



## Learning with a lazy eye: a potential treatment for amblyopia

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## MAILBOX

### Learning with a lazy eye: a potential treatment for amblyopia

In a thought provoking editorial in the *BJO*, Hoyt raised two very important issues relating to the treatment of human amblyopia.<sup>1</sup> Firstly, there is currently no effective alternative to occlusion therapy for treating amblyopia. Secondly, there is considerable "slippage" of visual acuity after cessation of occlusion therapy. Our sole purpose in responding to this editorial is to draw attention to some very recent work, showing significant long term improvements in visual performance in the adult amblyopic eye that, potentially, could be adapted for use as an effective alternative to occlusion therapy.

Visual perceptual learning—improved visual performance on a given psychophysical task after extensive training—is a well established phenomenon in the normal visual system.<sup>2</sup> This form of learning is often tightly coupled to stimulus characteristics encoded early in visual cortex, such as the orientation or spatial frequency (size) of a visual stimulus. The stimulus specificity of perceptual improvements through training suggests that some aspect of neural processing, whether it be the tuning of individual neurons or the weighting of synaptic connections, remains malleable or "plastic," even in the adult visual system.

Recent studies have shown that this form of neural plasticity is not restricted to the normal visual system. Indeed, with an appropriate training regime one can produce a marked improvement in visual performance of the adult amblyopic eye. Perceptual learning produces a 50–60% improvement in Vernier acuity (positional acuity)<sup>3</sup> and, crucially, in some subjects this improvement in Vernier acuity transfers to other forms of spatial discrimination such as Snellen acuity. By way of example, one amblyopic observer improved from a pre-training value of 20/42 (~6/12), attaining 20/20 (6/6) after extensive training on the Vernier task.<sup>3</sup> This suggests that the adult amblyopic visual system retains a great deal more neural plasticity than previously supposed. Such improvements in visual performance are not limited to acuity tasks. A longitudinal study found that training on a contrast detection task led to a twofold improvement in the contrast sensitivity of the amblyopic eye, with minimal "slippage" 12 months after the cessation of training.<sup>4</sup>

At present, relatively little is known about the benefits of perceptual learning in childhood amblyopia during the "sensitive period." Given the greater degree of neural plasticity in the developing visual system, one would imagine that the benefits of perceptual learning might greatly outstrip those observed in the adult population. Having said this, a recent study on the efficacy of perceptual learning in previously treated amblyopic children did not support this supposition.<sup>5</sup> While the children (aged 7–10, beyond the sensitive period as defined by Hoyt) showed significant improvements after 7–10 sessions, the results were no better than those of adults. Further work with "fresh" (untreated) and younger amblyopes is required to corroborate and extend these initial findings to younger children, and to determine the "dose-response" function for perceptual learning.

Several large scale clinical studies in the United Kingdom and United States have shown that standard occlusion therapy is effective in treating human amblyopia. However, the benefits are far from universal and a significant number of children (about one third) gain little or no visual benefit despite protracted treatment.<sup>6</sup> This is unfortunate given that occlusion therapy is difficult to implement, is often associated with some degree of distress to the child, and may have an impact on educational development. As Hoyt correctly notes in his original editorial, no alternative treatment strategies currently exist for these individuals. The development of perceptual learning as a clinical tool may rectify this situation and provide an alternative method both for the treatment of amblyopia and for eliminating or reversing "slippage" once treatment has ceased. Moreover, if the initial perceptual learning studies in children with amblyopia withstand further experimental scrutiny and deliver encouraging results in younger and previously untreated children, the 250 year old practice of "patching" the amblyopic eye may be supplanted or at the least supplemented by a new treatment protocol.

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## NOTICES

### Managing human resources

The latest issue of *Community Eye Health* (No 56) assesses the use of human resources in the delivery of eye care. For further information please contact: Journal of Community Eye Health, International Resource Centre, International Centre for Eye Health, Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK (tel: +44 (0)20 7612 7964; email: [Anita.Shah@lshtm.ac.uk](mailto:Anita.Shah@lshtm.ac.uk); online edition: [www.jceh.co.uk](http://www.jceh.co.uk)). Annual subscription (4 issues) UK £28/US\$45. Free to developing country applicants.

### 9<sup>th</sup> Frankfurt Marburg Vitreoretinal Symposium

The 9<sup>th</sup> Frankfurt Marburg Vitreoretinal Symposium will be taking place in Marburg, Germany on 11-12<sup>th</sup> May 2006. For further information please contact the Congress Organisation/Gerling, PO Box 29 03 33, D-40530 Dusseldorf, Germany (tel: +49 211 59 22 44; fax: +49 211 59 35 60; [www.congresse.de](http://www.congresse.de)).

### 8<sup>th</sup> EUNOS Meeting – 2007

The 2007 European Neuro-ophthalmology Society meeting (EUNOS; [www.eunos.web.org](http://www.eunos.web.org)) will be taking place in Istanbul, Turkey on 26-29<sup>th</sup> May 2007. For further information please visit [www.eunos2007.org](http://www.eunos2007.org) or contact Pinar Aydin [aydinp@eunos2007.org](mailto:aydinp@eunos2007.org)

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