Neuroplasticity of Cognitive Processes:
Behavioral and Neuroanatomic Change during Recovery from Brain Damage

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In the T. L. L. Temple Neuroplasticity Lab, we are investigating how the brain reorganizes following damage to support recovery of cognitive functions. A major focus is on the recovery of language and memory abilities after stroke, examining individuals at both the acute stage (within 72 hrs of stroke) and the chronic stage (more than 1 year post-stroke), relating behavioral changes to both structural and functional neuroanatomic changes, using advanced MRI methods. Methods for tracking structural changes include perfusion-weighted imaging to uncover hypoperfused regions that may contribute to behavioral impairment and diffusion-tensor imaging to examine fiber tract integrity. Methods for tracking functional changes include decoding the content of brain representations using multivariate pattern analysis (MVPA) and representational similarity analysis (RSA), as well as a more recent line of work based in “network neuroscience” that takes measures of modularity and flexibility of the whole brain network and relates them to behavioral performance and to predict of recovery. Finally, we are investigating the use of electrophysiological stimulation to enhance recovery. There is high potential for collaborative work across departments at Rice and the medical center to put Rice in the forefront of research on neuroplasticity.