Grammar in ‘agrammatical’ aphasia: What’s intact?
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Are “language mechanisms fundamentally preserved in aphasia” (Hula & McNeil, 2008)?

- Yes, if the appearance that they are not is caused by cognitive mechanisms preventing “access”.
- Previous evidence in favor:
  - Residual language function in aphasia relying on parts of the pre-existing brain-language network (Stefaniak et al., 2021; Griffis et al., 2017; Kiran et al., 2015).
- What about evidence from spontaneous speech?
  - Typical variables in previous quantitative analyses of spontaneous speech are unsuitable to address this issue (Prins & Bastiaanse, 2004; Bryant et al., 2016).
- Here we operationalized the notion of “intact” grammatical knowledge as the preservation of the syntactic hierarchy.

### Aim and hypotheses

- **Aim:** To operationalize what it means for grammar to be “intact” and test this in those speakers with agnostic Broca’s aphasia that produce minimal sentences.
- **General hypothesis:**
  - The characteristic pattern of dysfluent “agrammatic” speech yields a distorted image of the grammatical complexity involved.
- **Specific hypotheses:**
  - Intactness of thematic structure, i.e. the syntactic nucleus of the proposition.
  - Intactness of the syntactic skeleton:
    - Presence and neurotypical distributions of Aspect-Tense-Modality (TAM) and discourse markers, after correcting for speech quantity.
    - *Clausal embedding* after allowing for compensatory strategies (specifically, quotational embedding) (Groenewold et al., 2013; Ulatowska et al., 2011).
  - Neurotypical *adjunct placement* at all heights of the syntactic hierarchy.
  - Error and pausing patterns reflecting mainly *omissions and compensations, and planning for grammar*.

### Methods

- **Data collection**
  - AphasiaBank database (MacWhinney et al. 2011)
- **Participants**
  - 20 persons with Broca’s aphasia
  - 20 healthy controls
- **Speech samples**
  - Free speech and Picture descriptions
- **Annotation** (Unit of analysis: an utterance)
  1. ATM
  - Aspect-Tense-Modality
  2. Clause embedding
  - (i) Quotational embedding; (ii) Non-quotational embedding
  3. Interactional language
  - (i) Response markers; (ii) Conformational
  4. Adjunct
  - (i) V-attached adjunct; (ii) Vp-attached adjunct; (iii) Propositional-level adjunct
  5. Pauses
  - (i) Between g-unit pauses; (ii) Between-phrase pauses; (iii) Within-phrase pauses
  6. Error patterns
  - (i) Omissions (ii) Morphological errors (iii) Word order violations
- **Statistical analysis**
  - Stage 1: Group comparisons: Mixed effects negative binomial regression
  - Stage 2: Within-group comparisons: Friedman tests
  - Stage 3: Error analysis: descriptive statistics

### Results

- **Between-group comparisons**
  - Fig 1. Estimated rates of the 13 linguistic variables for the two groups.
  - BA > HC : Quotational embedding, Response marker, and Between g-units pauses
  - HC > BA : Tense, Non-quotational embedding, and Adjunct of all types

- **Within-group comparisons**
  - Fig 2. Mean ratios of subtype variables from different domains in both groups.

- **Error analysis**
  - Fig 3. Distribution of error subtypes.
  - Omission of free morphemes
  - Omission of bound morphemes
  - Morphological error
  - Word order

### Conclusion

- The overall pattern of results supports the *intactness of the syntactic hierarchy*.
- This question BA as a *model of the loss grammatical competence* in the brain.