

Retaining the McCollough effect: Is sleep = lack of visual exposure?

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Abstract:

Earlier (VSS, 2007), we demonstrated that a retention period consisting mainly, but not entirely, of sleep (8 hours sleep+4 hours wake) following sustained exposure to colored oriented stimuli helped retain the resulting aftereffect (McCollough effect) to a greater extent than when they remained awake over the intervening period. The findings raised key questions, which we address here. i) Does sleep help retain a greater portion of the plasticity via some mechanism unique to sleep? We adapted and tested observers following an ~8 hour long intervening period that consisted almost entirely of sleep (monitored with sleep logs and actigraphy). As a control, the same observers were run on a separate session in which they remained awake throughout a retention period of identical duration as in sleep, but the adapted eye was deprived of visual stimulation. In the sleep condition, observers (n=4 thus far) retained 76% of the original ME, whereas in the wake (visually deprived) condition, the same observers retained 82% of the original ME. Thus, sleep did not impart greater retention of the aftereffect compared with visual deprivation. ii) Does sleep help retain the ME via some sleep-dependent mechanism that is independent of sheltering the AE from visual exposure? We provided stimulation throughout the night through the closed eyelid of the adapted eye. Stimulation consisted of a continuous, cyclic pattern of flickering LEDs, which gave rise to the percept of a red ganzfeld. A parsimonious account of the role of sleep in AE retention would be one based on (the lack of) visual exposure in sleep: exposure to light in sleep ought to destroy the AE. Three observers thus far have participated. Additional observers will be required to test the prediction. Our results thus far indicate that there is no mechanism unique to sleep that helps retain the visual aftereffect.