Understanding the neural mechanisms that support the spontaneous recovery of cognitive abilities can place important constraints on mechanistic theories of brain organization and function, and holds potential to inform clinical interventions. Connectivity-based MRI measures have emerged as a way to study how recovery from a brain injury is modulated by changes in intra- and inter-hemispheric connectivity. Here we report a detailed and multi-modal case study of a 26 year-old male who presented with a left inferior parietal glioma infiltrating the left arcuate fasciculus. The patient underwent pre- and post-operative functional MRI and Diffusion Tensor Imaging, as well as behavioral assessments of language, motor, vision and praxis. The surgery for removal of the tumor was carried out with the patient awake, and direct electrical stimulation mapping was used to evaluate cortical language centers. The patient developed a specific difficulty with repeating sentences toward the end of the surgery, after resection of the tumor and partial transection of the arcuate fasciculus. The patient recovered from the sentence repetition impairments over several months after the operation. Coincident with the patient's cognitive recovery, we document a pattern whereby intra-hemispheric functional connectivity was reduced in the left hemisphere, while inter-hemispheric connectivity increased between classic left hemisphere language regions and their right hemisphere homologs. These findings suggest that increased synchrony between the two hemispheres, in the setting of focal transection of the left arcuate fasciculus, can facilitate functional recovery [1)].

1)
Chernoff BL, Teghipco A, Garcea FE, Belkhir R, Sims MH, Paul DA, Tivarus ME, Smith SO, Hintz E, Pilcher WH, Mahon BZ. Reorganized language network connectivity after left arcuate fasciculus resection: A case study. Cortex. 2019 Nov 5;123:173-184. doi: 10.1016/j.cortex.2019.07.022. [Epub ahead of print] PubMed PMID: 31812105.