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Optical Spectrum, Retinal Focus, Metabolic, and Ecological Factors Influencing Myopia in School Age Children

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Abstract

The global prevalence of myopia in children under 19 years is projected to be 324 million by year 2025. The optical stimuli at the retina that specify focus (e.g. comparison of luminance contrast between cone types) to control accommodation have also been demonstrated to drive eye growth mechanisms, integrated, however, over a sustained near focusing interval, that is disrupted by brief periods of myopic defocus. Reviews on the role of illumination (spectrum, intensity and temporal frequency), circadian rhythm disruption, and light-induced changes in sex hormones, have been published in recent years.

Prior emphasis on a genetic basis for myopia has given way to an environmental etiology, including educational pressures, limited time spent outdoors and factors beyond ethnicity. Neural biomarkers of myopia suggest that moderate to high myopia goes together with changes in brain physiology. A review of holistic interventions for myopic children recommends vision therapy, muscle and fascia manipulation, osteopathy, massage of acupressure points, and limited use of smart phones and head mounted displays (AI, VR, or AR). Reversed polarity contrast on electronic displays may help. Variables that contribute to the onset and progression of myopia include reduced presence of the blue (SWS) component of illumination in electronic displays or in ambient light. Repeated and sustained ciliary muscle stress, reduced collagen synthesis, and nutritional factors regulating eye growth and eye pressure make a contribution.

Amino acid, enzyme, hormone, and mineral content of dietary grains and feed for farm animals and fowl used for production of milk, eggs and meat, are likely to affect ocular and cognitive variables in children and teenagers. Soil composition, and diversity of dietary plant foods, berries, nuts, legumes, vegetables, fruit and herbs in agro-forestry ecosystems need to planned to support health of the eye and brain, and managed by nonprofit farmer cooperatives, subsidized by government agencies and philanthropists.

Biography:

Following education in Medical Optometry (AIIMS) and Visual Neuroscience (SUNY, NIH) Dr. Aggarwala studied nutrition, metabolism, public health, ergonomics, vision therapy, and behavior modification principles. He was admitted as a Fellow of the American Academy of Optometry in December, 1999.
From a growing interest in diabetes, Dr. Aggarwala visited the USDA Human Nutrition Lab in Beltsville, Maryland. With concern for the gypsy moth and Lyme disease challenges affecting eastern forests of North America, Dr. Aggarwala visited the Forest Service in Pittsburgh.

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