

Effects of a blue light absorption filter on accommodation, convergence and pupil size

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Statement of the Problem: Computer Vision Syndrome (CVS) is defined by the American Optometric Association as “a complex of eye and vision problems related to activities, which stress the near vision and which are experienced in relation or during the use of computer”(1). Blurred vision, dry eye, burning sensation, redness, headache and diplopia are the main symptoms resulting from an improper use of computers(2). The purpose of this study was to evaluate the accommodation, convergence and pupil diameter when reading on a screen with a short-wavelength absorbing filter (Reticare®) and to compare these parameters to those obtained when reading on paper and on screen (without using a filter).

Methodology & Theoretical Orientation: Thirty children were evaluated in three different situations: reading on a tablet without a short wavelength filter, reading on a tablet with a short wavelength filter (Reticare®) and on paper. Participants were asked to read under these three different conditions for sixty minutes while their convergence, accommodation and pupil diameter were measured.

Findings: A larger pupil diameter was observed when reading on paper than when reading on screens (p-value=0.001). Regarding accommodation and convergence, no differences were observed between reading on screen and on paper. Furthermore, no differences were found when using the short-wavelength absorption filter.

Conclusion & Significance: No differences regarding accommodation or convergence were found when reading on paper and on screen. A larger pupil diameter was observed among the paper readers. This difference was probably due to the screen light stimulation(3). Using a blue-wavelength absorption filter when reading on screens does not improve or impair convergence or accommodation(4, 5).

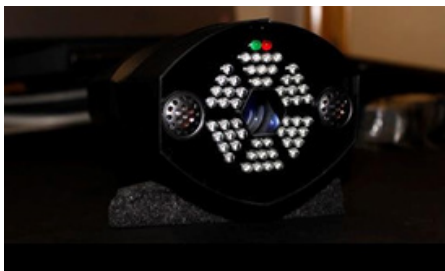


Figure1. Power Refractor II (PlusOptix, Germany)

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Pupil diameter, accommodation and convergence were monitored with the binocular dynamic pupillometer Power Refractor II (Plusoptix, Germany) (Figure 5). This instrument measures the pupil diameter in a range of 4 to 8 mm (precision of 0.1 mm and an error of ± 0.3 mm), monocular refraction, assessing spherical ametropia in a range between +5.00 D and -7.00 D (0.25 D precision, and an error of ± 0.25 D) and convergence, by monitoring interpupillary distance, with a precision of 1 mm.

Biography:

Jorge Donís is an optometry PhD student. He has an expertise in clinical optometry and follows a PhD program in binocular vision. He belongs to the Optics, Optometry and Vision department in Universidad Complutense (Madrid). He is involved in several lines of investigation. Some of them focus on potential blue light effects on binocular vision while others focus on vision and specific visual markers in neurological disorders such as multiple sclerosis. He publishes many articles in reputed journals.