Grammatical Class, Inflectional Entropy and Imageability Effects in Picture Naming: A Multiple Single-case Study on Italian Aphasic Patients

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The nature of grammatical class effects that characterize the aphasic patients’ production is a long-debated issue in neurolinguistics, particularly in relation to the study of verb-noun dissociations. Semantic accounts have been proposed (e.g., Bird et al., 2003), as verbs happen to be characterized by lower imageability in comparison to nouns. However, the complexity of the inflectional paradigm is an additional confounding variable, which has been mostly overlooked in literature. In fact, in highly inflected languages like French or Italian verbs have much more complex paradigms than nouns, with a larger number of possible word forms. The actual predictability of the inflectional paradigm can be measured in terms of inflectional entropy - a variable incorporating family size and form frequencies -, which has been shown to predict the aphasic patients’ performance (Van Ewijk & Avrutin, 2011).

In this study we investigated verb-noun dissociations in a picture naming task administered to a large sample of Italian aphasic patients, in order to disentangle the grammatical class effect from the influence of either imageability or inflectional entropy.

Materials and Methods

The performance of 107 aphasic patients was assessed in two picture naming tasks (Crepaldi et al., 2006). In the noun task, patients were asked to name 50 pictures representing either natural (N=25) or artificial (N=25) objects, whereas in the verb task 50 pictures representing actions were used. First, dissociated patterns of accuracy between the tasks were assessed. Then, the performance of each patient in verb production was investigated using multiple logistic regressions. Imageability and inflectional entropy were introduced as predictors, as well as word frequency, age-of-acquisition and length.

Results and Discussion

A dissociation between nouns and verbs was observed in 56 patients. Only one of them demonstrated larger impairment with nouns than with verbs. The results of the analyses on the verb-impaired (V-impaired participants) patients and the patients with no dissociation (control participants) is summarized in the Table. When significant, imageability had a facilitatory effect on the patients’ verb production, whereas the effect of inflectional entropy was negative.

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Since 38 out of 55 V-impaired patients did not show any effect of either imageability or inflectional entropy, we can conclude that grammatical class effects cannot be reduced to a by-product of either of these variables. In particular, the results discourage the hypothesis of a semantic account of verb-noun dissociation in aphasia, since the distribution of the imageability effect is similar between the V-impaired and the control participants. On the contrary, the verb-production is influenced by inflectional entropy in 6 out of 55 V-impaired patients, whereas the effect is almost never observed in the control participants, suggesting that the access to paradigmatic information depends on the representation of grammatical properties, and not on purely distributional information.

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Effects of covariates in verb production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No effect</td>
</tr>
<tr>
<td>Verb-impaired patients</td>
<td>55</td>
<td>38</td>
</tr>
<tr>
<td>Patients with no noun-verb dissociation</td>
<td>51</td>
<td>37</td>
</tr>
</tbody>
</table>

Table: distribution of patients showing significant imageability (IMG) and/or inflectional entropy (IE) effects in verb production, within the two groups considered (verb-impaired patients vs. patients with no grammatical class effect).

References

