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# Quantitative and qualitative verbal fluency assessment in primary progressive aphasia

### **Overview and aim**

Verbal fluency, which is decreased in primary progressive aphasia (PPA)<sup>[1]</sup>, involves several cognitive processes, such as language and executive functions. In this study, we aimed to investigate this impairment, with a quantitative (number of words generated), usually carried out, but also with a qualitative (clustering, switching, word-frequency and perseveration/repetition errors) verbal fluency analysis, for the three variants of PPA (non-fluent/agrammatic (nfvPPA), semantic (svPPA), and logopenic (lvPPA)). We also added a design fluency task. With this comprehensive assessment, we aimed to highlight the nature of the fluency impairment and contribute to differential diagnosis.

## **Methods**

We recruited 29 participants who met the current criteria for PPA (9 nfvPPA, 10 svPPA, 10 lvPPA) and 29 healthy controls, matched for age, gender and education. Participants underwent a verbal (grammatical, semantic and phonemic (GREMOTs)) and design (RFFT) fluency assessment.

## Results

Switches

Letter V

Fruits

Verbs

\* p<.05





Clusters

Switches

Letter V

Fruits

	Comparison bet
	4,5 4 3,5 3
- nfvPPA produce fewer <u>clusters</u> and <u>switches</u> than lvPPA (respectively $U = 68.5$ , p < .05 ; $U = 1$ , p < .05) (no significant difference is found between nfvPPA	<b>k</b> 2,89 2 1,5 1 <b>k</b> 2,89 2 1,86 1,83 1



- IvPPA <u>cluster sizes</u> are more reduced than nfvPPA ones (U =
- svPPA produce fewer <u>perseveration errors</u> than IvPPA (U = 11,

nfvPPA and lvPPA produce more perseveration than repetition errors

The three variants generate more verbs in grammatical fluency than nouns

(respectively Z = 2.000, p < .05 ; Z = 5.000, p < .05).

in semantic and letter-word fluency tasks.

### **Discussion and conclusions**

These findings fit well with Gorno-Tempini et al. (2011)<sup>[1]</sup>, who describe a verbal fluency deficit in PPA, and with Troyer's<sup>[2]</sup> model of verbal fluency (1997), in which clustering is associated with the semantic system and supported by temporal lobe, whereas switching is associated with executive functioning and related to frontal lobe, which is relatively spared in svPPA but impaired in nfvPPA. For this variant, the design fluency deficit confirms an executive impairment. The better production of verbs for grammatical fluency could provide additional information concerning the relative preservation of verb lexical treatment in PPA, unlike some other neurodegenerative diseases. Qualitative analysis of verbal fluency provides additional information and should contribute to classification of PPA. Additional clinical features could underpin Marshall clinical roadmap (2018)<sup>[3]</sup> for PPA diagnosis.

Proposal of additional features on Marshall clinical roadmar Is speech effortful



Switches

Letter V

Fruits

Verbs

\* p<.05

- $\Rightarrow$  Proposal for additional clinical features that could contribute to PPA diagnosis : - a larger cluster size leads to the diagnostic of nonfluent variant,
- a large number of perseveration errors contributes to distinguish the logopenic variant from the semantic one,
- an affected design fluency task leads to the diagnostic of nonfluent variant.

#### References

<sup>[1]</sup> Gorno-Tempini, M.L., Hillis, A.E., Weintraub, S., Kertesz, A., Mendez, M., Cappa, S.F., ... Grossman, M. (2011). Classification of primary progressive aphasia and its variants. *Neurology*, 76(11), 1006-1014.

<sup>[2]</sup> Troyer, A. K., Moscovitch, M., & Winocur, G. (1997). Clustering and switching as two components of verbal fluency: Evidence from younger and older healthy adults. *Neuropsychology*, *11*(1), 138–146.

<sup>[3]</sup> Marshal Marshall, C. R., Hardy, C. J. D., Volkmer, A., Russell, L. L., Bond, R. L., Fletcher, P.D., ... Warren, J. D. (2018). Primary progressive aphasia: a clinical approach. Journal of Neurology, 265(6), 1474–1490.