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Preattentive Visual Search (PAVS): A Clinical Tool for Glaucoma

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Preattentive Visual Search (PAVS) – A Clinical Tool for Glaucoma

Abstract

Glaucoma is known to cause peripheral field loss but its impact is often underestimated. The inability to detect a target in an isolated area of the visual field may not be perceived as a significant disability. The determination here however that glaucoma adversely affects an individual's capacity to deploy attention is an important one. This can be applied to infer the potential impact of the condition on lifestyle, even in the absence of diffuse perimetric field loss. Everyday tasks such as searching for car keys may prove more tedious and require more serial inspection. The ability to guide attention is a fundamental capacity of the human system and when compromised through visual dysfunction has the potential for devastating consequences. Other significant contributions of this research may be summarised as follows:

- Development of a perceptual search index (PSI) provides a novel means of isolating the true visual search effects of compromised visual function by eliminating psycho-motor deficits.
- Traditionally, orientation tasks have been used in clinical PAVS tests. The current strategy utilizes for the first time flicker and motion displacement tasks that may be appropriate in the detection of glaucoma. When combined with the orientation task, the test becomes capable of preferentially assessing the parallel pathways that may be differentially affected in glaucoma, potentially increasing the diagnostic capacity of the test.
- Glaucoma results hint at dissociation between the effects of low versus high tension glaucoma on search efficiency. Previous research suggests that the mechanism of damage and the type of perimetric field defects are different between the two types. This finding extends that interpretation to visual search although more detailed examination would be appropriate to substantiate this.
- For the first time diagnostic PSI values have been determined based on response times (RT) rather than the RT x set size slopes traditionally quoted. Such PSI values facilitate easier clinical interpretation of results in terms with which clinicians are possibly more familiar.
- Some of the task specific findings here serve to modify the conclusions of other authors. Eccentricity effects for example are negligible here which is at odds with previous findings. The nature of the stimuli thus will play a significant role in determining the presence or absence of such an eccentricity effect. The supra-threshold nature of the stimuli employed here negates the effect. The effect of blur was previously untested, and while the resistance of flicker to blur in other psychophysical techniques had been established, the results here substantiate its resistance in visual search. The results of such ametropia effects have been published (Loughman & Davison, 2002; Davison & Loughman, 2006).

- Early and accurate diagnosis of glaucoma is imperative to optimise clinical management. Whether the current test detects pre-perimetric field loss is yet to be established and therefore its ultimate value remains to be seen. What is presently obvious is its significant, raw potential as a mass screening tool for glaucoma with sensitivity and specificity values vastly in excess of tonometry or ophthalmoscopy. Evaluation in other clinical optic neuropathies may also serve to widen its scope of practice and yield a valuable tool in the investigation of ocular dysfunction.

Citation

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