Sign language acquisition changes the temporal processing characteristics of the visual system: Evidence from deaf and hearing native signers

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To date, it is still a matter of debate to what extent early experience shapes the functional characteristics of the sensory systems. In the present study, we tested whether congenital deafness and/ or the acquisition of a signed language alter the temporal processing characteristics of the visual system. Moreover, we investigated whether, assuming crossmodal plasticity in the deaf, the temporal processing characteristics of reorganized (auditory) areas resemble those of the visual cortex. Steady-state visual evoked potentials were recorded in congenitally deaf native signers (n = 26), hearing native signers (n = 17), and matched controls (n = 34). The luminance of the visual stimuli was periodically modulated at 12, 21 and 40 Hz. For the groups of hearing nonsigners, the optimal driving rate was 12 Hz. In contrast, for the groups of deaf and hearing signers the optimal driving rate was 21 Hz, suggesting that signers have higher preferred frequencies than nonsigners. In addition, we observed that the group of deaf signers compared to the groups of hearing nonsigners and hearing signers showed a larger response over right occipital electrodes when stimulated at 12 Hz in the peripheral visual field. We did not observe evidence for cross-modal recruitment of auditory cortex in the group of deaf signers. Taken together, these data suggest a higher preferred neural processing rate as a consequence of the acquisition of a signed language and an enhanced response to peripheral stimuli as a consequence of deafness. Both effects suggest intramodal plasticity of the visual system.