

Individual-subject functional localization does not benefit ERP analyses

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Background

- ▶ EEG/ERP data are central to neurobiology of language research, but, due to the richness of the signal and a large number of preprocessing/analysis steps, certain standard analytic approaches may be susceptible to false positives (Luck & Gaspelin, 2018).
- ▶ A proposed remedy: **functional localization (FuncLoc)**
- ▶ FuncLoc = method from fMRI where experimental effects are analyzed only within fROIs identified, in each individual, by an independent 'localizer' task established a priori to tap the cognitive process of interest (Saxe et al., 2006).
- ▶ FuncLoc confers benefits in sensitivity + functional resolution (Nieto-Castañon & Fedorenko, 2012) in fMRI, MEG (Liu et al., 2001), ECoG (Cogan et al., 2016), and fNIRS (Powell et al., 2017).

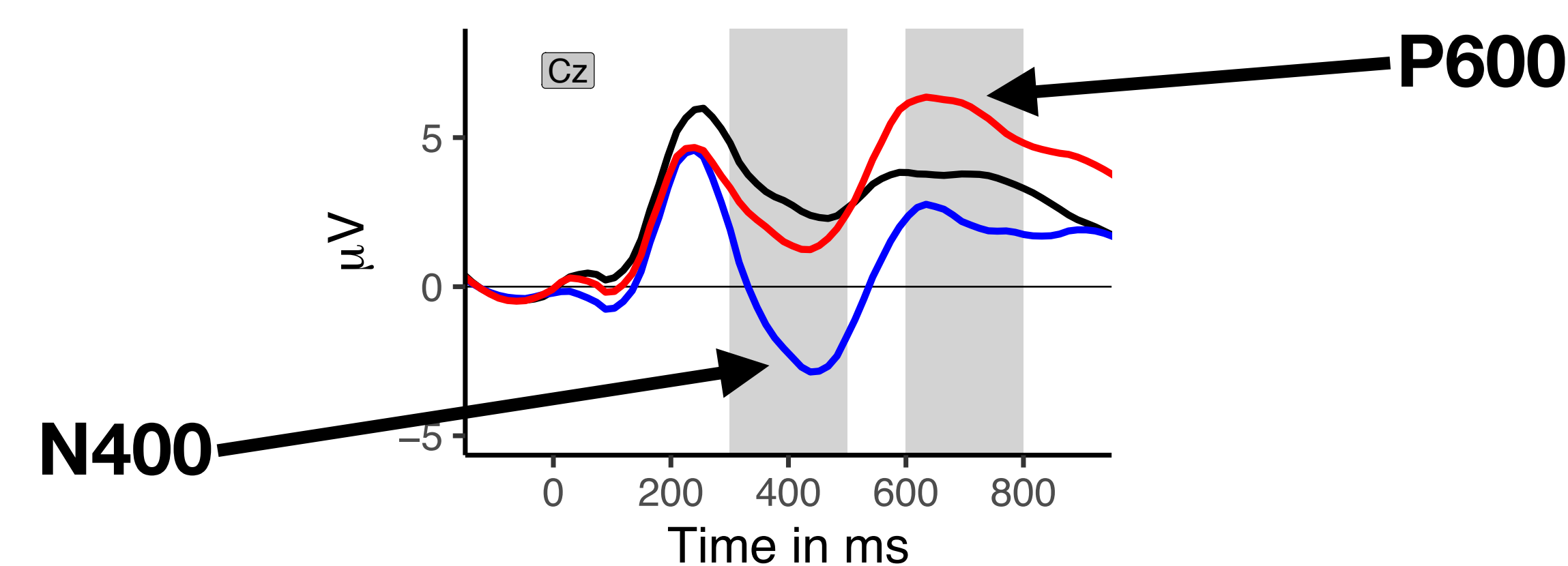
Question

Does functional localization confer benefits to the analysis of ERP data in language research (as suggested by Luck & Gaspelin, 2018)?

Dataset & Results

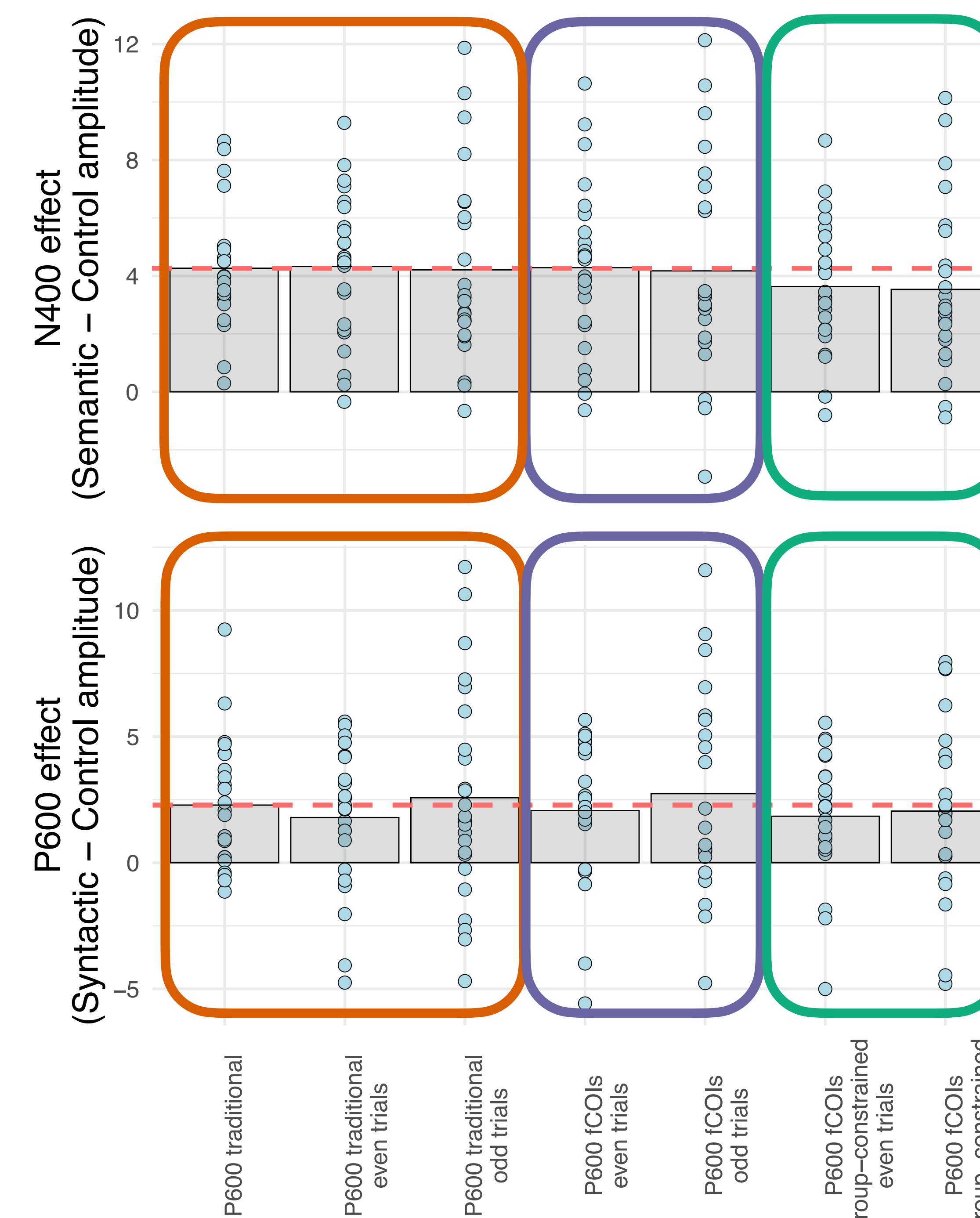
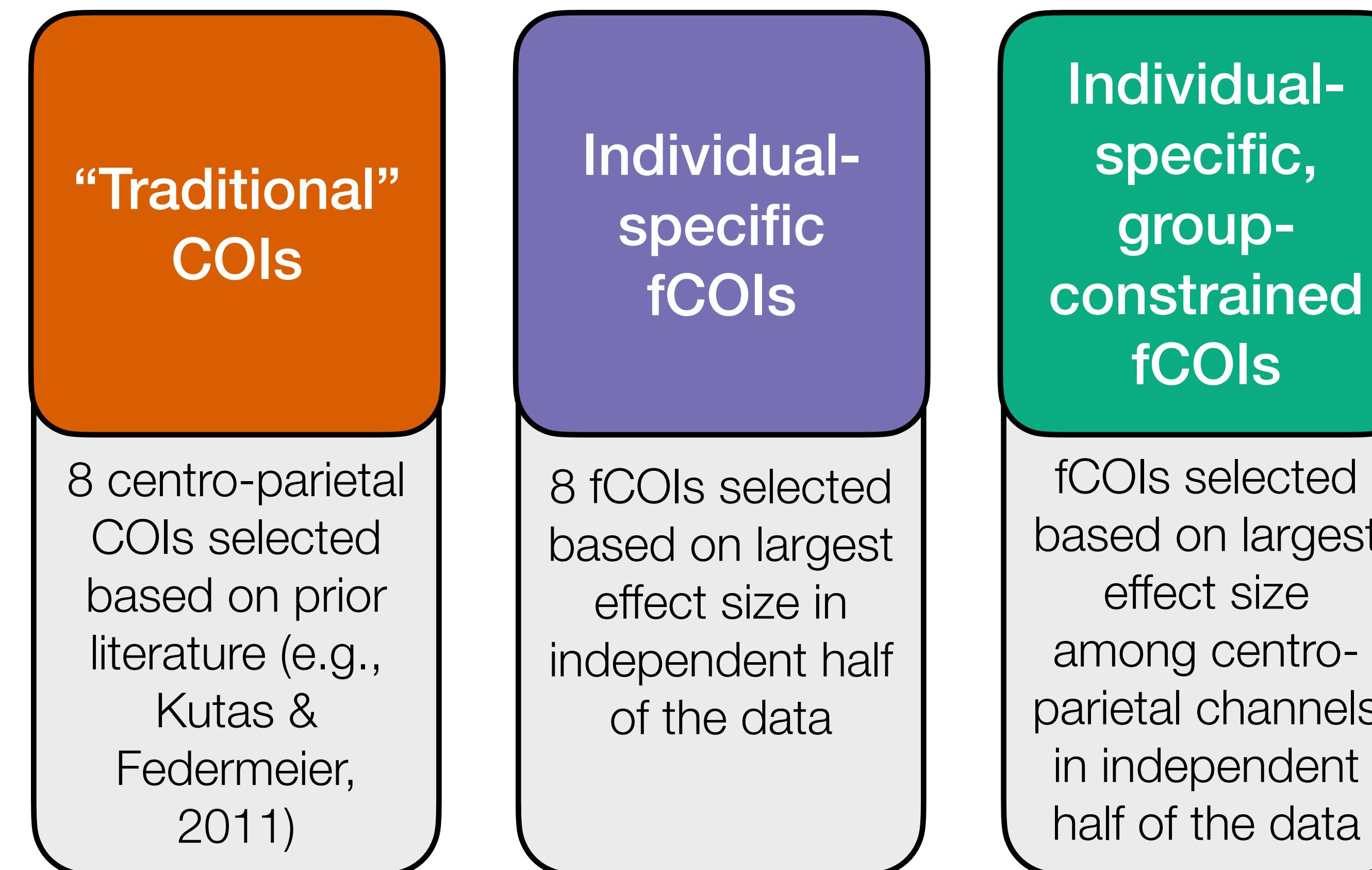
- ▶ N=24 English speakers read sentences presented word by word.
- ▶ 40 sentences per condition per participant (+ fillers & questions interspersed).

Condition	ERP effect of interest	Example sentence
Control	-	The storyteller could turn any incident into an amusing anecdote
Semantic	N400	The storyteller could turn any incident into an amusing antidote
Syntactic	P600	The storyteller could turn any incident into an amusing anecdotes



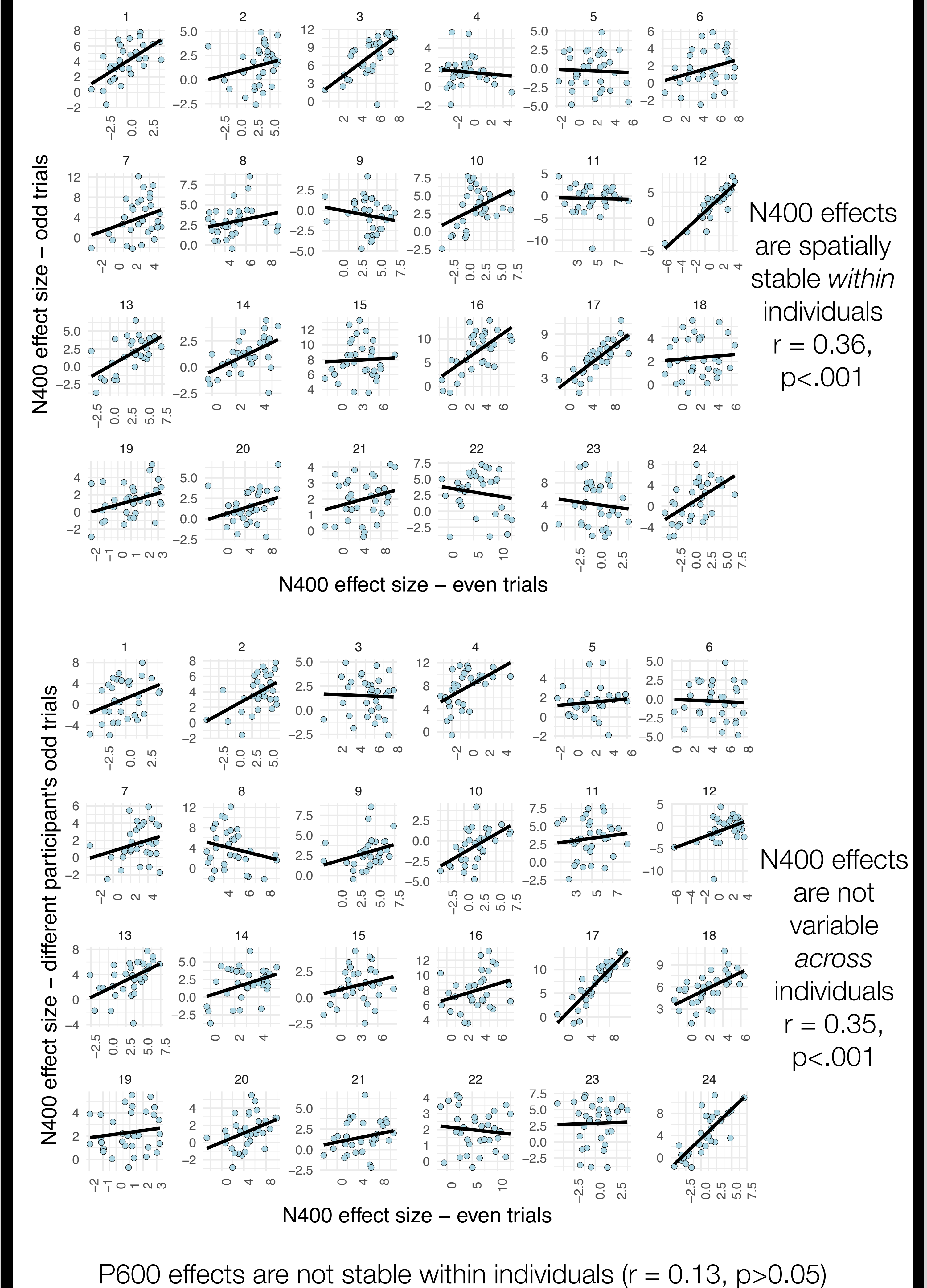
<https://www.biorxiv.org/content/10.1101/2020.02.08.930214v2>

Channel selection & effect size



Spatial stability of the signal

FuncLoc is beneficial when signals are spatially **stable within** but **variable across** individuals over time.



Conclusions

- ▶ Individual-specific fCOIs did not yield larger effect sizes compared to the traditional approach for either N400 or P600.
- ▶ N400, but not P600, was moderately spatially stable *within* individuals. Neither was spatially variable *across* individuals.
- ▶ FuncLoc does not appear to afford greater statistical power in analyses of ERP data (unlike fMRI, MEG, ECoG, fNIRS).
- ▶ Future work: test other components/datasets and explore the utility of FuncLoc in the time domain (i.e., identifying individual-specific time windows of interest).