Suggested Reference


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Similar estimates of contrast sensitivity and acuity from psychophysics and automated analysis of optokinetic nystagmus

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Background
The contrast sensitivity function (CSF) is a valuable way to characterise functional vision. The psychophysical CSF (ψ) characterises a subject’s perception of contrast for a range of spatial frequencies (SFs). The psychophysical CSF is an area of interest for clinical applications, such as the assessment of visual function in children. Automated assessment of contrast sensitivity using modern eyetrackers has been shown to be quicker than psychophysical measurement, with equal accuracy. However, automated assessment using optokinetic nystagmus (OKN) has yet to achieve equal accuracy, and is generally quicker.

Methods

Expt. 1 results: Effect of velocity & SF on OKN
Figure 1. (a) Percentage of visually measured contrast (ψ) as a function of velocity for a single observer. Data from the full set of SFs (black line) and a simple model (blue line) are shown for the full set of SFs. (b) Percentage of visually measured contrast (ψ) as a function of SF for a single observer. Data from the full set of SFs (black line) and a simple model (blue line) are shown.

Expt. 2 results: Contrast sensitivity for report & OKN
Figure 2. (a) Comparison of contrast sensitivity and acuity (ψ and log(ψ)) as a function of velocity for a single observer. Data from the full set of SFs (black line) and a simple model (blue line) are shown.

Expt. 3 results: Trial-by-trial agreement of report & OKN
Figure 3. (a) Trial-by-trial agreement of report and OKN for a single observer. Data from the full set of SFs (black line) and a simple model (blue line) are shown.

Summary
We have proposed a practical method for measuring the CSF using an automated analysis of optokinetic behaviour and compared it to psychophysical measurement. We report a high degree of agreement between methods, with slight bias towards over-estimating acuity. Further study is needed to understand the reasons for this bias.

Acknowledgements
This work was supported by the New Zealand Ministry of Health (grant #16/026) and the Royal Victorian Eye and Ear Hospital Foundation (grant #2015/20).