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Introduction to the Special Issue on Critical Periods Reexamined: Evidence from Human Sensory Development

Several decades ago, evidence for critical periods emerged in animal research on imprinting and on visual development. In both cases, input early in life altered the behavioral responses of the animal to later input (e.g., to conspecifics, to fine detail) and induced observable changes in the nervous system. These effects occurred during a critical period shortly after birth, such that the comparable manipulation later in life had no effect. Based on these findings, some scientists drew the inference that the nervous system loses plasticity after infancy; however, recent studies of humans with a variety of sensory deficits indicate considerable residual plasticity even in adulthood (e.g., Levi, Polat, & Hu, 1997; Ramachandran & Rogers-Ramachandran, 2000; Taub, Uswatte, & Elbert, 2002).

In this special issue, recent evidence on human sensory development is used to reexamine the concept of critical period. The articles draw on evidence from three sensory modalities: vision, audition, and touch. The authors examine the effects of both natural variations in experience during normal development and perturbations to development, in each case examining the effect of the timing of input. Collectively, the articles provide new insights on the concept of critical periods and the limits to plasticity in human development. The special issue ends with a commentary by Mark Johnson.

Contributors:

George F. Michel & Ambler N. Tyler: Critical period: A history of the transition from questions of when, to what, to how.

Terri L. Lewis & Daphne Maurer: Multiple sensitive periods in human vision: Evidence from visually deprived children.

Scania de Schonen, S. Sangrigoli, R. Camps, J. Mancini, E. Maes, & A. Laurent: Early brain lesions and face-processing development.

Kathryn M. Murphy, Brett R. Beston, Philip M. Boley, & David G. Jones: Development of human visual cortex: A balance between excitatory and inhibitory plasticity mechanisms.

Dennis M. Levi: Perceptual learning in adults with amblyopia: A reevaluation of critical periods in human vision.

Janet Werker & Richard Tees: Speech perception as a window for understanding plasticity and commitment in language systems of the brain.

Robert V. Harrison, Karen A. Gordon, & Richard J. Mount: Is there a critical period for cochlear implantation in congenitally deaf infants? Analysis of hearing and speech perception performance after implantation.

Laurel Trainor: Are there critical periods for musical development?

Krish Sathian: Visual cortical activity during tactile perception in the sighted and visually deprived.

Mark Johnson: Sensitive periods in functional brain development: Problems and prospects.

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Ramachandran, V., & Rogers-Ramachandran, D. (2000). Phantom limbs and neural plasticity. Archives of Neurology, 57, 317–320.

Taub, E., Uswatte, G., & Elbert, T. (2002). New treatments in neurorehabilitation founded on basic research. Nature Reviews Neuroscience, 3, 228–236.

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