COETF REPORT
RAPPORT DU FFOCÉ

In an effort to highlight some of the projects and research by COETF award recipients, the COETF Trustees and Awards Committee have selected project reports to be published in the Canadian Journal of Optometry · Revue canadienne des optométristes. Recognizing that many recipients intend to publish their work in cited journals, the reports are not considered to be clinical articles. COETF funded research, when completed and peer reviewed, may be published in CJO·RCO and other journals. The COETF reports are intended to provide relevant information for the benefit of our readers and to showcase the high caliber of optometric research funded by COETF … Canadian Optometry's Charity.

COETF INTERIM REPORT - 2006

by Cindy S. Ho, BSc, OD

RESEARCH PROJECT SUMMARY

The human visual system consists of two main parallel neural pathways that process attributes of form (e.g. colour, orientation, size) and motion (e.g. speed, direction), respectively, in a visual scene. Children with amblyopia have difficulty performing tasks such as identifying small letters on a vision chart because of abnormal development in visual areas of the brain involved in form perception. Most clinical tests for amblyopia involve tests of form perception. Despite evidence that motion and form pathways develop differently early in life, motion perception is rarely tested clinically likely because the relationship between motion perception and amblyopia has not yet been well studied. Although seldom studied, recent studies (including those from our laboratory) have shown that motion perception is indeed affected in amblyopia. Undetected motion deficits may explain why patching treatment is not always effective.

Our present studies in the University of British Columbia's Visual Neuroscience Laboratory at BC's Children's Hospital continue to use psychophysics and neuroimaging to identify visual areas of the brain that could be responsible for impaired motion perception in amblyopic children. This could facilitate development of new and improved tools to diagnose and treat amblyopia, help us to understand the limitations of current treatment, and provide valuable insight into understanding normal human visual perception. Our research has been funded in part by the Canadian Optometric Education Trust Fund from 2003 to 2005. No additional funding was requested for 2006.

While the cortical changes responsible for the form perception deficits in amblyopia are well documented, the effect of amblyopia on neurons in cortical areas involved in motion perception is more ambiguous. A recent publication from our laboratory (Ho et al., 2005) revealed that motion perception is not normal in the non-amblyopic eyes of some amblyopic children and that different aspects of motion pathway function may be selectively affected in strabismic, anisometropic, and aniso-strabismic amblyopia. These findings suggest that diagnosis and treatment of amblyopia may need to take into account fundamental neural differences between the amblyopic subtypes.

PROGRESS TO DATE & FUTURE DIRECTION FOR 2006 /2007

In 2005, our goal was to assess 12 control subjects and 24 amblyopic subjects (12 anisometropic and 12 strabismic) on our psychological tasks. Data collection for the

computer-generated motion tasks has been completed for all but 6 strabismic subjects. During 2005, I submitted three additional manuscripts for publication based on our psychophysical studies to date (two are published or in press; one is currently under revision). The programming of the dynamic visual stimuli required for the functional MRI (fMRI) scanning has been started. Functional MRI scanning with all amblyopic and control subjects should be completed by the end of 2006. Functional MRI image processing and statistical analysis will be performed using the Brain Voyager QX software with the help of the Children's Brain Mapping Centre at BC's Children's Hospital. The anticipated completion date of our project is August 2007. Dissemination of our fMRI research findings through publications and presentations will likely begin in the spring of 2007. We will submit a final report to COETF in the fall of 2007.

ABSTRACT, PRESENTATION & PUBLICATION SUMMARY FOR 2005-2006

Ho, C.S., Paul, P., Asirvatham, A., Cavanagh, P., Cline, R & Giaschi, D.E. (2006). Abnormal Spatial Selection and Tracking in Children with Amblyopia. Vision Research, 46, 3274-3283.

Giaschi, D.E., Ho, C.S. & Cavanagh, P. (Aug 2006). Deficiencies of higher-order motion perception in children with amblyopia. European Conference on Visual Perception.

Ho, C.S. & Giaschi, D.E. (2006). Deficient maximum motion displacement in amblyopic children. Vision Research, under revision.

Wang, J., Ho, C.S. & Giaschi, D.E. (2006). Deficient motion-defined and texture-defined figure-ground segregation in amblyopic children. Journal of Pediatric Ophthalmology & Strabismus, in press.

Ho, C.S., Giaschi, D.E., Boden, C., Dougherty, R.F., Cline, R. & Lyons, C. (June 2005). Deficient motion perception in the fellow eye of amblyopic children. Vision Research, 45, 1615-1627.

Ho, C.S., & Giaschi, D.E. (May 2005). Low-level and high level maximum motion displacement deficits in amblyopic children. Human Early Learning Partnership Research Days, University of British Columbia, Faculty of Graduate Studies.

Ho, C.S., & Giaschi, D.E. (May 2005). Low-level and high level maximum motion displacement deficits in amblyopic children. Journal of Vision (abstract for Vision Sciences Society conference proceedings).

Ho, C.S., & Giaschi, D.E. (April 2005). Deficits of maximum motion displacement in amblyopic children. Department of Ophthalmology Annual Research & Alumni Day, University of British Columbia.