

MYOPIA MANAGEMENT: SIMPLIFYING THE OPTIONS

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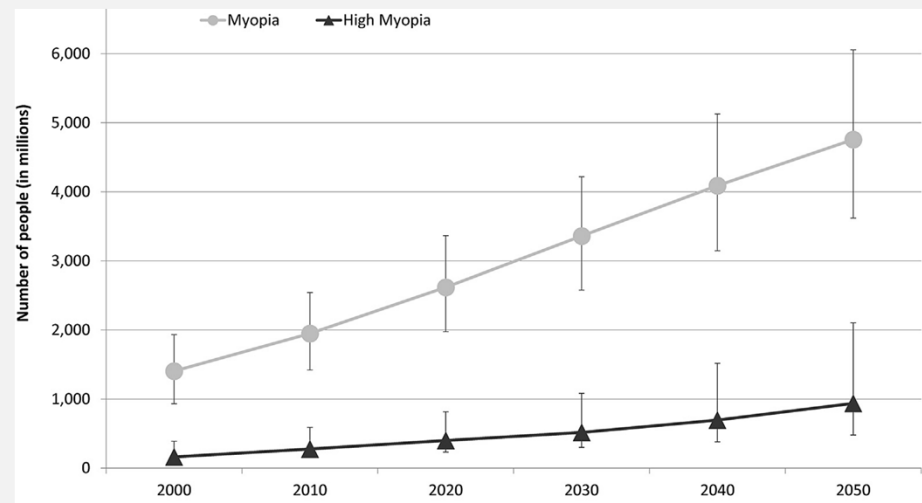
March 24, 2024

FINANCIAL DISCLOSURES

- Alcon
- CooperVision
- Johnson and Johnson
- SightGlass Vision

PREVALENCE OF MYOPIA

- 42% of the United States population is myopic and 25% of children are myopic
- By 2050, it's estimated 50% of the population worldwide will be myopic (~5 billion people) and ~1 billion will have high myopia



HOW DO WE PREDICT WHICH PATIENTS WILL
BECOME MYOPIC?

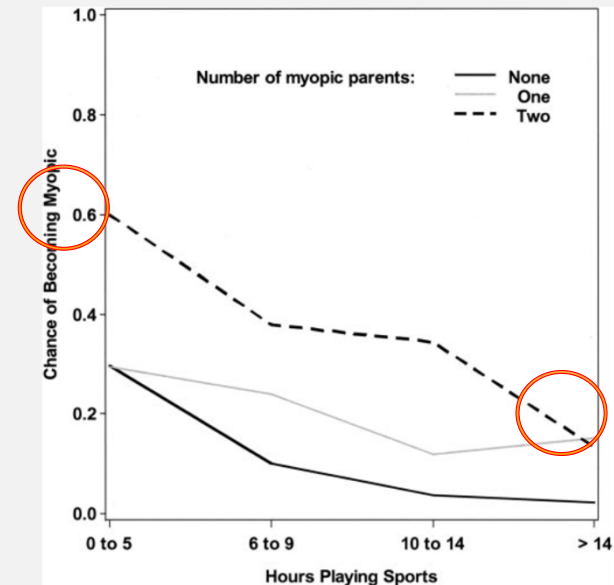
POTENTIAL FACTORS IMPACTING MYOPIA DEVELOPMENT

- **Refractive Error**

- Parents' refractive error
 - 1 myopic parent: 2.17x risk
 - 2 myopic parents: 5.40 x risk
- Patient's current refractive error
 - +0.75 D or less hyperopia with young school aged children

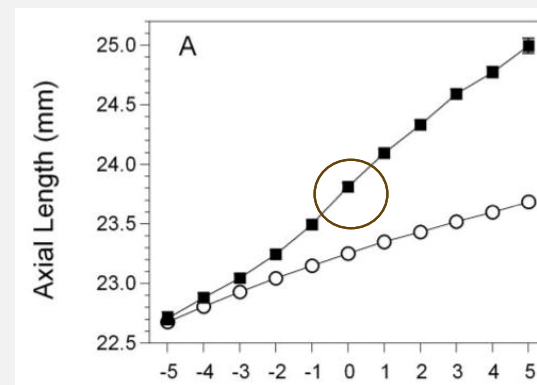
- **Time spent outdoors**

- Nonmyopes: 11.65 ± 6.97 hours/week
- Future myopes: 7.98 ± 6.54 hours/week



PREDICTING MYOPIA

Age (years)	Refractive Error
6	$< +0.75$ D
7-8	$\leq +0.50$ D
9-10	$\leq +0.25$ D
11	\leq Plano



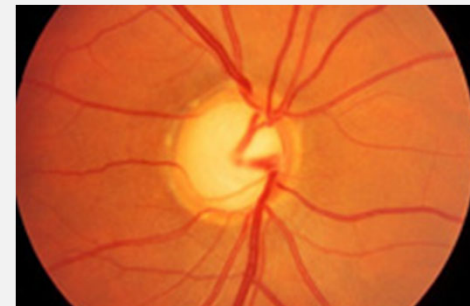
- Myopia calculators

Zadnik et al., 2015

Mutti et al., 2007

IMPORTANCE OF MYOPIA MANAGEMENT

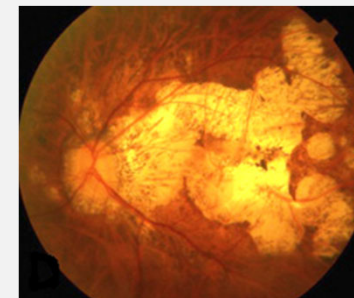
- Complications associated with myopia:
 - Glaucoma
 - Cataracts
 - Retinal holes and tears
 - Retinal and vitreal detachments
 - Myopic macular degeneration
 - Choroidal neovascular membranes
 - Lacquer cracks
 - Lattice degeneration



EVERY DIOPTER MATTERS

Odds ratios	Glaucoma	PSCC	Retinal detachment	Myopic maculopathy
-1.00 to -3.00	2.3	2.1	3.1	2.2
-3.00 to -5.00	3.3	3.1	9.0	9.7
-5.00 to -7.00	3.3	5.5	21.5	40.6
Greater than -7.00			44.2	126.8

- Reducing myopia by 1.00 D, decreases the risk of myopic maculopathy by 40%



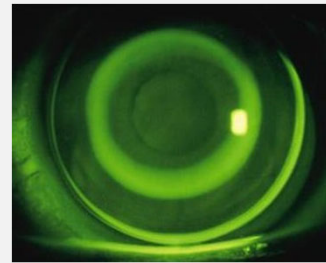
Bullimore et al, 2019

Flitcroft, 2012

MYOPIA CONTROL TREATMENT OPTIONS

- **Contact Lenses**

- Orthokeratology
- Soft multifocal lenses



- **Topical Agents**

- Low dose atropine



- **Spectacles**

- Not currently available in the United States

- **Low-level red-light therapy**

- Safety concerns



IN OFFICE TESTING

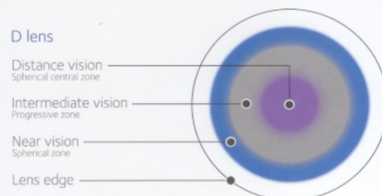
- Consent/patient education
- Visual acuity (distance/near)
- Pupil size
- Accommodative amplitude
- Autorefraction and subjective refraction
- Slit-lamp biomicroscopy exam
- Axial length
- Topography
- Dilated fundus examination

CENTER DISTANCE SOFT MULTIFOCAL CONTACT LENSES

Brand	MiSight (FDA approved)	Biofinity Multifocal "D"	Biofinity Multifocal toric "D"	Proclear Multifocal "D" and XR "D"	Proclear multifocal toric "D"
Material	Omafilcon A	Comfilcon A	Comfilcon A	Omafilcon B	Omafilcon B
Power ranges	-0.25 to -7.00 D	+6.00 to -10.00 D	+10.00 to -10.00 D (Cylinder power: -0.75 to -5.75 D) (Axis: 5-180° in 5° steps)	+20.00 to -20.00 D	+20.00 to -20.00 D (Cylinder power: -0.75 to -5.75 D) (Axis: 5-180° in 5° steps)
Add powers	1 add power (+2.00 D of myopic defocus)	+1.00 to +2.50 D in 0.50 D steps	+1.00 to +2.50 D in 0.50 D steps	+1.00 to +4.00 D in 0.50 D steps	+1.00 to +4.00 D in 0.50 D steps
Replacement	Daily disposable	Monthly	Monthly	Monthly	Monthly

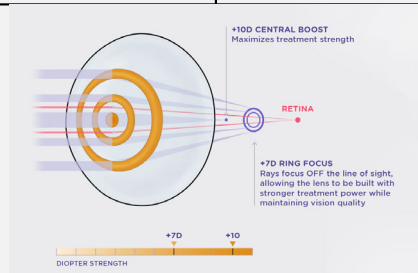


- Treatment zones creating myopic defocus
- Correction zones



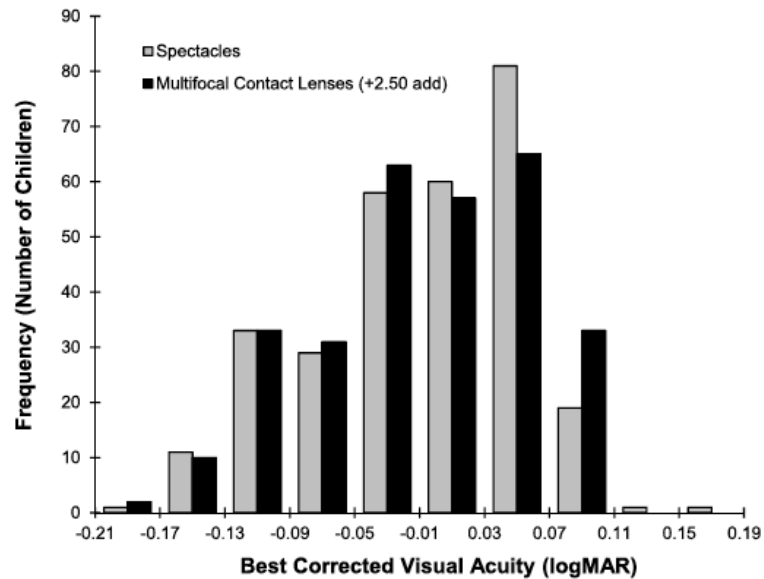
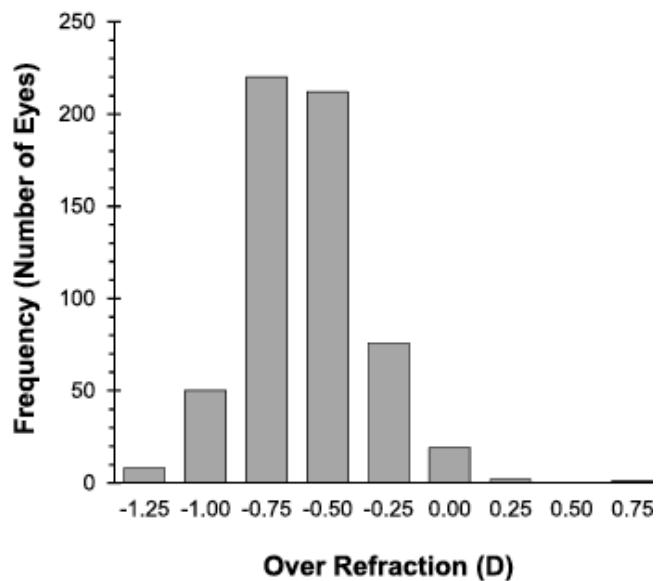
CENTER DISTANCE SOFT MULTIFOCAL CONTACT LENSES

Brand	NaturalVue	Abiliti	SpecialEyes Multifocal (toric multifocal also available)	Other specialty soft lenses
Material	Etafilcon A	Senofilcon A	Hioxifilcon D	
Power ranges	+4.00 to -12.25 D	-0.25 to -8.00 D	+25.00 to -25.00 D	
Add powers	1 add power	1 add power	Up to +4.00	
Replacement	Daily	Daily	Quarterly	



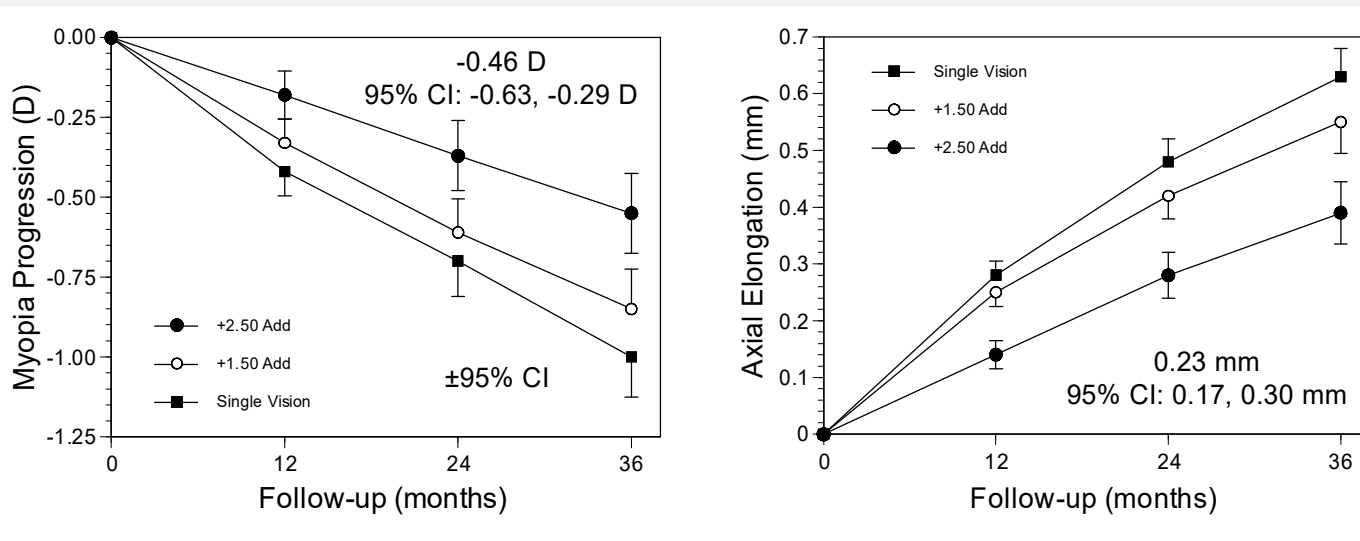
Not
available in
the US

VISION WITH SOFT MULTIFOCAL LENSES



- Mean spherical over refraction: OD -0.61 ± 0.24 D
- Mean best-corrected MFCLs: -0.01 ± 0.07
- There was no difference in vision with single vision lenses compared to center distance multifocal lenses (Biofinity Multifocal +2.50 add D lens). On average, subjects took -0.50 to -0.75 DS OR to achieve optimal vision while wearing center distance multifocal lenses.

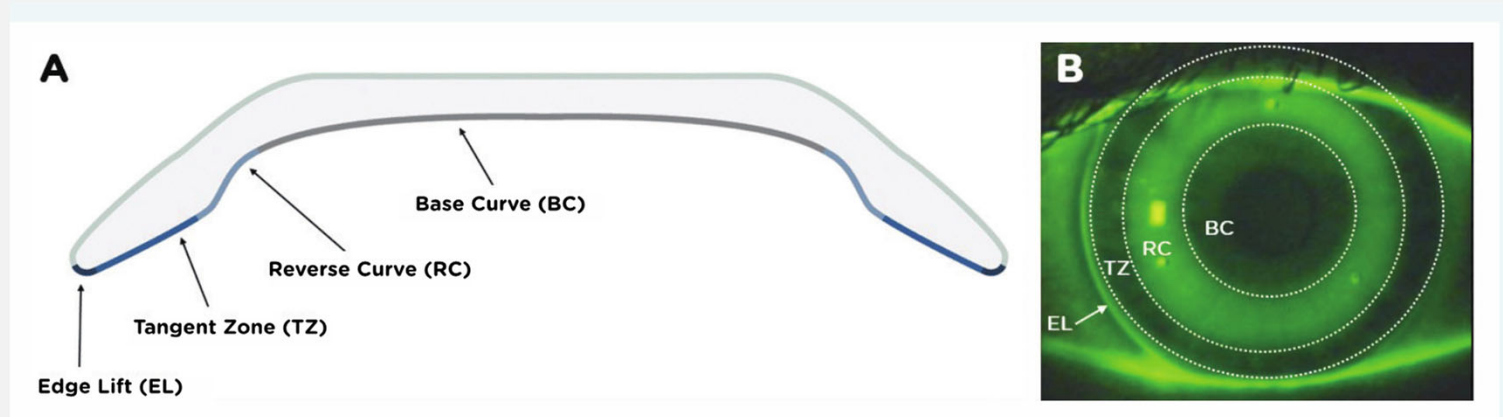
BLINK STUDY RESULTS



ORTHOKERATOLOGY

- Fitting options
 - Empirical ordering
 - Rx, K values (topography), HVID
 - Trial lens fitting
 - Custom software and topography

ANATOMY OF AN ORTHOKERATOLOGY LENS

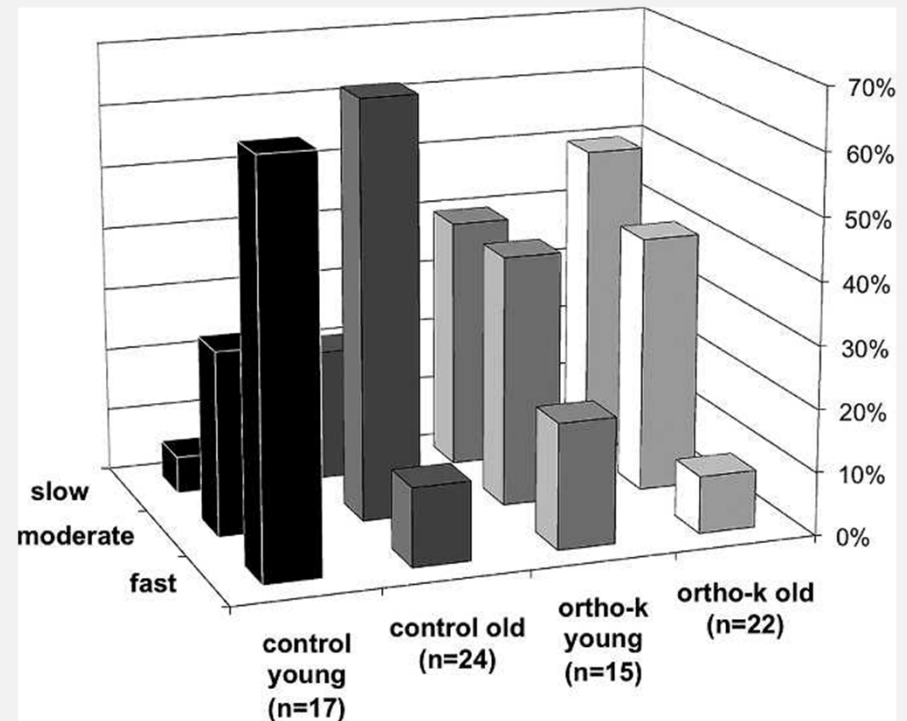


The parts of an ortho-K lens: A) Base Curve (BC), Reverse curve (RC), Tangent Zone (TZ), Edge Lift (EL).
B) The corresponding distinct fluorescein pattern for each section of the lens (BC, RC, TZ & EL)

(Images Johnson & Johnson Vision © 2023)

AGE AND MYOPIA PROGRESSION

- Axial elongation was correlated with initial age of subjects
- Percentages of 7-8 year old subjects with fast myopia progression (>1.00 D/year)
 - Control group: 65%
 - Orthokeratology group: 20%
- Percentages of 9-10 year old subjects with fast myopia progression (>1.00 D/year)
 - Control group: 13%
 - Orthokeratology group: 9%

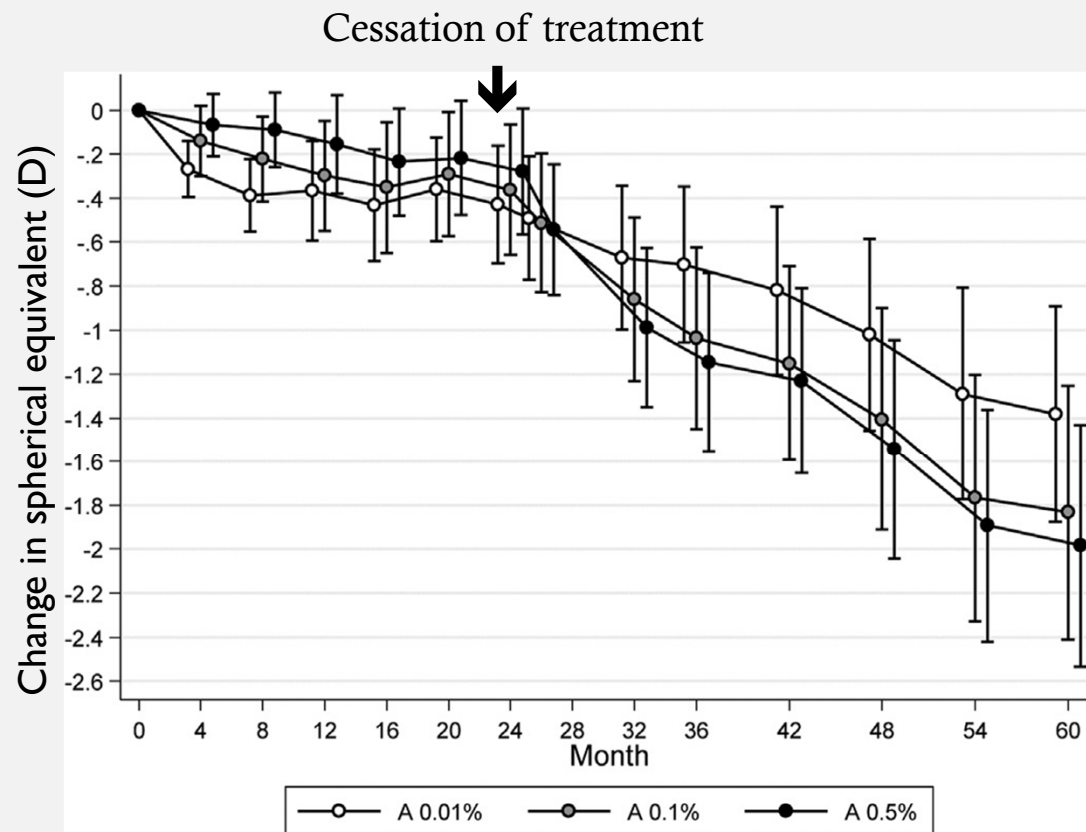


ATROPINE

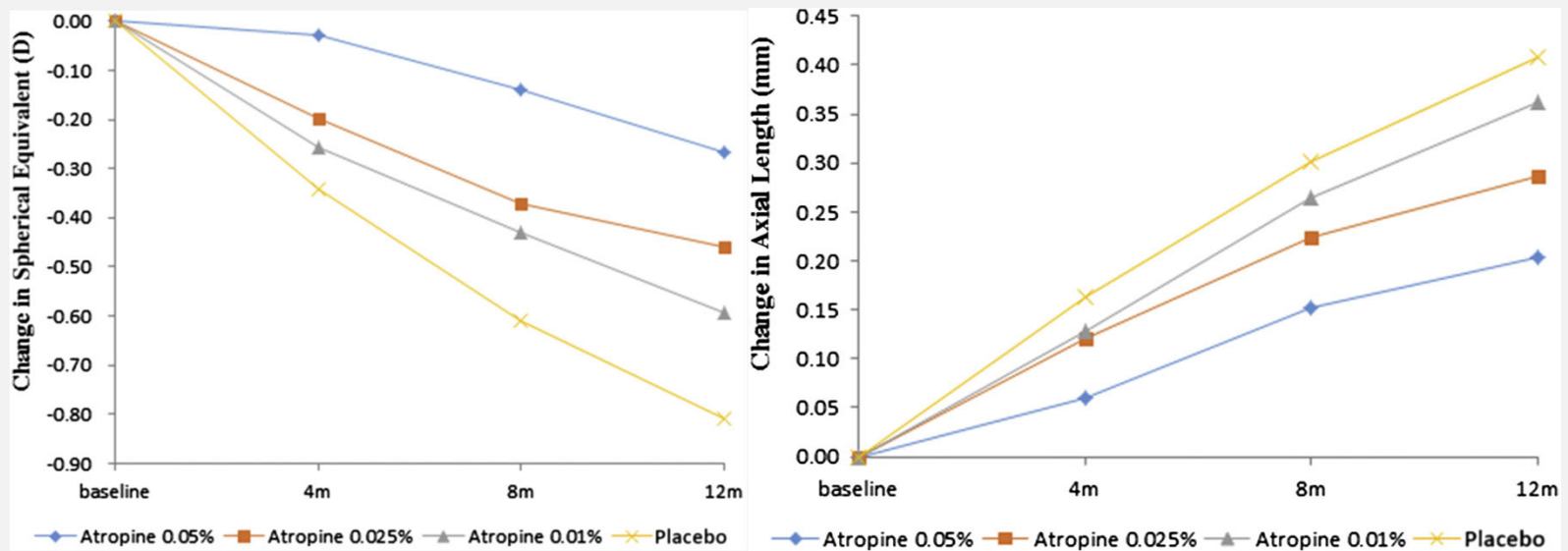
- Mechanism of action
- Concentration (0.01%, 0.02%, and 0.05%)
 - Which is best?
- Dosage: 1 GT QHS OU
- Use of compounding pharmacy
 - Differences in compounding

ATOM 2 STUDY

- 0.5% was most effective over the 2 years of treatment
- 0.01% was more effective year 2 than year 1
- 0.01% had the smallest rebound effect



LAMP STUDY



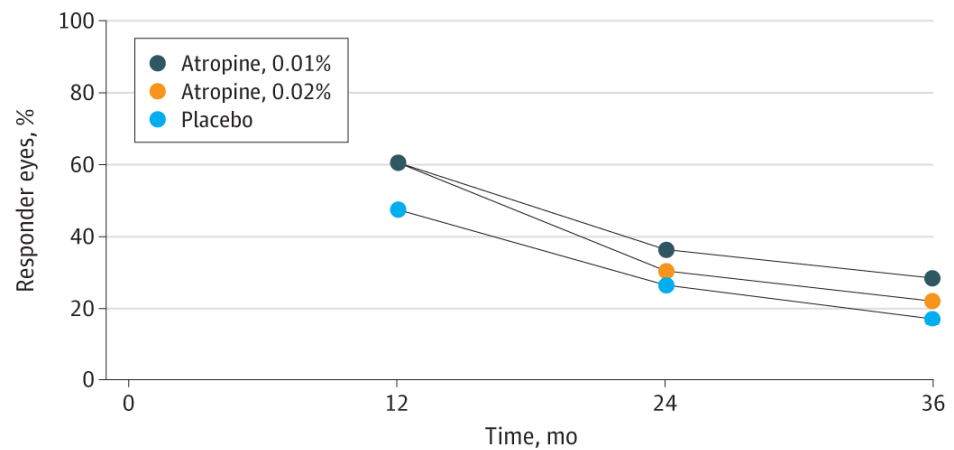
Spherical equivalent change after 12 months:

0.05%: -0.27 ± 0.61 D 0.025%: -0.46 ± 0.45 D

0.01%: -0.59 ± 0.61 D Placebo: -0.81 ± 0.53 D

CHAMP STUDY

A Proportion of mITT set with <0.50-diopter myopia progression (responder)



Atropine, 0.01%, No. of eyes	216	194	200
OR (95% CI) low-dose atropine/placebo	3.90 (1.35 to 11.26)	3.39 (1.00 to 11.44)	4.54 (1.15 to 17.9)
P value	.01	.05	.03
Atropine, 0.02%, No. of eyes	360	346	366
OR (95% CI) for low-dose atropine/placebo	4.78 (1.75 to 13.04)	1.52 (0.49 to 4.70)	1.77 (0.50 to 6.26)
P value	.002	.46	.37
Placebo, No. of eyes	244	238	252

ATROPINE SIDE EFFECTS

	0.05%	0.025%	0.01%	Placebo
Photochromatic glasses needed (%)	30.3	34.3	30.0	39.6
Progressive glasses needed (%)	0.9	0.0	1.8	0.9
Photophobia at 2 weeks* (%)	31.2	18.5	5.5	12.6
Photophobia at 1 year (%)	7.8	6.6	2.1	4.5

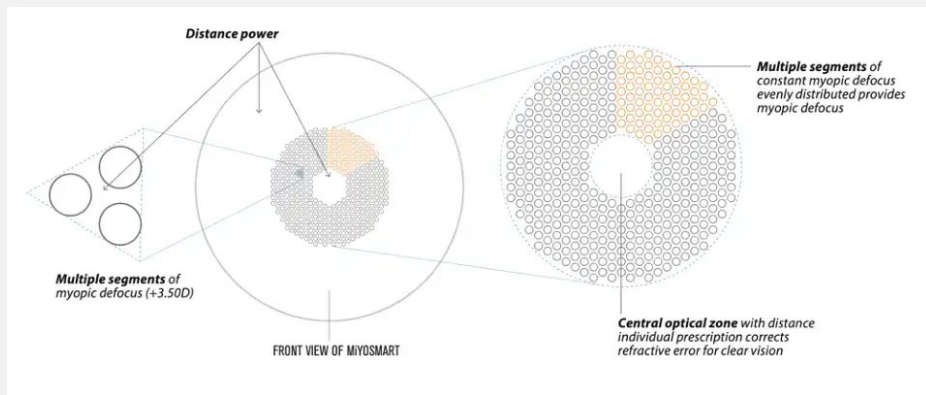
- Minimal side effects were observed with 0.05% atropine compared to placebo with the only significant difference being photophobia at 2 weeks



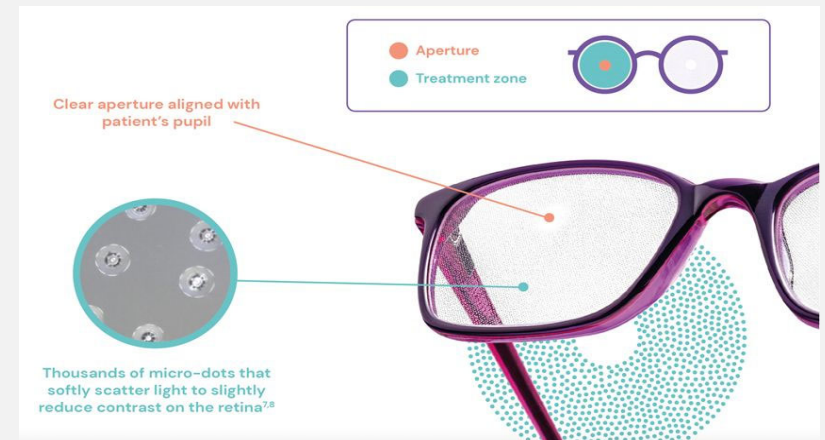
SPECTACLES

- MiYOSMART (Hoya)
 - Islands of +3.50 D add, honeycomb pattern
- DOT (SightGlass)
 - Reducing contrast with light scattering elements to reduce the progression of myopia
- MyoCare Design (Zeiss)
 - CARE technology, alternating zones of correction and defocus in ring like pattern
- Stellest (Essilor)
 - HALT technology (Highly Aspherical Lenslet Target)

SPECTACLES

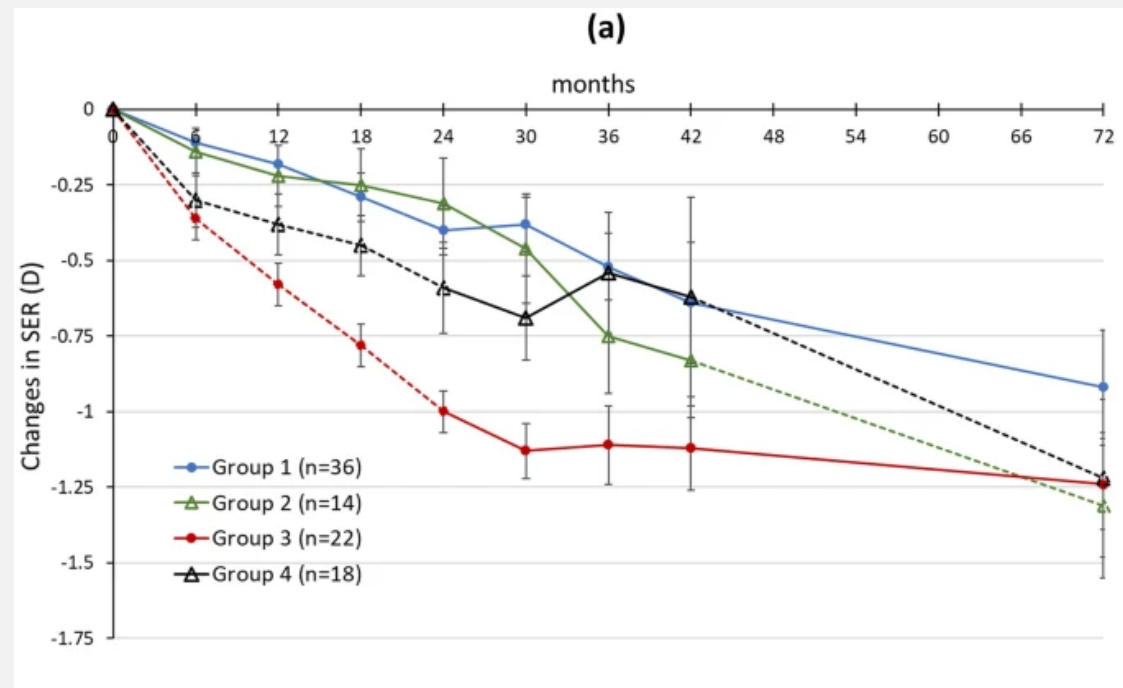


MiYOSMART, HOYA



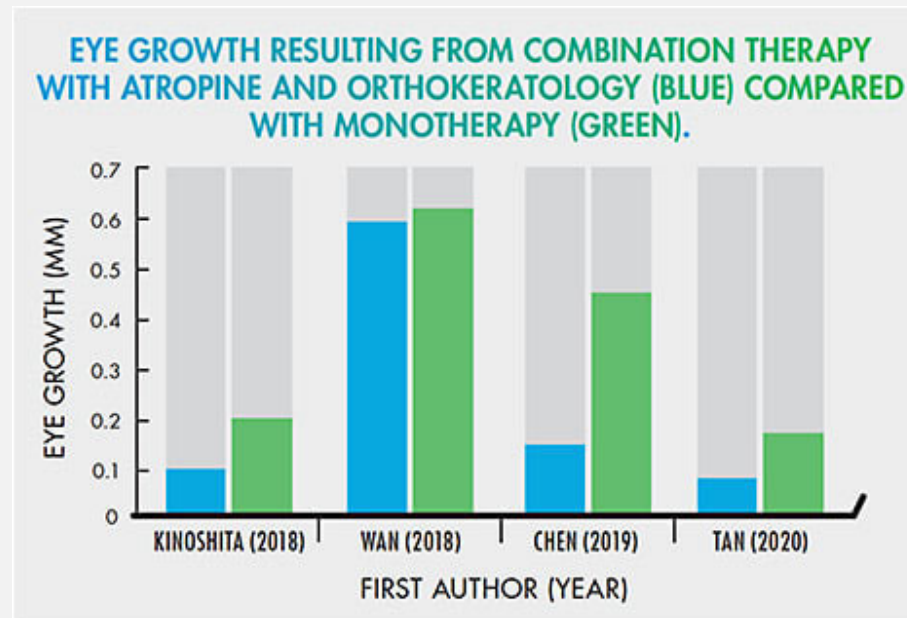
Diffusion Optics Technology, SightGlass Vision

DIMS STUDY

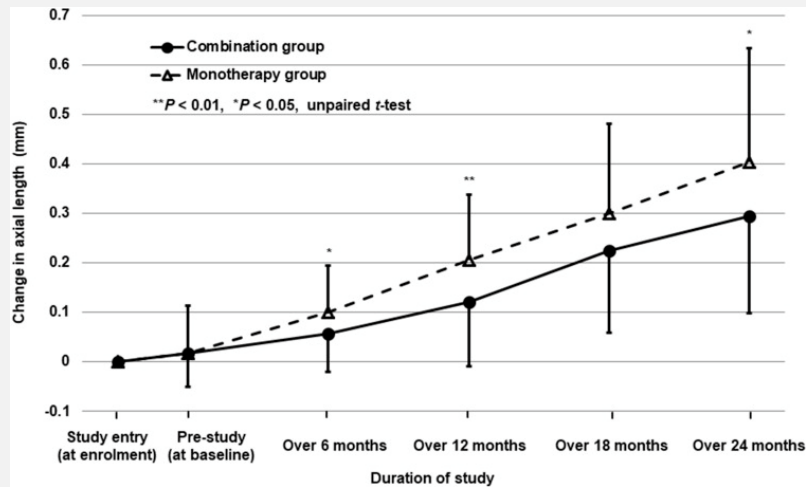


- Solid lines represent time of wearing DIMS lenses
- Dotted lines represent time of wearing single vision lenses (control)

COMBINATION TREATMENTS

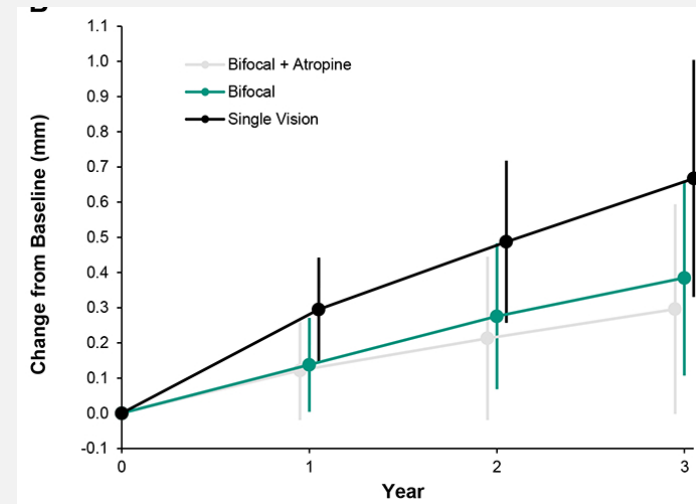


COMBINATION TREATMENTS



OrthoK + 0.01% atropine was 53% more effective than OrthoK

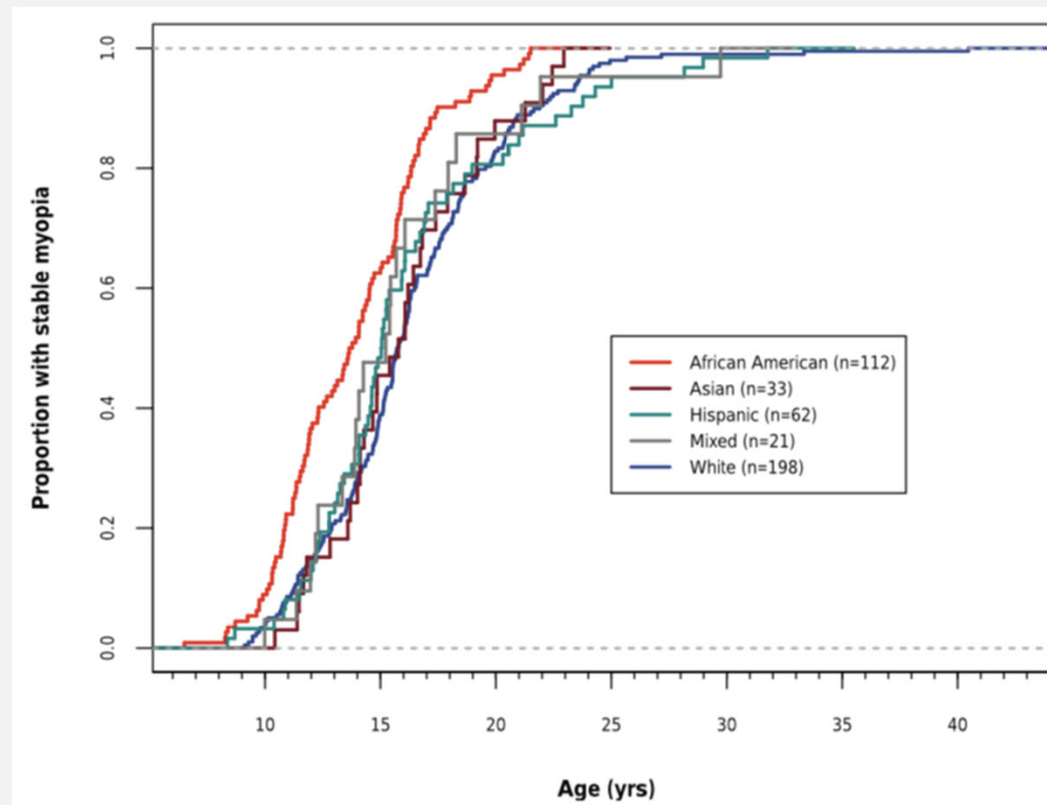
Kinoshita 2020



Multifocal CL's + 0.01% atropine wasn't more effective than multifocal CL's

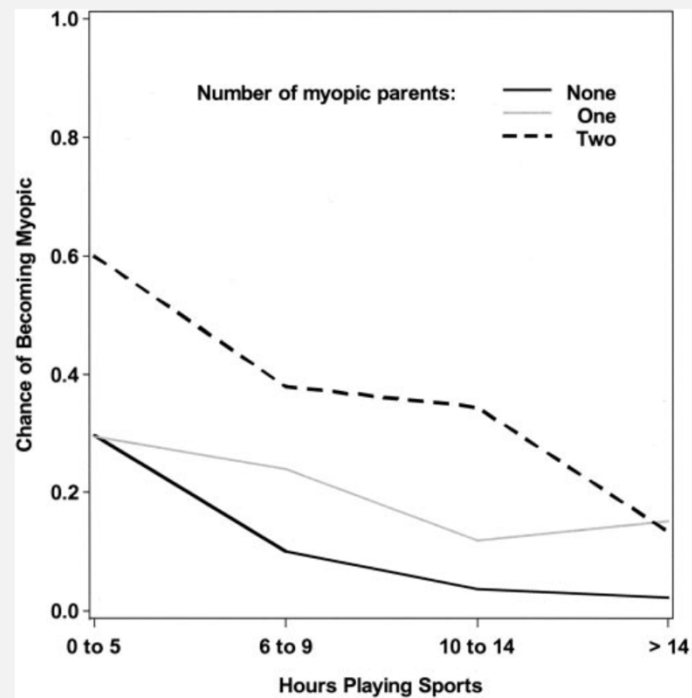
Jones 2022

WHEN SHOULD WE STOP TREATMENT?



PREVENTING OR DELAYING MYOPIA

- Time outdoors
- Atropine?



LAMP2

Abstract

Objective To evaluate the efficacy of **low-concentration atropine eyedrops at 0.05% and 0.01% concentration for delaying the onset of myopia.**

Interventions Participants were assigned at random to the 0.05% atropine (n = 160), 0.01% atropine (n = 159), and placebo (n = 155) groups and had eyedrops applied once nightly in both eyes over 2 years.

Main Outcomes and Measures The primary outcomes were the 2-year cumulative incidence rate of myopia (cycloplegic spherical equivalent of at least -0.50 D in either eye) and the percentage of participants with fast myopic shift (spherical equivalent myopic shift of at least 1.00 D).

Results Of the 474 randomized patients (mean age, 6.8 years; 50% female), 353 (74.5%) completed the trial. The **2-year cumulative incidence of myopia in the 0.05% atropine, 0.01% atropine, and placebo groups were 28.4% (33/116), 45.9% (56/122), and 53.0% (61/115),** respectively, and the percentages of participants with fast myopic shift at 2 years were 25.0%, 45.1%, and 53.9%. **Compared with the placebo group, the 0.05% atropine group had significantly lower 2-year cumulative myopia incidence (difference, 24.6% [95% CI, 12.0%-36.4%]) and percentage of patients with fast myopic shift (difference, 28.9% [95% CI, 16.5%-40.5%]).** Compared with the 0.01% atropine group, the 0.05% atropine group had significantly lower 2-year cumulative myopia incidence (difference, 17.5% [95% CI, 5.2%-29.2%]) and percentage of patients with fast myopic shift (difference, 20.1% [95% CI, 8.0%-31.6%]). **The 0.01% atropine and placebo groups were not significantly different in 2-year cumulative myopia incidence or percentage of patients with fast myopic shift.** Photophobia was the most common adverse event and was reported by 12.9% of participants in the 0.05% atropine group, 18.9% in the 0.01% atropine group, and 12.2% in the placebo group in the second year.

Conclusions and Relevance Among children aged 4 to 9 years without myopia, nightly use of 0.05% atropine eyedrops compared with placebo resulted in a significantly lower incidence of myopia and lower percentage of participants with fast myopic shift at 2 years. There was no significant difference between 0.01% atropine and placebo. Further research is needed to replicate the findings, to understand whether this represents a delay or prevention of myopia, and to assess longer-term safety.

PATIENT MANAGEMENT AND EDUCATION

- Informed consent
- Some treatment options discussed are used off-label for myopia management
- Choose the most appropriate treatment option
 - Consider the impact on the patient's vision, ocular health, and quality of life
- Set realistic expectations (this isn't reversal of myopia)
- Financial considerations
- When to stop treatment
- Staff involvement

THANK YOU!

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