

# Behaviour after cerebral lesions in children and adults (1962)

DMCN   
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Teuber HL, Rudel RG. Behaviour after cerebral lesions in children and adults. *Dev Med Child Neurol* 1962; 4: 3–20.

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It is generally believed that brain injuries vary in their effects according to the age at which they are sustained, but the nature and extent of these differences remain elusive. A full enquiry requires, ideally, the study of strictly comparable lesions in the young and the old, the opportunity for follow-up examinations extending over decades in both groups and, lastly, the availability of behavioural tasks for which normal attainment is known, and which are equally applicable to the brain-injured child and the brain-injured adult.

The investigations of behavioural changes after brain injury in children and adults, reported here, are far from fulfilling all these requirements. In particular, these studies are obviously deficient with regard to our first postulate, that of comparable lesions. Identical lesions in children and adults are so rare that one is often forced to turn to animal experiments as a supplementary source of information. Admittedly, animal experiments introduce phylogenetic differences in addition to the ontogenetic ones; yet available animal studies can help to indicate some of the directions in which the answers to the ontogenetic question may be sought. Accordingly, we begin this account with a brief consideration of animal experiments, before presenting some of the results obtained in our laboratory in studies of brain-injured adults and children.

## Commentary

Choosing a single paper from the archives of *Developmental Medicine & Child Neurology* proved a much harder task than I had imagined. My final choice was for a paper by Hans-Lukas Teuber and Rita Rudel that was already a classic when I encountered it as a postgraduate in the late 1970s. My interest in neuropsychology had been stimulated as an undergraduate when I attended a lecture series by Teuber, who was Eastman Professor at Oxford University from 1971 to 1972. When I started my own neuropsychological studies with children, I was fascinated by the striking differences in outcome for focal brain lesions acquired in childhood vs adulthood, with Basser's report of hemispherectomy cases providing particularly compelling evidence of how language functions could develop in the right hemisphere if the left were damaged early in life.<sup>1</sup>

Teuber and Rudel's paper was published in the same year, but took an experimental rather than a clinical approach, comparing a range of perceptual tasks in both adults and children

who had sustained brain damage. The authors made some astute observations that challenged any simple-minded notion that early lesions simply have less impact than later ones.

Of particular interest was their observation that, for children with brain damage sustained in early childhood, the nature of the deficits varied with the time since injury. Teuber and Rudel distinguished between three kinds of tasks, on the basis of their sensitivity to brain injury in adults. The first type, exemplified by detection of embedded figures, revealed general deficits in both adults and children with brain injury, regardless of lesion localization. The second type of task was one that was selectively sensitive to frontal lobe lesions in adults, and involved tilt-induced bias in auditory localization. On this task, brain injury had little effect on younger children, but a much more pronounced effect on older children. The final type of task was one that was largely insensitive to brain injury in adults, and involved self-righting after body tilt in the absence of visual or auditory cues. On this task, there were large effects of brain injury on children aged up to 9 years, but little evidence of deficit in older children.

In terms of our current understanding, such findings make a lot of sense; an early deficit that resolves may reflect reorganization of brain function. For instance, we now know that a focal left hemisphere lesion is often associated with an early delay in language acquisition, but this recovers once the right hemisphere takes over the function. However, deficits in functions mediated by late-maturing structures, such as frontal lobes, may become more apparent as the child grows older. Indeed, Teuber and Rudel noted an earlier suggestion by Ritchie Russell that a frontal lesion in a child may, in the longer term, have more devastating consequences than a comparable lesion in an adult, insofar as the frontal lobes are implicated in the development of specific functions but less important for the maintenance of those functions.

Although the general conclusions reached by Teuber and Rudel are very much in tune with contemporary views of the developing brain, their approach to assessing perceptual functions has been largely forgotten. Those who currently use embedded figures tests to study weak central coherence in autism are mostly unaware of the role that Teuber and colleagues played in developing these and similar tasks to study perceptual processes in adults and children with brain injury.

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## Reference

1. Basser LS. Hemiplegia of early onset and the faculty of speech with special reference to the effects of hemispherectomy. *Brain* 1962; 85: 427–60.