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(REVIEW ARTICLE)

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Neighboring myopia with vitamin D

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Abstract

Myopia, otherwise known as near-sightedness, has emerged as a global epidemic, impacting almost one in three individuals across the world. High myopia and other sight-threatening eye disorders are more likely to occur in adulthood due to the rising incidence of myopia in early childhood. In this short review, we clarified known as well as possible environmental and lifestyle factors that influence the onset and course of myopia. Increased outdoor time has been repeatedly linked to a lower risk of myopia in children, according to epidemiological and interventional studies. Exposure to the properties of natural sunlight light, and the release of retinal dopamine may be the main causes of this protective effect. Although the precise mechanisms underlying this aggravation are not entirely understood, it seems to be caused by changes in relative peripheral refraction, overstimulation of accommodation, or a complex interaction of these factors, resulting in problems such as chromatic aberration, blur, and defocus in retinal images. Myopia can be avoided or its advancement slowed by improving the modifiable important environmental factors, such as time spent outside and close work. Research findings are frequently masked by the complex relationships between environmental and lifestyle factors, making it difficult to separate their distinct effects. The need for prospective studies that use objective measurements, including measuring light exposure and near work, is underscored by this intricacy. For a more thorough understanding of how different environmental factors can be changed to prevent or reduce the progression of myopia, this research are essential.

Keywords: Myopia; Emmetropization; Genetics; Environment; light exposure; Outdoor time; Risk factors; Progression

1. Introduction

Myopia or near-sightedness is a refractive error that is pre dominantly caused by a mismatch between the optical power of ocular components (i.e., the cornea and the crystalline lens) and the axial length (AL) of the eye whereby light entering the eye is focused anterior to (in front of) the retina, leading to the blurred vision of distant images . In axial myopia, an excessive antero-posterior elongation of the eyeball occurs with thinning of the retina, choroid, and sclera. This excessive axial elongation is hypothesized to trigger sub-foveal chorio-retinal stretching, increasing the risk of sight-threatening ocular diseases such as posterior staphyloma, retinal degeneration, and glaucoma. On the other hand, refractive myopia is predominantly associated with steepening of the cornea and lens curvature which increases the optical power of the eye. Blurred distance vision due to myopia can be corrected using negative (concave) spectacles or contact lenses that refocus the image on the retina[1].

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2. Materials and Methods

An extensive literature search was done in selecting the articles. All the full length articles including case studies were selected by using mesh terms like Myopia, Emmetropization, Genetics, Environment, light exposure, Outdoor time, Risk factors, Progression by using search engines like PubMed, google scholar, Scopus, web of science etc.

3. Results and Discussion

3.1. Choroidal Change with Near Work

Studies investigating the relationship between accommodation and ocular changes have shown elongation in axial length and thinning of the choroid with accommodation. During accommodation, inward forces of the ciliary muscle on the equator of the globe produce mechanical stretching of the globe, leading to eye globe expansion. Reportedly, the choroid thins rapidly in response to hyperopic defocus induced by a negative-powered lens or prolonged accommodation, and vice versa [2]. Baksh, J. et al noted that choroidal thinning and axial elongation were more common in myopic eyes than in emmetropic eyes. However, the choroidal thinning returned to normal when the myopic defocus was removed. A recent study on adults undergoing excimer laser surgery reported an average increase of 34 microns choroidal thinning the increase was seen immediately after the surgery and was assumed to be caused by a decrease in the tension of the ciliary muscle. As the clarity of the retinal image improved after the surgery, the tension in these muscles decreased, leading to an increase in choroidal thinning [2].

3.2. Impact of outdoor games on myopia

Recently, melanopsin-expressing RGCs (mRGCs: melanopsin expressing retinal ganglion cell) have been found to be widely involved in light-induced control of a variety of physiological functions in mammals, changing the way we analyze the non-image-forming effects of light[3].

The violet light transmissive phakic intraocular lens reduced myopia progression and axial length elongation compared with the non-violet light transmissive type. Shinojima A et al clinical study in children aged 6–12 years found that the axial elongation supression rate in the violet light transmissive glasses group was ~20% over 2 years. Thus, these studies suggest the OPN5 pathway as a possible target for myopia treatment [3].

3.3. Factors in myopia control progression

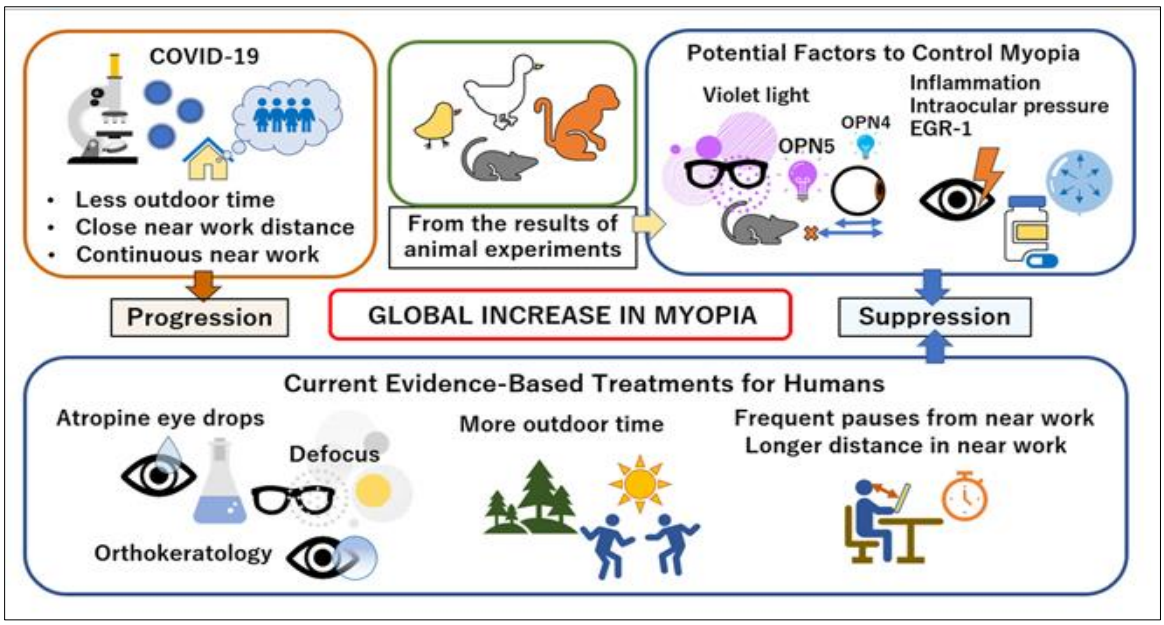

Figure 1 Factors in myopia control progression

4. Conclusion

The onset and course of myopia are significantly influenced by the environment. On the other hand, excessive near work can aggravate the incidence of myopia regardless of outdoor time.

There is debate over the independent effects of other possible factors on the development of myopia, including the spatial frequency of the visual environment, circadian rhythm, sleep, diet, smoking, socioeconomic position, and education.

Through this review we would like to comment that there is much need for more studies in myopia progression. There are number of studies stating the causes but very less studies for control strategies. Thus this review helps in focusing research on much advances strategies in myopia control.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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