

How amblyopic vision uses phase and amplitude information in natural images

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As many as 5% of the population may suffer from amblyopia, a condition in which vision is impaired in one eye without obvious pathologies of the eye or visual pathways and cannot be corrected by refractive means. Unfortunately, simple laboratory or clinical tests of visual performance may not always reflect the full nature of this disability. Our objective was to identify the real extent of the visual disability of amblyopia using stimuli related to everyday visual tasks. A modified two-alternative forced-choice experiment was used to measure sensitivity to changes in natural images caused by systematic perturbations of the phases or amplitudes of the coefficients in their Fourier spectra (Tadmor and Tolhurst, 1994 *Vision Research* 34 541 - 554; Thomson and Foster, 1995 *Journal of Physiology* 485 25P). Experiments were performed on amblyopic subjects with one eye being used at a time. Subjects had to discriminate between test images made by gradually exchanging the phase spectra between two different natural images (five subjects) or by gradually randomising the phase spectrum (seven different subjects). Both kinds of phase perturbation were much less easily detected when the amblyopic eye was used than when the good eye was used. These effects were equally pronounced when the subject has to discriminate between images with different Fourier amplitude spectra (the second seven subjects).

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