

# Dissociating global and local biological motion processing in the human brain

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## Introduction

Biological motion perception is thought to be subserved by dedicated centers in the human brain.

Behaviourally, it has also been shown to implicate at least two distinct mechanisms: one for the retrieval of global form, and another purported to be sensitive to “local” information<sup>1-4</sup>. **Here, we use fMRI to characterize these two mechanisms in the human brain.**

## Method

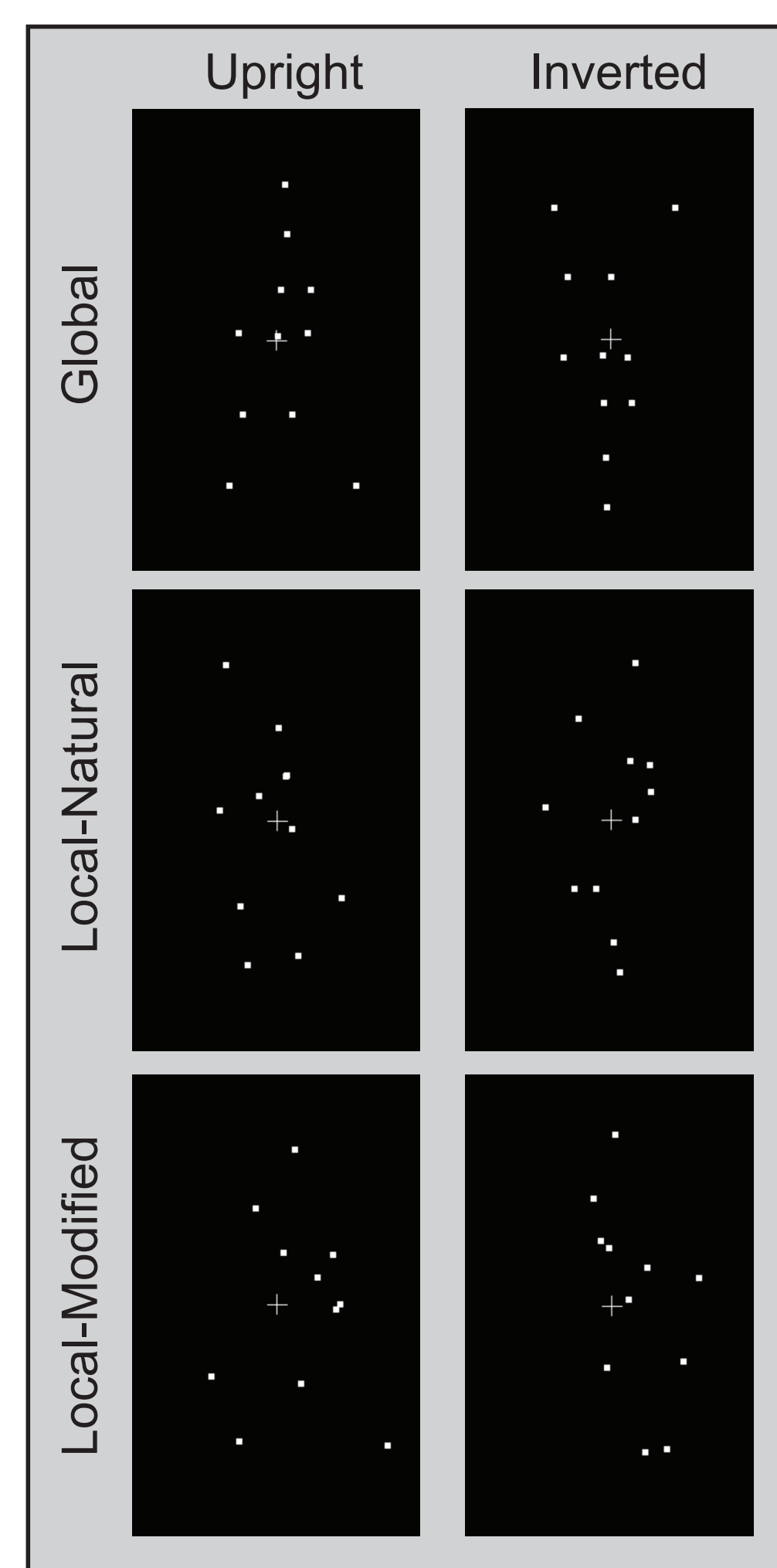
### Stimulus & Design

3 (walker) x 2 (orientation)  
n = 19

**Global walker:** local cues neutralized by superimposing leftwards/rightwards motion

**Local walker:** configuration perturbed by horizontal spatial scramble

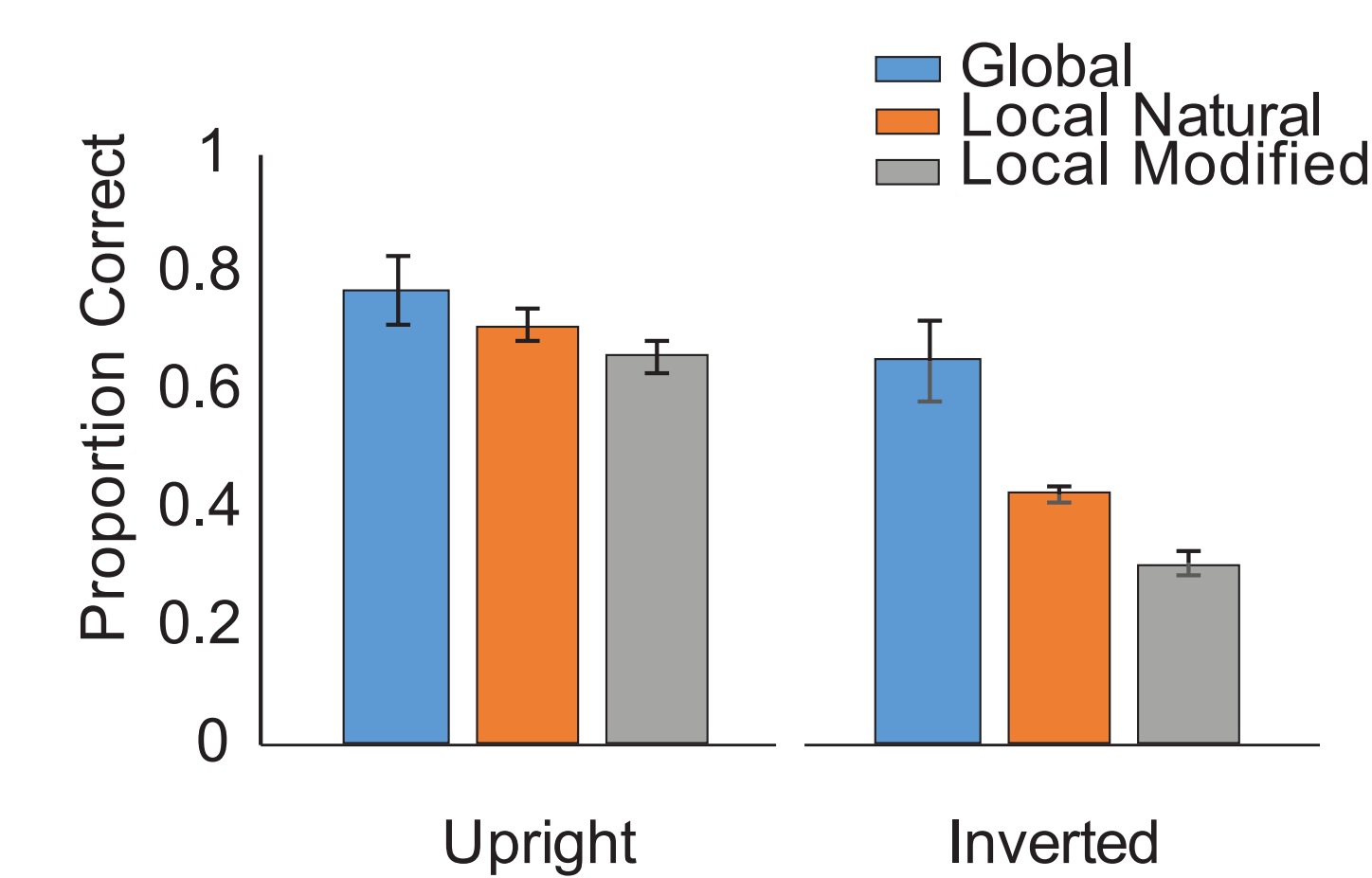
**Local modified walker:** as above, but with additional perturbation of local motion



Left or Right?

## Results

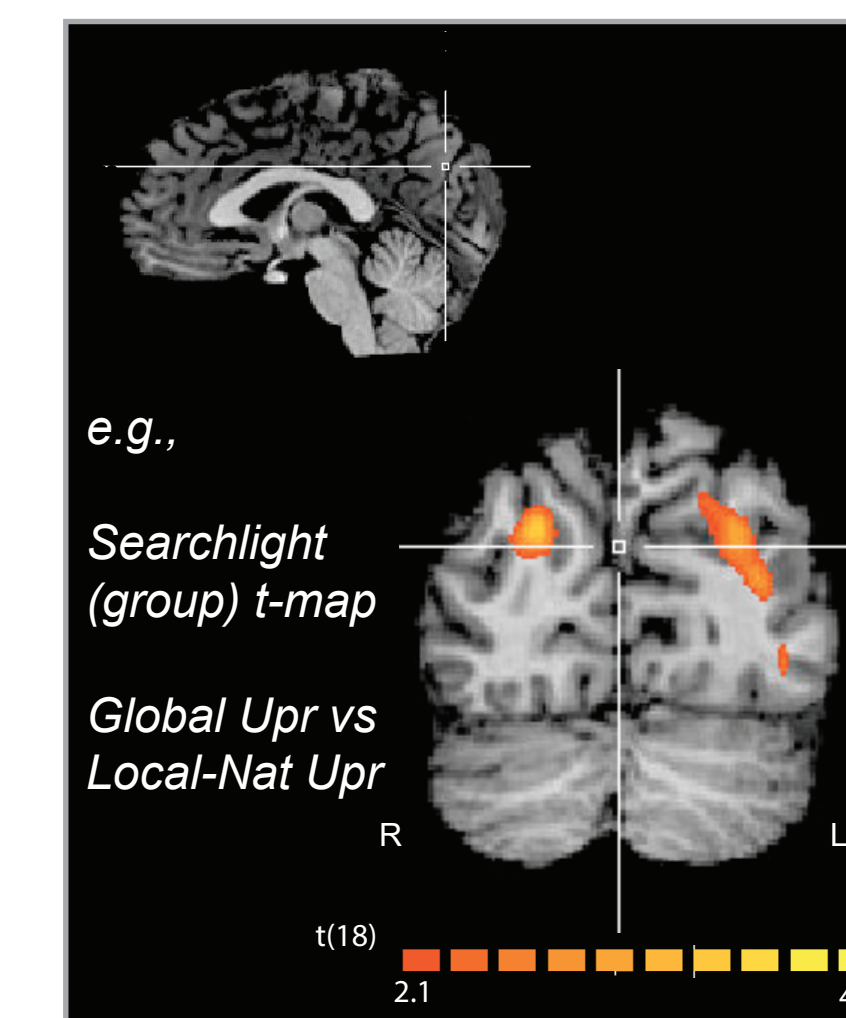
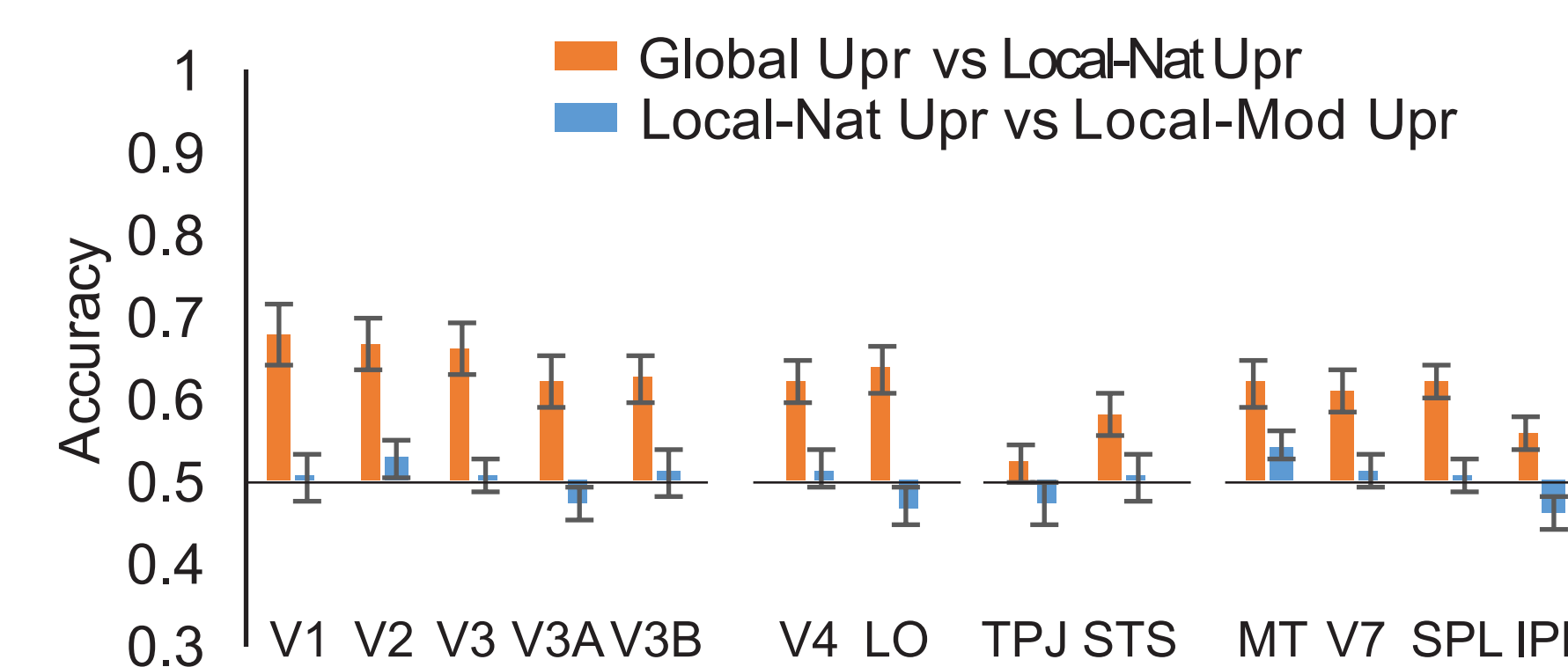
### Behaviour



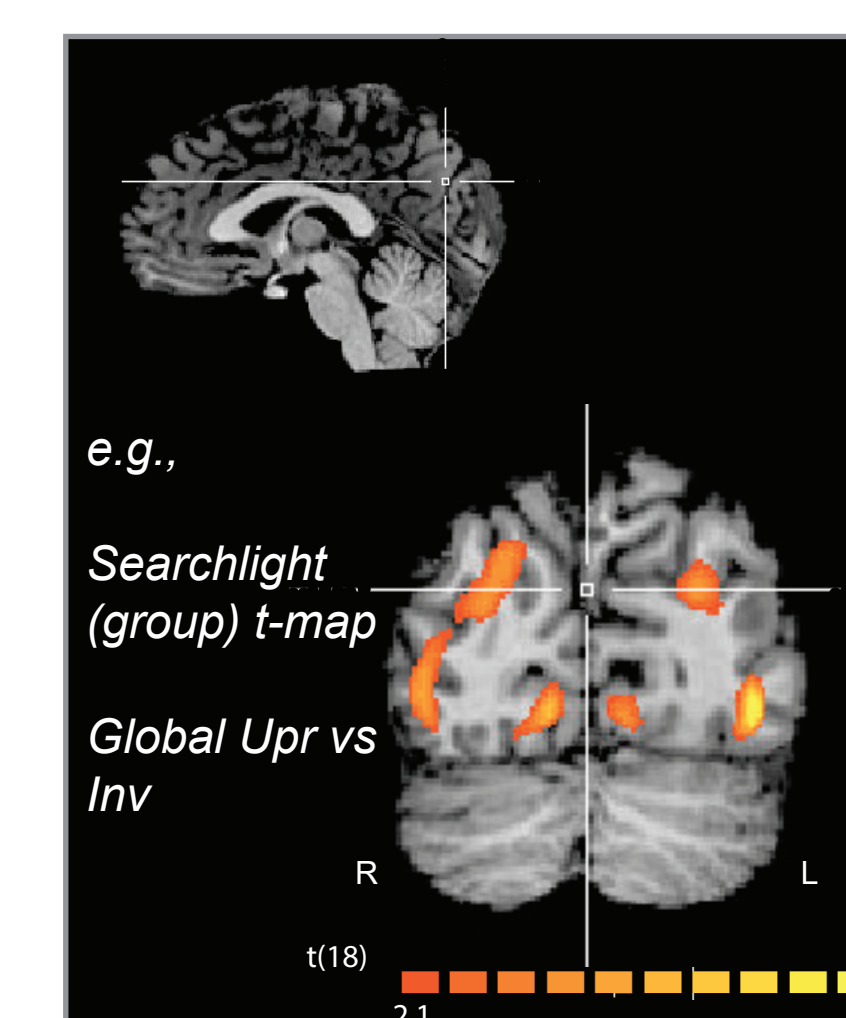
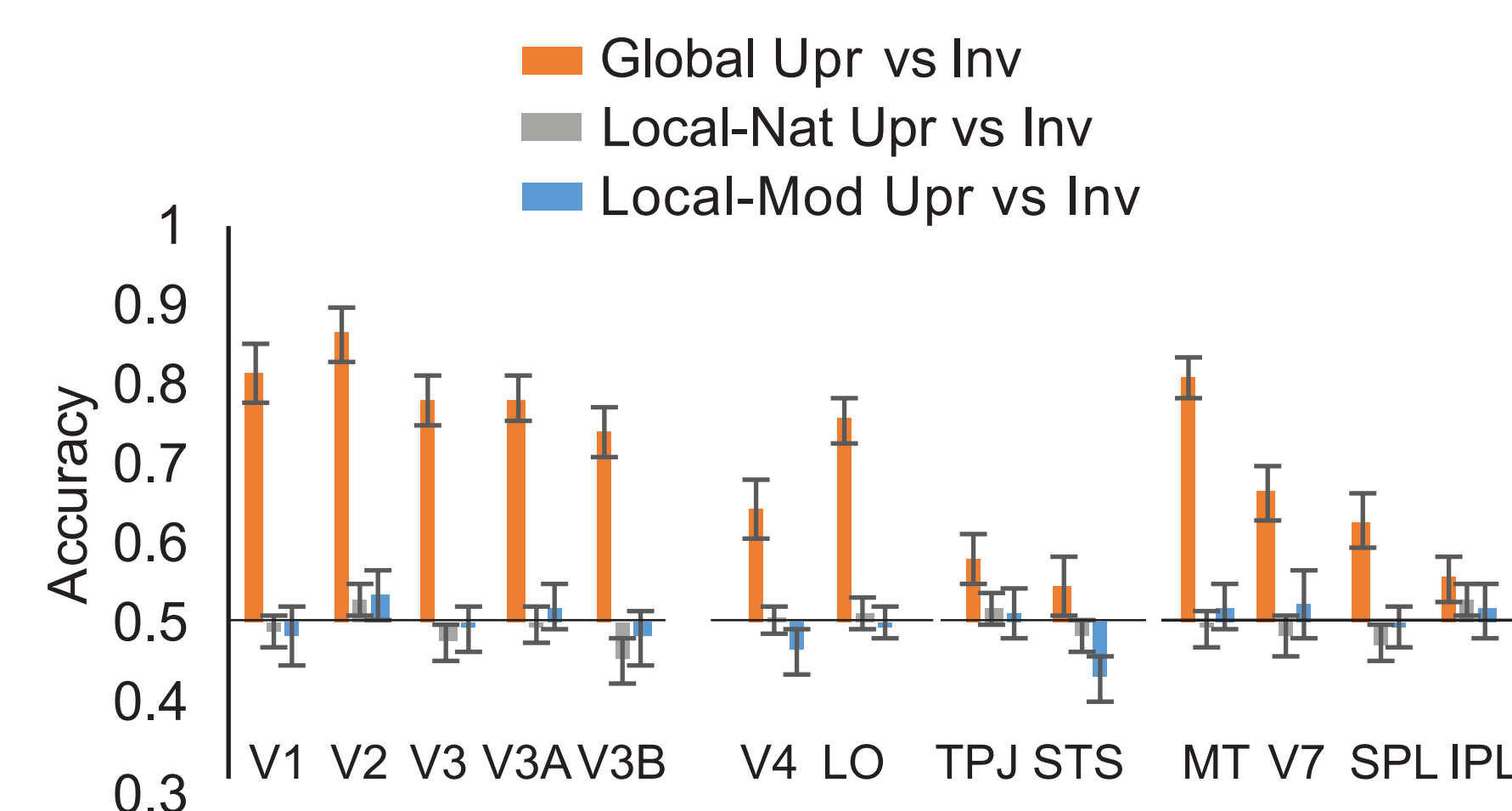
All stimuli can be well-discriminated when shown upright but accuracies are significantly worse when they are inverted.

### MVPA (ROI-based) and Searchlight

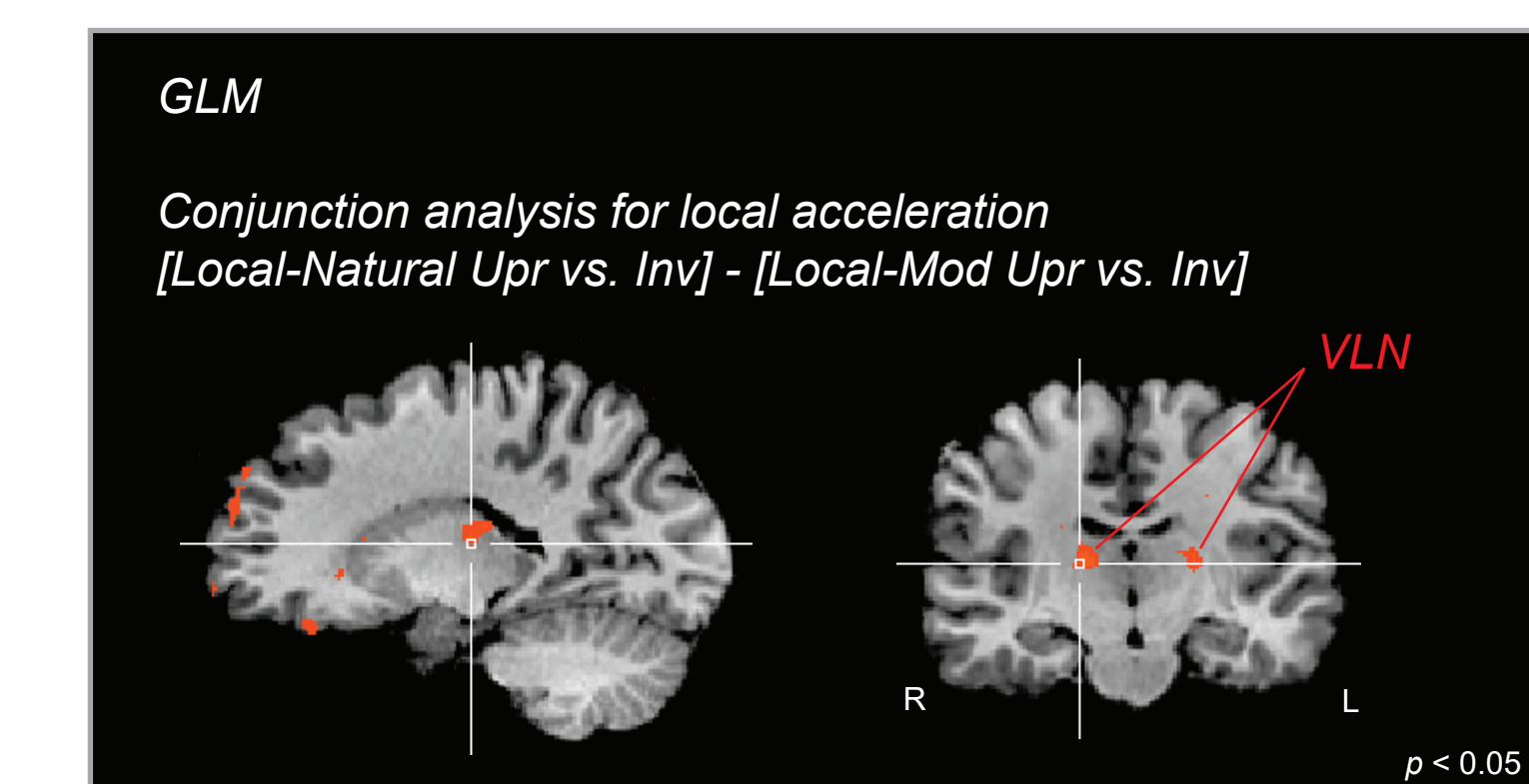
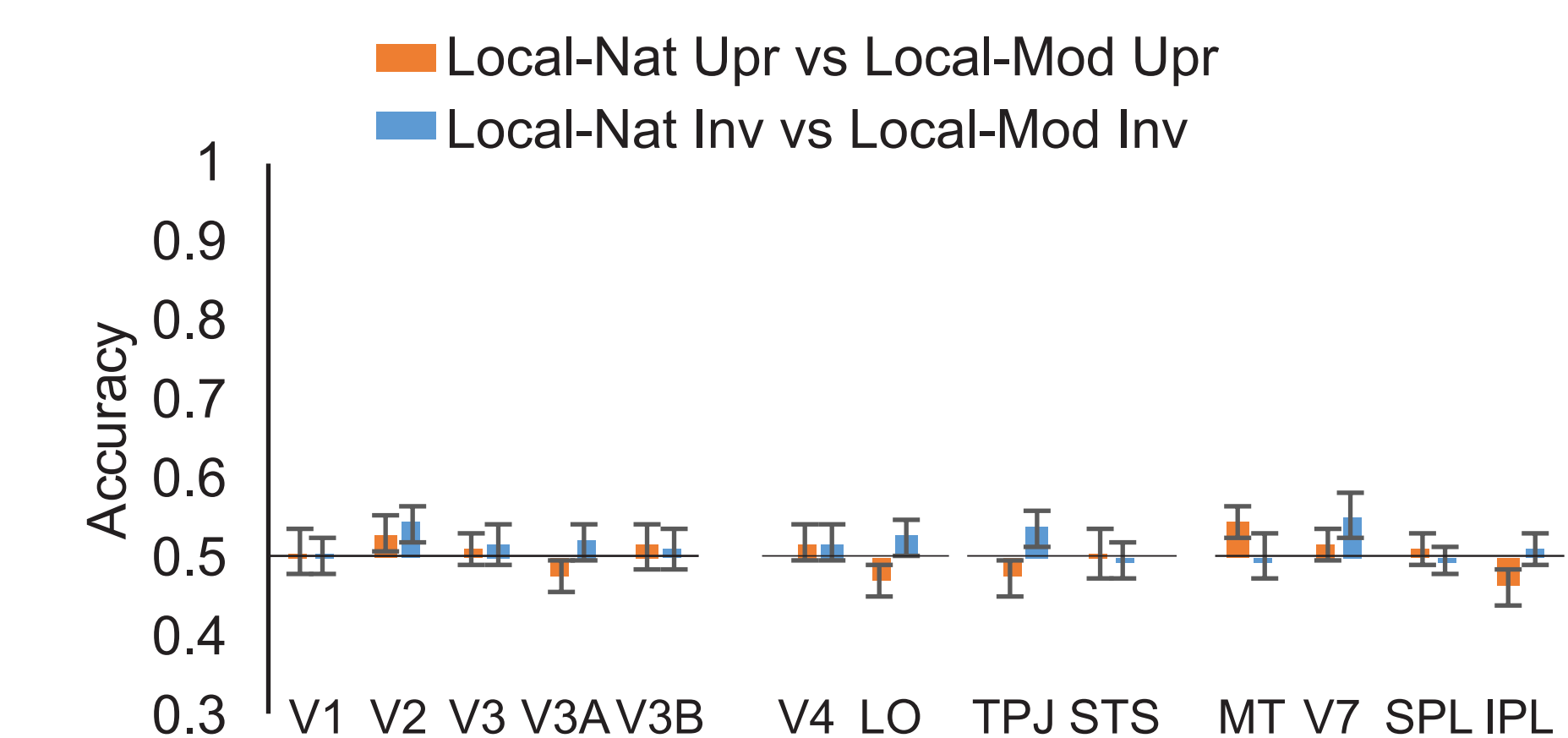
#### Testing stimulus type (i.e., global form vs local motion)



#### Testing orientation for global form, local motion



### Testing local acceleration



## Discussion

Global form and local aspects of biological motion can be discriminated reliably and widely along early and late visual cortex<sup>5-7</sup>.

Local information that has been previously shown to be critical for perceptual (behavioural) discriminations -- in particular, acceleration -- can not be discriminated by the cortex, however.

Intriguingly, we identified a cluster in subcortical VLN that responds preferentially to local acceleration. Might this reflect an evolutionarily-older *local* biological motion system that is subcortical?<sup>1</sup>

## References

<sup>1</sup>Troje, N. F., & Westhoff, C. (2006). *Current Biology*, 16(8), 821-824.

<sup>2</sup>Chang, D. H., & Troje, N. F. (2009). *Journal of Vision*, 9(5), 8-8.

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<sup>5</sup>Jastorff, J., & Orban, G. A. (2009). *The Journal of Neuroscience*, 29(22), 7315-7329.

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