# Effects of continuous theta-burst stimulation on stereoscopic vision

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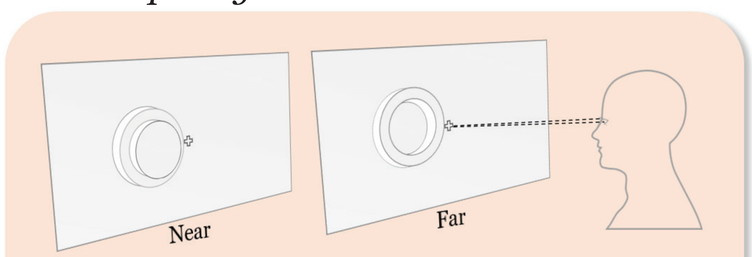
## Introduction

Previous studies have shown that continuous theta burst stimulation (cTBS)[1-2] and perceptual training (PT)[3-4] can independently improve stereoscopic vision. However, it is unknown whether cTBS and PT drive plasticity through the same neural mechanisms. Here we examine the combined effects of cTBS and PT versus the effects of either method alone.

- If combining cTBS and PT leads to greater improvement in stereoscopic performance than with cTBS and PT alone, this would suggest thta that cTBS and PT involve non-overlapping neural mechanisms.
- If combining cTBS and PT leads to comparable improvements as to those obtained with cTBS or PT alone, this would suggest that cTBS and PT improve stereopsis through the same neural mechanism.

## Method

### *Fine Disparity Task*



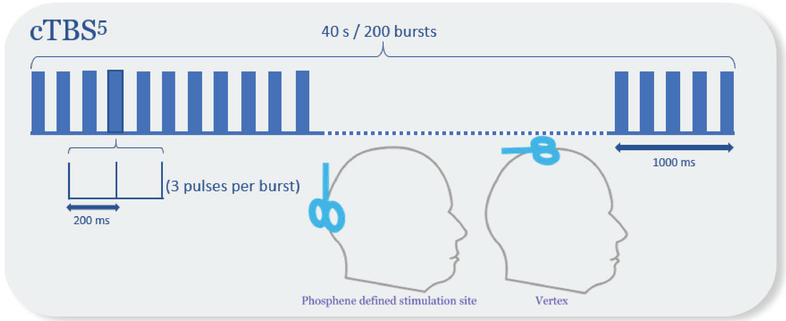

Subjects will be asked to judge whether the central target is in front of/ behind the surround.
Task difficulty varies according to the QUEST staircase by adjusting the disparity of the central target relative to the surround.

### *Transcranial Magnetic Stimulation (TMS)*

- cTBS is a variation of high-frequency repetitive TMS.
- During stimulation, the magnetic field induced by the electrical coil causes current over the target brain region through electromagnetic induction.

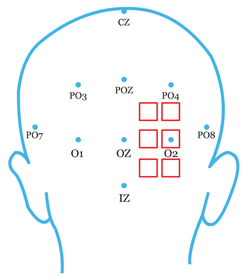

Magstim Rapid² Stimulator

### *cTBS protocol*




### *Phosphene Localization*

- Phosphene is an illusory percept of a flash of light.
- A pair of double pulses will be applied to the six pre-determined locations (indicated by the red squares) to determine the location that elicits the strongest phosphene.



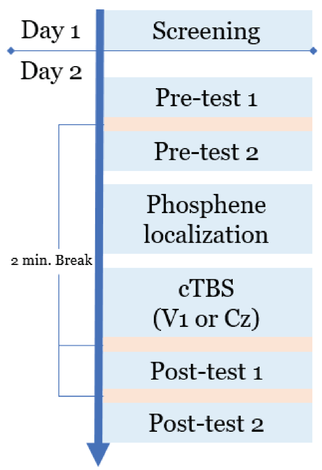

## Design

### *Task 1*

- To establish the effects of cTBS on stereoscopic vision as indexed by the fine disparity task

2 Groups
- Right V1 cTBS
- Cz cTBS

- Before and after cTBS, subjects will complete 2 runs of fine disparity task (208 trials in total).



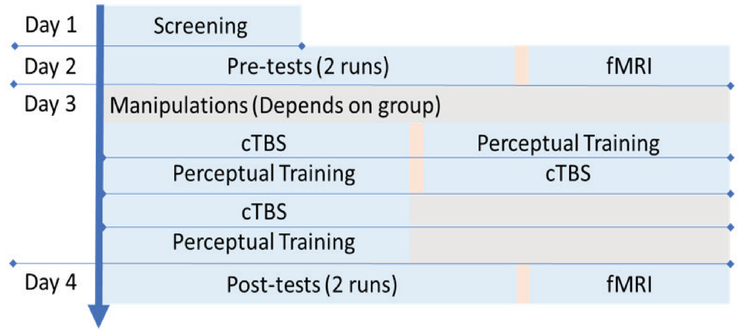

### *Task 1 - Hypotheses*

- Improved stereoscopic performance after cTBS over right V1 but no change after cTBS over the vertex.
- cTBS improves stereopsis by decorrelating neuronal noise[2].

### *Task 2*

- To examine the combined effects of cTBS and perceptual training (PT) on stereoscopic vision.

4 Groups
- cTBS⟶PT; PT⟶cTBS; cTBS alone; PT alone
- PT will consist of 10 runs of fine disparity discrimination training (1040 trials in total)[3].




### *Task 2 - Hypotheses*

- Combining cTBS and PT (cTBS⟶PT & PT⟶cTBS) will lead to a greater improvement in stereocopic performance than improvements obtained with cTBS and PT alone.
- cTBS and PT involve different neural mechanisms.
- While cTBS may induce decorrelation of neuronal noise, PT may instead improve stereopsis by a reweighting of the sensory inputs[6].

References

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