

Grammar in ‘agrammatical’ aphasia: What’s intact?

Han Zhang^a, Wolfram Hinzen^{a,b}

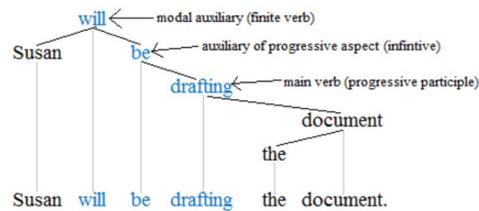
^a Department of Translation and Language Sciences, Universitat Pompeu Fabra, Barcelona, Spain

^b Catalan Institute for Advanced Studies and Research (ICREA), Barcelona, Spain

*Corresponding author: han.zhang@upf.edu

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

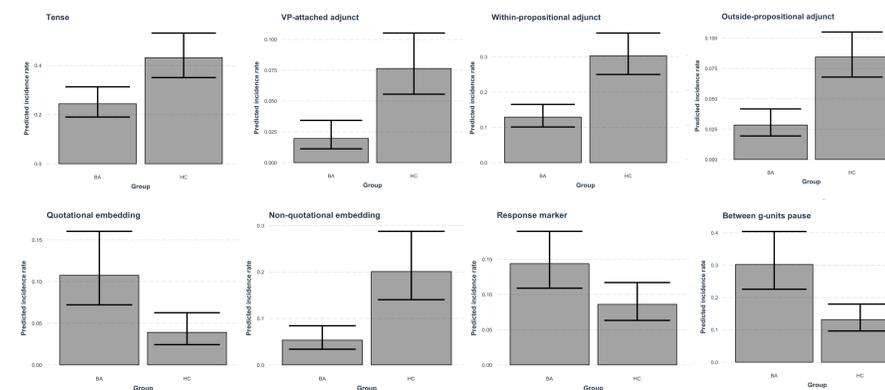
- **Aim:** To operationalize what it means for grammar to be “intact” and test this in those speakers with agrammatical Broca’s aphasia that produce minimal sentences.
- **General hypothesis:**
 - The characteristic pattern of dysfluent “agrammatic” speech yields a distorted image of the grammatical 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) Conformationals
 - 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.**

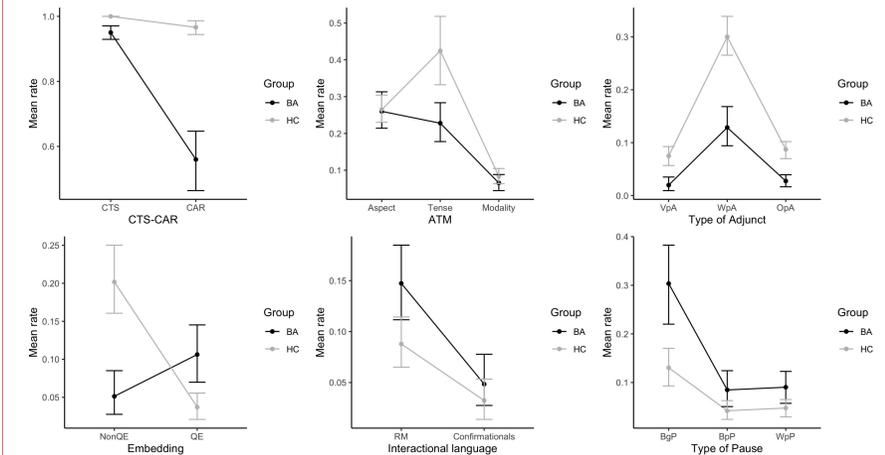


BA > * HC : Quotational embedding, Response marker, and Between g-units pauses

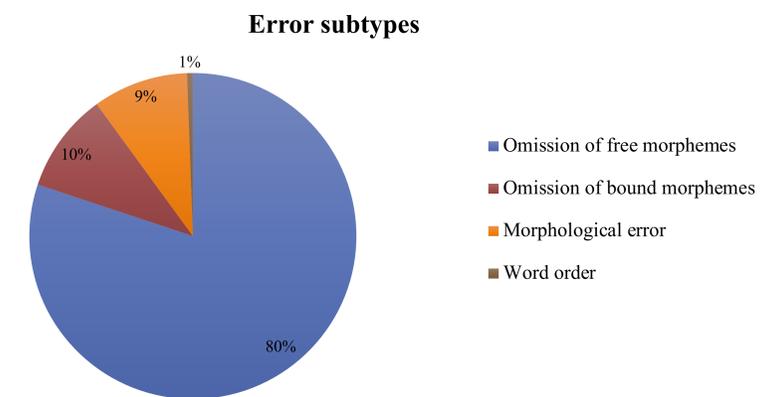
HC > * BA : Tense, Non-quotational embedding, and Adjunct of all types

Results

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



- **Error analysis**
 - Fig 3. Distribution of error subtypes.**



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.