An Investigation of Object Permanence and its Relationship to Smooth Pursuit Eye Movement

by

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Submitted in partial fulfilment of the requirements for the degree of Doctor of Psychology (Clinical)

University of Tasmania (October, 2012)
I certify that this thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information where acknowledgement is made in the text of the thesis, and that to the best of my knowledge and belief this thesis contains no material previously published or written by another person except where due acknowledgement is made in the text of the thesis.

Megan Scanlan
21st January 2011

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Abstract

The aim of the present thesis was to investigate the role of ‘object permanence’ in smooth pursuit eye movement in humans. Churchland, Chou, and Lisberger (2003) found that smooth pursuit eye velocity was maintained in monkeys when target motion was occluded by an object in comparison to a condition where target motion was briefly removed, suggesting that object permanence may facilitate the maintenance of smooth pursuit velocity. In the present thesis, two smooth pursuit eye velocity intervals were measured in nine conditions. In each condition the motion of a target was interrupted for 200ms, either by removal in a series of gap-like conditions, or occlusion by a real object, a computer-generated object, or an illusory object stimulus. Baseline smooth pursuit eye velocity was also recorded without target interruption. Eye velocity was measured at two intervals: 100ms pre-interruption and 120ms post-interruption, and the difference between these intervals yielded a Mean Change in Eye Velocity value. Analyses partially supported the findings of Churchland et al., with Mean Change in Eye Velocity in the Gap condition significantly greater than Baseline smooth pursuit eye movement. However, no such difference was found between Baseline and the computer generated Object, Real Object, or Illusory Object conditions. Overall, there was a clear, though non-statistically significant, pattern in the raw data indicating that object permanence may play a role in allowing smooth pursuit eye velocity maintenance as suggested by Churchland et al., and it is proposed that the eye velocity memory component of their model may function on a continuum of engagement. It was concluded that the findings provide some evidence for object permanence promoting the maintenance of human smooth pursuit eye velocity when an object blocks the perception of target motion.
Acknowledgements

The first thanks belongs to Dr Walter Slaghuis. Wally, thank you for your valuable insights, your guidance, your hours of careful proofreading, and for supporting me in many ways throughout this project. Thanks also goes to Dr Raimondo Bruno and Michael Quinn for your helpful statistical suggestions. Jarrod, you may have only contributed 30 minutes of assistance to this project, but a little bit of explanation from a control systems engineer made computational models of the smooth pursuit system SO much easier to understand.

Joel, you know what writing a thesis is like. Thank you for your constant love and support, and I look forward to our thesis-free future together! Janie, my X-box-playing, shopping-savvy, coffee-drinking mate, our friendship has been a continual source of pleasant diversion. I don’t know what I would have done without you. To other Annex-dwellers, thanks for the friendship and many, many cuppa breaks. To my family, thank you for being so encouraging. I am also grateful to Jackie, Anila, and Elizabeth for maintaining my sanity! Finally, to the creators of The Big Bang Theory: thanks for making nerdiness and thesis-writing ‘cool’ and for inspiring me onwards toward my goal.
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