

Development and lateralization of language in the presence of early brain lesions

There is a broad consensus that language is, in most right-handers and in a substantial part of left-handers, controlled by the left hemisphere.¹ This seems to be, at least in part, genetically determined, as neuroanatomical asymmetries have been observed already prenatally (e.g. a larger left planum temporale²). Left hemisphere lesions in adolescents and adults accordingly lead to persistent language deficits. However, this is not the case in lesions acquired prenatally or in early childhood.

Regarding the development of functional lateralization of language, clinical neuropsychology has gained much insight from studying children with early unilateral brain lesions. Inspired by the findings of this research, two competing hypotheses on the development of language lateralization have been put forward. The equipotentiality hypothesis was inspired by the finding that children can develop normal language functions despite hemispherectomy of the entire left hemisphere.³ It assumes that, initially, both hemispheres are equally able to sustain language functions with lateralization towards the left hemisphere determined gradually during the course of development.⁴ The older a child is when they suffer a left hemispheric brain lesion, the more difficulty they experience in regaining their language skills.

Lenneberg's view was soon challenged by studies (e.g. Woods and Carey⁵) suggesting that early and even congenital left hemisphere lesions do lead to subtle but persistent language deficits. The hypothesis of irreversible determinism was born, which states that the right hemisphere can never master language functions to the same perfection as the left hemisphere.

The two extremes were brought together (mainly in the 1990s) in the emergentist view, which states that in the course of language development, one of the hemispheres emerges to take the dominant role. This theory is supported by a whole range of developmental neuropsychology studies, combined with structural and/or functional neuroimaging. Many studies may show that both hemispheres seem to be involved in language acquisition, depending on the developmental stage and on the particular function involved. In healthy children, functional magnetic resonance imaging studies reported an age-dependent increase in left-hemisphere lateralization of language-activation.⁶ Children with congenital brain lesions seem to be impaired in the acquisition of syntactic and lexical abilities.⁷ However, children with left hemisphere brain lesions tended to be more impaired in vocabulary and syntax, than children with right-hemisphere lesions.⁸ The study by Chilosi et al.⁹ in this issue may demonstrate again that in this critical period of language acquisition a fully functional left hemisphere seems to be important:

while the children with right-hemisphere damage showed a normal lexical development, the children with left hemisphere damage were significantly delayed.

However, as adolescents or adults, these children who previously had language delay often show clinically normal levels of language skills, with only subtle, if any, deficits persisting.^{10,11} This shows that, while the infant brain seems to contain biases which, in the absence of early brain damage, lead to an eventual left-hemispheric specialization for language, these biases can be overcome.¹⁰ However, in this issue, Chilosi et al.⁹ illustrate that the right hemisphere has to work 'hard' and 'arduously' to overcome these biases. They report a strong association between atypical language lateralization in the dichotic listening task and delayed language skills in children starting to acquire complex and grammatical language.

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