Phonemic and semantic fluency are neuropsychological tests widely used to assess patients' language and executive abilities and are highly sensitive tests in detecting language disorders in glioma patients. However, the networks that are involved in these tasks could be distinct and suggest either a frontal (phonemic) or temporal (semantic) involvement. 42 right-handed patients (26 male, mean age = 52.5 years, SD=±13.3) were included in this retrospective study. Patients underwent awake (54.8%) or asleep (45.2%) surgery for low-grade (16.7%) or high-grade glioma (83.3%) in the frontal (64.3%) or temporal lobe (35.7%) of the left (50%) or right (50%) hemisphere. Pre-operative tractography was reconstructed for each patient, with the segmentation of the inferior fronto-occipital fasciculus (IFOF), arcuate fasciculus (AF), uncinate fasciculus (UF), inferior longitudinal fasciculus (ILF), the third branch of the superior longitudinal fasciculus (SLF-III), frontal aslant tract (FAT), and corticospinal tract (CST). Post-operative percentage of damage and disconnection of each tract, based on the patient's surgical cavities, were correlated with verbal fluencies scores at one week and one month after surgery. Analyses of differences between fluency scores at these timepoints (before surgery, one week and one month after surgery) were performed; lesion-symptom mapping was used to identify the correlation between cortical areas and postoperative scores. Immediately after surgery, transient impairment of verbal fluency was observed, which improved within a month. Left hemisphere lesions were related to a worse verbal fluency performance, being damage to the left superior frontal or temporal gyri associated with phonemic or semantic fluency deficit, respectively. At a subcortical level, disconnection analyses revealed that fluency scores were associated with the involvement of the left FAT and the left frontal part of the IFOF for phonemic fluency, and the association was still present one month after surgery. For semantic fluency, the correlation between post-surgery performance emerged for the left AF, UF, ILF, and the temporal part of the IFOF, but disappeared at the follow-up. This approach based on the patient's pre-operative tractography, allowed us to trace for the first time a dissociation between white matter pathways integrity and verbal fluency after surgery for glioma resection. The results confirm the involvement of a frontal anterior pathway for phonemic fluency and a ventral temporal pathway for semantic fluency. Finally, these longitudinal results suggest that the frontal executive pathway requires a longer interval to recover compared to the semantic one [1)].

1)
Zigiotto L, Vavassori L, Annicchiarico L, Corsini F, Avesani P, Rozzanigo U, Sarubbo S, Papagno C. Segregated circuits for phonemic and semantic fluency: A novel patient-tailored disconnection study. Neuroimage Clin. 2022 Aug 9;36:103149. doi: 10.1016/j.nicl.2022.103149. Epub ahead of print. PMID: 35970113.