

AB016. Cholinergic enhancement reduces the temporary shift in perceptual eye dominance induced by a few hours of monocular occlusion

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Background: A few hours of monocular deprivation with a diffuser eye patch temporarily strengthens the contribution of the deprived eye to binocular vision. This shift in favour of the deprived eye is characterized as a form of adult visual plasticity. Studies in animal and human models suggest that neuromodulators can enhance adult brain plasticity in general. Specifically, acetylcholine has been shown to improve certain aspects of visual function and plasticity in adulthood. We investigated whether a single administration of donepezil (a cholinesterase inhibitor) could further augment the temporary shift in perceptual eye dominance that occurs after two hours of monocular patching.

Methods: We conducted three experiments to investigate whether donepezil enhances the shift in perceptual eye dominance induced by monocular patching. In each experiment, healthy adults completed two experimental sessions while taking either donepezil (5 mg, oral) or a placebo (lactose) pill. In experiment 1 we patched the non-

dominant eye for 2 hours and measured ocular balance with a binocular phase combination task. In experiment 2 we patched for one hour to investigate whether donepezil shortens the amount of time necessary to observe a shift in ocular dominance. In experiment 3 we patched for 2 hours and measured ocular balance with a binocular rivalry task to see if the effect of donepezil was comparable across the two tasks. We calculated AUCs for the shift in perceptual eye dominance across five time points after removing the patch to compare our treatment conditions in each experiment.

Results: Donepezil significantly reduces the magnitude and duration of the shift in perceptual eye dominance produced by both 2 ($P<0.01$) and 1 hours ($P<0.05$) of monocular patching when measuring ocular balance with a binocular phase combination task. Donepezil also reduces the magnitude of the shift in ocular dominance when measuring balance with a binocular rivalry task.

Conclusions: Previous studies have demonstrated that cholinergic potentiation enhances adult brain plasticity. Because of this, we hypothesized donepezil would further augment the strength of the deprived eye after patching. Our study demonstrates that enhanced cholinergic potentiation actually interferes with the consolidation of the perceptual eye dominance plasticity induced by several hours of monocular deprivation. These results contribute to the growing evidence that cholinergic potentiation enhances certain forms of adult brain plasticity at the expense of others.

Keywords: Neural plasticity, donepezil (Aricept); short-term monocular deprivation; ocular dominance (OD); binocular combination; binocular rivalry; neuromodulation; excitatory/inhibitory balance (E/I balance)

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