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Thema: Starting point for literacy development: a functional brain model for grapheme-phoneme integration

Most people acquire literacy skills with remarkable ease even though the human brain is not evolutionary adapted to this relatively new cultural phenomenon. Associations between letters and speech sounds form the basis of reading acquisition in alphabetic scripts. We investigated the functional neuroanatomy of associations between letters and speech sounds using functional magnetic resonance imaging (fMRI). The most interesting finding is a modulation of the response to speech sounds in early auditory cortex by visual letters. Furthermore these basic integration processes of letters and speech sounds mimic the temporal integration patterns of multimodal neurons in natural stimuli in animals. Based on the analyses of single-subject data and group data aligned on the basis of individual cortical anatomy, a model for the integration of graphemes and phonemes will be presented. Our data indicate that the efficient processing of culturally defined associations between letters and speech sounds may be based on a naturally evolved neural mechanism for integrating audiovisual speech.