

# Drawing on the right brain for aphasia recovery

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Champions of the right brain as a wheelhouse for cognition in stroke recovery, take heart. Evidence inconsistent with Marcel Kinsbourne's theory of transcallosal interhemispheric inhibition<sup>1</sup> has long been available. However, some researchers maintain that the main influence of right brain regions in patients with aphasia due to stroke is to further disrupt or reduce the functional activation of already damaged left brain language networks. The study presented by Pani et al.<sup>2</sup> in this issue of *Neurology*® will help restore depth to this important issue.

Kinsbourne's theory was originally invoked to explain pathologic spatial bias (spatial neglect) after right brain injury. By this account, corpus callosotomy should reduce transcallosal interhemispheric inhibition and pathologic poststroke syndromes should improve. However, in animal models of poststroke paralysis<sup>3</sup> and spatial neglect<sup>4</sup> as well as in a man who underwent callosotomy for control of epilepsy,<sup>5</sup> callosal interruption did not improve behavioral performance. Based on this evidence, we might conclude that transcallosal interaction between the intact right brain and the damaged left brain is neutral to recovery.

Pani et al. present data that take us beyond this conclusion. They examined brain MRI in 28 men and 5 women recovering from aphasia. In their study, they demonstrate higher fractional anisotropy, essentially reflecting the uniformity of water diffusion within white matter and derived from diffusion tensor imaging data, in the right middle temporal gyrus, pars opercularis, and precentral gyrus in patients who recovered language abilities more fully after stroke. Thus, a measure of connectivity in the right frontal brain, suggesting more intact and functional wiring, predicted or accompanied better aphasia recovery. Of note, these brain regions are homotopic, in other words analogous in location, to regions in left hemisphere language network that are critical for language processing. By contrast, white matter indices in a control nonhomotopic region in the right brain (superior parietal lobule) did not predict language recovery. This suggests that a well-wired right brain actively supports aphasia rehabilitation.

The authors' findings support those of others<sup>6</sup> who reported a complete loss of aphasia recovery in a woman who had previously experienced a left brain stroke after a second ischemic stroke affecting multiple white matter regions in the right brain. This implies that right brain subcortical networks may reorganize so as to improve naming and word retrieval, thus playing a facilitatory, rather than inhibitory, role in aphasia recovery. However, Pani et al. also describe another interpretation of those results. Increased fractional anisotropy in the right frontal white matter might have been present before the stroke, and might reflect atypical asymmetries of development of the language system. Previous researchers reported that the volume, and potentially the white matter development, in the right frontal region may be larger relative to the left brain in children and adults with developmental language disorders and dysfluent speech.<sup>7,8</sup> Although problematic in healthy language development, these atypical systems may be more resilient to brain injury than typically left-developed language systems.

The current study results are important to those of us who care for people with aphasia after stroke in 3 ways. First, examining the right brain may eventually assist us in counseling patients and their families about the possibility of speech and language recovery. However, many of us are also familiar with changes in function that can occur after years of living successfully with aphasia. Inspecting the right frontal subcortical regions may help us to determine whether a second ischemic event, or another treatable disorder, is responsible for the change. Because brain asymmetry, development, reorganization, and aging differs between the sexes, future studies looking at representative groups of women and men recovering from aphasia will influence the way we use these results. Finally, the notion that the integrity of right hemisphere structures may positively influence aphasia recovery may offer new treatment targets for novel interventions, such as brain stimulation, which can focally modulate and facilitate activity in the brain.

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Intriguingly, Crosson et al.<sup>9</sup> suggested that the aging brain may reorganize spontaneously, resulting in increasing activity in the right pars triangularis during verbal fluency tasks. Differences in white matter integrity in these right brain regions between people with good and poor aphasia recovery might thus reflect differences in the brain age between these 2 groups rather than stroke-related reorganization. We look forward to more studies specifically examining these ideas in the future.

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