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Letter to the Editor
Re: Lateralization of Cognitive Functions in Aphasia after Right Brain Damage

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Dear Editor: I read with great interest the review by Ha, et al.[1] describing three patients; two with "crossed aphasia in right handers" and one with "aphasia after right hemisphere damage in a left hander". I am writing to clarify some of the laterality-indexed ambiguities raised by the article concerning the three cases described therein.

To accomplish this, one needs to be aware of new insights into the verifiable difference between neural and behavioral handedness. Thus, neural handedness bespeaks of the directionality of callosal traffic underpinning the laterality of motor control (including speech) in an individual (either from left to right hemisphere or from right to left hemisphere). On the other hand, behavioral handedness averred by the subject signifies a declaration which may or may not correspond to the above-mentioned directionality of signal transfer between the two hemispheres. This is because under normal conditions our behavioral handedness is frequently dictated by the society's convictions and norms (e.g. forced conversions or imitating a loved one in the family) whereas neural handedness (laterality of motor control) is a hard-wired and immutable phenomenon reflecting the directionality of callosal traffic). The rate of incongruence between the two kinds of handedness mentioned is -15-20% (majority of them occurring among left handers). The above scheme provides for a physiological distinction between the two hemispheres (major and minor); with former containing the command center and the latter functioning as a slave microprocessor for carrying out the biddings of the major hemisphere for events occurring on the nondominant side of the body. The fact that drawing two lines simultaneously by both hands always results in drawing two unequal lines (both in length and straightness) is a testimony to the validity of above described physiology with the hand directly connected to the command center drawing the longer and straighter line as the other hand is delayed by an amount equal to an interhemispheric transfer time.

From the data provided in the article,[1] it appears that the major clinical difference between cases 1 and 2 on one side and case 3 on the other was the absence of neglect in the latter and the fact that case 3 was a left hander (whereas the others were right handers). Regarding case 3, the question requiring an explanation is the preservation of verbal comprehension in a patient who was mute following an extensive infarction involving the right hemisphere (erroneously assumed by the authors to have been his major hemisphere because of his left handedness). Given

Fig. 1. Note complete deviation of the left eye toward the damaged left hemisphere. The right eye remains at the midline, i.e. internuclear ophthalmoplegia.[4] Publically available information indicates that Congresswoman Giffords maintained her faculty of speech from the start the start of the traumatic brain injury on January 8, 2011.

the above-described circuitry, the preserved comprehension of case 3 indicates he was an ostensible (behavioral) left hander who was left hemispheric for speech (i.e. a neural right hander). Now, mutism and anarthria seen in these three patients following infarction of their minor (right) hemispheres have been described before.[2] The latest example of the neuro-behavioural mismatch mentioned above is the case of the right-handed US Congresswoman Gabrielle Giffords.[3] As it can be seen in the figure below, depicting her gaze in the acute stage of the injury caused by a bullet traversing the length of the minor hemisphere, the left eye is fully deviated to the left (i.e. looking towards the damaged hemisphere) while the right eye fails to adducted simultaneously (internuclear ophthalmoplegia). The reason of such an arrangement has been describes elsewhere (Derakhshan, 2005).[4]

Following a supratentorial lesion affecting the minor hemisphere in an ostensible right hander, the left eye has deviated to the extreme left due to unopposed activity of the eye field on the right (major) hemisphere. Diaschitic suppression of pontine center on the right side did not allow yoking of the right eye via the right medial longitudinal bundle (Fig. 1).[4]

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