The neural encoding of thematic roles

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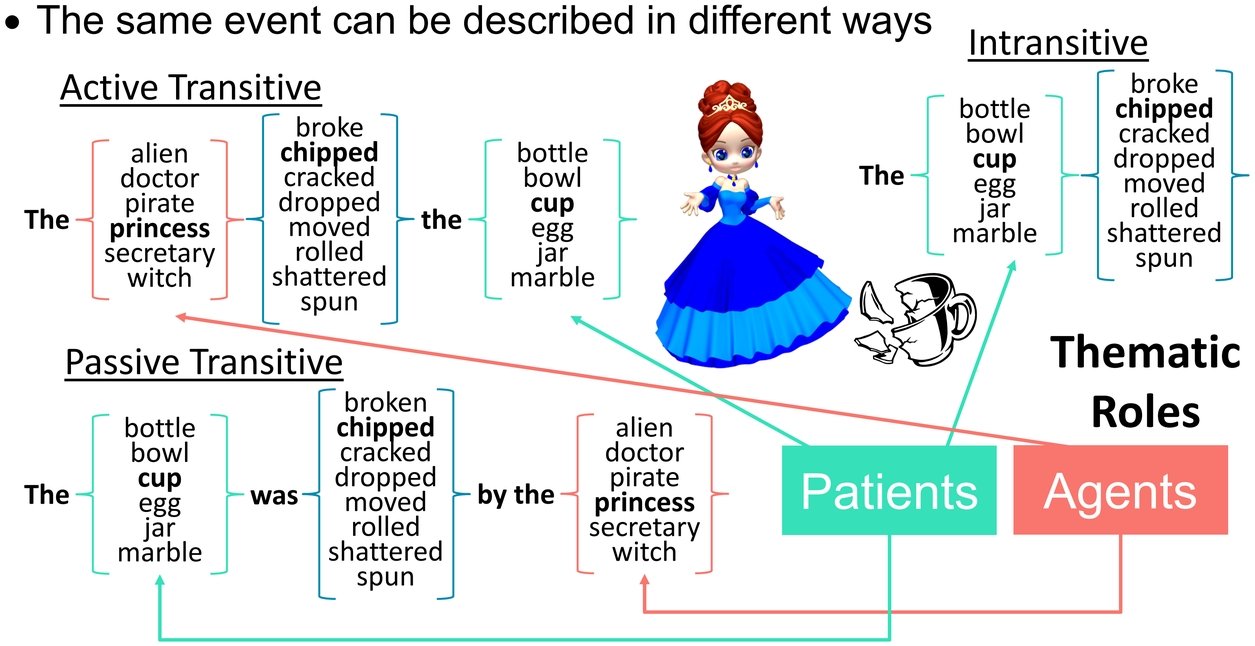
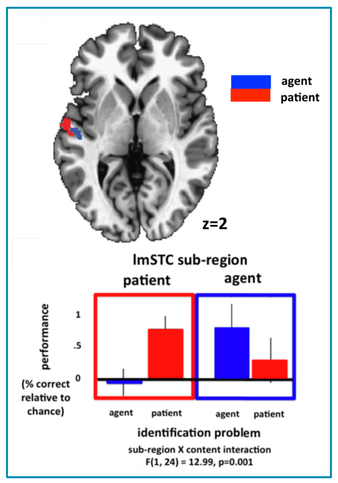
Introduction

- The same event can be described in different ways



- To capture this regularity in meaning, linguists posit thematic roles (e.g., Fillmore, 1968; Gruber, 1965; Jackendoff, 1972)
- How are thematic roles encoded in the brain?
- Classifier trained on fMRI data while participants read active and passive transitive sentences reliably (and dissociably) decoded the identity of the agent or patient, regardless of syntactic position (Frankland & Greene, 2015)
- If thematic roles, straightforward prediction: single argument of intransitive sentences should also be decodable by patient-selective voxels

Frankland & Greene

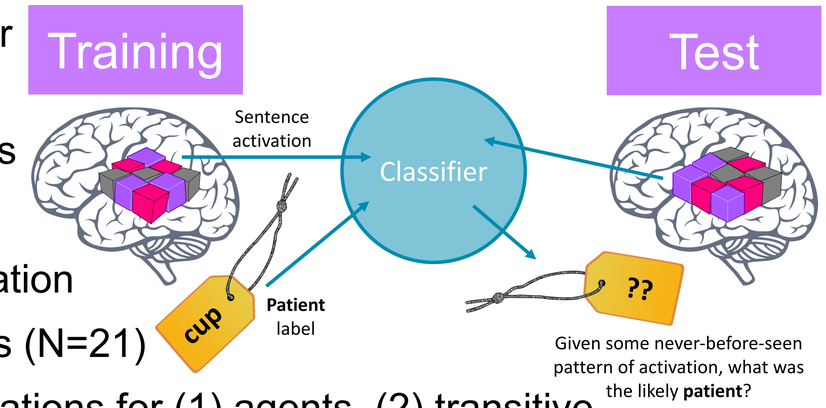


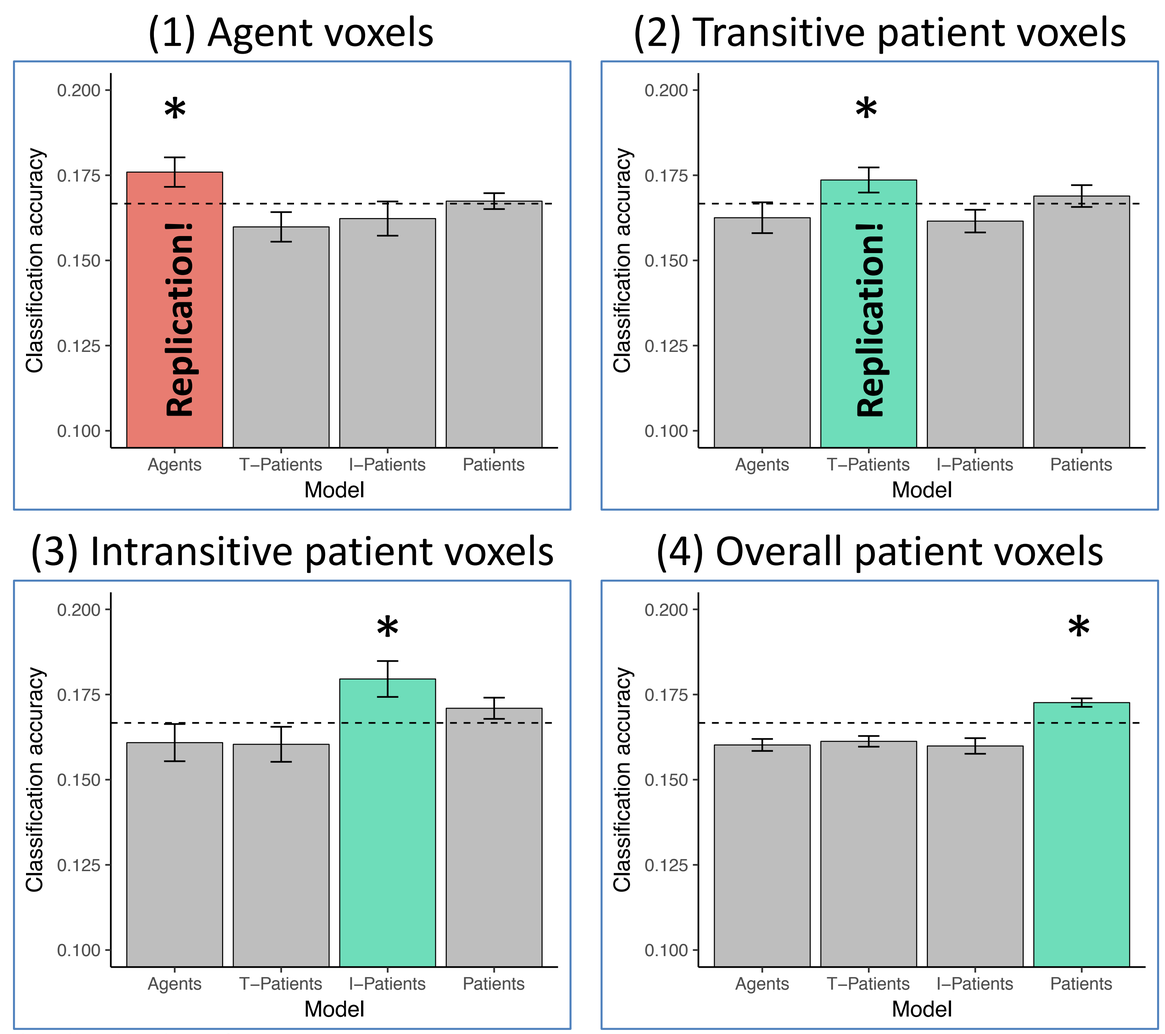
Discussion

- Replication of Frankland & Greene (2015)
- Intransitives are separate—not decodable in transitive patient region
- Importance of relational structure? (e.g., Goldberg, 1995)
- Causation/transfer-of-force? (e.g., Croft, 1991)
- Different levels of abstraction? Narrower vs. broader roles (e.g., Dowty, 1991; Van Valin & LaPolla, 1997)

Methods & Results

- MVPA searchlight classification (Kriegeskorte et al., 2006)
- ROI: Left posterior temporal lobe
- 2-mm cubic voxels
- 576 sentences
- 8-fold cross-validation
- Group-level *t*-tests (N=21)
- Separate classifications for (1) agents, (2) transitive patients, (3) intransitive patients, and (4) overall patients





* Dotted line indicates chance performance

References: [1] Croft, W. (1991). *Syntactic categories and grammatical relations.* University of Chicago Press. • [2] Dowty, D. R. (1991). Thematic proto-roles and argument selection. *Language, 67*(3), 547-619. • [3] Fillmore, C. J. (1968). The case for Case. In E. Bach & R. T. Harms (Eds.), *Universals in Linguistic Theory* (pp. 1-88). Holt, Rinehart, & Winston. • [4] Frankland, S. M., & Greene, J. D. (2015). An architecture for encoding sentence meaning in left mid-superior temporal cortex. *PNAS, 112*(37), 11732-11737. • [5] Goldberg, A. E. (1995). *Constructions: A construction grammar approach to argument structure.* University of Chicago Press. • [6] Gruber, J. (1965). Studies in lexical relations (Doctoral dissertation). MIT, Cambridge, MA. • [7] Jackendoff, R. S. (1972). *Semantic interpretation in generative grammar.* MIT Press. • [8] Kriegeskorte, N., Goebel, R., & Bandettini, P. (2006). Information-based functional brain mapping. *PNAS, 103*(10), 3863-3868. • [9] Van Valin, Jr., R. D., & LaPolla, R. J., (1997). *Syntax: Structure, meaning, and function.* Cambridge University Press.

CNS 25, March 24-27, 2018 • Boston, MA