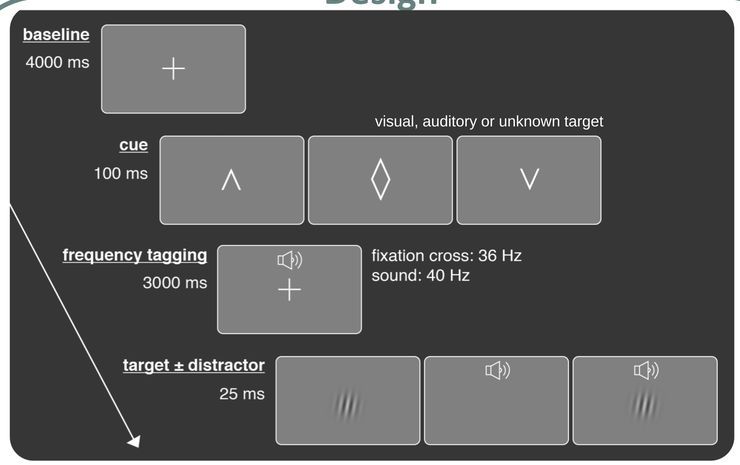


Oscillatory activity in the alpha range (~ 8 – 12 Hz) is known to play a role in selective attention [5,6]

For a long time it was believed to disengage early visual areas, eliciting top-down gain control [7,8]

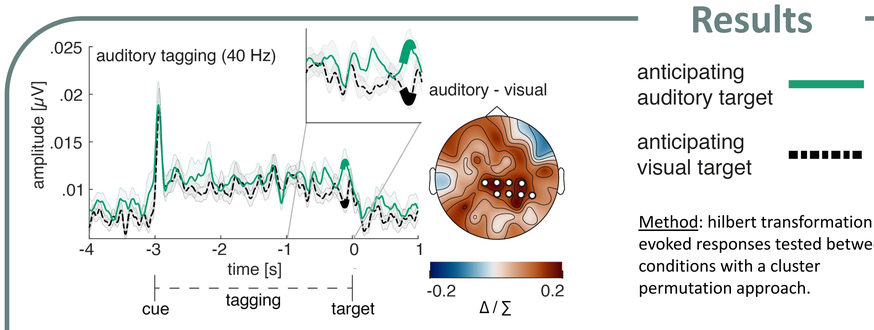
We now know this is not the case: Alpha activity does not covary over trials with sensory processing in early visual areas! [9,10]

Design



cross-modal discrimination task. In the cue-to-target interval we applied frequency-tagging, rhythmic stimulus presentation at 36 Hz (visual) and 40 Hz (auditory) irrelevant to the task. This evokes attention-dependent responses[11], which we tracked to measure changes in sensory processing. 50% of known targets were also accompanied by a random distractor of the other modality.

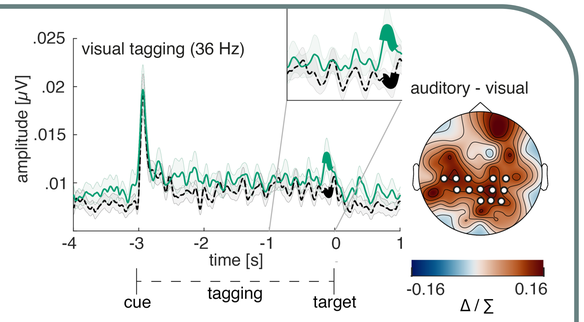
Results



anticipating auditory target

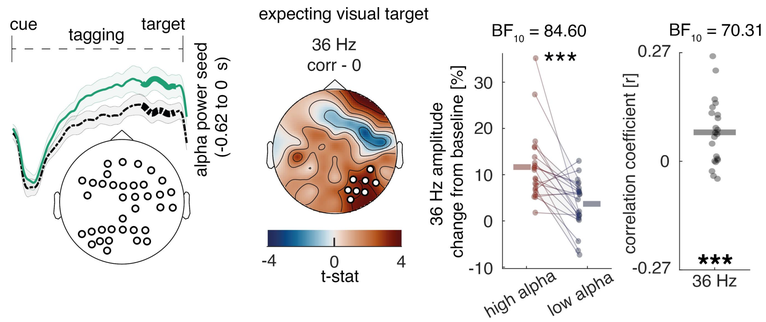
anticipating visual target

Method: hilbert transformation of evoked responses tested between conditions with a cluster permutation approach.



auditory processing is **increased** shortly before anticipating a demanding **auditory** target.

visual processing is also **increased** shortly before anticipating a demanding **auditory** target, but visual information is detrimental to the task!



alpha activity correlates over trials with visual processing at later than primary visual stages

Method: correlation between alpha power seed and frequency-tagging response shortly before target onset. test of correlation model against 0 model, corrected for multiple comparisons with a cluster permutation approach; median split for high and low alpha power trials; t-test against 0 of correlation coefficients

Conclusion

1. Multimodal attention is **supramodal** under **demanding conditions**

→ **When there's high demand, we cannot listen without watching!** (unless we close our eyes of course!)

2. **Alpha activity** covaries over trials with sensory processing at **later** than early sensory stages

→ No gain control, but **gating** of information to **downstream** areas

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