



Title: Myopia : contrast or defocus: which mechanisms are in play?

Author: Langis Michaud

Abstract:

Summary

Myopia is becoming endemic and has recently been defined as a disease based on the negative impacts of excessive elongation of the globe on eye health. After more than 30 years of study, it is now clear that myopia occurs when the retina is no longer in homeostasis and reacts anachronistically to the visual signals it receives.

This presentation aims to review the known mechanisms of myopia and attempt to explain how it is possible to intervene to regulate eye growth by controlling the environment (where the optical signals originate) or how these signals can be modified optically or with the help of pharmacology (when they enter into the eye). Finally, the author opens the door to future technologies to further improve our management of Myopia.

Learning objectives

At the end of the presentation, attendees will be able to

1. Understand the retinal mechanism driving the eye growth
2. Describe the impact of optical devices on the visual signal
3. Determine how low dose atropine can help to manage myopia

1.0 Introduction

1.1 Myopia prevalence and expected epidemic growth

1.2 Consequences of myopia progression

1.2.1 Myopia now defined as a disease

1.2.2 Standard of care now means to manage myopia



2.0 What do we know

2.1 Image signals

2.1.1 Contrasts

2.1.2 Spatial frequencies

2.1.3 Chromatic aberrations

2.1.4 Luminance

2.2 Myopia mechanisms

2.2.1 Retinal structure

2.2.1.1 Ganglion cells /bipolar cells

2.2.1.2 On and Off pathway

2.2.1.3 The “sweet spot” (macular area)

2.2.2 Retinal response to the visual signal

2.2.2.1 Choroidal reaction

2.2.2.2 Scleral remodelling

3.0 What can we do

3.1 Modifying the quality of the visual signal

3.1.1 Environment

3.1.1.1 Outdoors

3.1.1.2 Reading distance/posture/screen time

3.1.1.3 Nutrition /physical activities /body mass index

3.1.2 Optical

3.1.2.1 Defocus theory

3.1.2.2 Contrast theory

3.1.2.3 Factors to enhance On pathway

3.1.2.4 Why multifocals/orthokeratology/defocus or dot glasses are working

3.1.3 Pharma



3.1.3.1 Atropine low dose

3.1.3.1.1 Mechanism of action

3.1.3.1.1.1 Serotonin- not muscarinic- receptors

3.1.3.1.1.2 Impact on dopamine secretion

3.1.3.1.1.3 Choroidal swelling

3.1.3.1.2 Mono vs combined therapy

3.1.3.1.3 A new player: new formulation – higher efficacy

4.0 The case of pre-myopia

4.1 Concept of hyperopic reserve

4.2 Impact of early interventions to delay myopia onset

5.0 Conclusion

5.1 Myopia is a consequence of the retinal response to a negative visual signal

5.2 It is possible to restore a fair balance at the retinal level and then influence the eye growth

5.3 We can manage efficiently