

# Management der Myopieprogression mittels Kontaktlinsen

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# Disclosure

- None
- Recognition for :  
Dr. Kate Johnson and  
Dr. Martin Lörtscher

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# Goals

- Why bother with Myopia Control?
  - Risk Profile
- Understand the science of Myopia Control
  - Central vs peripheral Retina Imaging
  - Dual Vision and Ortho-Keratology
- Putting Science into daily Praxis
  - Patient Selection and Management

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# Why Myopia Control?

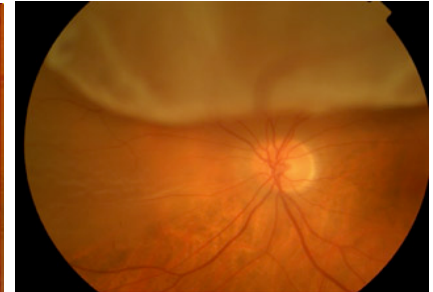
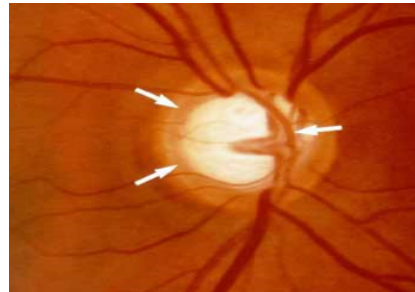
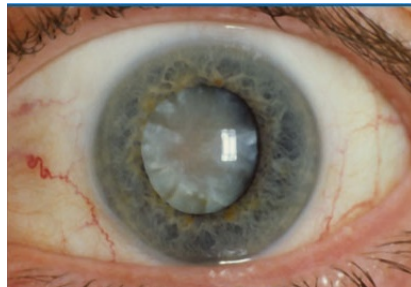


freedom from myopia



# Why Myopia Control?

	Cataract (PSCC)	Glaucoma	Retinal detachment
-1.00 to -3.00	2	4	4
-3.00 to -6.00	3	3	10
-6.00 or more	5	4	16



Lim et al, IOVS 1999; Mitchell et al, Ophthalmol 1999; The Eye Disease Case-Control Study Group, Am J Epidemiol, 1993; Beijing Rhegmatogenous Retinal Detachment Study Group, Ophthalmol 2003.

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# Why Myopia Control?

- Brennan (CLAE 2012) showed that slowing down the progression rate is eminent for prevention of high myopia ( $> -6\text{dpt}$ ).

Reducing myopia progression by	Reduction in frequency of high myopia
33%	73%
50%	90%

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# Etiology of Myopia

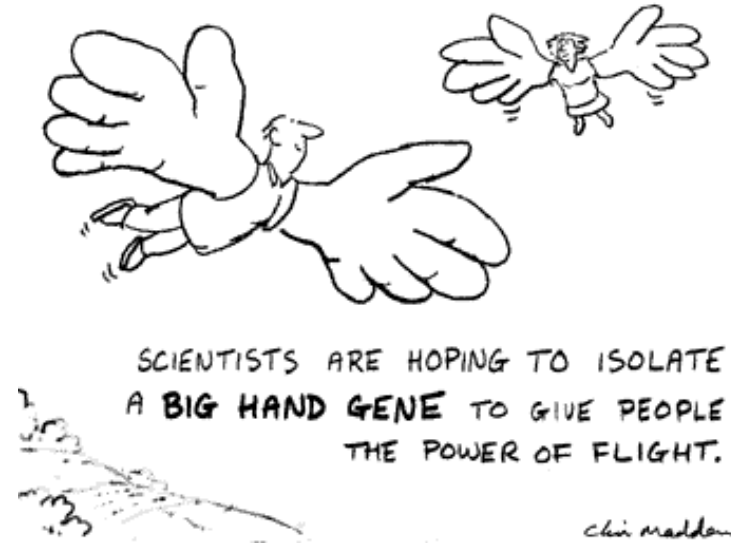
- Genetics

## Parents:

- One myopic parent = 2x risk
- Two myopic parents = 5-6x risk

## Ethnicity:

- 20% - 30% in USA, Europa, Ozeanien
- Over 80% in some parts of Asia



Morgan et al 2005, Pacella et al 1999; Zadnik 1997; Rose et al 2008, Ip et al 2008; Azizoglu et al 2011; Junghans et al 2005; Morgan et al 2005

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# Etiology of Myopia

- Environment
  - Less than 1.5hours outdoor activity **PLUS**
  - high near work demand more than 3hours beside school / college

Jones-Jordan et al 2010

Lack of Vitamin D ?  
Focusing ?  
Convergence ?

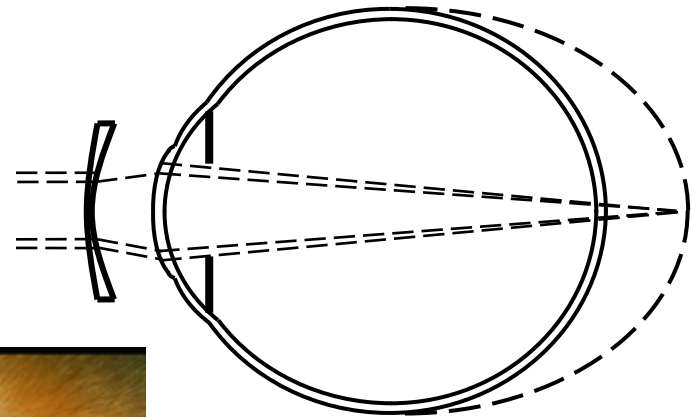
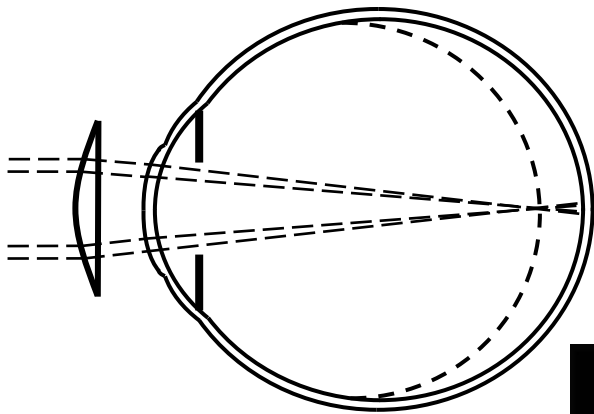


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# Etiology of Myopia

- Central Defocus



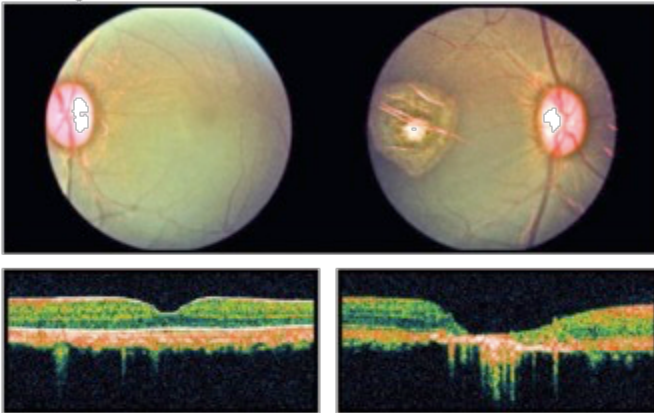
Hyperopic  
defocus

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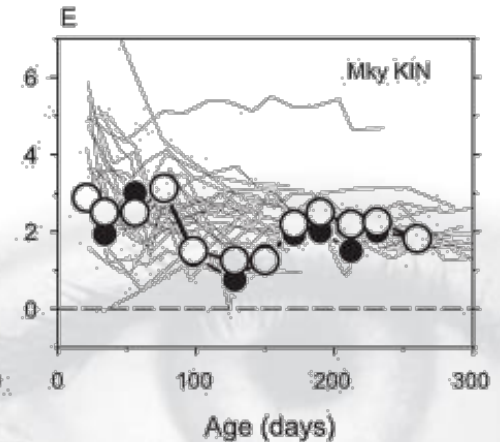
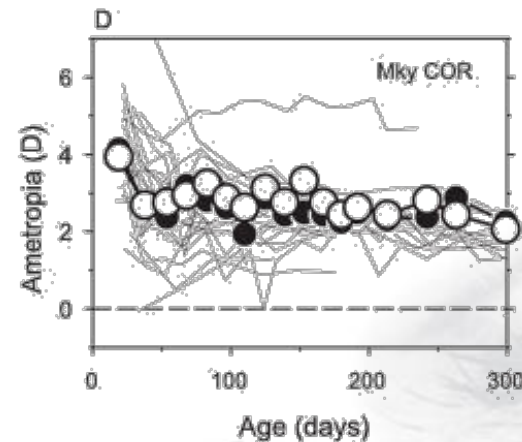
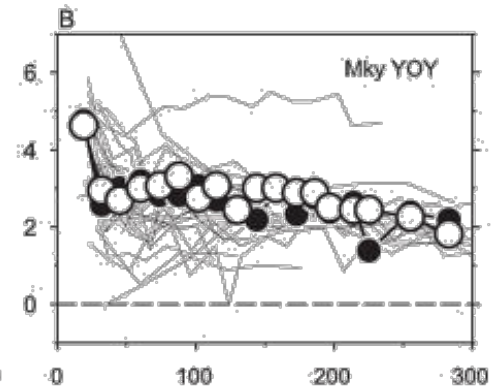
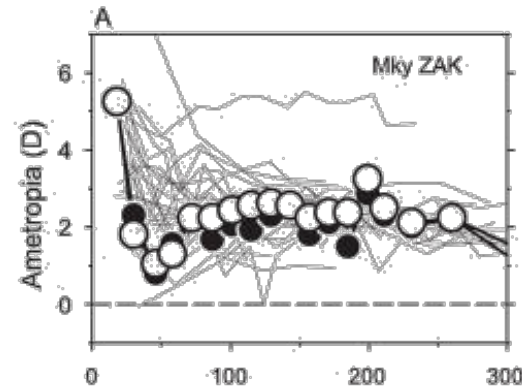
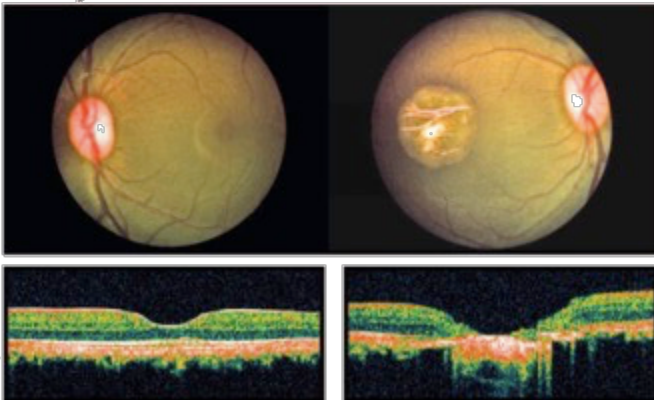
# Etiology of Myopia

- Peripheral Defocus (Smith et al 2007)

A. Mky FID



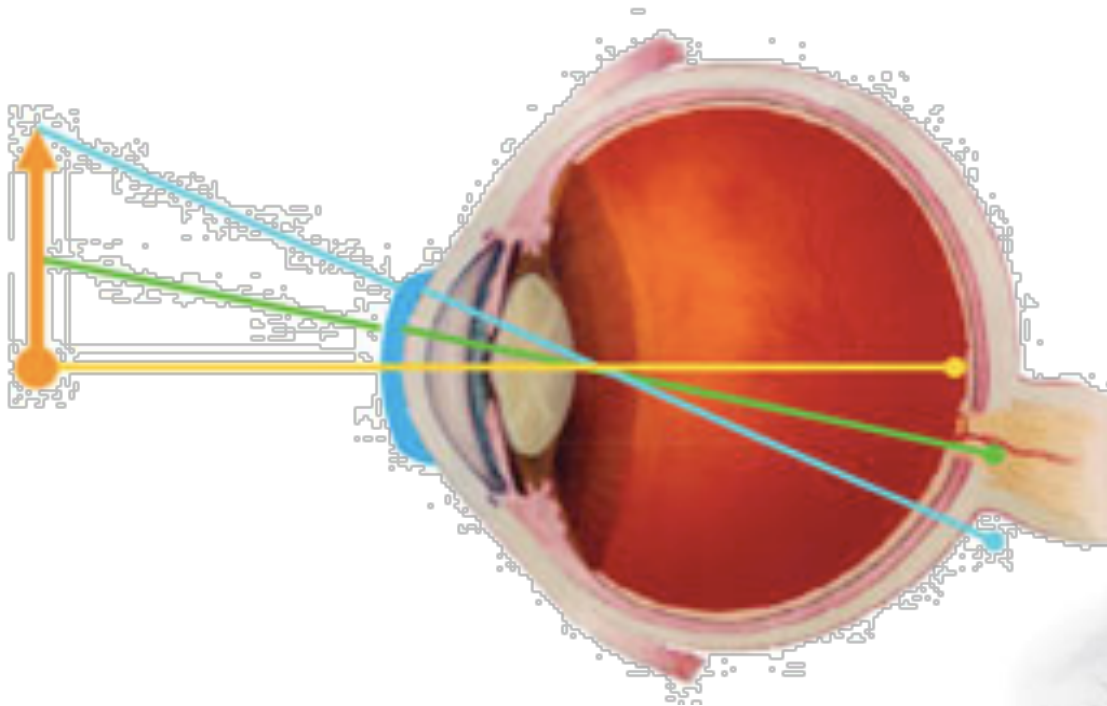
B. Mky KIN



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# Etiology of Myopia

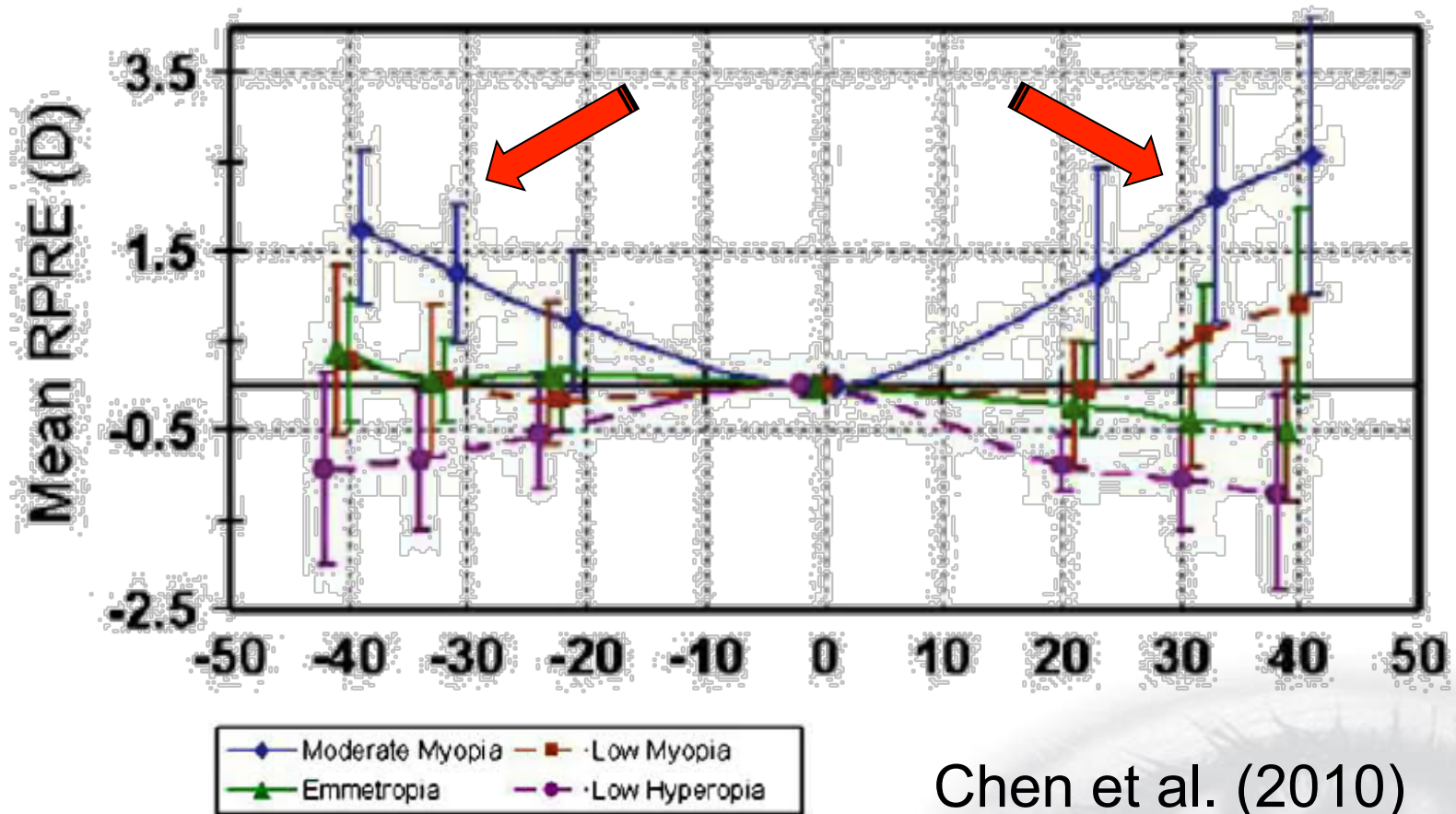
- Relative peripheral Hyperopia  
(Relative Peripheral Defocus RPD or  
Relative Peripheral Refractive Error RPRE)



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# Etiology of Myopia



Chen et al. (2010)

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# Myopia Control Strategies

Method	Reduction in axial length grow		
Atropine	30% - 77%	✓	
Monovision	48%	(✓)	←
Normal RGP or Hydrogels	0% - 5%	✗	
Spectacles (PAL, Bifocal)	12% - 55%	(✓)	
Spectacle MyoVision (Refractive Radial Gradient)	0% - 29%	✗	
Multifocal Hydrogel (DualFocus, Proclear D, Biofinity D)	29% - 69%	✓	←
Orthokeratology	32% - 100%	✓	←

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# Monovision

- Monovision Study Design Phillips (2005)
- 13 Children (One eye full correction, the other eye max 2.00 D under correction)
- Years of age 11 – 13
- Monitoring
  - Cyclo Autoref
  - Ultrasound axial length

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# Monovision Results

- The full corrected eye was accomodating for near targets!
- Myopia Progression

N = 13	Corrected eye	Undercorrected eye	Reduction of Progression in %
SER (D/yr)	-0.72 ± 0.32	-0.32 ± 0.30	56%
VCD (mm/yr)	0.29 ± 0.11	0.15 ± 0.12	48%
Time	18.7 Month		

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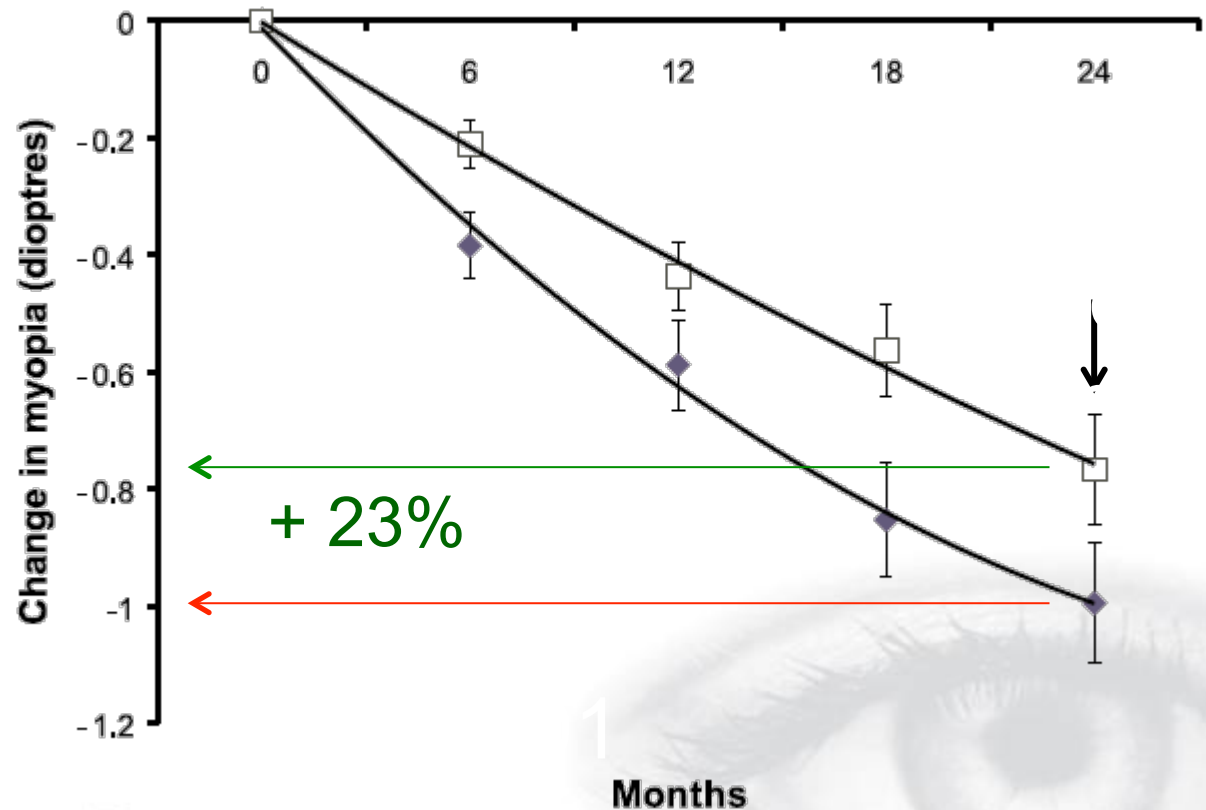


# Binocular Undercorrection

- Chung et al (2002) 0.75 D undercorrection

N= 94

Age 9 -14

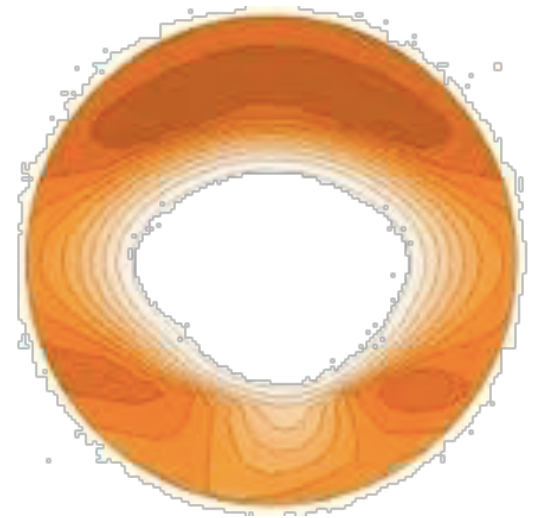


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# Refractive Radial Gradient

- Reduction of relative peripheral Hyperopia
  - 210 Children, years 6 – 16
  - Cyclo autorefraction & Biometry
  - 4 Groups
    - SV Spex (n=50)
    - 3 new Typ SV
- Result: same effect on myopia progression in all 4 groups

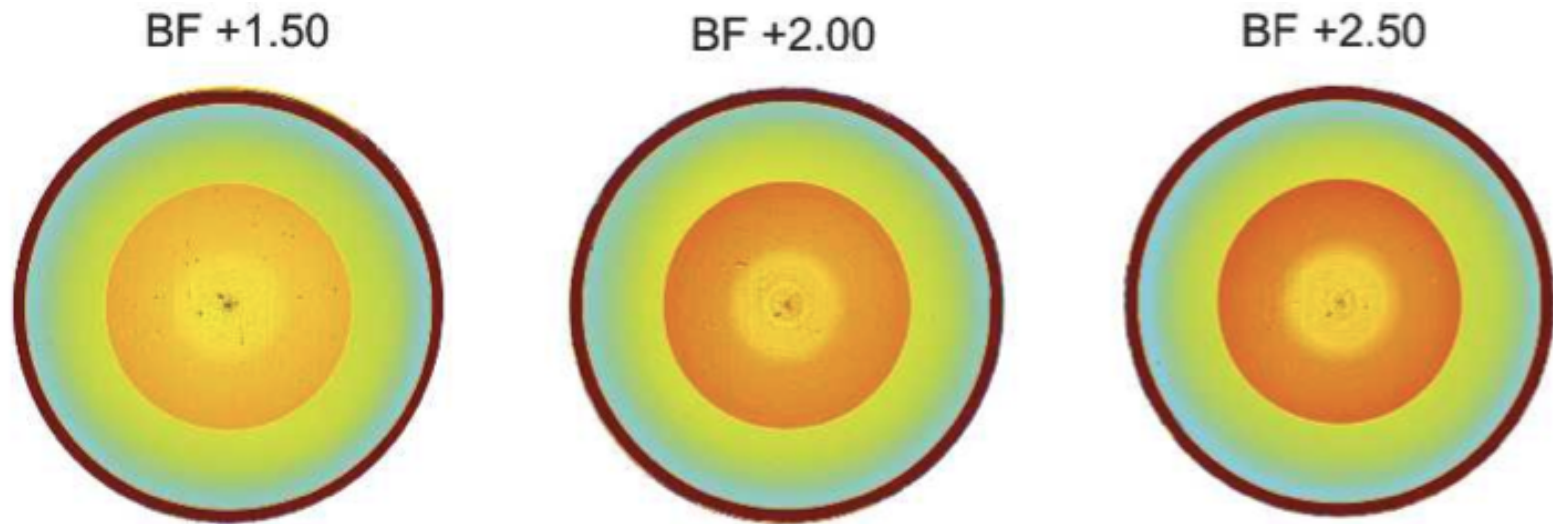


*Sankaridurg et al, 2010*

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# Biofinity Bifocal (D)



Yellow = Distance / Red = Treatment zones

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# Biofinity Bifocal (D)

Multifocal Hydrogel (DualFocus,  
Proclear D, Biofinity D)

29% - 69%



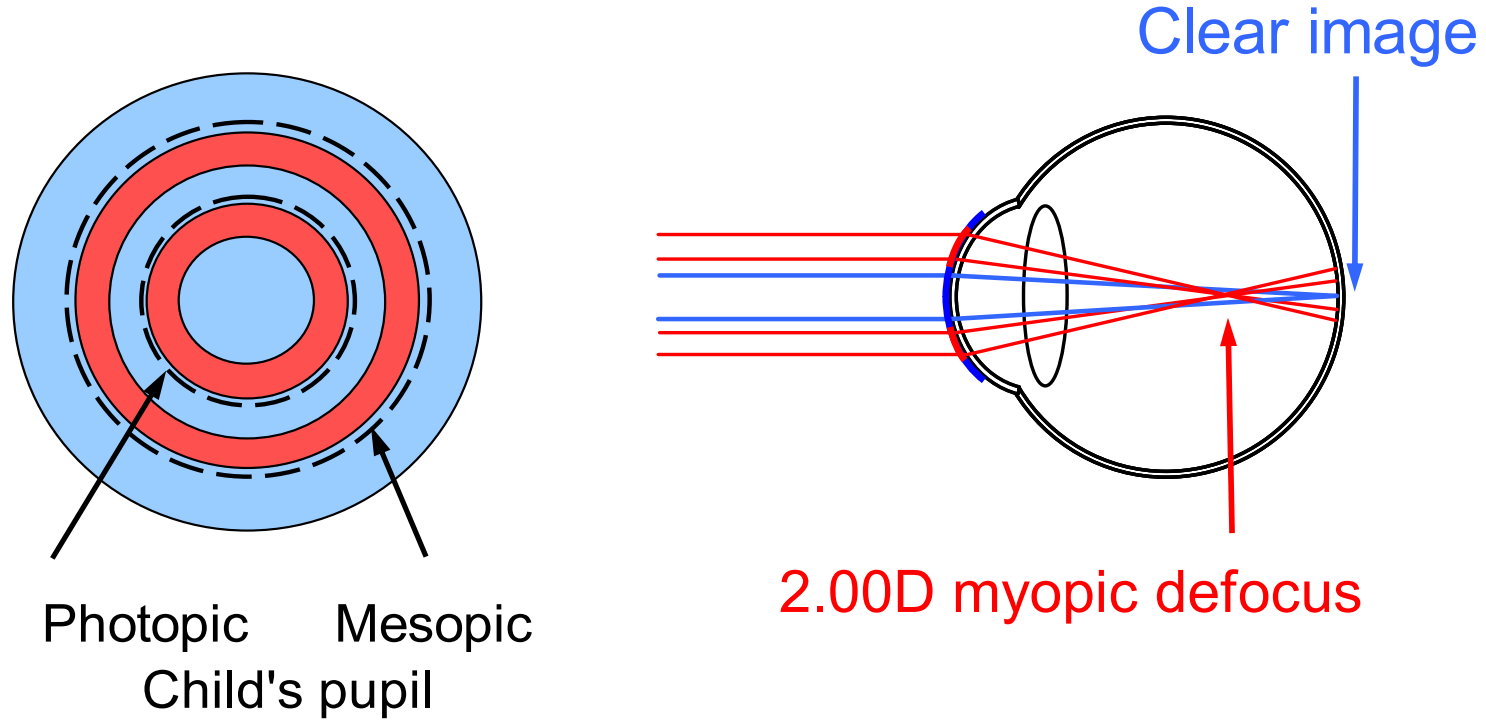
- ✓ Good starting point for lower grade or slower progressing Myopia.
- ✓ Different Add. options. (+1.0/+1.5/+2.0/+2.5)
- ✓ Daily Wear or Extended Wear possible.

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# Dual Focus contact lens

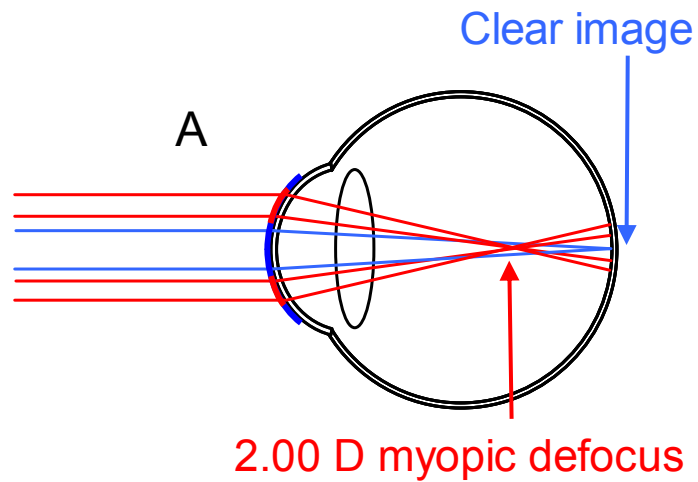
(MySight Cooper)



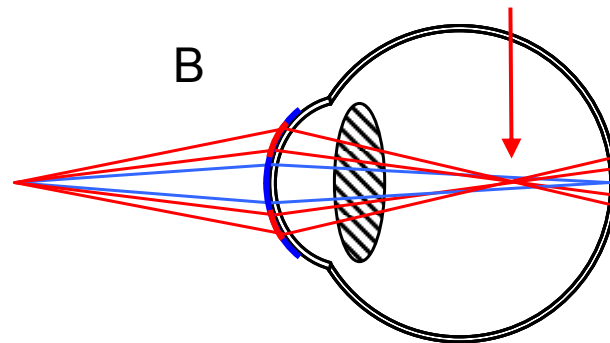
Blue = Distance / Red = Treatment zones

Anstice & Phillips (2011)

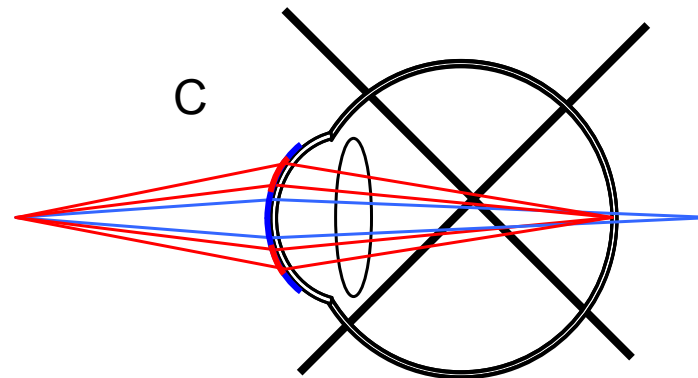
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DF @ Distanz  
(& Bi-focal)



DF @ Nähe



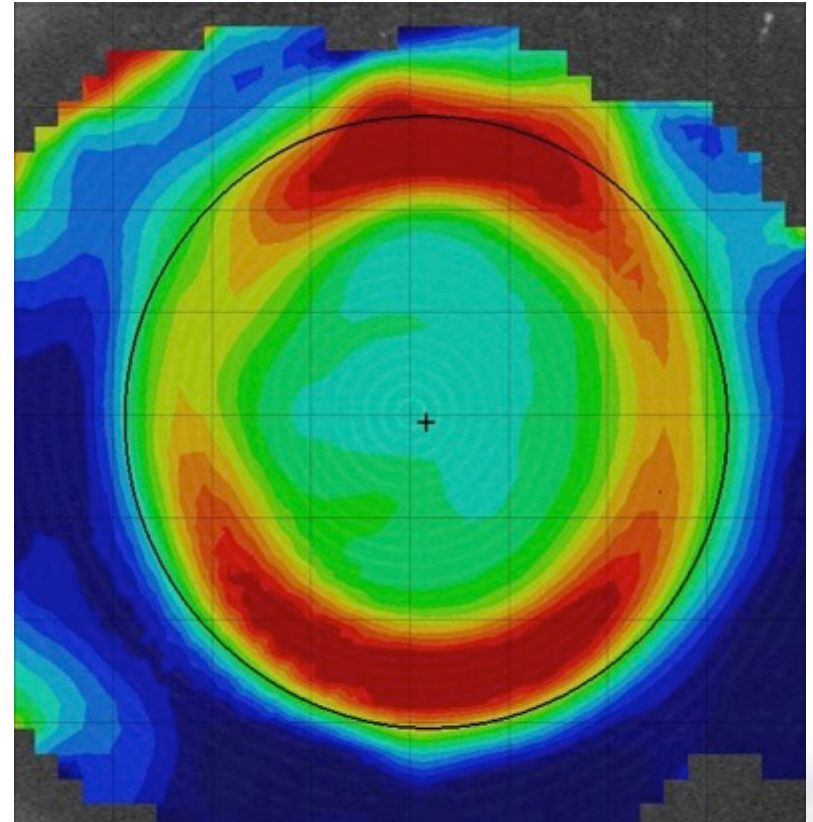
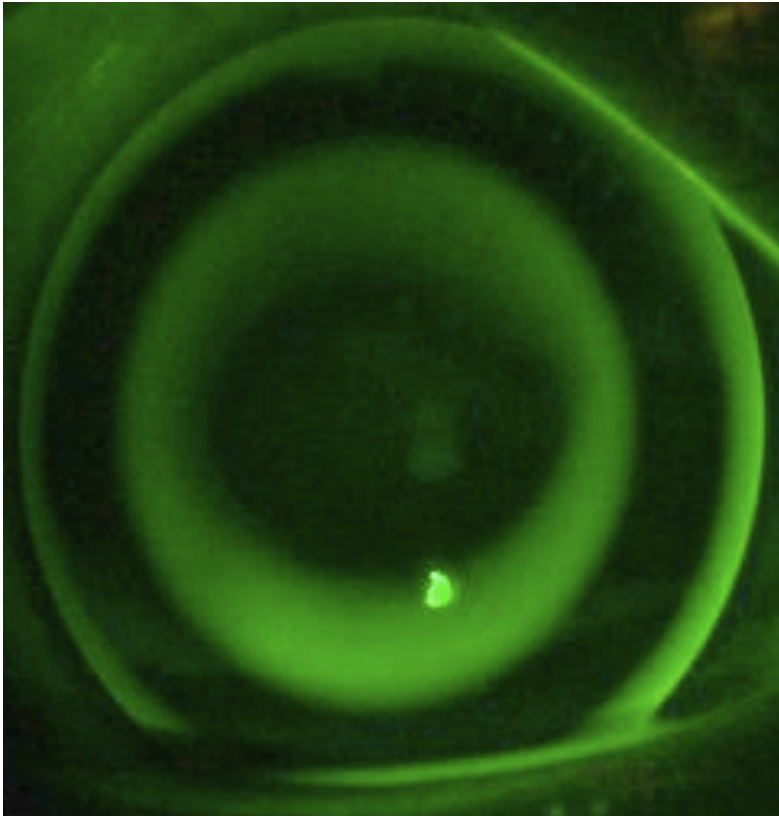
Bi-focal @ Nähe

# Simultaneous Defocus Results

Study	control	Age (yrs)	n	Reduction in myopia progression (SER)	Reduction in eye elongation
Anstice & Phillips 2011	Contralateral SVCL	11-14	40	37%	49%
Lam et al. 2013	SVCL	8-13	49	25%	32%
Walline, Greiner et al 2013	Historical SVCLs	8-11	31	50%	29%

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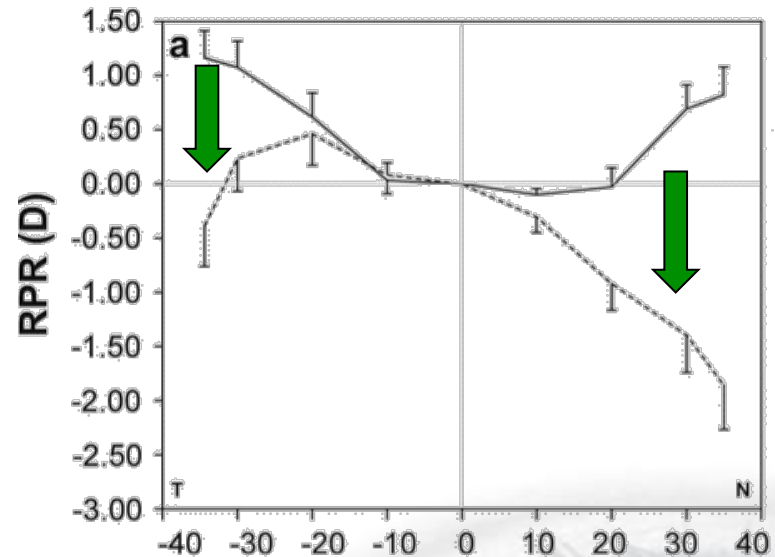
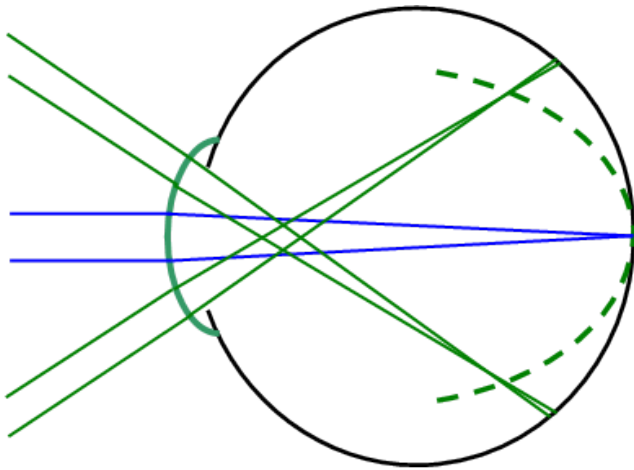
# Orthokeratology



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# Orthokeratology Hypothesis

- Ortho-K changes the relative peripheral defocus from Hyperopic to a Myopic defocus



Kang & Swarbrick (2011)

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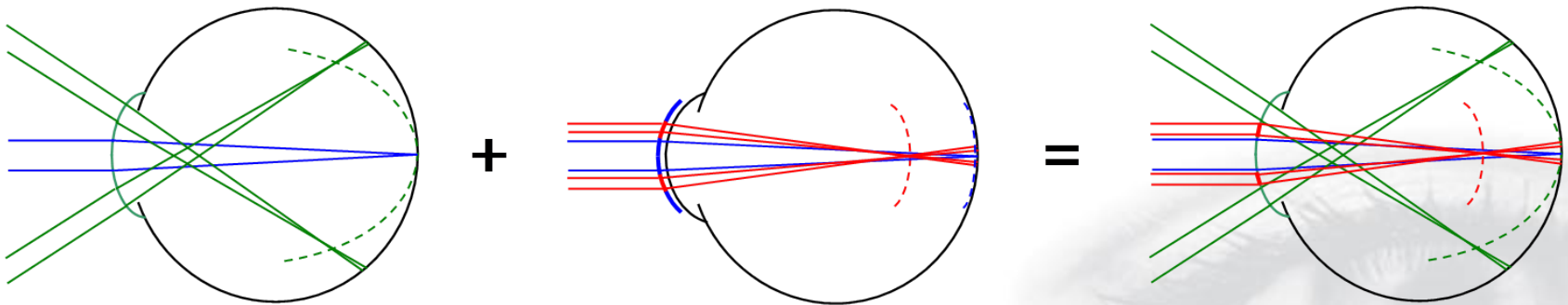
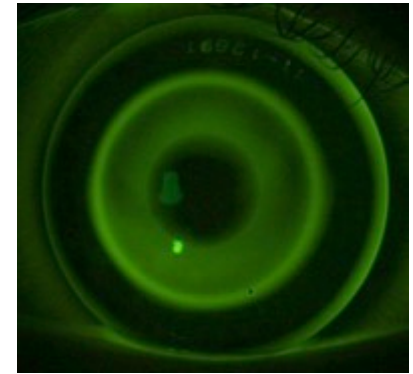
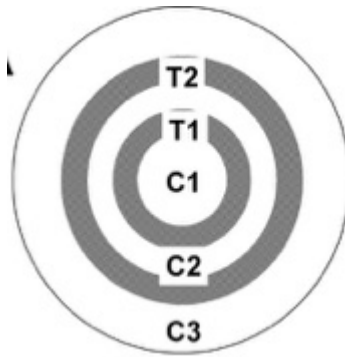
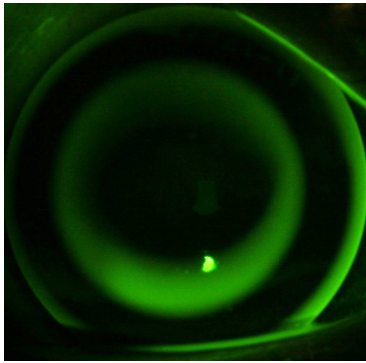


# Orthokeratology Results

Study	control	Age (yrs)	n	Drop-out	Reduction in axial elongation
Cho et al 2005	Specs	7 - 12	43	19%	46%
Walline et al 2009	SCLs	8 - 11	40	30%	55%
Kakita et al 2011	Specs	8 - 16	105	23%	36%
Hiraoka et al 2012	Specs	8 - 12	43	27%	31%
Santo-Rubido 2012	Specs	6 - 12	61	13%	32%
Cho & Cheung 2012	Specs	7 - 10	78	24%	43%

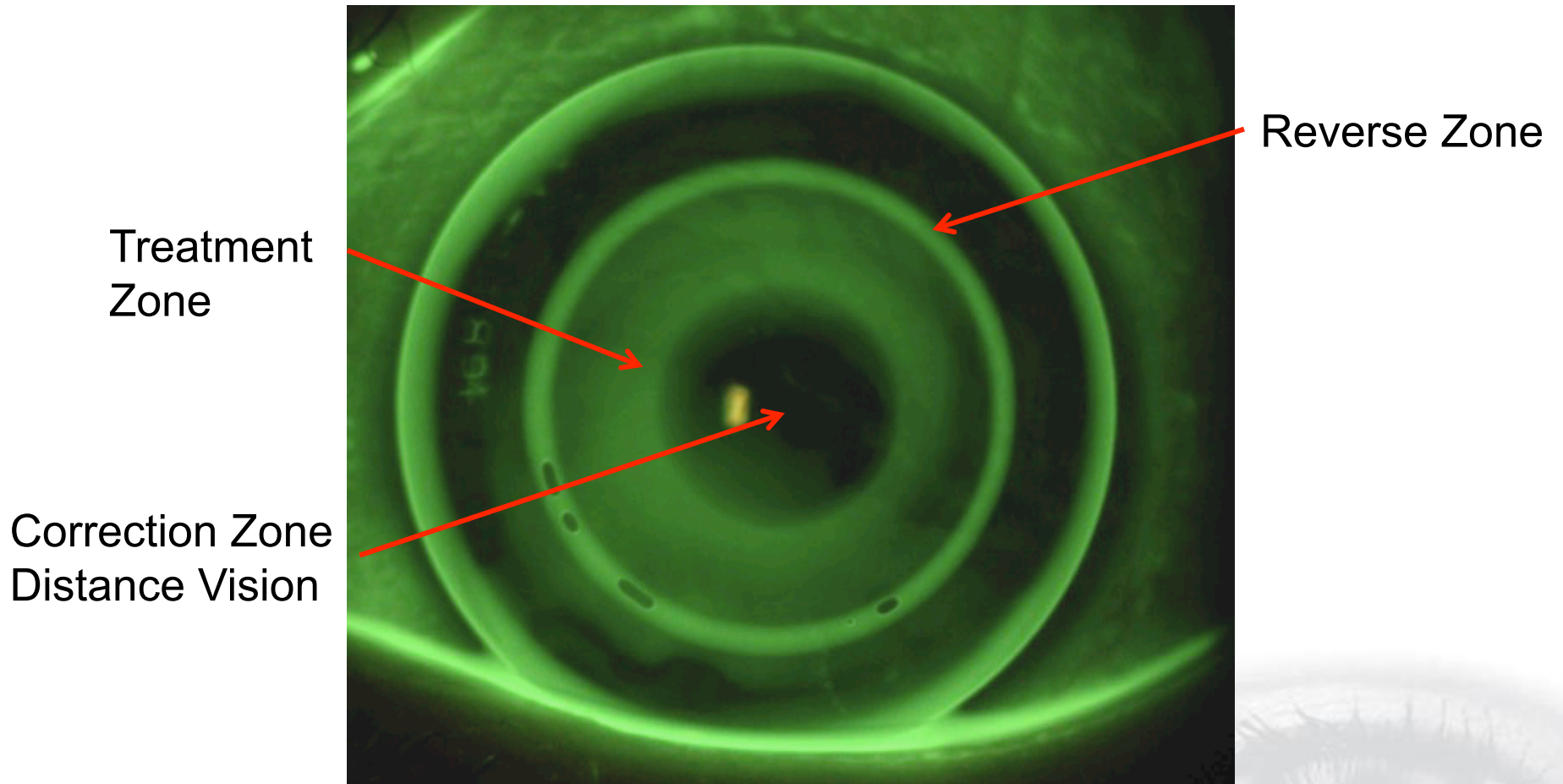
# Multifokal Orthokeratology (MOK)

Loertscher / Phillips et al (2014)



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# MOK Fluorescein Pattern



© Falco

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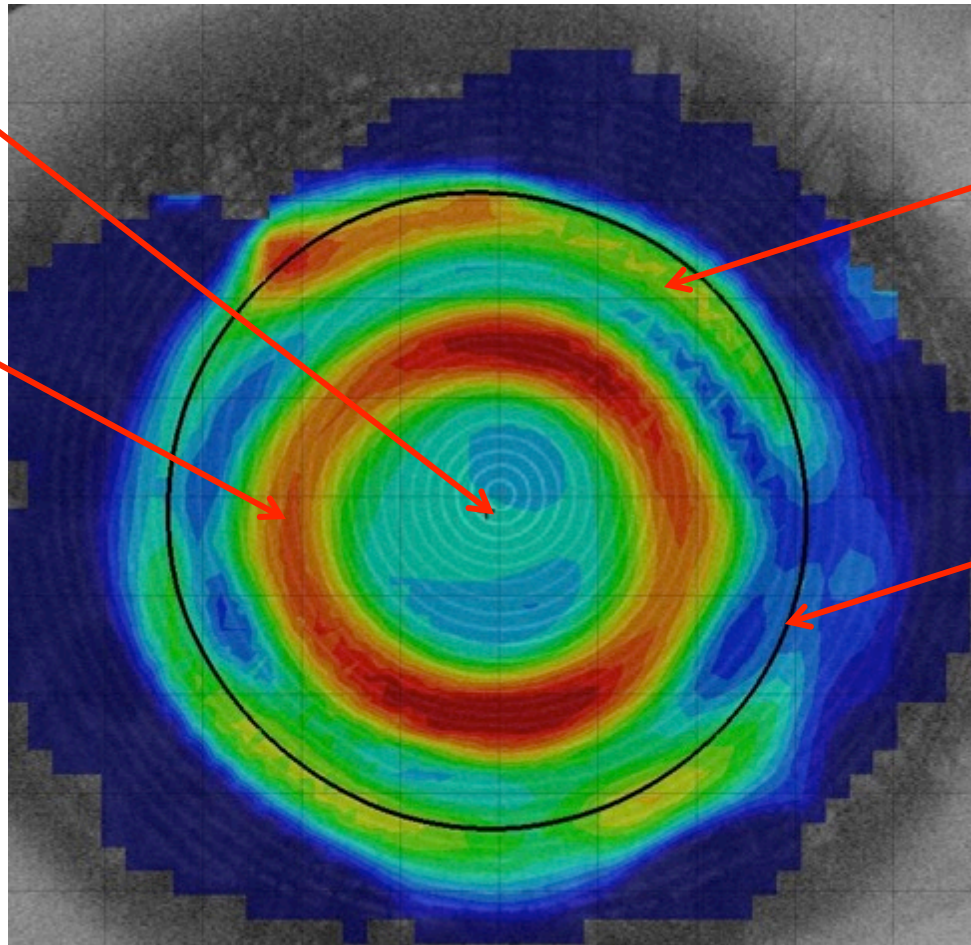
# MOK Topography

Correction Zone  
Distance Vision

Treatment  
Zone

Reverse Zone

Pupil



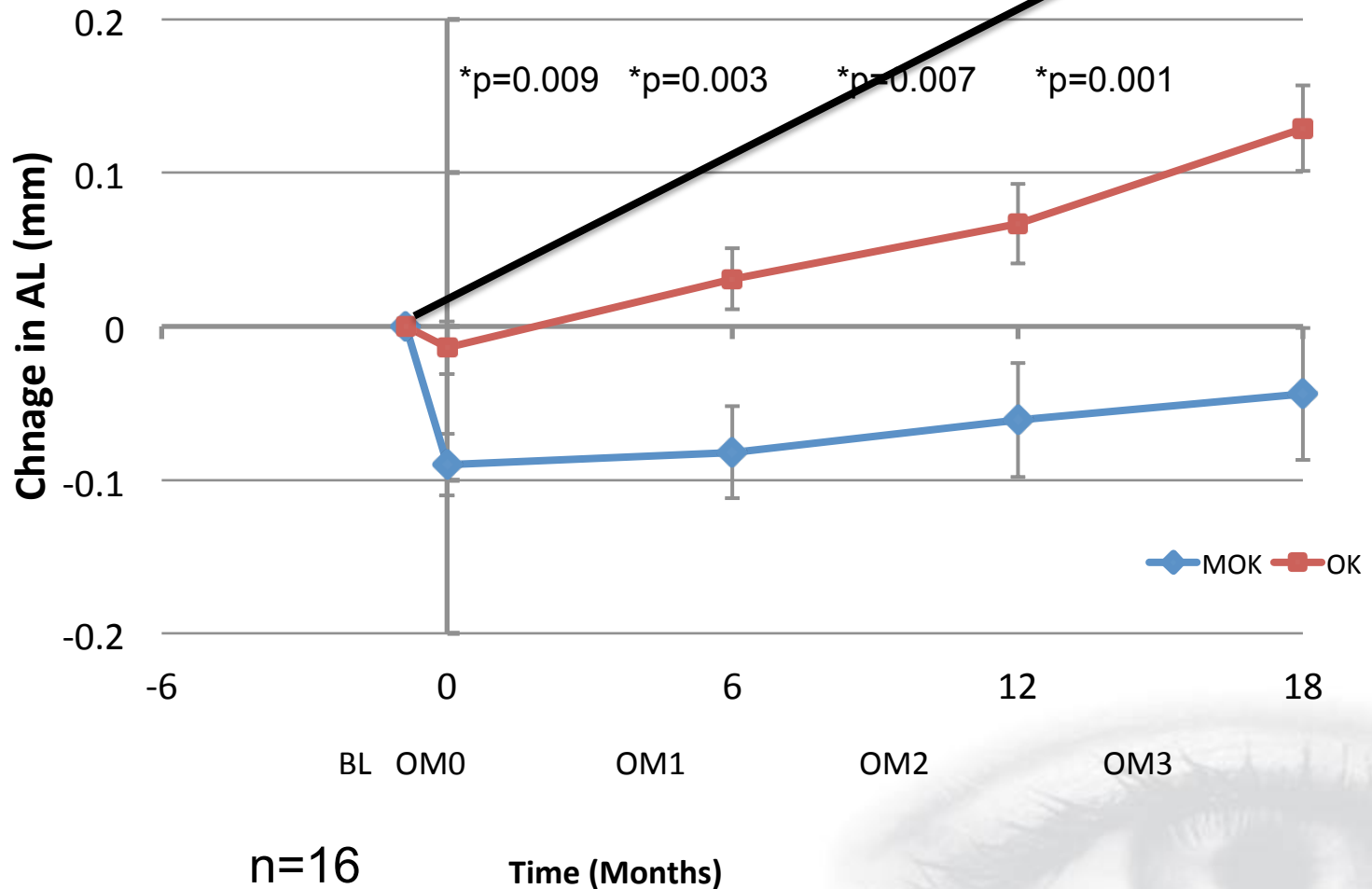
© Lörtscher

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# MOK Axial length

Loertscher / Phillips et al (2014)

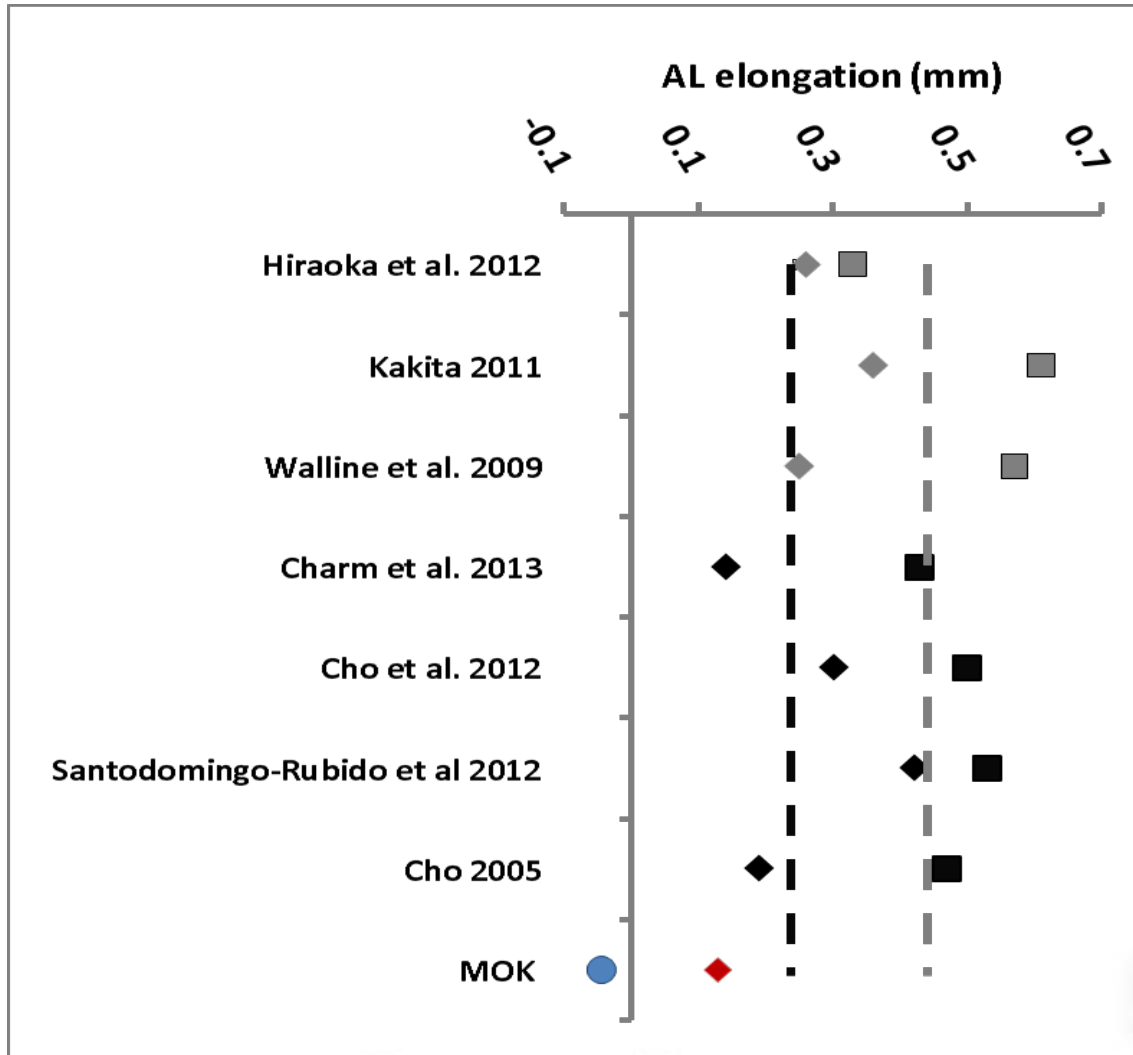
Phillips 2005  
0.29mm



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# MOK Comparison

Loertscher / Phillips et al (2014)

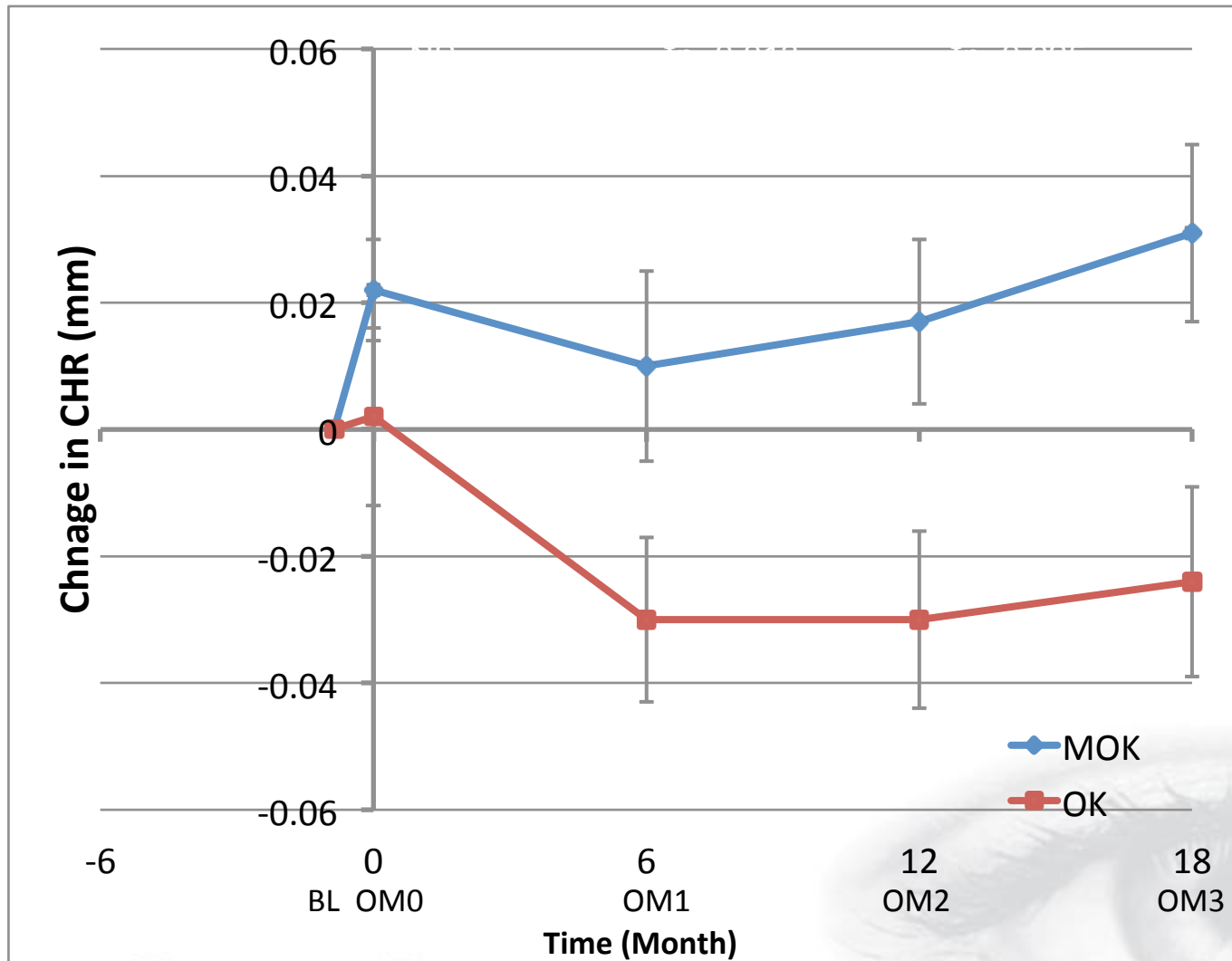


◆ Orthokeratology  
■ Spectacle

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# MOK - Choroidal Thickness

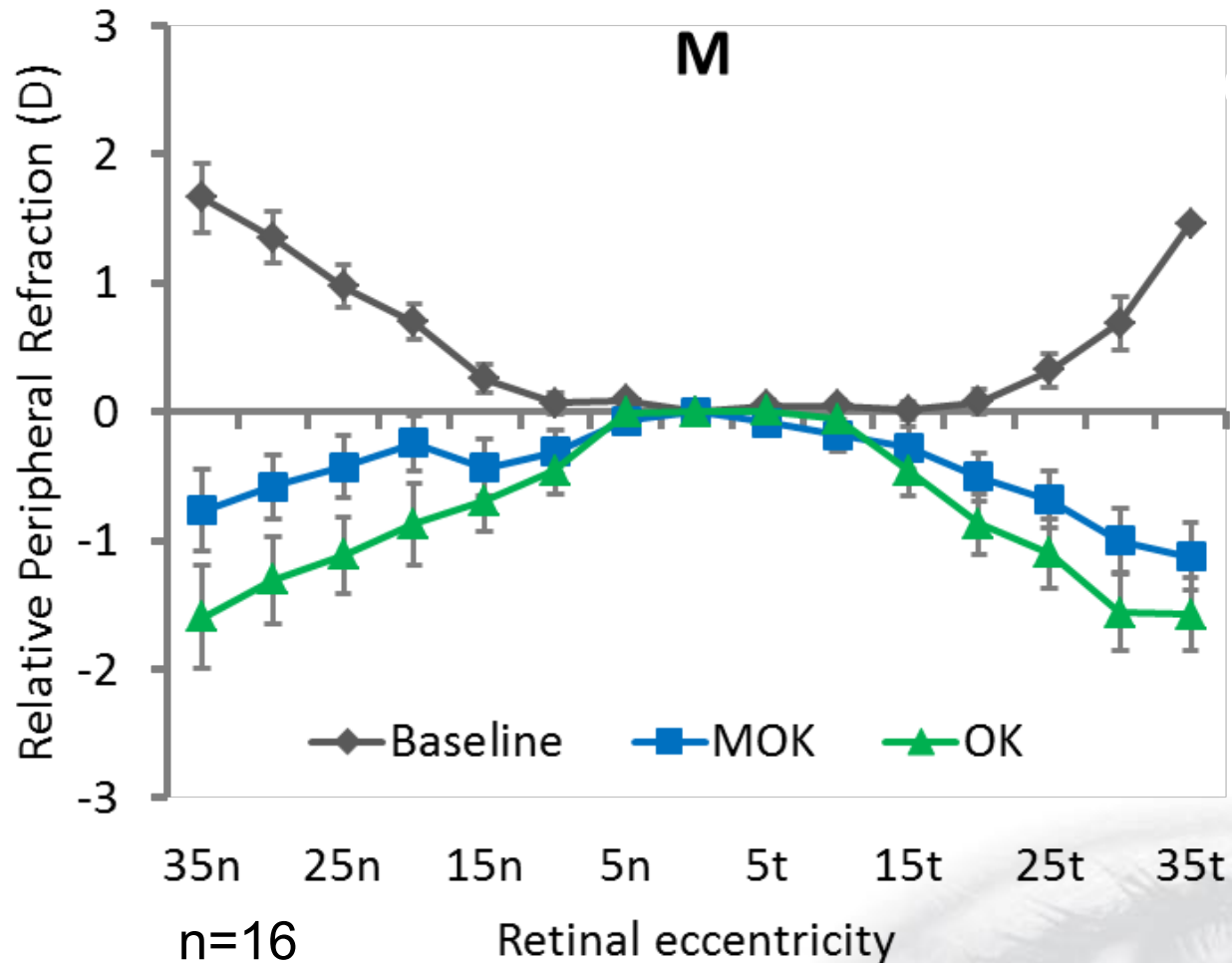
Loertscher / Phillips et al (2014)



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# MOK – RPR

Loertscher / Phillips et al (2014)



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# MOK – Theory

- Central defocus causes increasing thickness of Chorioidea
  - Cholinergic antagonists (e.g. atropine) responsible for thickening of Choriodea and prevent the development of defocus driven myopia in animals
- Central– Simultaneous defocus seems to have a bigger impact than peripheral defocus alone
- Additive Effect of central and peripheral defocus is possible

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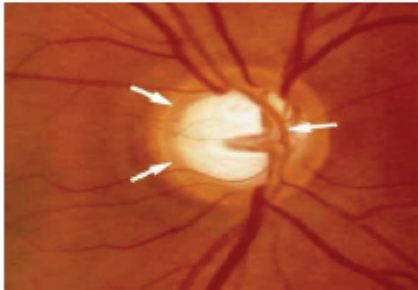
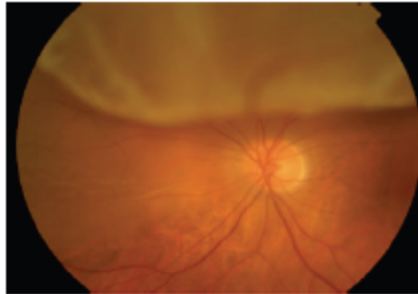
# MOK – Fitting principles

- Fitting accordingly to normal Ortho-K
  - Distance Vision need an extra week longer to fully achieve
  - Corneal Astigmatism can be corrected up to 4.0 D
  - 6month follow up
  - yearly exchange of contact lenses

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# Myopia Risks vs CL Risks



VS



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# Myopia Risks vs CL Risks

	Risk per year	Lifetime risk
Retinal detachment (any)	0.005 to 0.03%	1 in 50 - 1 in 300 1 in 20 over -5.00D
Retinal detachment after cataract surgery	0.5 to 1.6% High myopes: up to 7%	1 in 65 - 1 in 200 1 in 14
Retinal detachment with 6/12 or worse	5 x risk in -1.00 to -3.00 12 x risk in -3.00D or more	
Glaucoma	1.5% in normal eyes 4.2% in -1.00D or more	1 in 66 1 in 24
Microbial keratitis (any)	Daily wear DD 0.02% Daily wear SiH 0.12% Extended wear 0.2%	1 in 75 1 in 13 1 in 8
Microbial keratitis with 2 line loss of BCVA	Daily wear DD 0% Daily wear SiH 0.01% Extended wear 0.03%	0 1 in 150 1 in 50

Gariano et al 2004, Ivanisevic et al 2000, Li et al 2003, Stapleton et al 2008, Mitchell et al 1999, Wilkes et al 1982, Lim et al 1999

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# Myopia Risks vs CL Risks

- Lifetime risk of **retinal detachment** in  $>5D$  myopia is 3.5x higher than MK with DD contact lenses
  - 2.5x higher with loss of BCVA with EW SiHy
- Lifetime risk of **Glaucoma** in  $>1D$  myope is 2x higher than risk of MK with loss of BCVA with EW SiHy

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# Summary

- There is evidence today that Myopia Control is working extremely well
  - Eye care practitioner are responsible to be active and to inform patients properly
- Biometry (axial eye length measurement) as the only valuable reference for Myopia control should be done yearly

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# Summary

- As we deal with young adults and children, proper instructions on handling, after care plan and emergency management is vital !





# Darf ich hier fragen? Antworten ?



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