Contiguous Locations Increase Reliability of Parietal Maps

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Background

The parietal cortex is intricately involved in a vast number of sensory and cognitive functions

Retinotopic mapping can reveal the architecture of the parietal cortex in individual participants

What is the best way to reveal parietal maps quickly and efficiently?

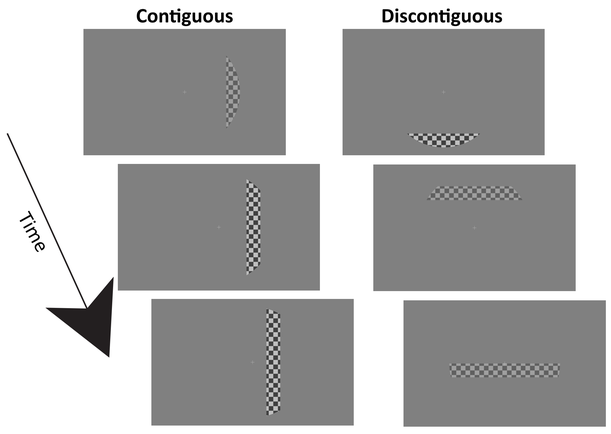
Attention increases:
- Reliablility of maps(Bressler & Silver, 2011)
- Size of representations (Sheremata & Silver, 2015)

Occipital maps demonstrated with non-contiguous stimuli
- Decrease distortion of visual field (Binda et al., 2013)
- Increase reliability (Senden et al., 2014)

Contiguous stimuli cue the next spatial location
- Contiguous stimuli confer attenional benefit

Do differences reflect in stimulus type reflect attentional mechanisms in parietal cortex?

Methods

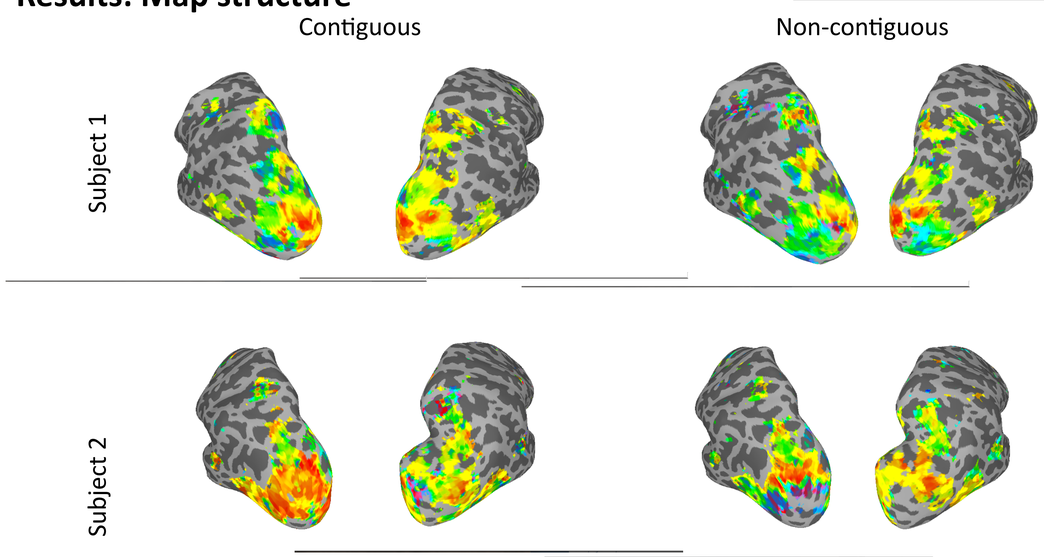


6 Runs per condition
Task: Detect contrast dimming
Stimulus positions pseudorandomized for each subject

Model Fitting:
Time series concatenated and fit to AFNI pRF model
Output: pRF location and size

Analysis:
- Retinotopic areas determined using independent data set
- Reliability measured by comparing first and second half of runs
- Spatial expectation effects measured using pRF size
  If expectation "pulls-along" pRF, contiguous > discontiguous

Results: Map structure



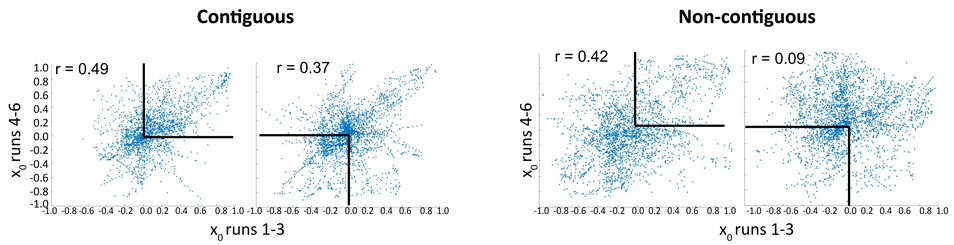
Visual inspection revealed map structure with both stimulus conditions

Subjectively easier to define topographic maps in IPS

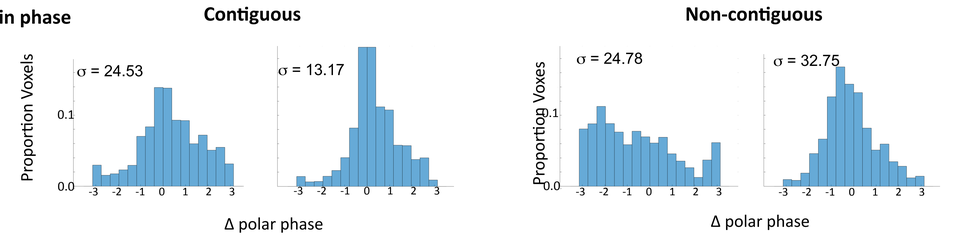
Results: Test-retest reliability (Group Analysis)

Reliability used to evaluate map structure in IPS0-2

Correlation pRF Center (x_0)



Difference in phase

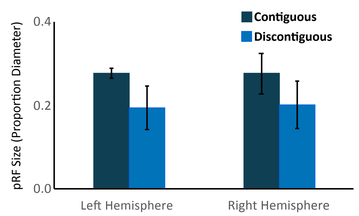


Greater reliability for contiguous mapping stimuli

Results: pRF Size

Do contiguous stimuli "pull" the pRF?

Predicts larger pRFs in contiguous mapping condition



pRFs larger in contiguous condition

Expectation-based effects of stimulus type

Summary

Greater reliability for pRFs using contiguous stimuli

- Subjective quality of map structure
- Quantified using test-retest reliability

Contiguous condition results in larger pRFs

Evidence for greater right-hemisphere reliability

Discussion

Contiguous stimuli more efficiently map parietal cortex

- Properties suggest role of attentional cueing

Continuously moving stimuli and averaging across runs may further improve map structure

Future Directions

Spatial attention cues used to inform future locations of stimuli

- Does spatial attention work via predictability?
- If so, does parietal processing require prediction?

Do pRF size differences reflect contiguous locations of stimuli, or do they reflect expectation?

- Impossible to differentiate with current paradigm