A NEW CALLOSAL SYNDROME

Dr. Laufer and colleagues’ article, 1 on time-related changes in motor performance of the upper extremity ipsilateral to a lesion in the brain, contains a critical piece of laterality-related data not interpretable by the doctrine of contralaterality of movement control (CMC) in humans. This is evident from the inability of the respected authors in explicating their findings (i.e., significant improvement of function in the limb ipsilateral to the major hemispheric lesion, with that of the right remaining rather unchanged with the passage of time). They also passed by the crucial factor lying at the root of the matter when they said (p. 171) that “the observed difference may, for example, be related to differential effect of practice of the dominant versus nondominant hand,” without offering any mechanism to mediate such a possible relationship between laterality of movement control (handedness) and the functional status of the nondominant hand, as it will be forthcoming.

In fact, it is the CMC doctrine itself that is the source of such bewilderments. This simplistic doctrine requires a substantial modification to answer not only the findings such as those described by Laufer et al. but also the classical laterality indexed triology consisting of 1) ipsilateral apraxia/contralateral paresis (with or without aphasia), 2) weakness of the nondominant limb in callosal insults, and 3) ipsilateral cortical weakness in lesions affecting the dominant hemisphere (of which I have recently submitted an example for publication in this journal).

Briefly stated, the 1-way callosal traffic scheme (as the neural underpinning of executive functions) maintains that all voluntary movements are planned and executed within the motor cortex of the major hemisphere with those to be performed by the nondominant limbs carried out by their exclusive motor apparatus located in the minor hemisphere, receiving the command via the callosum. The evidence in favor of this scheme is overwhelming and has been detailed elsewhere. 5-7 Thus, the reason for the relatively stationary status of the dominant limbs of their cases is the fact that the minor hemisphere’s postictal improvement was anatomically irrelevant to the functional status of the ipsilateral (right) hand. The situation was different regarding the lesion affecting the dominant hemisphere where any postictal healing is directly translated into better transcallosal communication with the minor hemisphere devoted exclusively to movements on the left side, resulting in the improved scores of the nondominant (left) hand.

Contrary to the authors’ reservations regarding the small number of their cases, that matter was in fact a boon, as the nature of the numerical data they collected (i.e., the speed of performance) could have been thrown out of kilter by the inevitable inclusion of subjects of ostensible laterality as the number of their subjects increased. Such incongruity of neural handedness (NH) and ostensible handedness (OH) is not uncommon, amounting to no less than 15% of the population, both clinically 4 (Table 2) and experimentally (3 out of 14 were incongruous in speech and handedness; 5 11 out of 40 were incongruous in handedness and speech 6), enough to have caused a Babylonian chaos in laterality research from 1912 (remember the Poffenberger paradigm?) to this day. Such incongruities are the basis for occurrences of crossed aphasia and crossed nonaphasia, entities denoting the inseparability of language and motor control in humans. 2, 3

Anyone who is suspicious of the modification suggested above will find solace in hearing a double click (instead of one) in attempts to snap fingers of both hands simultaneously, with the second arising from the neurally nondominant hand (Derakhshan, unpublished data). The phenomenon has been known to musicologists for 160 years (the melody lead of the right hand in piano players), hitherto ascribed to artistic expressiveness. 7 It might be said that the biological nature of the latter observation was the same as the subject of inquiry in Laufer and colleagues’ project.

There is also a sensory dimension to the asymmetrical influence of the major hemisphere upon the minor now discussion, manifested by the hitherto unexplained improvement in neglect (best exemplified in line cancellation tests) when the nondominant hand is employed compared to performing the same with the dominant. 8-9 Here, moving the nondominant hand, which requires initiation of the command from the major hemisphere, activates the minor hemisphere, substantially reducing the neglect of the nondominant extrapersonal space. This, however, is the subject of a future exploration, with the above-mentioned theory as a guide.

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