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Lecture

Laterality and cognition: Handedness as a factor differentiating cognitive abilities

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Abstract

Laterality refers to humans' tendency to prefer one side of their body instead of the other. The inborn lateralization of cerebral hemispheres is most often expressed through the humans' handedness. Therefore, one common approach to investigate the relationship between cerebral lateralization and cognition is to consider handedness as an indicator of brain laterality and to compare right- and left-handed subjects' performance in cognitive tasks (Vlachos, 2016). The aim of this review is to summarize and evaluate recent evidence, which indicate that handedness can be regarded as a factor differentiating cognitive abilities.

Many studies attempted to assess the association between brain lateralization, as indicated by handedness, and cognitive abilities. Johnston, Nicholls, Shah and Shields (2013), by using data from the US national longitudinal survey of youth found that left-handed children have significantly lower test scores than right-handed children in many domains of cognitive development (memory, vocabulary, mathematics and comprehension) but not in reading. Al-Hashel et al. (2016) explored the cognitive variation between left- and right-handed school-aged children and found that right-handed children had superior visuospatial abilities, while left-handed children showed better simple reaction times. Vlachos, Gaillard, Vaitsis and Karapetsas (2013) examined large left- and mixed-handed groups of children and adults and showed that left- and mixed handedness are associated with an elevated risk for some developmental or cognitive deficits. In addition, Powell (2011) found that left- and right-handed young adults performed similarly in measures of verbal comprehension, perceptual organization and intentionality, but not in working memory tasks, where right-handers performed significantly better than left-handers. These results suggest that any observed difference in cognitive development between the handedness groups is likely to concern specific abilities. Similarly, a recent meta-analysis, which investigated the association of verbal and spatial abilities with handedness, indicated that there is a small but significant cognitive advantage of right-handers on spatial ability (Somers, Shields, Boks, Kahn, & Sommer, 2015). However, in the verbal domain, this advantage is only significant in children.

In conclusion, handedness is considered to relate to cerebral laterality and this asymmetry is fundamental to human cognition. Recent studies have revealed that left- and right-handed groups exhibit differences in their performance on a range of cognitive ability measures. However, these differences remain poorly understood. Prospective studies can further shed light on the relationship between handedness and cognition. The better understanding of the effect of handedness and brain laterality on children's cognitive development could also serve to explain any observed educational differentials.

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