

Functional dissociation of language and working memory revealed by pattern analysis of subject-specific conjunction maps



Terri L. Scott^{1*}, Tyler K. Perrachione²

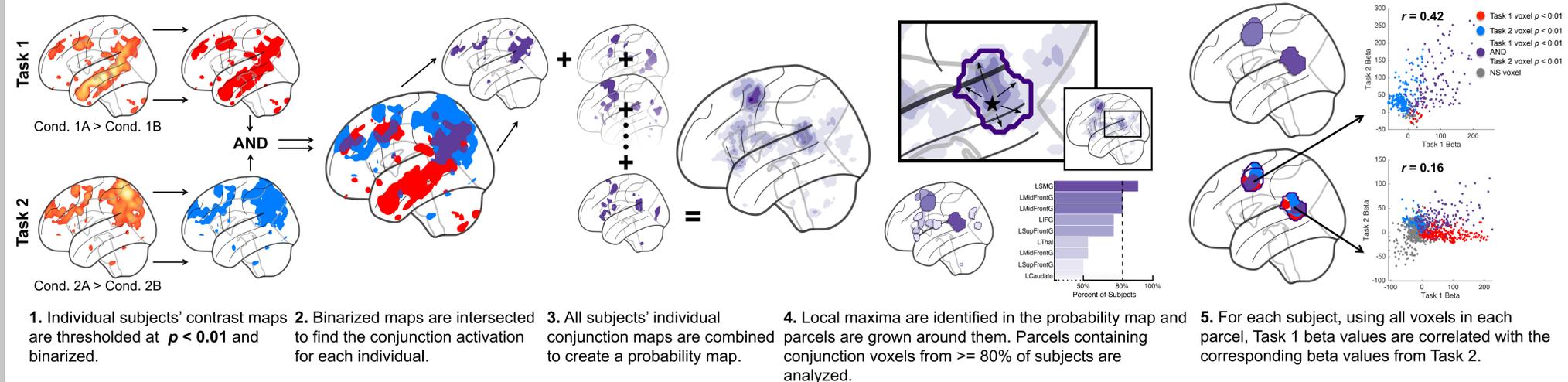
¹Graduate Program for Neuroscience, Boston University, ²Department of Speech, Language & Hearing Sciences, Boston University

PDF of this poster can be found at <http://sites.bu.edu/cnrlab/publications/conference-presentations-abstracts/>; *Correspondence: tlscott@bu.edu

Summary

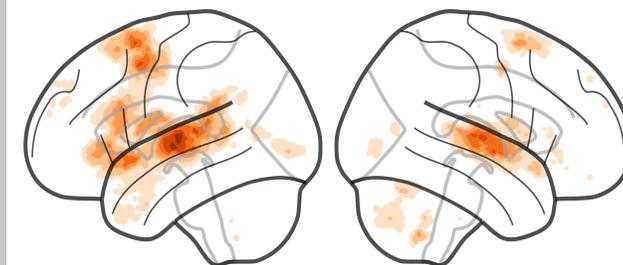
- Separable brain networks with opposing functional specificity are thought to support language and working memory (WM) (Fedorenko et al. 2010; 2012), however consistent exceptions have been observed in neuroimaging of **verbal working memory (VWM)** tasks.
- Here, we compare and contrast activation in the brains of individual subjects evoked during functional magnetic resonance imaging (fMRI) of **language**, **VWM**, and **spatial working memory (SWM)** tasks.
- In a majority of participants, significant overlapping activity between **language and VWM** was found in 8 brain areas with median $r = 0.12$, 3 brain areas showed overlap between **language and SWM** with median $r = -0.05$, and 16 regions were identified as showing overlap between **VWM and SWM**, with highly correlated patterns of activity across these tasks in each region (median $r = 0.44$).
- In regions showing overlap between language and WM, correlations between the tasks were relatively low. These results indicate that, even in regions where there is overlap in functional activation (conjunction) between language and verbal or spatial working memory, the degree of neurocomputational convergence is minimal.

Analysis Methods

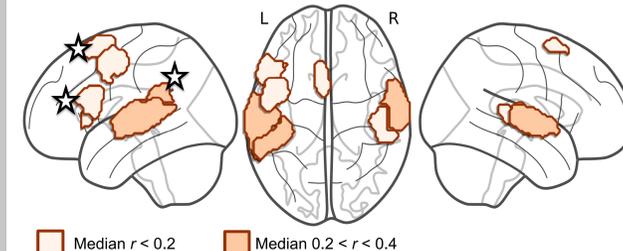


Language/Speech and Verbal Working Memory

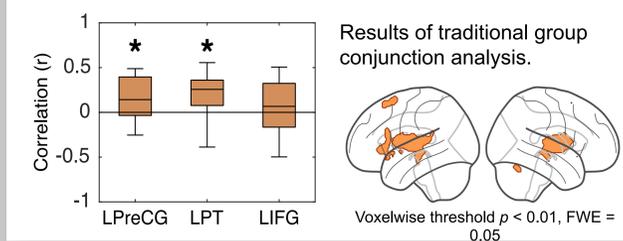
Results: Probability Maps



Results: Parcels that encompass conjunction voxels from 80% or more subjects

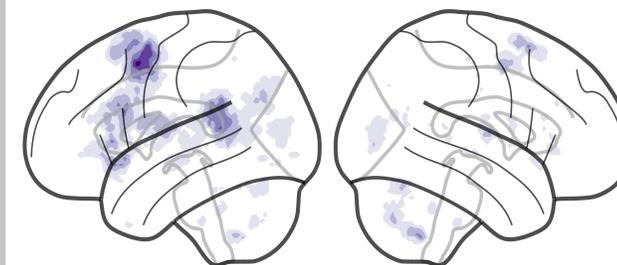


Results: Correlations from three representative parcels

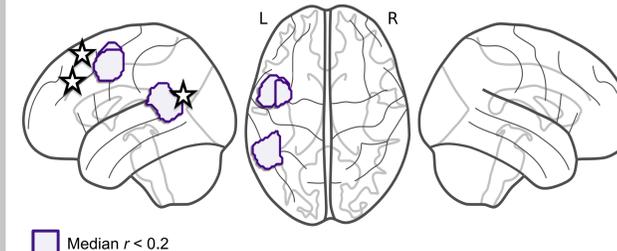


Language/Speech and Spatial Working Memory

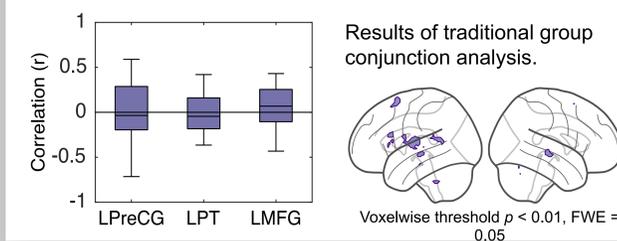
Results: Probability Maps



Results: Parcels that encompass conjunction voxels from 80% or more subjects



Results: Correlations from three representative parcels

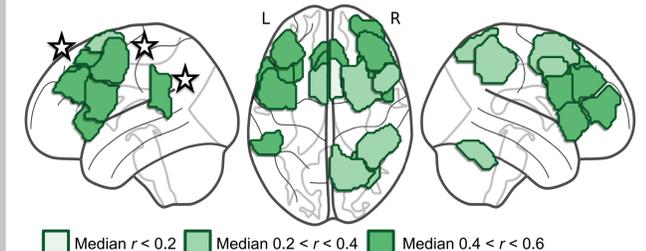


Verbal and Spatial Working Memory

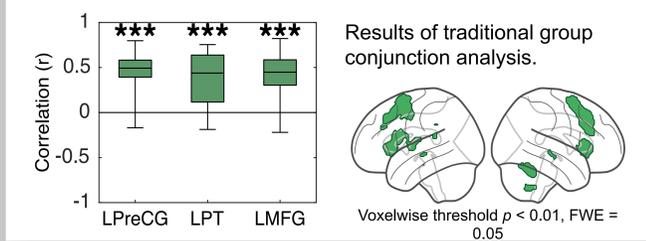
Results: Probability Maps



Results: Parcels that encompass conjunction voxels from 80% or more subjects

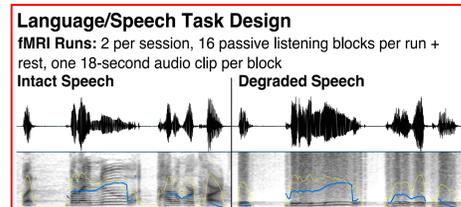


Results: Correlations from three representative parcels

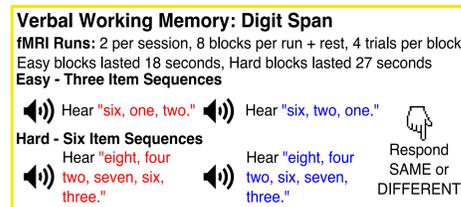


fMRI Tasks

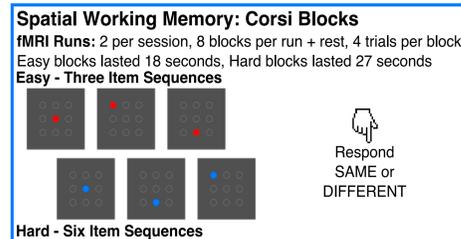
Participants: 20 fluent English-speaking adults (12 female; age 19-32 years, $M = 24.1$ years)



Acquisition: Continuous-sampling block design, using simultaneous multislice imaging (TR=0.75s).



Analysis: GLMs were computed in each run of each task and then data were aligned to a common MNI template.



Communication Neuroscience Research Laboratory

Funding: This project is supported by the NIDCD of the National Institutes of Health under award number R03DC014045 and a NARSAD Young Investigator Grant to TP. TS was supported under NIH training grant T90DA032484.