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Visual perceptual learning for the treatment of visual field defect

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Although visual field defect (VFD) is a common sequela of brain damage, the rehabilitation for VFD is still very limited. We tried to evaluate the efficacy of novel approach, i.e. visual perceptual learning (VPL), for the treatment of VFD, and to investigate neural mechanism underlying improvement of VFD with the use of functional connectivity MRI (fcMRI). We hypothesized that repeated visual stimuli on the blind visual field might induce VPL accompanied by enhancement of inter-hemispheric functional connectivity. Chronic stroke patients with VFD were trained 36 times for 3 months (training group, n = 10). Perimetry and fcMRI were done four times (i.e. pre-training, 1-month, 2-month, and 3-month post-training). Another chronic stroke patients with VFD underwent perimetry and fcMRI twice with 3-month interval without visual training (control group, n = 10). In training group, VPL was induced in the majority of patients, and visual field scores from baseline to post-training significantly improved compared with control group. Improvement of visual field scores was significantly associated with increased inter-hemispheric functional connectivity between visual cortices. These data demonstrate that VPL occurs in the blind visual field in chronic stroke patients. VPL may induce visual field recovery through inter-hemispheric functional connection.

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