

CORE
Research & Education

Myopia Control

An Update...

Lyndon Jones PhD DSc FCAHS FCOptom FAAO

Professor and University Research Chair
School of Optometry & Vision Science,
Depts of Physics, Biology, Chemical Engineering & Chemistry
Director, Centre for Ocular Research & Education,
University of Waterloo, Ontario, Canada




Centre for Ocular Research & Education

CORE
Research & Education

Lyndon Jones PhD, DSc, FCAHS, FCOptom, FAAO
Financial Disclosures

Over the past three years, members of CORE have received research funding and/or honoraria from the following 15 companies & 3 funding agencies:

- Alcon
- Inflamm Research
- Safilens
- Allergan
- Johnson & Johnson Vision
- Santen
- Contamac
- Menicon
- Shire
- CooperVision
- Nature's Way
- SightGlass
- GL Chemtec
- Novartis
- Visioneering

Centre for Ocular Research & Education

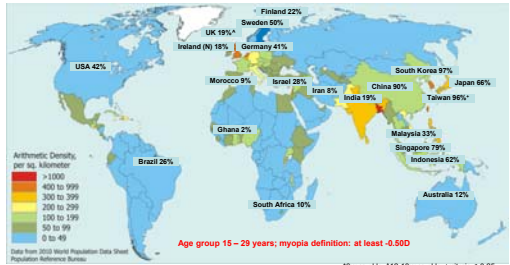
CORE
Research & Education

Prevalence

Centre for Ocular Research & Education

CORE
Research & Education

Myopia Prevalence




Age group 15 – 29 years; myopia definition: at least -0.50D

Centre for Ocular Research & Education

CORE
Research & Education

China

- Sixty years ago
 - 10–20% of the Chinese population was myopic
- Today:
 - up to 90% of teenagers and young adults are myopic¹
 - almost 20% are highly myopic
 - less than 4% are emmetropic




Centre for Ocular Research & Education

CORE
Research & Education


Prevalence of Myopia

2010
Nearly 28%
affected by
Myopia

2050
Nearly 50%
affected by
Myopia



Estimated 4.7 billion myopes



Centre for Ocular Research & Education

1. Sun et al. High prevalence of myopia and high myopia in 5000 Chinese university students in Shanghai. Invest Ophthalmol Vis Sci 2012; 53:12, 7504-9

1. Fonn: Concerned parents and patients. Eye Contact Lens 2010; 36:2, 67.
2. Holden et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. Ophthalmology 2016; 123:5, 1036-42.

CORE
Centre for Ocular Research & Education


Onset?

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Change Over Time

- The onset of myopia is shifting to a younger age in Taiwanese school children¹
 - n=10,000 each year
 - 11 year-olds in 1983
 - 10 year-olds in 1986
 - 9 year-olds in 1990
 - 8 year-olds in 2000



18% of Singaporean children at the age of 7 are at least -6.00D myopic²

1. Liu, Ann Acad Med Singapore, 2004
2. Saw, IOVS, 2005

Centre for Ocular Research & Education

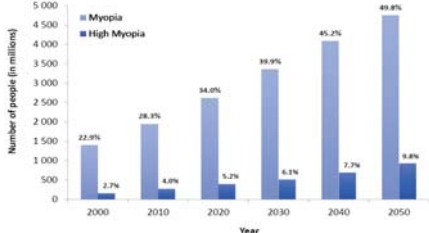
CORE
Centre for Ocular Research & Education

So What?

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Increase in High Myopia



Year	Myopia (millions)	High Myopia (millions)
2000	22.9%	2.7%
2010	28.3%	4.8%
2020	34.0%	5.2%
2030	39.9%	6.1%
2040	45.2%	7.7%
2050	49.8%	9.8%

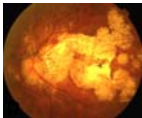
Modified from: Holden BA, Frisbie TR, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. Ophthalmology 2016; 123:5: 1036-42. Source: postdoctoral.com

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Impact of Myopia on Risk

Emmetropia = 1x	Cataract (PSCC)	Retinal Detachment	Myopic Maculopathy
-1.00 to -3.00	2.1	3.1	2.2
-3.00 to -6.00	3.1	9.0	9.7
-6.00 or greater	5.5	21.5	40.6



Younan et al 2002, Vongphanti et al 2010, Filtrath 2012

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Visual Impairment: Myopic Macular Degeneration

Br J Ophthalmol. 2018 Jul;102(7):888-892. doi: 10.1136/bjophthalmol-2017-011286. Epub 2018 Apr 26.

Global prevalence of visual impairment associated with myopic macular degeneration and temporal trends from 2000 through 2050: systematic review, meta-analysis and modelling.

Frisbie TR¹, Jona M^{1,2}, Hawton K^{3,4}, Saranandana R^{5,6}, Nishikiori T⁷, Ito SM⁸, Wansa T⁹, Resnikoff S^{1,2}.

	Visual Impairment	Blindness
2015	10.0 million	3.3 million
2050	55.7 million	18.5 million

Frisbie et al. Global prevalence of visual impairment associated with myopic macular degeneration and temporal trends from 2000 through 2050: systematic review, meta-analysis and modelling. Br J Ophthalmol 2018; doi:10.1136/bjophthalmol-2017-011286

Centre for Ocular Research & Education

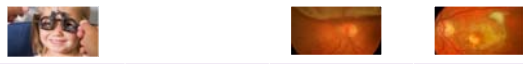
CORE
Research & Education

Myopia Control Strategies

Centre for Ocular Research & Education

CORE
Research & Education

Impact of Reducing Myopia



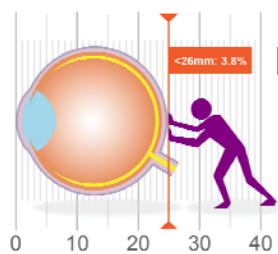
	Prescription	Retinal detachment	Myopic maculopathy
Do nothing	-6.00	16x	40x
Reduce by 50%	-3.25	10x	10x
Reduce by 75%	-1.25	2x	2x

Fitzfarr, The complex interactions of retinal, optical and environmental factors in myopia aetiology. Prog Retin Eye Res. 2012;31:622-60.

Centre for Ocular Research & Education

CORE
Research & Education

Risk of visual impairment¹




¹ Thiberman et al.: Association of Axial Length With Risk of Unresectable Visual Impairment for Europeans With Myopia. JAMA Ophthalmol 2016; 134:12: 1355-1363.

Centre for Ocular Research & Education

CORE
Research & Education

Time Outdoors

- Recent studies have shown that time outdoors appears relevant to myopia **onset**¹⁻⁵
 - increased light exposure?
 - light-related release of retinal dopamine, which may be critical to regulating ocular growth⁶
 - reduced time reading?
 - reduced accommodation
- Schools in Asia now increasing exercise and time outdoors as a public health issue

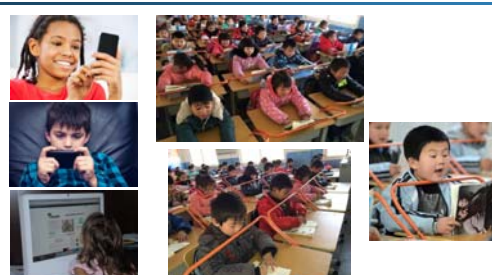


1. Lee et al. Risk factors for onset progression of myopia in young Taiwanese men. Optometric Contact 2014; 1-4.
2. Sun et al. Outdoor activity and myopia among 101 primary students in urban and rural regions of Beijing. Zhonghua Yi Xue Za Zhi 2010; 90: 161-4.
3. Sheehy et al. The influence of time spent outdoors on the development and progression of myopia in children: A 20-year follow-up study. Acta Ophthalmol 2014; 92: 759-64.
4. van der Lely et al. Myopia onset and progression in children: A 10-year follow-up study. Optom Vis Sci 2015; 92: 11-16.
5. Sun et al. Myopia and outdoor activity among primary school children in urban Beijing: a 10-year follow-up study. PLoS One 2015; 10: e0132660.
6. Wang et al. Retinal dopamine, retinal thickness, and myopia progression. Opt Vis Sci 2012; 89: 460-7.

Centre for Ocular Research & Education

CORE
Research & Education

Unusual Attempts...



Centre for Ocular Research & Education

CORE
Research & Education

Reviews



The Prevalence and Impact of High Myopia
JAMA Ophthalmol. 2012;30(3):383-389.

The Future of Myopia Control Contact Lenses
Optom Vis Sci. 2016;93(3):338-43.

Optical and pharmacological strategies of myopia control
Optom Vis Sci. 2018;95(3):338-43.

1. Jones & Liaw. The prevalence and impact of high myopia. Eye Contact Lens 2012; 38(3): 188-96.
2. Smith & Walline. Controlling myopia progression in children and adolescents. Annu Rev Public Health 2015; 36: 133-43.
3. Gifford & Gifford. The Future of Myopia Control Contact Lenses. Optom Vis Sci 2016; 93(3): 338-43.
4. Tanskanen et al. Contact Lens Methods for Control Myopia Control. Optom Vis Sci 2016; 93(3): 320-30.
5. Walline. Myopia Control: A Review. Eye Contact Lens 2016; 42(3): 3-12.
6. Sankaralingam. Contact lenses to slow progression of myopia. Clin Exp Optom 2017; 100(5): 432-437.
7. Wang. Optical and pharmacological strategies of myopia control. Clin Exp Optom 2018; 101(3): 321-332.

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Pharmaceuticals

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Atropine

- Mechanism unknown
 - Atropine non-selective anti-muscarinic agent that has a high affinity to M1-M5 receptors
- Clinically significant treatment effects
- Concerns about post-treatment rebound effects¹ and the short^{2,3} and long-term side effects⁴

Myopia increase over 2 years⁵:

- 0.49D
- 0.38D
- 0.30D
- Control group: -1.20D

1. Tong, Ophthalmology, 2009; 2. Chia, Ophthalmology, 2006; 3. Shih, J. Ocul. Pharmacol. Ther. 1999; 4. Smith, IOVS, 1984; 5. Chia, Ophthalmology, 2012

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Low Dose Atropine Effects

- Atropine for the Treatment of Myopia 2 (ATOM2) Study
- N=400 myopic Chinese children
- Assigned to 0.5%, 0.1%, and 0.01% atropine, administered 1x nightly for 2 years
- Compared with ATOM1 study results
 - placebo vs 1% atropine for 2 years

Chia et al. Atropine for the treatment of childhood myopia: safety and efficacy of 0.5%, 0.1%, and 0.01% doses (Atropine for the Treatment of Myopia 2). Ophthalmology 2012; 119: 347-54

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

ATOM2

Figure 2. Mean change in spherical equivalent for groups from baseline, 2 weeks, and 4 to 24 months with atropine 0.01%, 0.1%, and 0.5% from the ATOM2 study, and placebo and atropine 1.0% from the ATOM1 study. A = atropine; ATOM = Atropine for the Treatment of Myopia; D = degrees; m = months; w = week.

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

ATOM2 Rebound Effects

- Children from ATOM2 stopped atropine treatment and followed for a further 12 months
- There was a myopic rebound after atropine was stopped
 - greater in eyes that had received 0.5% and 0.1% atropine
 - 0.01% atropine effect was more modulated and sustained

Chia et al. Atropine for the treatment of childhood myopia: changes after stopping atropine 0.01%, 0.1% and 0.5%. Am J Ophthalmol 2014; 157: 451-457.e1.

Centre for Ocular Research & Education

CORE
Centre for Ocular Research & Education

Atropine

Author (year)	Concentration (%)	% reduction	Overall average
Shih et al 1999	0.1	56	69%
Shih et al 1999	0.25	58	
Shih et al 1990	0.50	96	
Chua et al 2006	1.0	77	
Chia et al 2012	0.01	59	
Chia et al 2012	0.10	68	
Chia et al 2012	0.50	75	


Sankaralingam. Contact lenses to slow progression of myopia. Clin Exp Optom 2017; 100(5): 432-437.

Centre for Ocular Research & Education

CORE
Research & Education

Atropine

- Most effective atropine concentration with fewest side effects = 0.01%
 - not commercially available (generally)
 - Singapore
 - compounded by pharmacy
 - preserved vs unit-dose
- Concerns about side effects
 - photophobia and accommodation issues reduced with low concentration
 - long-term effect on ciliary body?
- Concerns remain about rebound effects
- Axial elongation vs myopia reduction?



Centre for Ocular Research & Education

CORE
Research & Education

Is 0.01% Atropine All Its Made Out to Be?

Atropine dosage:	ATOM2 study Chia et al 2012			LAMP study Yam et al 2018		
	0.5%	0.1%	0.01%	0.01%	0.025%	0.05%
Mydriasis (mm)	+3	+3	+1	+0.5	+0.8	+1
Amps baseline (D)	15.8	16.7	16.2			
Amps 2 weeks	2.2	3.8	11.3	1 year amps reduction		
Amps 2 years	4.0	6.8	11.8	-0.3D	-2D	-1.6D
Refractive efficacy (%)	75	68	59	27	43	66
Axial efficacy (%)	29	25	-8	12	29	51

• Mismatch between refractive error and axial length

• 0.05% much better than 0.01%

Myopia Profile

About Kate
Dr Kate Kate is a clinical optometrist, research team educator and professional leader from Brisbane, Australia, and a co-founder of Myopia Profile.

1. Chia et al. Atropine for the treatment of childhood myopia: safety and efficacy of 0.5%, 0.1%, and 0.01% doses (Atropine for the Treatment of Myopia 2). *Ophthalmology* 2012; 119(2): 347-54.
2. Yam et al. Low-Concentration Atropine for Myopia Progression (LAMP) Study: A Randomized, Double-Blinded, Placebo-Controlled Trial of 0.05%, 0.025%, and 0.01% Atropine Eye Drops in Myopia Control. *Ophthalmology* 2019; 126(1): 113-124.

Centre for Ocular Research & Education

CORE
Research & Education

Spectacles



Centre for Ocular Research & Education

CORE
Research & Education

Under-Correction

Centre for Ocular Research & Education

CORE
Research & Education


Spectacle Under Correction

Rationale

- under-correction reduces accommodative response for near vision
- animal studies
 - myopic defocus (induced by plus lenses) halts ocular elongation^{1,2}

Hypothesis

- under-correction slows down myopia progression

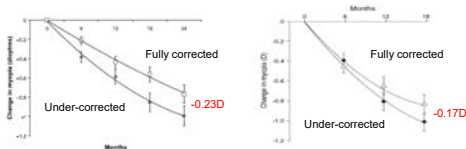


1. Irving. *Optom Vis Sci*. 1991; 2. Kistlak. *J of Med Optics*. 2010.

Centre for Ocular Research & Education

CORE
Research & Education

Spectacles (under-correction)



Under-correction of myopia with spectacle lenses **enhances** rather than inhibits myopia progression

1. Chung et al. Undercorrection of myopia enhances rather than inhibits myopia progression. *Vision Res* 2002; 42(22): 2655-9.
2. Adler & Mitchell. The possible effect of undercorrection on myopia progression in children. *Clin Exp Optom* 2006; 85(5): 315-21.

Centre for Ocular Research & Education

CORE
Research & Education

Multifocals/PALs

Centre for Ocular Research & Education

CORE
Research & Education

Bifocals or PALs

- COMET study^{1,2}
 - +2D PALs vs. single vision lenses (SVLs)

Time Point	PAL group (ΔSVL)	SVL group (ΔSVL)
Baseline	0.0	0.0
One Year	-0.15	-0.30
Two Year	-0.25	-0.50
Three Year	-0.30	-0.65

- Most of the treatment effect in year 1
- After 3 years: -0.20D less myopia progression in PAL group
- Statistically but NOT clinically significant

→ Generally, PALs & Bifocals produced only small & initial treatment effects
→ NEI: Routine prescription of PALs for myopia control NOT recommended³

¹ Gwiazda et al; IOVS 2003 ² Gwiazda et al; IOVS 2004 ³ Legerton & Chou; Rev Optom 2009

Centre for Ocular Research & Education

CORE
Research & Education

Spectacles: Novel designs

- Essilor Myopilux
 - Short corridor PAL?
 - Essilor data – 62% treatment effect

Centre for Ocular Research & Education

CORE
Research & Education

Spectacles: Novel designs

- Zeiss MyoVision Pro
 - Launched October 2018 in Canada
 - central clear zone
 - peripheral defocus
 - Zeiss data – 30% treatment effect
 - more effective on young patients
 - more effective if parental history of myopia
 - further validation required
 - » long term study data

Centre for Ocular Research & Education

CORE
Research & Education

Spectacles: Novel designs

2018.04.18
Spectacle lens designed by PolyU slows myopic progression by 60% and stops in 21.5% of children

A specially designed spectacle lens developed by The Hong Kong Polytechnic University (PolyU) was found to have slowed down myopic progress by 60% in participating children, and 21.5% of them had their myopic progression halted completely. This lens will be launched in summer this year, offering a non-contact, spectacle lens solution to myopic children.

The Defocus Incorporated Multiple Segments (DIMS) Spectacle Lens designed by Professor Carly Lam, Professor of the School of Optometry at PolyU, and Professor To Chi-ho, Henry G. Leong Professor in Elderly Vision Health and Head of the School, is designed for slowing myopic progression in children. It has won the Grand Prix, Grand Award and Gold Medal with the Congratulations of Jury at the 46th International Exhibition of Inventions of Geneva, 2018.

Centre for Ocular Research & Education

CORE
Research & Education

Spherical RGPs

Centre for Ocular Research & Education

CORE
Research & Education

Alignment Fit RGPs

- No impact on axial growth and myopia control **not** demonstrated

A Randomized Trial of Rigid Gas Permeable Contact Lenses to Reduce Progression of Children's Myopia

JOHANN KATZ, M.D., OLIVER D. SCHENK, M.D., MPH, BRUNO J. FERRAZ, D.D.S., BR. MICHAILIDIS, M.D., MARIAM ALHAJRI, M.D., MARIAM ALHAJRI, M.D., LATAKONG CHAN, CHONG TSH KHOO, FRANCIS FRANK, FASH, AND MELISSA CA

A Randomized Trial of the Effects of Rigid Contact Lenses on Myopia Progression

John J. Walline, D.O., PhD, Lisa A. Jones, PhD, Ronald D. Jones, D.O., PhD, Ronit Zuckerman, M.D., PhD

Objective: To compare the effects of rigid gas permeable (RGP) contact lenses with different peripheral defocus designs on myopia progression in children.

Methods: In a randomized, parallel, 2-year study, we compared the effects of RGP contact lenses with different peripheral defocus designs on myopia progression in children.

1. Katz et al. A randomized trial of rigid gas permeable contact lenses to reduce progression of children's myopia. *Am J Ophthalmol* 2003; 136:1: 82-90.
2. Walline et al. A randomized trial of the effects of rigid contact lenses on myopia progression. *Arch Ophthalmol* 2004; 122:12: 1760-6.

Centre for Ocular Research & Education

CORE
Research & Education

Peripheral Defocus Concept

Centre for Ocular Research & Education

CORE
Research & Education

Hyperopic Peripheral Defocus

Eye stretches to match peripheral retina to image shell

Figure modified from Smith, C. "Visual Experience & Myopia" (pdf available at: http://www.oxeye.org/invents/congress_video/day3/Session120910201209Research%20of%20Collaborators/East%20Smith%20-%20Myopia%20Research.pdf)

Centre for Ocular Research & Education

CORE
Research & Education

Hyperopic Peripheral Defocus

New strategies

- Development of **new spectacle and contact lens designs** that correct ametropia at BOTH fovea and periphery by reducing peripheral hyperopic defocus

Image shell and ocular shape closely match

Centre for Ocular Research & Education

CORE
Research & Education

Animal Models

Animal Models of Myopia and Therapeutic Options

Inhibition of Defocus-Induced Myopia in Chickens

By: Woods J, Guthrie SE, et al. *Invest Ophthalmol Vis Sci* 2013; 54:4: 2662-8.

Woods J, Guthrie SE, et al. Inhibition of defocus-induced myopia in chickens. *Invest Ophthalmol Vis Sci* 2013; 54:4: 2662-8.

Centre for Ocular Research & Education

CORE
Research & Education

Chicken model Peripheral defocus

Retinoscopy

Day	MPC lens (Test1)	Untreated eyes	MPC lens (Test2)	MPC that allow peripheral defocus	Control lens
Day 1	~1.0	~1.0	~1.0	~1.0	~1.0
Day 9	~0.5	~0.8	~0.5	~0.5	~0.5
Day 7	~0.2	~0.6	~0.2	~0.2	~0.2
Day 20	~0.1	~0.4	~0.1	~0.1	~0.1
Day 16	~0.0	~0.3	~0.0	~0.0	~0.0

Woods J, Guthrie SE, et al. Inhibition of defocus-induced myopia in chickens. *Invest Ophthalmol Vis Sci* 2013; 54:4: 2662-8.

Centre for Ocular Research & Education

CORE
Research & Education

Peripheral Defocus Correction

Figure 2. A: Concentric ring and B: progressive power multifocal lens designs where white represents distance correction and black represents the plus power treatment zone

Kang. Optical and pharmacological strategies of myopia control. Clin Exp Optom 2018; 101(3): 321-332.

Centre for Ocular Research & Education

CORE
Research & Education

Commercially available CD Multifocals

- CooperVision
 - Biofinity D multifocal*
 - Proclear D multifocal*
- J&J
 - Acuvue Oasys for presbyopia*
- Visioneering
 - NaturalVue Multifocal*
 - daily disposable lens

* Off label use if prescribed for myopia control purposes

Centre for Ocular Research & Education

CORE
Research & Education

Peripheral Defocus SCL

Centre for Ocular Research & Education

CORE
Research & Education

Myopia & SCL with Peripheral Focus Control

Effect of Dual-Focus Soft Contact Lens Wear on Axial Myopia Progression in Children

Nishi, S., Arino, S., Jones, P.D., Jaki, E., Philip, M.C., Jones, L.P., & Sankaridurg, P. (2011). Effect of Dual-Focus Soft Contact Lens Wear on Axial Myopia Progression in Children. *Ophthalmology*, 118(6), 1152-61.

Abstract: Purpose: To test the efficacy of an experimental dual-focus soft contact lens (SCL) in slowing axial myopia progression in children. Design: Prospective, randomized, control eye contact lens trial. Participants: Forty children, 11-16 years old, with a refractive error of -1.0 to -3.0 diopters. Methods: Dual-focus SCLs were fitted to control eyes that were randomly assigned to wear either a single vision (SV) SCL lens with the same parameters as the control eye assigned to wear the DF SCL or the DF SCL lens. Main Results: Axial length (AL) increased significantly more in the control eyes than in the DF SCL eyes over 12 months. Accommodation (A) was significantly higher in the control eyes than in the DF SCL eyes over 12 months. Conclusions: Axial length was a change in axial length over 12 months. Accommodation (A) was significantly higher in the control eyes than in the DF SCL eyes over 12 months.

1. Anstice et al. Effect of dual-focus soft contact lens wear on axial myopia progression in children. *Ophthalmology* 2011; 118(6): 1152-61.
2. Sankaridurg et al. Decrease in rate of myopia progression with a contact lens designed to reduce relative peripheral hyperopia: one-year results. *Invest Ophthalmol Vis Sci* 2011; 52(13): 9362-7.

Centre for Ocular Research & Education

CORE
Research & Education

Commercially Available CD MF Study

- 8-11 yr-olds
 - N=40 for 2 yrs
- CD MF with +2D add
 - Proclear "D"
- Compared against age-matched prior group wearing SV SCL
- Soft MF CL wear resulted in a **50% reduction** in the progression of myopia and a **29% reduction** in axial elongation during the 2-year treatment period

Walline et al.: Multifocal contact lens myopia control. *Optom Vis Sci* 2013; 90(11): 1207-14.

Centre for Ocular Research & Education

MiSight™
ActivControl™ Technology

- Daily disposable
- Proclear material (omafilcon A)
- Multizone, dual-focus design
 - 2D myopic defocus
- **Increasingly available**
 - UK launch spring 2017
 - Canada launch Jan 2018

1. Anstice & Philipps - Effect of dual-focus soft contact lens wear on axial myopia progression in children. *Ophthalmology* 2011; 118(6): 1152-61.
2. Kolbaum et al. Vision performance with a contact lens designed to slow myopia progression. *Optom Vis Sci* 2013; 90(3): 200-14.

Centre for Ocular Research & Education

Seven-year clinical study

- Phase 1**
 - Three years
 - Parallel group - Test and control
 - Double masked
- Phase 2**
 - Three years
 - All wearers in MiSight® 1 Day
 - No masking
- Phase 3**
 - One further year
 - Assessment of post-treatment effect (potential rebound)
 - No masking

Centre for Ocular Research & Education

MiSight® trial - 0 to 36 months

Age: 8-12
Randomized Double Masked
Sites: UK, Portugal, Singapore, Canada

144 Subjects Enrolled

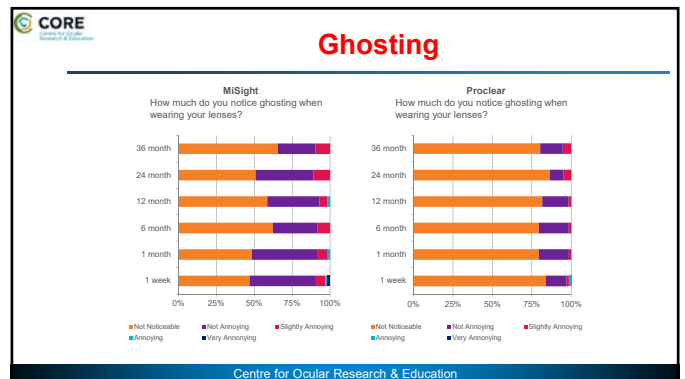
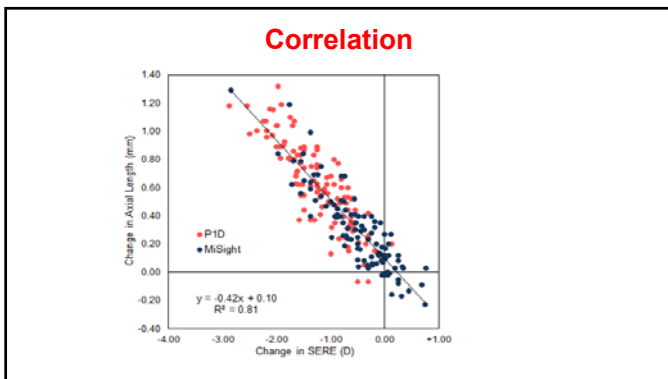
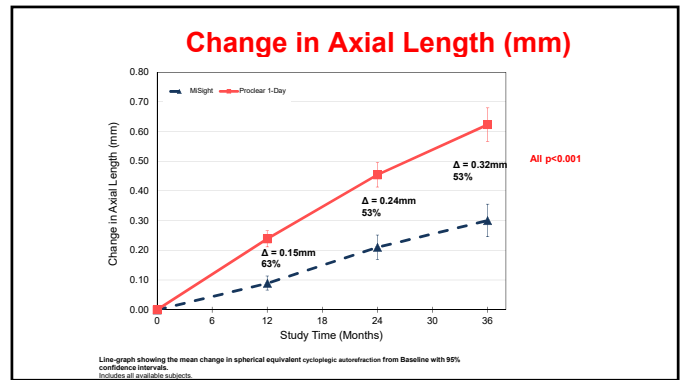
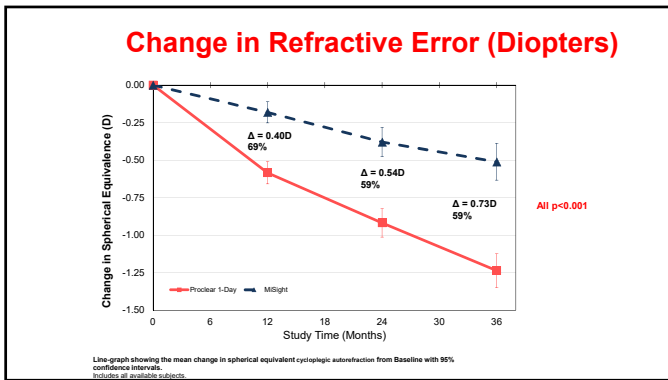
74 Subjects Dispensing Visit

56 Subjects 36-Month Visit

70 Subjects

53 Subjects

Centre for Ocular Research & Education



Seven-year clinical study

- Phase 1**
 - Three years
 - Parallel group - test and control
 - Double masked
- Phase 2**
 - Three years
 - All wearers in MiSight® 1 Day
 - No masking
- Phase 3**
 - One further year
 - Assessment of post-treatment effect
 - No masking

Centre for Ocular Research & Education

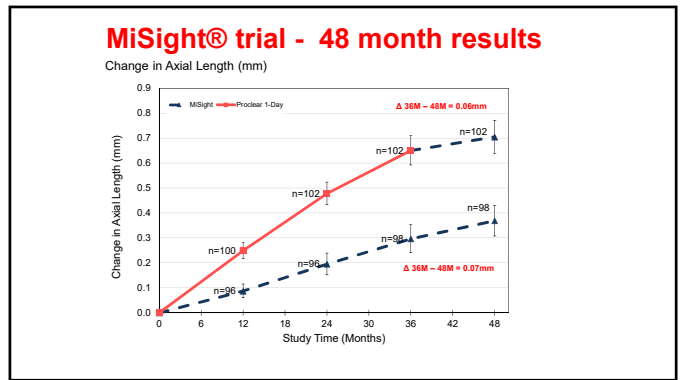
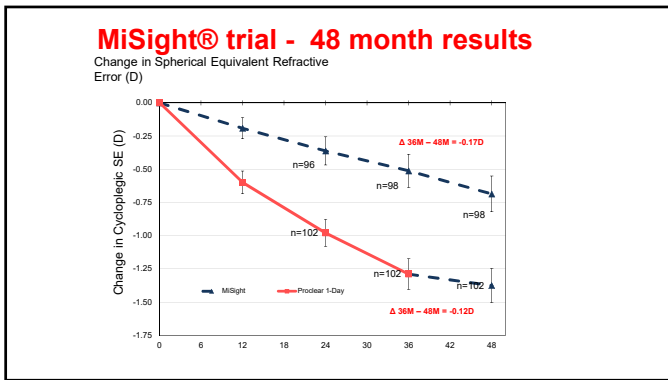
MiSight® trial - 36 to 48 months**

**** Age 11-15 at new Baseline**

- All DC within 4 weeks of fitting
- 4/5 DC were vision related

**** Trial will continue through 72 months**

1 subject ineligible at 36M
2 decided specs were more convenient
1 moved away



Summary of Phase 2 data

- Switching into MiSight® from single vision correction requires clear expectation on vision effects to maximise uptake
- Treating a child at any age is beneficial – but starting earlier is better
- Don't be put off because of fast progression in one year

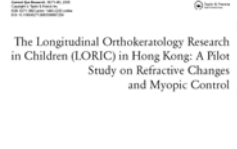
Centre for Ocular Research & Education

Orthokeratology

Centre for Ocular Research & Education

Ortho-K Lenses?

- Orthokeratology CL slow the growth of the eye by about 50%



The Longitudinal Orthokeratology Research in Children (LORIC) in Hong Kong: A Pilot Study on Refractive Changes and Myopic Control

Corneal reshaping and myopia progression


1. Cho et al.: The longitudinal orthokeratology research in children (LORIC) in Hong Kong: a pilot study on refractive changes and myopic control. *Curr Eye Res* 2005; 30:1: 71-80.

2. Walline et al.: Corneal reshaping and myopia progression. *Br J Ophthalmol* 2009; 93:9: 1161-5.

Centre for Ocular Research & Education

MK & OK?

- High number reported
 - Young children – devastating results
 - Pseudomonas* & *Acanthamoeba*
- Associated with
 - poor fitting
 - poor education
 - practitioner and patient
 - use of tap water
 - use of low Dk materials




Microbial Keratitis in Overnight Orthokeratology: Review of the First 50 Cases

Watt & Swarbrick: Microbial keratitis in overnight orthokeratology: review of the first 50 cases. *Eye Contact Lens* 2005; 31:5: 201-8.

Centre for Ocular Research & Education

MK & OK?

- 1317 patients
- 640 adults (49%) and 677 children (51%)
- 2599 patient-years of wear
- Risk of MK with overnight corneal reshaping contact lenses is similar to that with other overnight modalities




The Risk of Microbial Keratitis With Overnight Corneal Reshaping Lenses

Bullimore et al.: The risk of microbial keratitis with overnight corneal reshaping lenses. *Optom Vis Sci* 2013; 90:9: 937-44.

Centre for Ocular Research & Education

OK & Rebound Effect?

- Subjects aged 8-14 yrs stopped OK after 2 yrs and resumed spec wear for 6 months
- Control group continued with OK use for 6 months
- Subjects who stopped OK had significant increase in axial length
- This was reversed if they recommenced OK wear
- "The results of this study suggest that early termination of OK treatment may not be recommended and, in case of discontinuation, it would be prudent to continue to monitor axial elongation after stopping lens wear for at least 6 months and to resume lens wear if rapid axial elongation was observed during the discontinuation period"



Choi & Cheung: Discontinuation of orthokeratology on eyeball elongation (DDEF). *Cont Lens Anterior Eye* 2017; 40:92-7.


Centre for Ocular Research & Education

Summary

Centre for Ocular Research & Education

When to intervene?

- Biggest impact on younger myopes
 - In particular fast progressors – greater than 0.50D per year
- Consider options/compliance
 - Contact lenses
 - Spectacles
 - Pharmaceuticals
- Manage expectations



Centre for Ocular Research & Education

CORE
Research & Education

Safety of SCL in Kids?

- Review of MK & IK in patients <18 yrs old – 19 studies
- “The overall picture is that the incidence of corneal infiltrative events in children is no higher than in adults, and in the youngest age range of 8 to 11 years, it may be markedly lower”*

Age Range (years)	CIE (per 100 patient-years)	IK (per 100 patient-years)	Total (per 100 patient-years)
8-11	~10	~5	~15
12-17	~25	~10	~35
18-24	~45	~15	~60
25-65	~35	~10	~45

Bullimore. The Safety of Soft Contact Lenses in Children. Optom Vis Sci 2017;94:638-46.

Centre for Ocular Research & Education

CORE
Research & Education

Risks Associated with CL Wear

Am I placing a child at risk of contact lens related infection?
Lifetime risk of Microbial Keratitis:
 Daily wear (DD) 1 in 75

Am I placing a child at risk of myopia associated pathology if I do nothing different?
Lifetime risk of retinal detachment (>-5.00D)
 Retinal detachment 1 in 20

Case for offering contact lenses for myopia control outweighs the risk of allowing myopia to develop unabated

Gifford P, Gifford KL. The Future of Myopia Control Contact Lenses. Optom Vis Sci 2016; 93-4: 336-43.

Centre for Ocular Research & Education

CORE
Research & Education

Thanks for your attention

Centre for Ocular Research & Education