Transcranial alternating current stimulation affects human BOLD responses during motion adaptation

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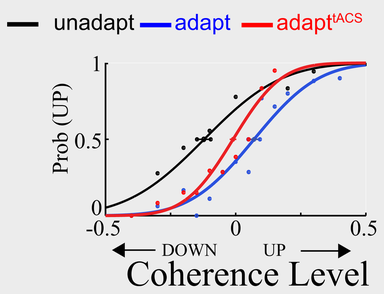
Introduction

Previous Observations:

Behavioral effects:

1. tACS (10 Hz) reduces motion aftereffect (MAE) in human subjects

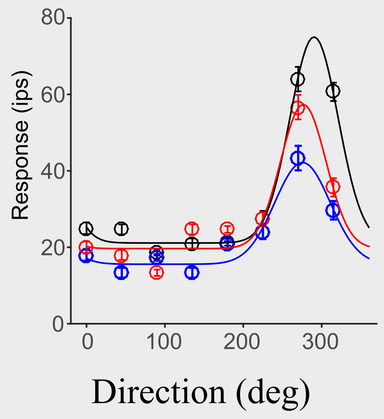
Kar and Krekelberg, 2014



Electrophysiological effects:

2. tACS (10 Hz) attenuates adaptation-induced changes in direction tuning in macaque MT neurons

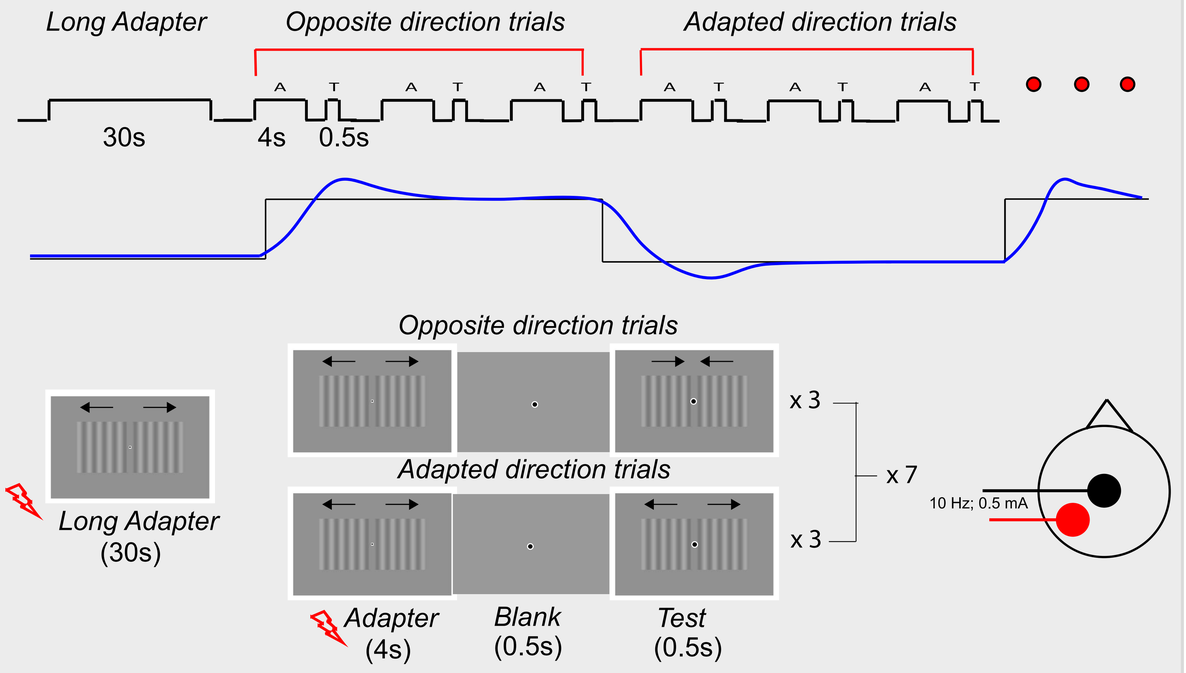
Kar, Duijnhouwer, and Krekelberg, 2014 (abstract)



Current Hypothesis:

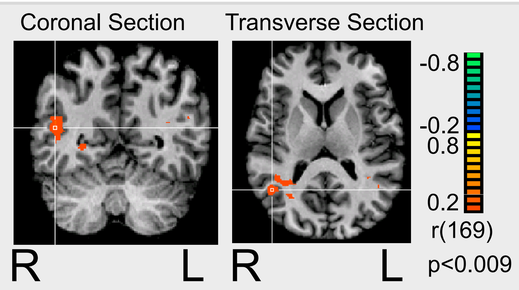
tACS reduces BOLD adaptation

Experimental Paradigm

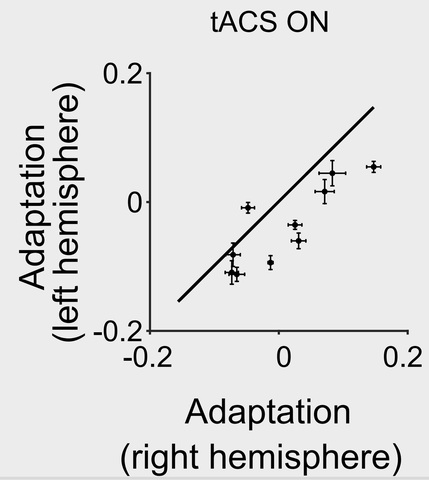


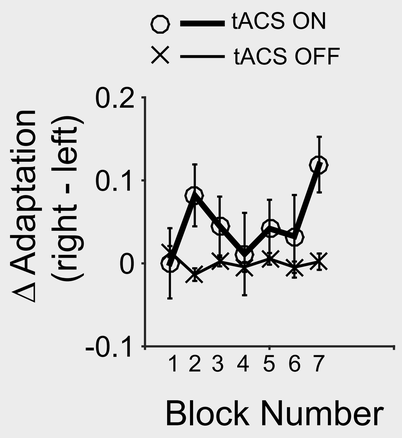
Huk, Reese, and Heeger (2001)

tACS reduces BOLD adaptation

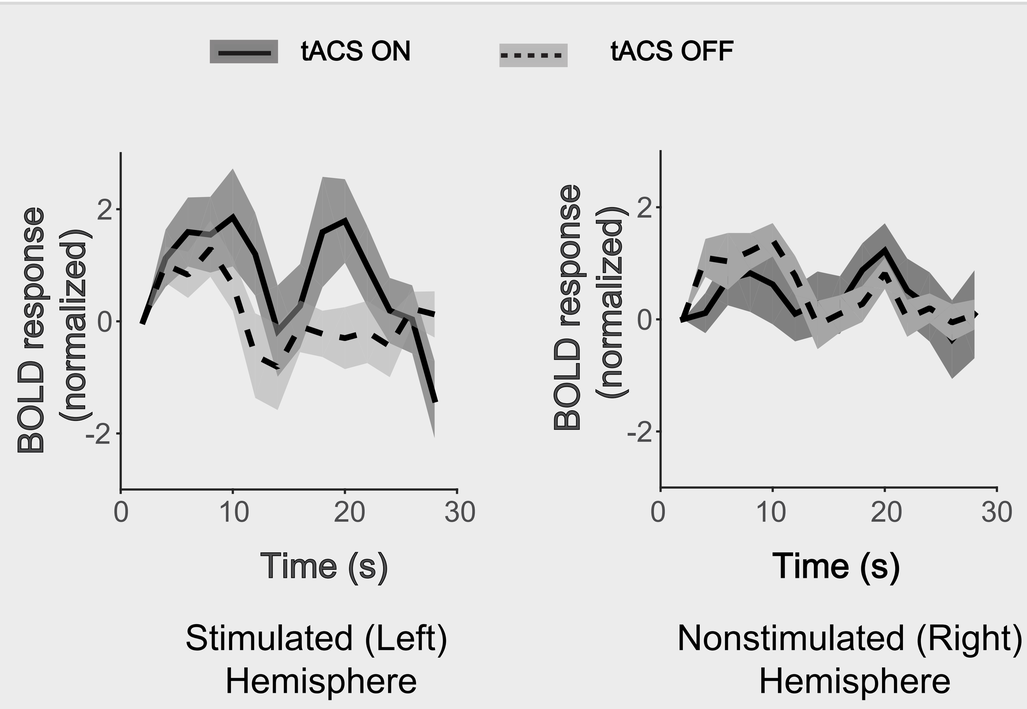


BOLD adapatation is reduced in a hemisphere specific way

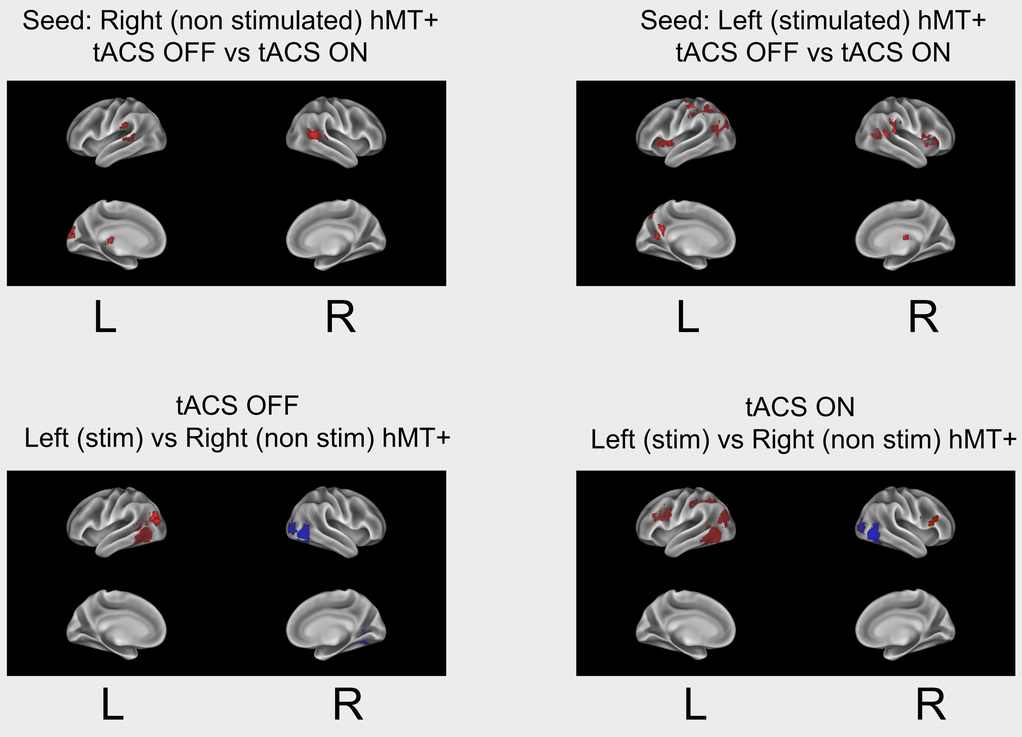




tACS increases BOLD during adaptation



tACS-induced changes in functional connectivity



Conclusions

1. 10 Hz tACS applied over parietal cortex during visual motion adaptation reduces BOLD adaptation.

2. Attenuation of adaptation leads to increased BOLD activity.

3. 10 Hz tACS changes functional connectivity (FC)

   - increases FC between stimulated and nonstimulated hMT+
   - increases FC between stimulated hMT+ and inferior frontal gyrus (MFG) bilaterally

References

- Kar, Kohitij and Krekelberg Bart.“Transcranial alternating current stimula tion attenuates visual motion adaptation.”Journal of Neuroscience(2014).
- Kar, K., Duijnhouwer, J, and Krekelberg, B: “tACS-What goes on inside? The neural consequences of transcranial alternating current stimulation.” Brain Stimulation 7.2 (2014).
- Huk, Alexander C., David Ress, and David J. Heeger. "Neuronal basis of the motion aftereffect reconsidered." Neuron 32.1 (2001).

Acknowledgements

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