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ORIGINAL ARTICLE

A Delphi study to develop practical diagnostic guidelines for visual stress (pattern-related visual stress)

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KEYWORDS

Delphi study;
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Abstract

Purpose: Visual stress (VS) is characterised by symptoms of visual perceptual distortions and eyestrain when viewing text, symptoms that are alleviated by individually prescribed coloured filters. A recent review supports the existence of VS and its treatment, but noted that controversy remains, in part due to inconsistencies in the diagnosis of the condition. The present paper reviews the diagnostic criteria for VS in the literature and reports a Delphi analysis of the criteria currently used in clinical practice.

Methods: Twenty-six eyecare practitioners were invited to participate in a Delphi study. They were selected because they were frequent prescribers of precision tinted lenses. In the first round they were sent a list of the indicators for which there is literature to suggest a relevance in the diagnosis of VS. The practitioners were invited to rank the indicators and add any additional criteria they use in diagnosis. In the second round a revised list was circulated, including items added from the responses in the first round.

Results: The respondents included optometrists, orthoptists and opticians. In the first round the response rate was 85%. Ninety-one percent of those who participated in the first round also responded in the second round. Strong indicators in the second round included the symptom of words moving when reading, voluntary use of an overlay for a prolonged period, improved performance of $\geq 15\%$ with an overlay on the Wilkins Rate of Reading test, and an abnormally high score on the Pattern Glare Test.

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PALABRAS CLAVE

Estudio Delphi;
Estrés visual;
Estrés visual
relacionado con
patrones;
Lectura

Conclusions: The strongest diagnostic criteria are combined in a diagnostic tool. This is proposed as a guide for clinical practice and further research.

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Estudio Delphi para el desarrollo de pautas diagnósticas para el estrés visual (estrés visual relacionado con patrones)

Resumen

Objetivo: El estrés visual (EV) se caracteriza por síntomas de distorsión perceptual visual y astenopía, que pueden aliviarse mediante filtros coloreados de prescripción individual. Una revisión reciente respalda la existencia de EV y su tratamiento, aunque hay que resaltar que persiste la controversia, debido en parte a las inconsistencias en cuanto a diagnóstico. El presente documento revisa los criterios diagnósticos del EV en la literatura, y reporta un análisis Delphi sobre los criterios utilizados en la actualidad en la práctica clínica.

Métodos: Se invitó a participar en un estudio Delphi a veintiséis facultativos. Éstos fueron seleccionados debido a su elevada prescripción de lentes tintadas de precisión. En la primera ronda, se les envió un listado de los indicadores a los que la literatura aporta relevancia para el diagnóstico del EV. Se solicitó a los facultativos que clasificaran los indicadores, y que añadieran cualquier criterio adicional que ellos utilizaran en su diagnóstico. En la segunda ronda, se hizo circular un listado revisado, incluyendo los ítems añadidos a partir de las respuestas de la primera ronda.

Resultados: Entre los facultativos participantes se hallaban optometristas, ortoptistas y ópticos. En la primera ronda el índice de respuesta fue del 85%. El 91% de los participantes en la primera ronda aportaron también sus respuestas en la segunda. Los indicadores sólidos en la segunda ronda incluyeron: síntoma de movimiento de las palabras al leer, uso voluntario de filtros durante un periodo prolongado, mejora del desempeño de $\geq 15\%$ en el índice de la prueba de lectura de Wilkins con el uso de filtros, y puntuación anormalmente elevada en la prueba PatternGlare.

Conclusiones: Se combinan los criterios diagnósticos más sólidos en una herramienta diagnóstica. Ello se propone como pauta en la práctica clínica y la investigación futura.

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Introduction

Visual stress (VS) is used in this manuscript to describe a syndrome characterised by symptoms of asthenopia and visual perceptual distortions that occur principally when reading and that are alleviated by individually selected coloured filters. VS is controversial.¹⁻³ The latest estimates are that VS is present in about 20% of people with dyslexia, although visual stress and dyslexia are different conditions.⁴

A neurological theory for VS was originally proposed in 1984 on the basis that the visual stimuli that evoke discomfort are generally those that also induce seizures in patients with photosensitive epilepsy.^{5,6} A neural mechanism for VS has found support in studies showing that the visual stimuli that induce discomfort also induce a large haemodynamic response, both in absolute terms, and relative to the response to comfortable stimuli.⁷ Individuals who are particularly susceptible to discomfort exhibit an abnormally large haemodynamic response.^{8,9} The large haemodynamic response is consistent with neural models that show a larger neural response to these stimuli, one in which the

sparseness of firing within the network is reduced, suggesting an inefficient cortical processing of uncomfortable stimuli.¹⁰ This interpretation is in turn consistent with evidence that the mathematical properties of uncomfortable stimuli differ from those of natural scenes.¹¹⁻¹⁴ Natural scenes are those that the visual system presumably evolved to process efficiently.

Text provides a visual stimulus that is un-natural on account both of the spatial periodicity of the lines of text¹⁵ and of the vertical strokes of the letters, which compromise vergence.¹⁶ Reducing the spatial periodicity of the lines using a typoscope increases comfort.⁶ Reducing the periodicity of the vertical strokes improves reading speed.¹⁷ It is therefore to be expected that some individuals will find reading visually stressful.

In the literature, there are several behaviours or signs that have been used as indicators of VS. These are listed in Table 1.

Anecdotally, the indicators in Table 1 are all positively associated one with another, although sometimes weakly. Few of the many pairwise associations have been

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