


Myopia control

The new frontier for optometry

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DISCLOSURE

- I have received funding from the following bodies for lectures, key opinion leader/product feedback, and research:
 - Aicon, American Academy of Optometry (UK), Association of Optometrists, Birmingham Focus on Blindness, Black & Lizza, Central (LOO) Fund, Corium Visual Technologies, College of Optometrists, Coopervision, ESRC, Essilor, General Optical Council, Hadassah College, Hoya, Institute of Optometry, Iris Fund for Prevention of Blindness, Johnson & Johnson, Leightons, MRC, NICE, Novartis, Optas, Paul Hamlyn Trust, Perceptive, Scrivens, Specsavers, Thomas Pocklington Trust.
- Lecture content always my own
- I am not a myopia researcher, but a clinician with an interest in helping my myopic patients




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PLAN

WHY?

HOW?

WHEN?



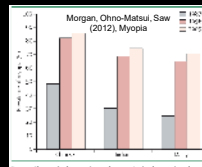
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It's like an epidemic!

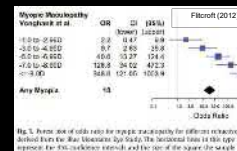
- Common and increasing prevalence
 - 93% of Taiwanese medical students are myopic (Lin et al., 1996)
 - Prevalence of myopia in USA has increased in last 30 years from 25% to 42% (Vitale et al., 2009)
 - Prevalence of myopia in UK has more than doubled in last 50y (McCullough et al., 2016)
 - 50-53% of UK university students are myopic (Logan et al., 2005)



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Why does myopia matter?


- Significant health impact of myopia
 - High myopia (5-6) increases risk of retinal detachment, myopic macular degeneration, glaucoma, & other conditions
 - "no evidence of a safe threshold level of myopia for any of the known ocular diseases linked to myopia" (Fitzcroft, 2012)
 - In the Copenhagen study myopia-related diseases are already the most common cause of impaired vision (Holden et al., 2014)



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Realistic goals of myopia control

- Reducing the rate of myopia progression by 50% would lead to reduction in frequency of high myopia of over 90% (Brennan, 2012)
- For person destined to be -6.00 (Fitzcroft, 2012)
 - No control: -6.00: RD risk 16x MMD risk 40x
 - 50% control: -3.25: RD risk 10x MMD risk 10x
 - 75% control: -1.25: RD risk 2x MMD risk 2x
- Average...means no guarantee!




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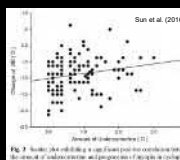

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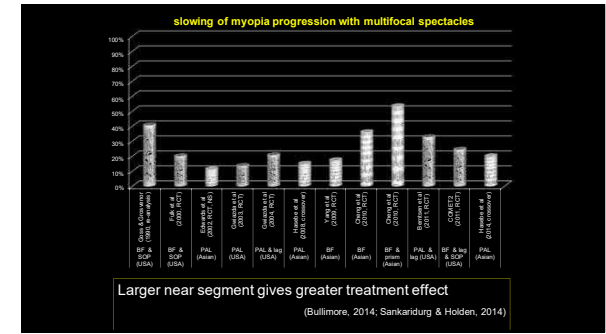
Myopia control: myth-busting

- Vision therapy is ineffective at slowing myopia (Woods, 1945; Koslowe 1991; Angi et al., 1996)
- Undercorrection may make myopia worse (Chung et al., 2002; Adler & Milodot, 2006; Vasudevan et al., 2014 c.f., Sun et al., 2016)

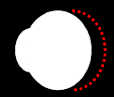



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Refractive error: conventional view



Hypermetropia (long-sighted)
- image shell focused behind retina



Emmetropia (normal vision)
- image shell focused on retina



Myopia (short-sighted)
- image shell focused in front of retina

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Myopia: the new view

Patient about to become myopic

- image shell focused on retina at fovea
- image focused behind retina in periphery
- *relative peripheral hyperopic defocus* - RPHD

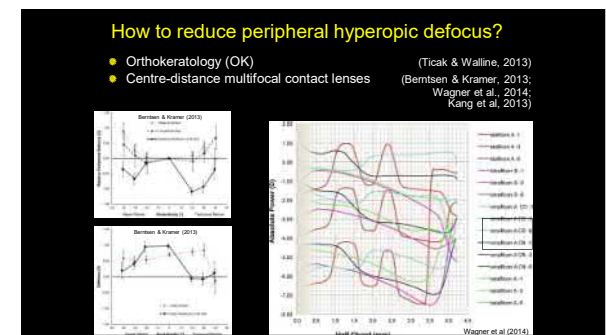
Reviews: Charman & Radhakrishnan (2010); Earl Smith (2011); Filzsch (2012)

The eye grows so the peripheral image is in focus causing myopia at the fovea

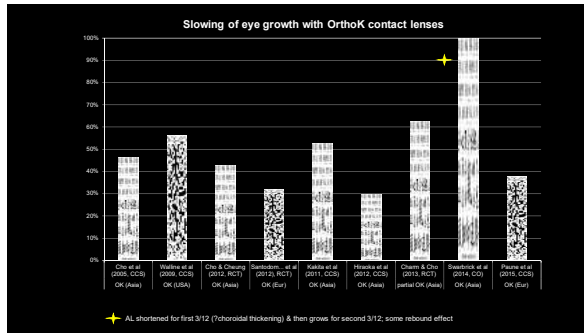
Spectacles or contact lenses correct the focus at the fovea, but not the RPHD so myopia progresses

BUT: see Atchison et al. (2015) Relative peripheral hyperopia does not predict development and progression of myopia in children

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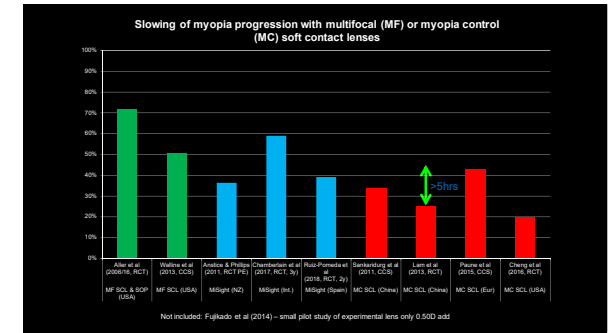
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Safety of overnight orthokeratology (OOK)

- For soft contact lenses, overnight wear increases risk of microbial keratitis (MK) by 10x
- Several cases of (MK) reported, mainly in Asian countries thought to be associated with poor hygiene
 - Tap water, old contact lens cases, suction holders
 (Watt & Swarbrick (2007))
- Risk of OOK similar to other overnight wear of contact lenses (Bullimore et al. (2013))

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Caveats

- Need more RCTs
 - But myopia control effective "on balance of probabilities" and need to start young
- Persistence of treatment effect
 - Unclear whether the treatment effect is sustained
 - May be rebound effect when stop intervention
 - Perhaps unlikely with optical interventions & can keep in MF CL until myopia likely to be stable
- Check for DV blur –max add for good DV
- Axial length changes correlated with myopia changes ($r^2 = 65\%$)
- If myopia wasn't multifactorial, then we would have solved it by now!

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Personal recommendations for Europe

- Both MiSight and OrthoK reduce myopia progression on average by about 50%
- Multifocal spectacles (E-seg) are less effective
 - If NV esophoria or high accommodative lag, may reduce progression by 30-40%
 - Aim to eliminate esophoria
 - If not esophoric and normal lag, effect only ~15%
- Also encourage kids to go outdoors

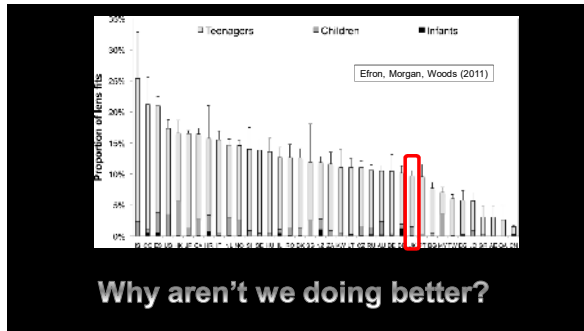
Used in research studies

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Other approaches to myopia control

- Keep glasses up-to-date
- Improve eye alignment and accuracy of focusing
 - Bifocals help with this for some cases
- Low dose atropine
 - Not yet in UK
 - Many parents don't like drugs
- Hoya MyoSmart
 - Not yet in UK

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Barriers to myopia control, Spring 2018

- Eyecare practitioners!
- Cost of contact lenses
- Fear of microbial keratitis
- Inconvenience of contact lenses

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Some key research on CL for children

- Soni et al. (1995): age 11-13y
 - 3 successful attempts in training
 - Exam helps
- CLIP study (Walline et al., 2007a,b; Jones et al., 2009)
 - 84 children (8-12) of 85 teens (13-17)
 - "No serious adverse events were reported during the 3 month study" Children do as well as teens
 - Similar chair time, slightly more tuition for children
 - Improved quality of life
- ACHIEVE study (Walline et al., 2009)
 - RCT of children (8-11), CL v. Specs, 3y
 - Physical appearance, athletic competence, social acceptance all significantly better with CL
 - 91% of CL group wore CL to 3 year check

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When to start myopia control

- When the myopia starts, ideally when hyperopia reduces
- BUT contact lens myopia control tends to be delayed
- Only suitable when motivated, sensible, hygienic

When to stop myopia control

- 90% of myopes are stable by age 21y

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Conclusions

- Myopia carries a small, but significant, risk of eye disease in later life
- Optometry is changing from a profession who corrects to one who treats myopia
- On average:
 - Orthokeratology & multifocal soft lenses slow progression by ~50% on average
 - Multifocal glasses slow progression by ~15% (upto 40%)
- Warn parents that "on average" means no guarantee of success

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