The Accuracy-Fluency Trade-off in Non-Fluent Aphasia

Halima Sahraoui and Silvia Martìnez-Ferreiro

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Halima Sahraoui[1] & Silvia Martìnez-Ferreiro[1]
[1] URI OCTOGONE-Lordat (EA 4156), University of Toulouse, France

*Halima Sahraoui, <u>halima.sahraoui@univ-tlse2.fr</u>

Introduction

Agrammatic utterances have traditionally been characterized by their reduced morpho-syntactic complexity: they tend to be short and simple, with frequent closed-class word omissions. Besides, fluency disturbances (to the inclusion of pauses, false starts, self-corrections, abusive use of fillers and pragmatic operators and repetitions) are frequent, thus making speech production visibly effortful. Results from previous corpora analyses confirm that variability in agrammatic performance is a key feature for understanding not only impaired but also strategic language use (Kolk & Heeschen, 1990; Kolk, 2006). Across-task variability may be determined by the use of differential adaptation strategies related to the amount of focus on form, which may enable a better grammatical accuracy under certain conditions (Sahraoui & Nespoulous, 2012). However, corrective strategies are only possible for patients with a preserved ability to detect errors and monitor their speech production (Postma, 2000; Oomen, Postma & Kolk, 2001).

We hypothesize that agrammatic patients, generally having minor comprehension deficits, may over-use monitoring skills in language production at a pre- or post-articulatory stage and that monitoring can vary in function of the type of task (Sahraoui, 2014). In order to understand how speech (non)fluency interacts with morpho-syntactic well-formedness in connected discourse and isolated sentences, we look at temporal aspects and fluency disturbances.

Methods

To study fluency and accuracy patterns in non-fluent aphasia, we performed an exhaustive data analysis of the speech output of 5 French-speaking agrammatic and 9 control individuals across 4 tasks (spontaneous speech, narratives, picture description and sentence production). Silent, filled pauses and fluency disturbances were semi-automatically coded and computed (Boersma & Weenink, 2015 ; MacWhinney, 2000). Analyses included speech and articulatory rate, pause duration and distribution, overt errors (e.g. incomplete words), dysfluencies (e.g. false starts) and repair strategies (self-corrections, revisions).

Results

Sentence production and connected discourse were found to diverge at different levels. First, the sentence production task yielded higher morpho-syntactic accuracy and complexity outcomes, whereas connected discourse tasks included more frequent omissions of grammatical morphemes. Second, differences were found as for the pattern of pauses and fluency disturbances with a dramatic fluency drop and more revisions in sentence production. Whereas narrative and picture description tasks showed a similar pattern, spontaneous speech included less frequent and shorter pauses as well as less self-corrections.

Conclusions

Accuracy and fluency are constrained by the type of deficit, but also by flexibility and adaptation procedures when encoding discourse or isolated sentences. Adaptive behaviour is an essential feature of agrammatic speech. This is confirmed by the omissions or "preventive adaptations" (pre-articulatory), commonly observed in spontaneous speech, and by the "corrective adaptations" (post-articulatory) observed in sentence production, where more complex and accurate structures lead to fluency issues such as longer pauses and self-interruptions. Higher processing demands to encode the target forms required by the sentence production task may ultimately be held responsible for the asymmetry. The intervention of pre- or post-articulatory speech monitoring and executive functions can then account for the trade-off between fluency and grammatical accuracy across tasks.

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