

# Behavioral measures of cross-modal attention accord with fMRI responses in V1, not MT+

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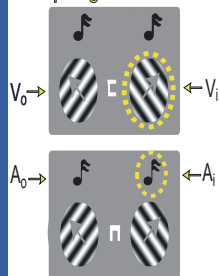


## INTRODUCTION

- Often information across our sensory modalities is not correlated and it might be necessary to suppress the processing of information in one modality to process information in another modality. For example, what happens to the response for an ignored visual stimulus when attention is directed away to the same modality versus a different modality?
- Previously, we found that fMRI responses to an ignored visual stimulus depend on the modality attended, with significant differences between MT+ and other early visual areas.
- Here we measure the strength of a visual motion aftereffect (MAE) to determine if response differences in our fMRI measures reflect perceptual differences.

## METHODS

### spotlight of attention



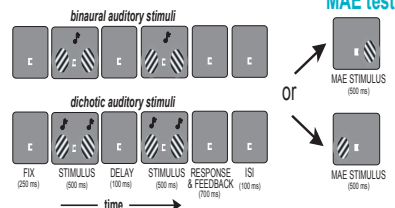
Two drifting gratings and an auditory tone (same or different in each ear) were presented simultaneously.

Subjects were cued to attend one stimulus and perform a two-interval forced choice speed discrimination (visual gratings) or frequency discrimination (auditory tones).

MAE strength was measured at the end of each trial using a nulling procedure: subjects judged the direction of a moving grating presented unpredictably at one of the two possible locations.

In MAE experiment 1 the contrast of all stimuli was held constant (100% maximum contrast). In MAE experiment 2 the contrast of the attention stimuli was varied in blocks, while the MAE test stimulus contrast was held constant.

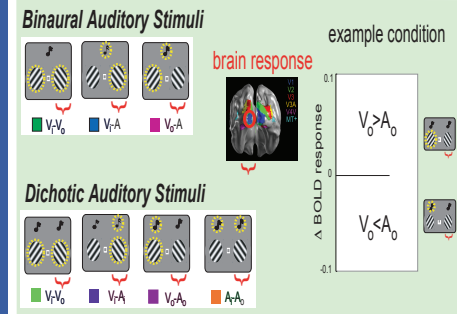
### events over time



EXPT #1: 2 locations x 7 speeds x 8 repeats/speed x 3-4 attention conditions x 16 repeats/attention condition (~5176-7168 trials/subject)  
EXPT #2: 2 locations x 7 contrasts x 7 speeds x 8 repeats/speed x 3-4 attention conditions x 2 repeats/attention condition (~4704-5276 trials/subject)

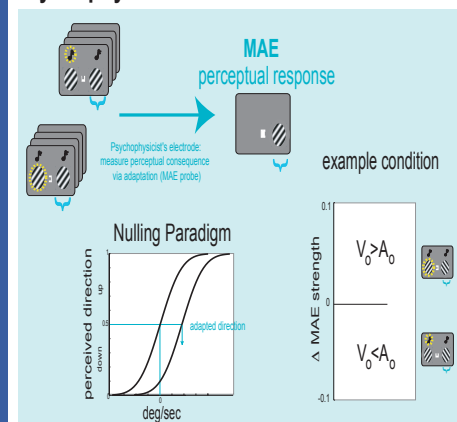
## PARADIGM

### fMRI Task



- Will differences in fMRI responses have a perceptual correlate?

### Psychophysical Task



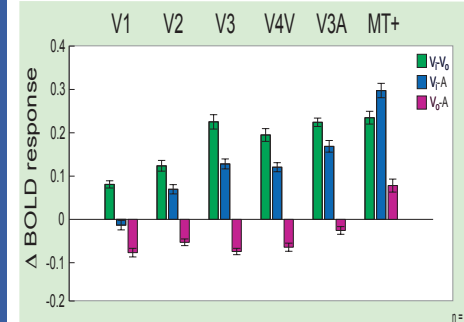
- Will the MAE at an ignored visual stimulus be stronger when attending an auditory stimulus (~fMRI results in V1) or a visual stimulus (~fMRI result in MT+)?

- Will the MAE saturate slowly with increasing contrast (~effects in V1) or quickly (~effects in MT+)?

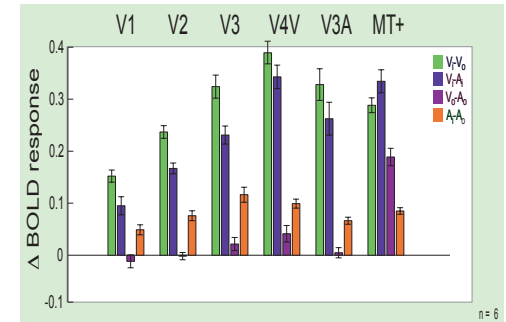
## RESULTS

### Binaural Auditory Stimuli

### fMRI Results

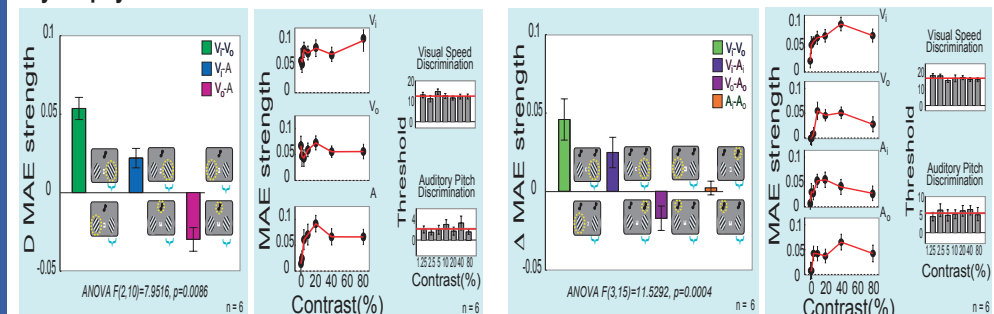


### Dichotic Auditory Stimuli



- fMRI responses to ignored visual stimuli are stronger in V1 when attending auditory, but stronger in MT+ when attending visual stimuli.

### Psychophysical Results



- The MAE to an ignored visual stimulus is stronger when attending an auditory stimulus, than when attending a visual stimulus.
- The strength of the MAE saturates slowly with increasing visual stimulus contrast.

## CONCLUSIONS

- Our MAE results with visual and auditory attention are most consistent with our fMRI results in V1 and V2, rather than in MT+.
- The MAE is stronger for an attended visual stimulus than an ignored visual stimulus, confirming previous studies (e.g., Rezec et al., 2004).
- For an ignored visual stimulus, the MAE is stronger when attending an auditory compared to a visual stimulus (but see Berman & Colby, 2002; Rees et al., 2001). Thus, motion perception is more strongly suppressed when attending within the same modality, rather than across modalities.
- As visual stimulus contrast increases, MAE strength increases gradually with visual and auditory attention.