

Controlling the Curve: The Science Behind Slowing Myopia Progression

Timed Course Outline • 50 minutes (1.0 CE credit hour)

LECTURER & COURSE INFORMATION

Lecturer: Patrick Stifter, OD

COURSE DESCRIPTION

This one-hour course examines the optical principles behind modern myopia-management lens technologies. Participants will explore how peripheral retinal defocus acts as a signal for axial elongation, and how current spectacle and contact lens designs slow progression either by imposing simultaneous myopic defocus or by reducing retinal contrast. The course emphasizes the optical variables that determine treatment performance and the optician's role in fit, centration, and consistent wear.

LEARNING OBJECTIVES

Upon completion, the participant will be able to:

1. Explain the optical relationship between peripheral retinal defocus and axial elongation, and describe why correcting central vision alone can leave a growth signal uncorrected.
2. Differentiate the primary optical strategies used in myopia-management lens designs — lenslet-based spectacle arrays and dual-focus/concentric-ring contact lens designs that impose simultaneous myopic defocus, versus contrast-reduction (diffusion optics) approaches.
3. Identify the optical variables that influence treatment performance — including add power, treatment-zone geometry, centration, pupil dependence, and light distribution — and explain why fit and consistent wear matter optically.

TIMED COURSE OUTLINE (50 MINUTES)

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| 1. Introduction: Myopia as an Optical and Structural Problem | 5 min |
| <ul style="list-style-type: none">• Myopia defined as axial elongation — the eye physically grows too long — not simply refractive blur.• Why progression matters: higher myopia raises lifelong risk of retinal detachment, myopic maculopathy, glaucoma, and early cataract.• The central question of the course: can the way light is focused (or defocused) on the retina influence how the eye grows?• Key distinction: correcting vision versus managing progression. | |
| 2. Optical Foundations: How the Retina Reads a Growth Signal | 10 min |
| <ul style="list-style-type: none">• Emmetropization: during childhood the eye uses retinal image quality as feedback to regulate its growth.• Defocus as a directional signal — an image focused behind the retina (hyperopic defocus) encourages elongation; an image focused in front (myopic defocus) discourages it.• Central versus peripheral refraction: the peripheral retina can sit in relative hyperopic defocus even when central vision is fully corrected.• Why standard single-vision lenses sharpen the fovea but may leave a peripheral “grow” signal uncorrected.• The retinal image as a three-dimensional shell rather than a single point — the periphery matters optically. | |
| 3. Strategy One: Imposing Simultaneous Myopic Defocus | 15 min |

- Core principle: superimpose a second, intentionally myopic image in front of the retina while preserving a clear central image for everyday vision.
- Simultaneous (competing) defocus: the visual system biases growth toward the nearer focal plane.
- Spectacle implementations:
 - Arrays of many small plus-powered lenslets distributed across the lens, surrounding a clear central distance zone.
 - These lenslets project a volume or shell of myopic defocus in front of the peripheral retina.
 - Optical variables: lenslet add power, size, density, ring or honeycomb arrangement, and the diameter of the clear central zone.
- Contact lens implementations:
 - Concentric-ring / dual-focus designs that alternate distance-correction zones with plus-powered treatment zones.
 - Center-distance geometry with a peripheral add; the treatment effect depends on how much light is myopically defocused.
 - Pupil size and lens centration determine the proportion of treated versus corrected light.
- Shared optical levers across both: add power, treatment-zone geometry and placement, centration, and pupil dependence.
- The central trade-off: enough defocus to signal the retina while preserving acceptable acuity and comfortable adaptation.

4. Strategy Two: Reducing Retinal Contrast

8 min

- An alternative theory: persistently high retinal contrast may itself contribute to elongation.
- Optical approach: introduce mild, uniform light scatter using many micro-scattering elements across the lens to gently lower image contrast.
- Preserves usable acuity while reducing the high-contrast signal reaching the retina — a modulation-of-contrast effect rather than a defocus effect.
- How it differs mechanistically: no competing focal plane is created; the lens modulates contrast, not focus.
- Optical considerations and trade-offs: contrast versus clarity, and performance under different lighting and task demands.

5. Comparing the Optics and Applying Them at the Dispensary

7 min

- Side-by-side comparison: defocus-based designs (spectacle lenslet arrays; dual-focus contact lenses) versus contrast-based designs.
- Why these optical effects only work as intended when the lens is properly fit, centered, and worn full-time — misalignment shifts treatment zones off the visual axis.
- Frame selection, vertex distance, pantoscopic tilt, and lens positioning considerations for lenslet spectacle designs.
- The optical rationale behind follow-up and wear-time guidance: treatment requires consistent retinal exposure to the designed signal.
- Explaining the optics to patients and parents in plain language, focusing on mechanism rather than any specific product.

6. Summary & Q&A

5 min

- Recap: the growing eye responds to optical signals — both defocus and contrast.
- The two main optical strategies and how each manipulates the retinal image.
- The optician's optical role: accurate fit, centration, and supporting consistent wear.
- Open floor for questions.