

## ABSTRACT

### REGULAR AND IRREGULAR MORPHOLOGY AND ITS RELATION WITH AGRAMMATISM: EVIDENCE FROM SPANISH AND CATALAN

Ruth de Diego Balaguer<sup>1</sup>, Albert Costa<sup>1</sup>, Nuria Sebastián Gallés<sup>1</sup>, Montse Juncadella<sup>2</sup> and Alfonso Caramazza<sup>3</sup>

(<sup>1</sup>Universitat de Barcelona; <sup>2</sup>Hospital de Bellvitge; <sup>3</sup>Harvard University)

#### INTRODUCTION

Damage to the left inferior frontal lobe typically results in a pattern of performance characterized by agrammatic production and asyntactic comprehension, suggesting that this brain area is implicated in morphosyntactic processing (e.g., Caramazza and Zurif, 1976). Recently, Ullman et al. (1997) have challenged this position and have argued that this brain area is only implicated in rule-based processes of all types. This proposal predicts that damage to the left inferior frontal lobe would result in: a) agrammatic speech production and b) poor performance with only those morphophonological processes that are rule-based. Accordingly, damage to this brain area would lead to poorer performance when applying regular morphophonological transformations than irregular morphophonological transformations, despite the fact that both processes involve morphosyntactic operations.

We tested this hypothesis by exploring the performance of two Catalan-Spanish bilingual agrammatic patients in a morphological transformation task. Patients were asked to complete aurally presented sentences using the appropriate verb tense form. For example, given the sentence frame “Ayer yo comía, Hoy yo...” (Yesterday I ate, today I ...), the patients were required to produce the verb form “como” (I eat). Regular and Irregular verbs were presented randomly in the same testing session. The patients were tested in their two languages: Catalan and Spanish.

According to Ullman et al.’s hypothesis, the two agrammatic patients with damage to the left inferior frontal lobe should perform more poorly with regular than irregular verbs.

#### PATIENT JM

JM is a right-handed, 50-year-old male who suffered brain damage 9 years before testing. A SPECT performed at the time of testing revealed severe left frontal hypoperfusion, moderate in the parietal lobe and mild in the temporal lobe. He was diagnosed as an “anterior aphasic” by means of the Test Barcelona (Peña-Casanova, 1990). JM shows right hemiplegia and hemianopsia. He produces short sentences (3 to 5 words) with many hesitations; he

omits or substitutes function words (especially prepositions) and verbs; he also produces subject-verb agreement errors. In various tests in which grammatical knowledge was needed to perform the task, JM performed very poorly (picture-sentence matching, sentence completion, etc.).

In the morphological transformation task, JM performed much better with regular than irregular verbs in both his L1 (Spanish regular: 82%, 28/34; Spanish irregular: 44%, 13/30;  $\chi^2 = 10.38$ ,  $p < .01$ ) and his L2 languages (Catalan regular: 91%, 31/34; Catalan irregular: 71%, 28/39;  $\chi^2 = 4.58$ ;  $p < .05$ ). Since irregular verbs were more frequent than regular verbs we analyzed separately a subset of the verbs matched in frequency. The same pattern of results was obtained – Spanish regular: 82%, 28/34; Spanish irregular: 53%, 11/20;  $\chi^2 = 5.35$ ,  $p < .025$ ; Catalan regular: 95%, 29/30; Catalan irregular: 74%, 22/30;  $\chi^2 = 5.05$ ,  $p < .025$ .

#### PATIENT MP

MP is a right-handed 42-year-old woman who suffered a large temporal hematoma in the left hemisphere, 7 years before testing. A recent SPECT scan showed marked hypoactivity in the whole left hemisphere, as well as the ipsilateral thalamus. She showed a profile of Broca’s Aphasia. She suffered severe right hemiplegia and reduced visual field. MP’s spontaneous speech is characterized by very short utterances (2 to 4 words), frequent use of idioms and unfinished sentences leading sometimes to isolated words, or sentences with an incorrect order of constituents; agreement violations (for auxiliary-verb and subject-verb agreement, especially for person and tense), verbs and function words omissions.

MP performed the morphological transformation task significantly better with regular than with irregular verbs both in L1 (Catalan regular 80%, 28/35; Catalan irregular 42%, 7/18;  $\chi^2 = 7.76$ ,  $p < .01$ ) and in her L2 (Spanish regular 90%, 25/28; Spanish irregular 52%, 13/25;  $\chi^2 = 9.32$ ,  $p < .01$ ).

#### CONCLUSIONS

Two agrammatic patients showed poorer performance in the morphological transformation

task with irregular than regular verbs. This differential difficulty was present in their two languages. These results suggest that the assumption that agrammatism is associated with poorer performance for regular than irregular morphosyntactic operations needs to be revised. The results are consistent with the hypothesis that left inferior frontal structures subserve morphosyntactic operations, irrespective of whether they are regular or irregular.

## REFERENCES

- CARAMAZZA A and ZURIF EB. Dissociation of Algorithmic and Heuristic Processes in Language Comprehension: Evidence from Aphasia. *Brain and Language*, 3: 572-582, 1976.
- PEÑA-CASANOVA J. *Test Barcelona. Programa integrado de exploración neuropsicológica*. Barcelona: Masson, 1991.
- ULLMAN MT, CORKIN S, COPPOLA M, HICKOK M, GROWDON JH , KOROSHETZ WJ and PINKER S. A neural dissociation within language: Lexicon a part of declarative memory, grammar processed by procedural system. *Journal of Cognitive Neuroscience*, 9: 266-276, 1997

Albert Costa, Pg. Vall d'Hebron, 171, 08035 Barcelona. E-mail: acosta@psi.ub.es