

Literature review: Light and colour in myopia control

Bruce JW Evans^{1,2}, Natalia Vlasak³, Rakhee Shah^{3,1}

¹ Optometry and Visual Sciences, City, University of London, London, UK.

²Institute of Optometry, London, UK.

³Hoya Vision Care, Amsterdam, the Netherlands

Purpose: The mechanism for the undeniable benefit from time outdoors at reducing the risk of myopia is not fully understood. It seems likely that the breadth of spectrum and intensity of outdoor light plays a key role. The treatment effect of increasing time outdoors at preventing and particularly slowing myopia progression is limited. Interventions manipulating exposure to light of different chromaticities and their attempts in slowing down myopia progression are of increasing interest. The aim is to comprehensively review the efficacy and safety of novel myopia control interventions using violet light (VL); blue light (BL); and repeated low-level red light (RLRL).

Methods: A comprehensive literature search was undertaken to identify studies published in English, evaluating the efficacy and safety of VL, BL and RLRL in myopia control in humans using keywords in Embase and PubMed databases. Randomised controlled trials (RCTs) were prioritised but relevant observational (non-RCT) studies were included enabling evaluation of effectiveness and safety of interventions in real-world clinical practice. Outcomes include change in spherical equivalent refraction (SE) and/or axial length elongation (ALE). The literature relating to colour vision defects and myopia was also reviewed.

Results: Twenty-three publications relevant to the main review were found, of which seven involved follow-up for a least one year (VL, 3; BL, 0; RLRL, 4). The literature is suggestive of a possible benefit from VL (statistically significantly less ALE) or a possible disadvantage of VL-blocking lenses. Studies on RLRL reveal significant treatment effects (statistically significantly less ALE and SE increase) comparing well with other myopia control interventions. In most RLRL studies, control groups did not receive a sham control intervention, hence not controlling for placebo effects. More importantly, safety concerns have recently been raised concerning RLRL, indicating that use of these devices may exceed maximum permissible exposure. Research on blue light is limited and interventions are yet to be developed. The literature concerning a relationship between colour vision defects and myopia is contradictory.

Conclusion: Additional studies are needed to determine whether VL plays a key role in myopia progression and whether associated interventions are safe and effective. There is more evidence supporting the efficacy or RLRL in myopia control, but important safety concerns recently raised means that these devices providing RLRL therapy cannot be endorsed.