

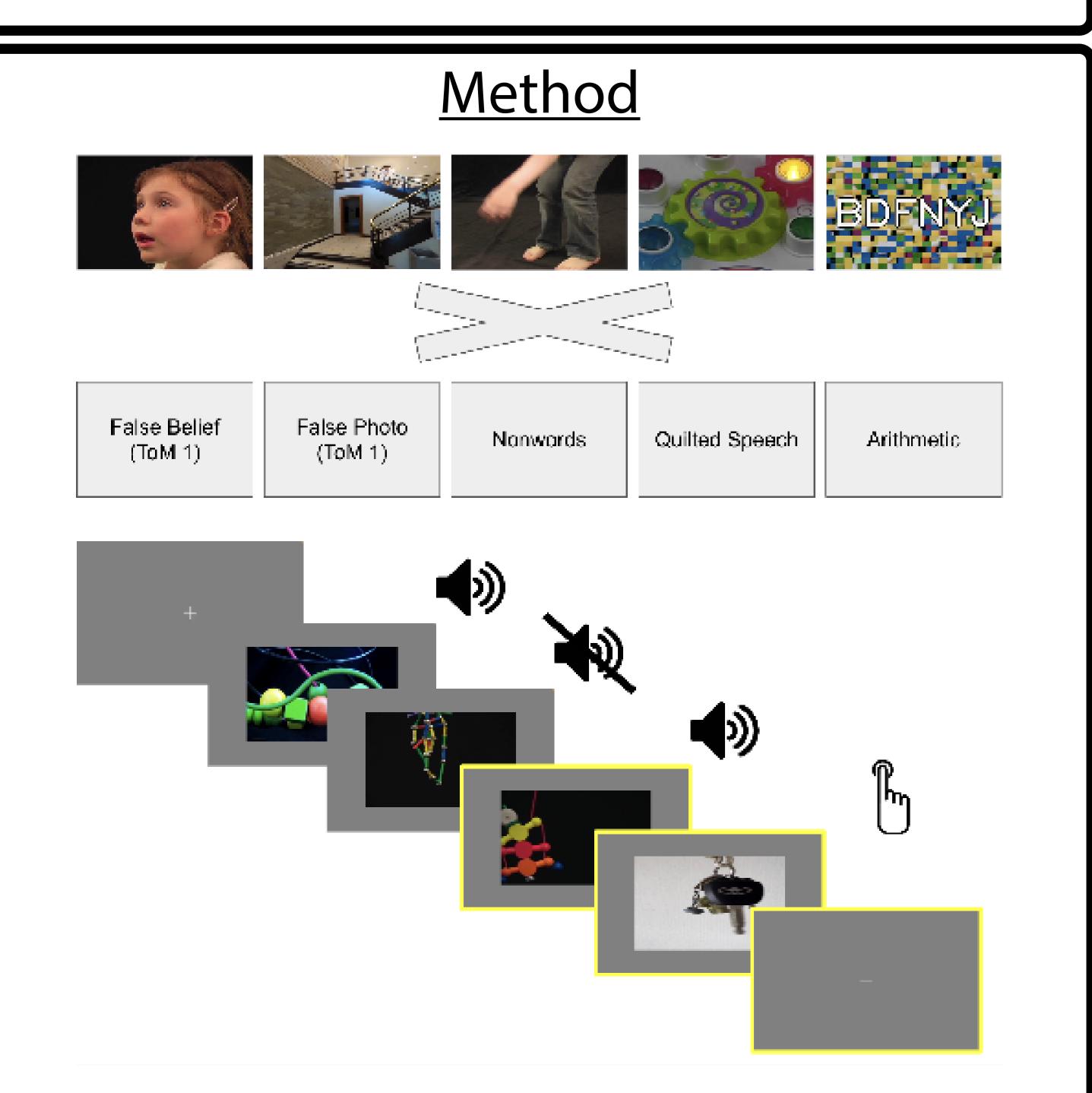
An Efficient Multimodal fMRI Localizer for High-Level Visual, Auditory, and Cognitive Regions in Humans



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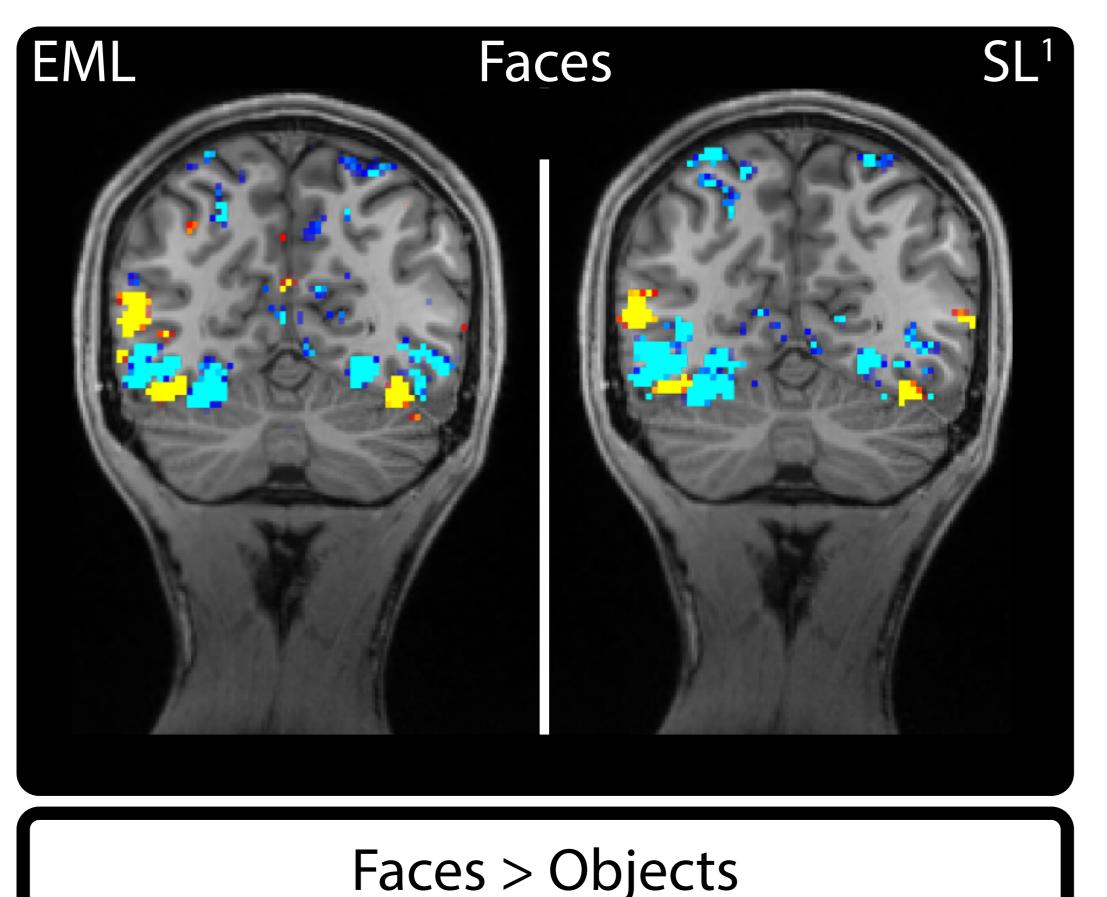
Motivation

- Functional localization in individual subjects allows precision investigation of functionally specific cortical regions without intersubject averaging. But localizer scans take time and cost money, and only one or two can typically fit within a scanning session.
- Here we introduce a new Efficient Multimodal Localizer (EML), which is able to identify in just 23 minutes established regions selective for:
- Faces, scenes, bodies, objects, words
- Language
- Speech sounds
- Theory of Mind (ToM)
- Demanding cognitive tasks (MD)
- Separate, standard localizers (SL) for these total 85 minutes



- Simultaneous, orthogonalized video and audio
- Visual: faces, scenes, bodues, objects, letters (on scr. obj.)
- Audio: False belief, false photo, nonwords, quilted speech, and arithmetic problems
- 5x5 counterbalanced design unconfounds conditions
- Task: Yes/No, "logical continuation" on the audio only
- Blocked design, five runs of ten 22-second blocks/run
- We compare to standard localizers for these contrasts

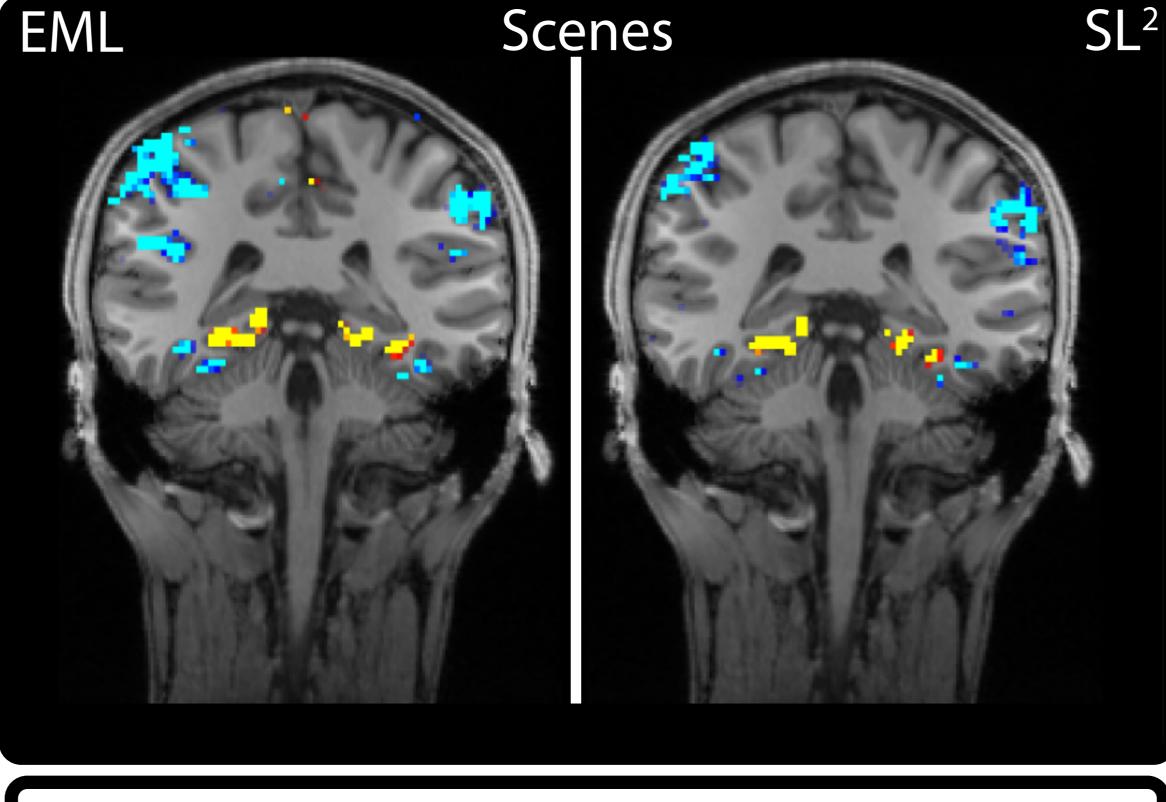
Efficient Multimodal Localizer identifies same fROIs as battery of Standard Localizers



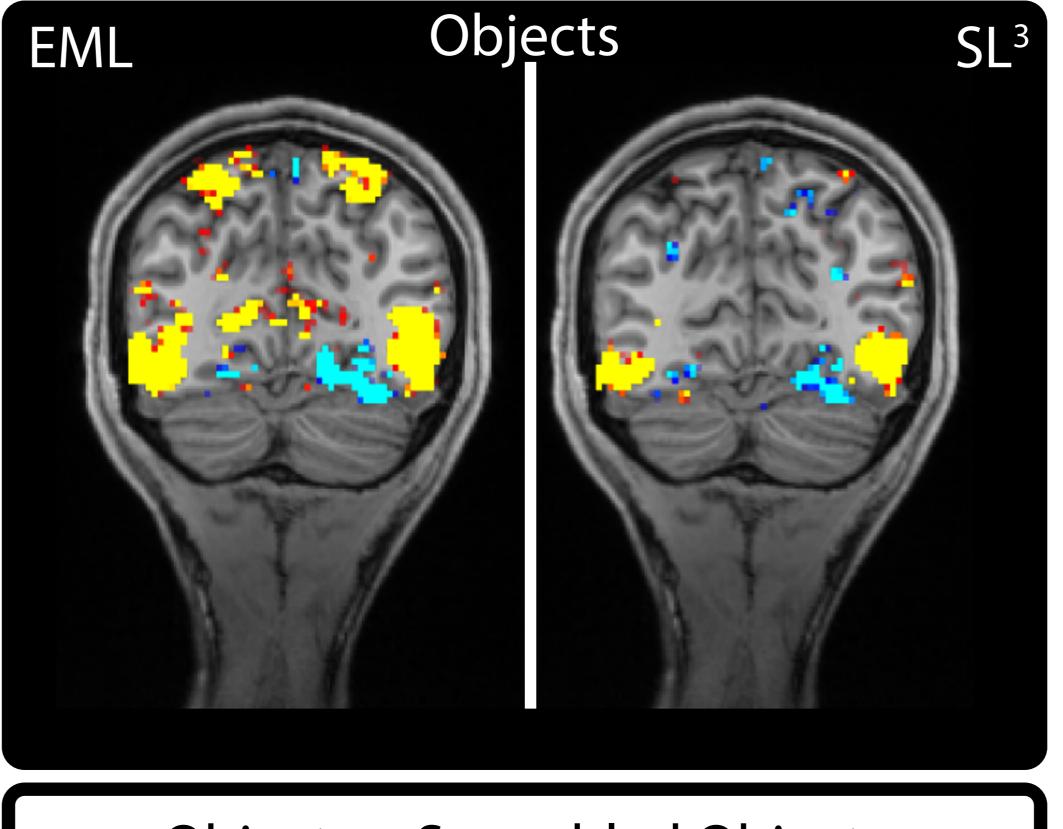
EML Bodies

Bodies > Objects

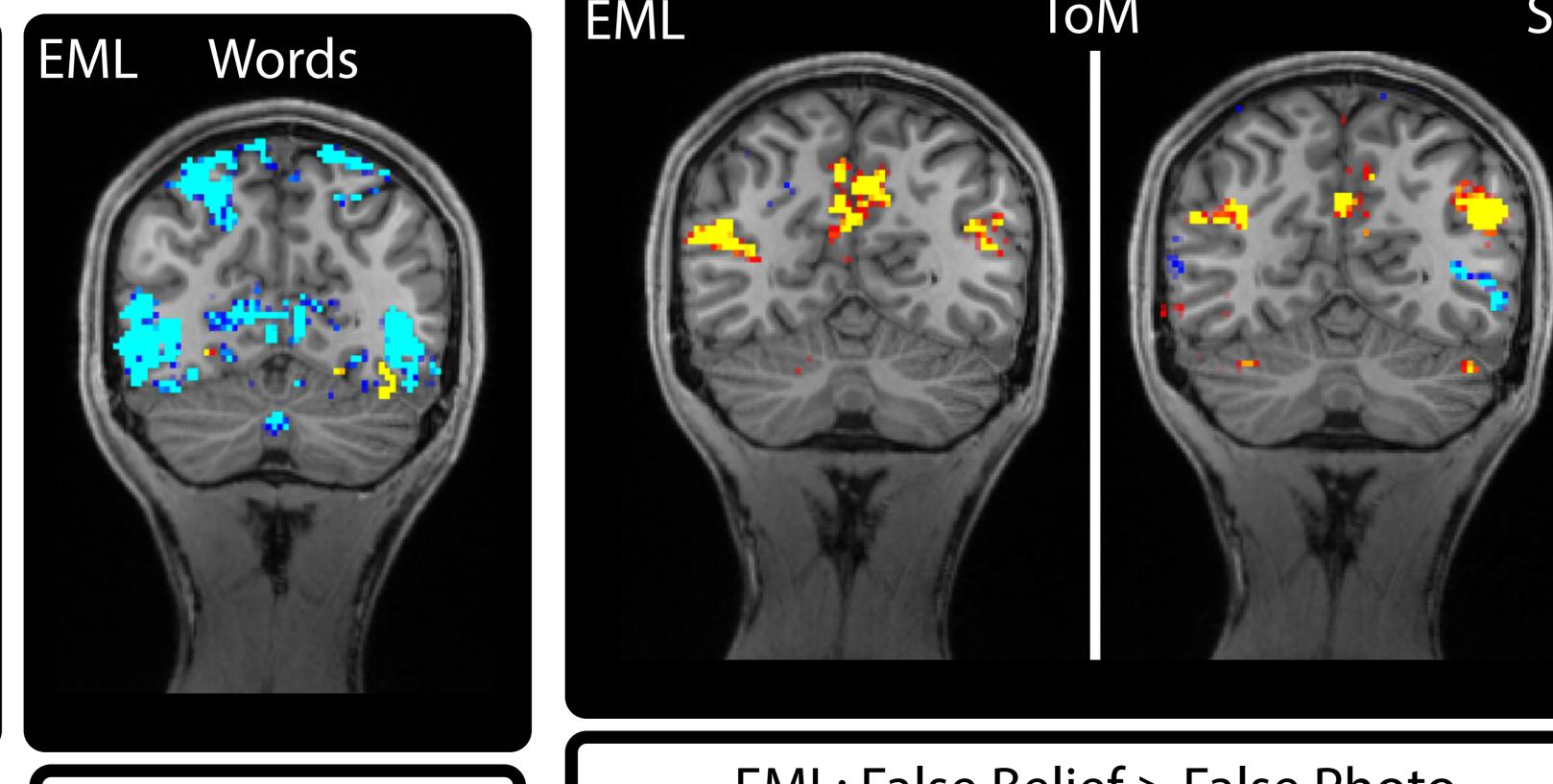




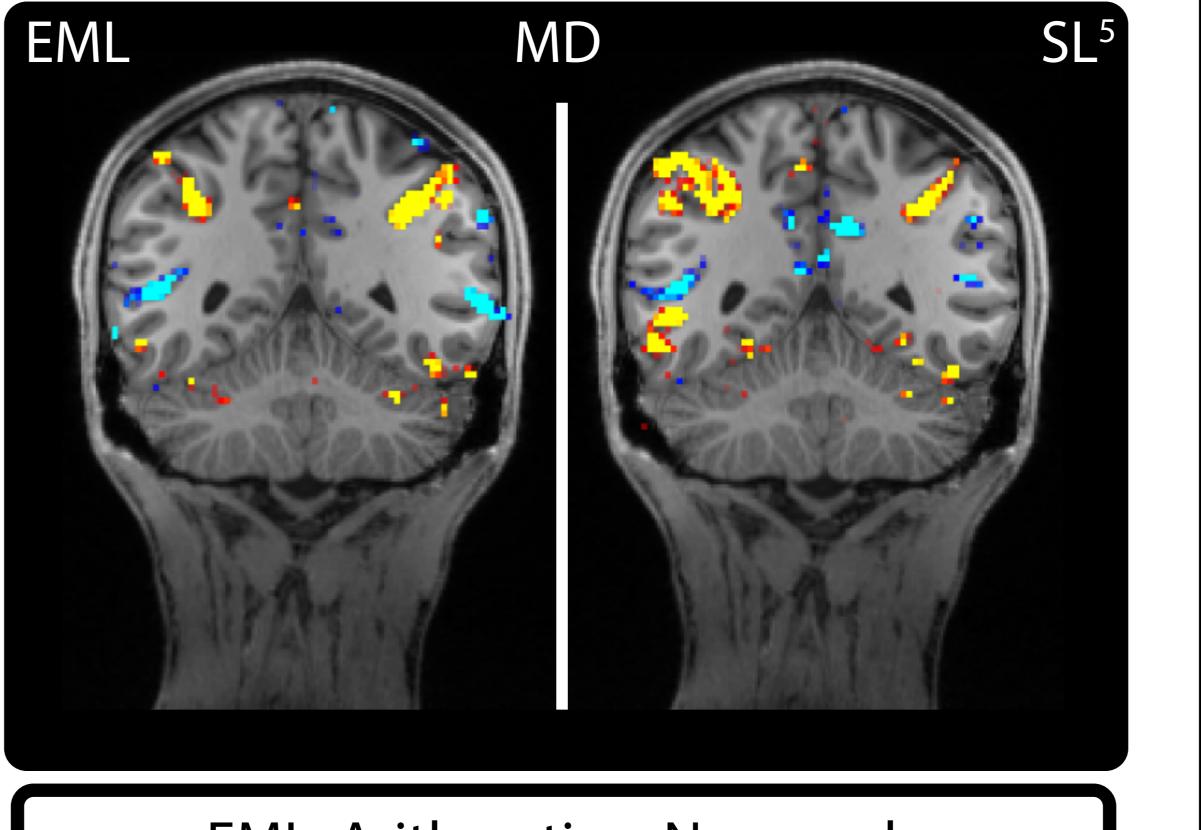
Scenes > Objects



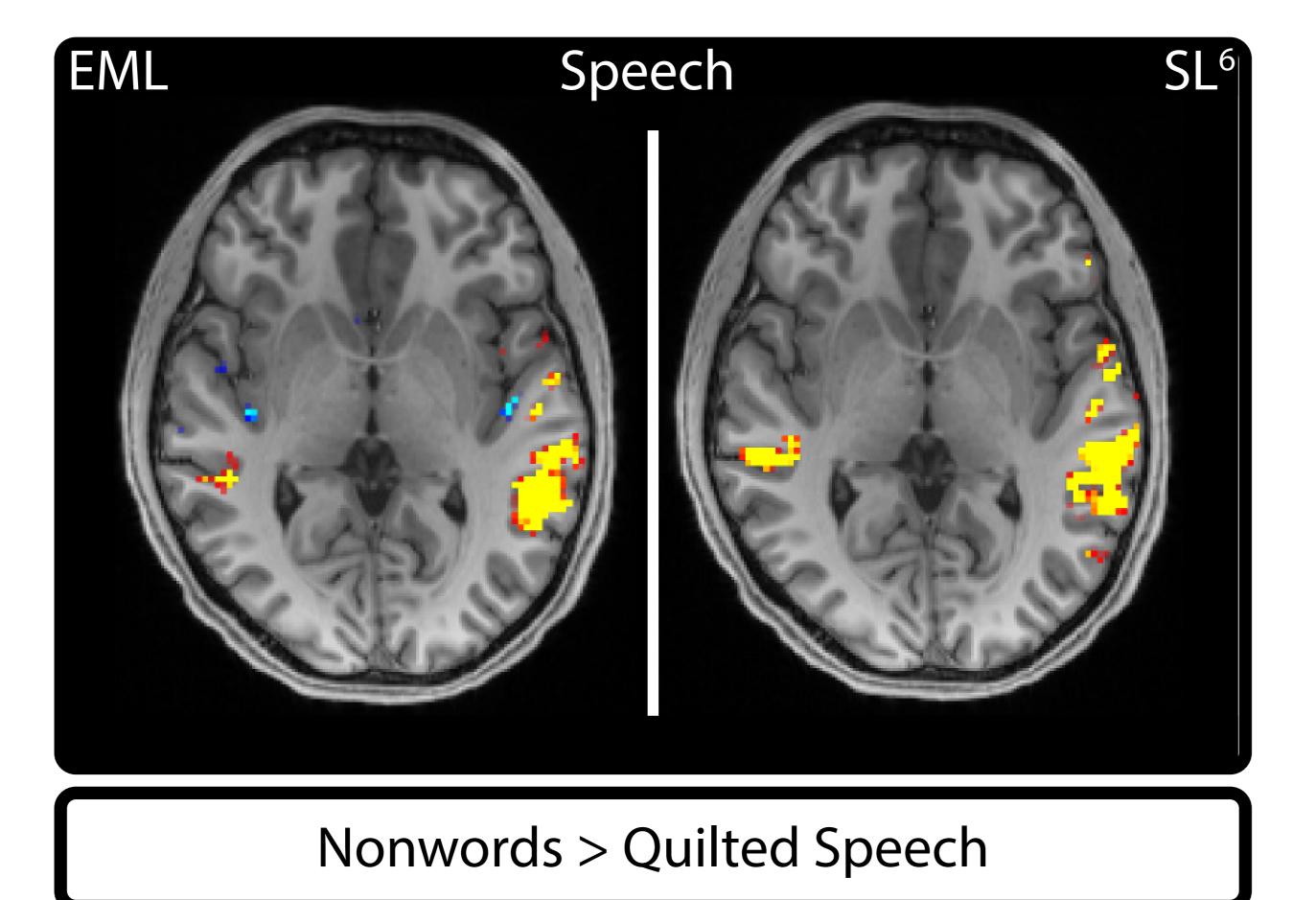
Objects > Scrambled Objects



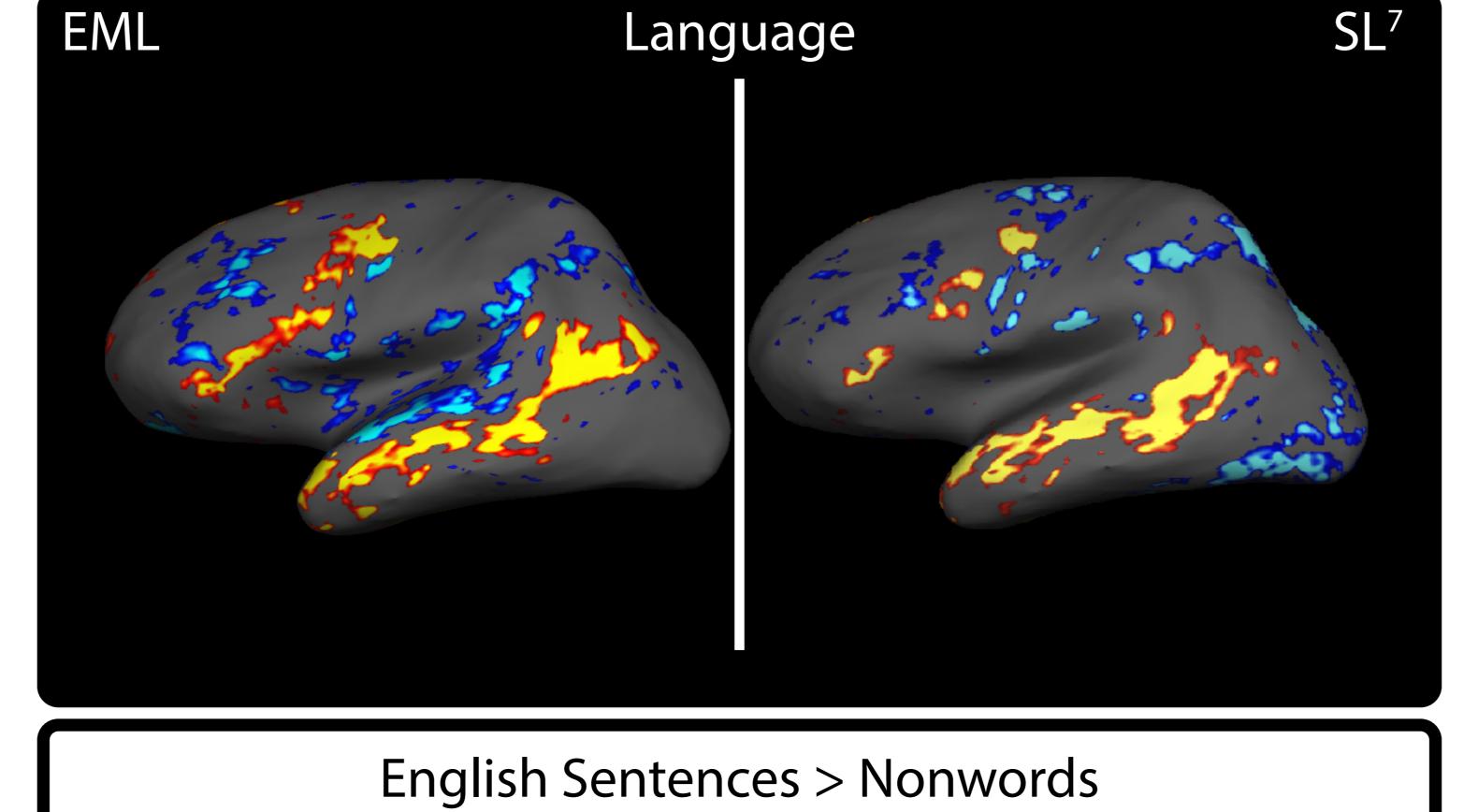


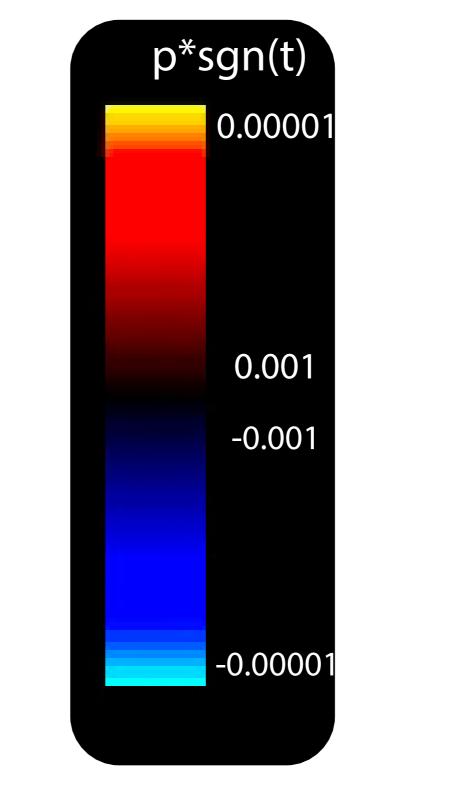


EML: Arithmetic > Nonwords SL: Hard SPWM > Easy SPWM

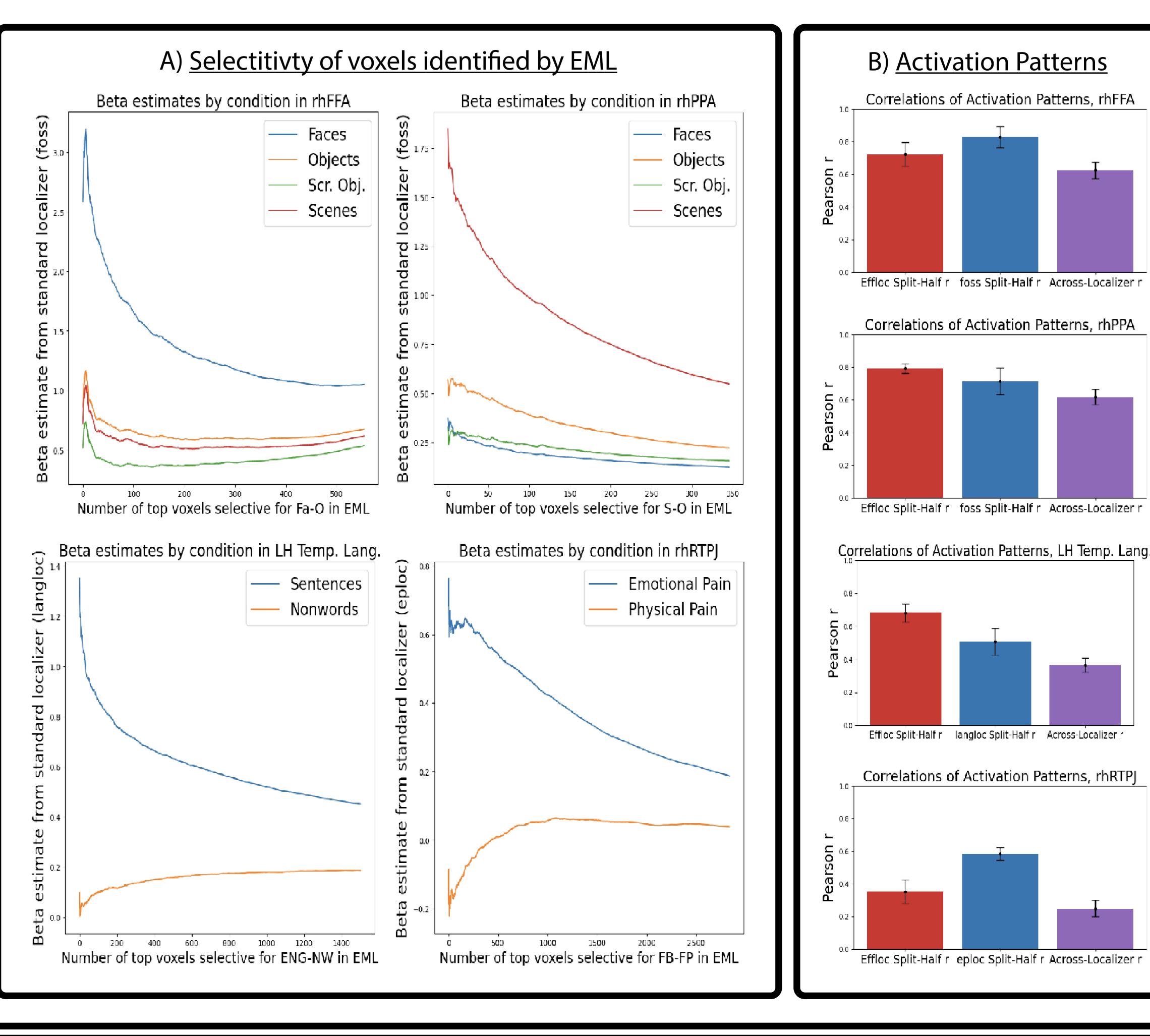


Words > Objects





Quantifying Similarity to Standard Localizers (n=10)



Discussion

- The EML identified the same fROIs as a battery of standard localizers in only 23 minutes, while running each of those standard localizers would total 85 minutes
- EML enables you to precisely relate the results of any fMRI study to each of the most widely-studied cortical regions, all in a single scanning session
- Useful for cortical mapping in populations where in-scanner time is limited, such as with patient groups or older participants
- Our method will be publicly available for widespread use, facilitating a common localization method across multiple labs

. Jacoby, Bruneau, Koster-Hale, & Saxe, (2016), Neurolmac 2. Epstein & Kanwisher. (1998). Nature. 5. Fedorenko, Duncan, & Kanwisher. (2013). PNAS 3. Grill-Spector. (2003). Current opinion in neurobiology. 6. Overath, McDermott, Zarate, & Poeppel (2015). Nature neuroscience