Myopia correction and management with spectacles

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Speaker's name :

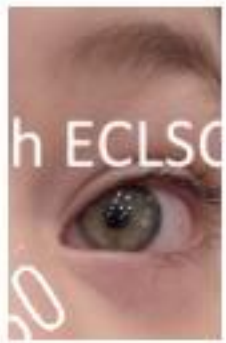
❑ I do not have any potential conflict of interest

☑ I have the following potential conflicts of interest to report:

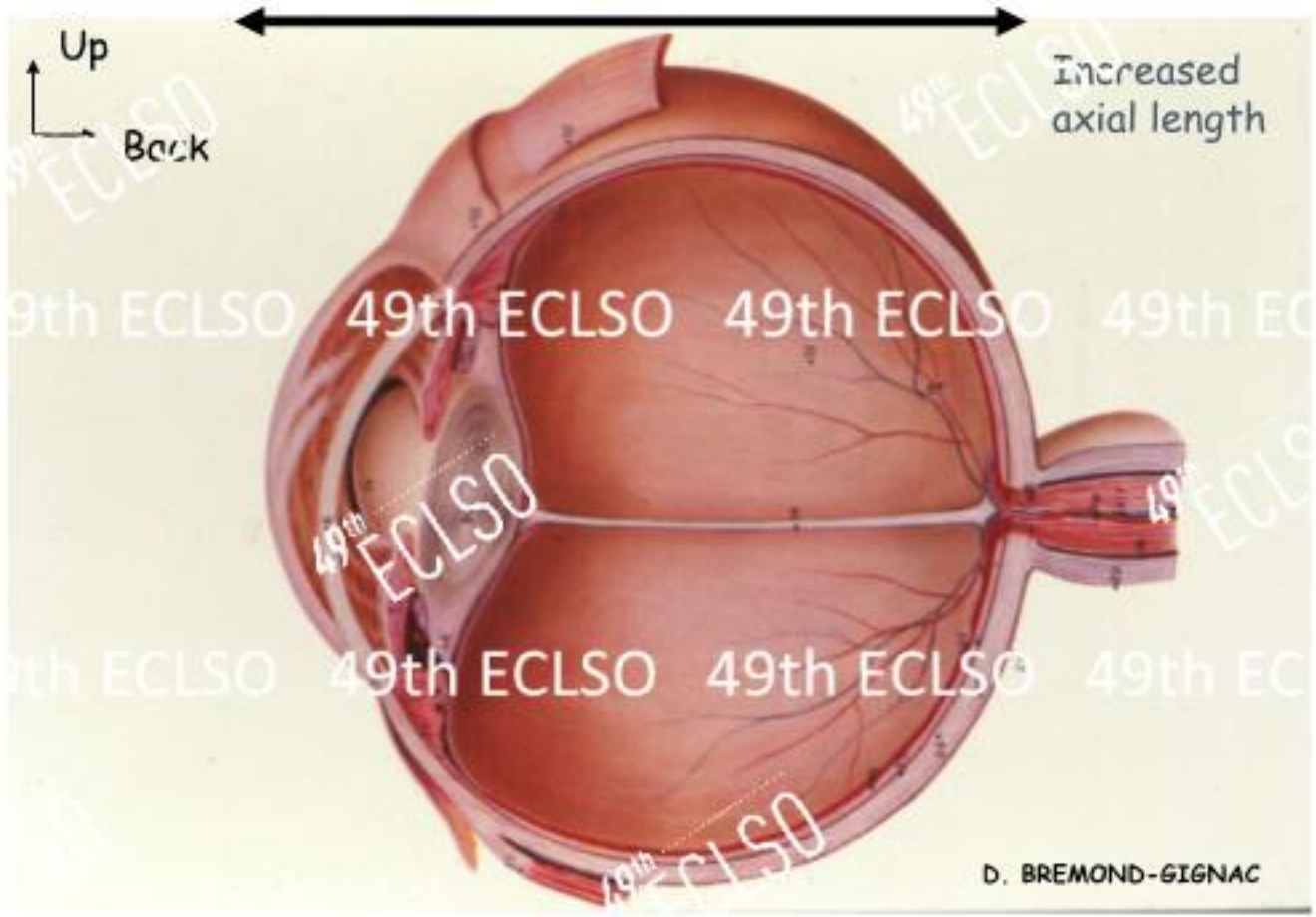
Alcon/Novartis, Bausch, Cooper, Hoya, Krys, Santen, Théa

Children's eye is not a miniature eye:

It grows!



Myopic eye



Concept of myopia blurrred vision

Needs to be corrected for visual development!

Children's visual impairment/blindness

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- One child becomes blind every minute
- 1,8M blind children in the world with prevalence 1,5 for 1000
- Definition of blindness in children is less 1/10ème for the best eye in children from 0 to 15 yo
- INSERM & ASNAV Studies:

20-25% ocular anomalies in children less than 6 yo

Bremond-Gignac D & al. Visual development in infants: physiological and pathological mechanisms. Curr Opin Ophthalmol. 2011

Myopia with visual impairment/blindness

- Myopia : socio-economic burden of myopia is major
- Evaluated at 268 Billions /year with blindness risk
- Global public health concern

Kempen JH, Mitchell P, Lee KE & al. The prevalence of refractive errors among adults... Arch Ophthalmol. 2004

Holden B, Sankaridurg P, Smith E, Aller T, Jong M, He M. Myopia, an underrated global challenge to vision: where the current data takes us on myopia control. Eye (Lond). 2014

Myopia diagnosis

- Diagnosis of myopia has to be done!
- Visual screening+++
- Differential diagnosis
- Optical correction
- Myopia Complications
- Prevention and myopia control

Very high Myopia of -18D

Recognize myopia initial check-up and correction

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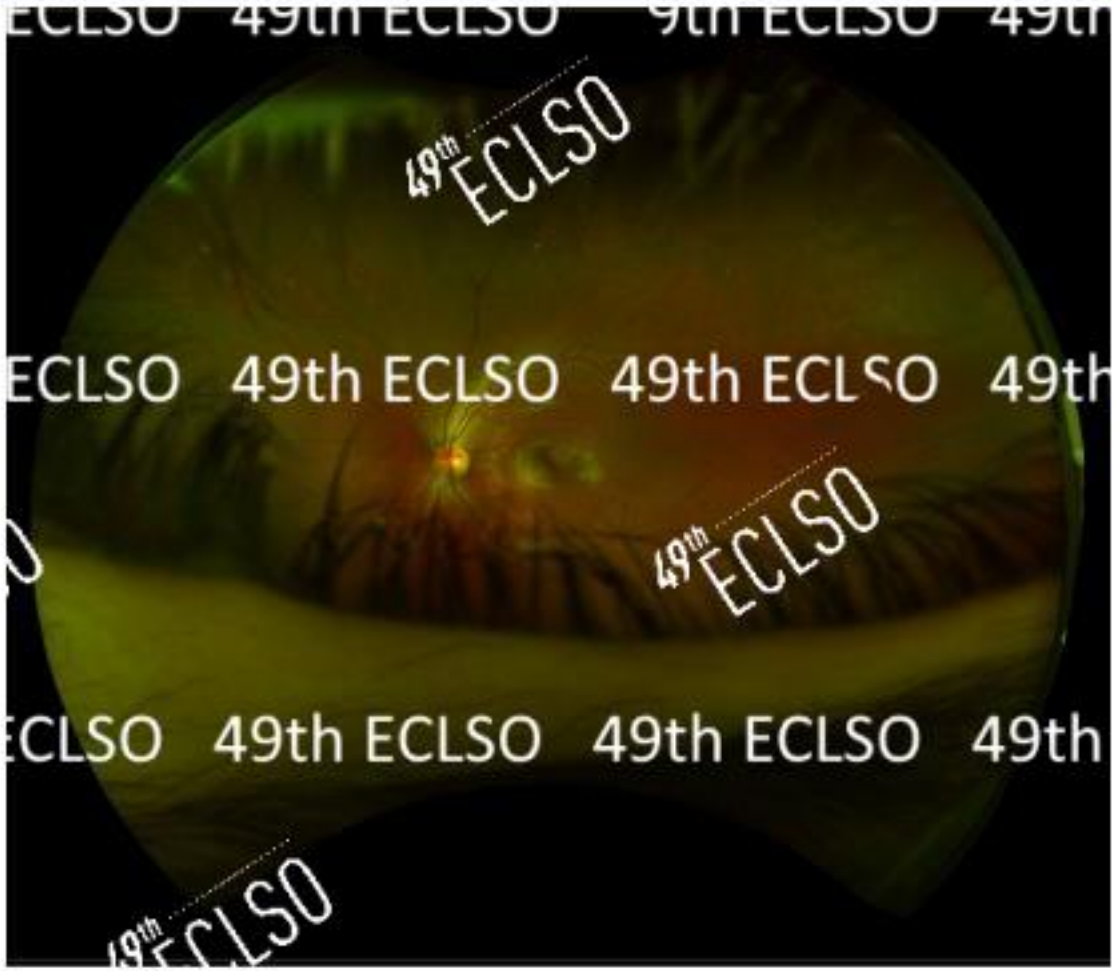
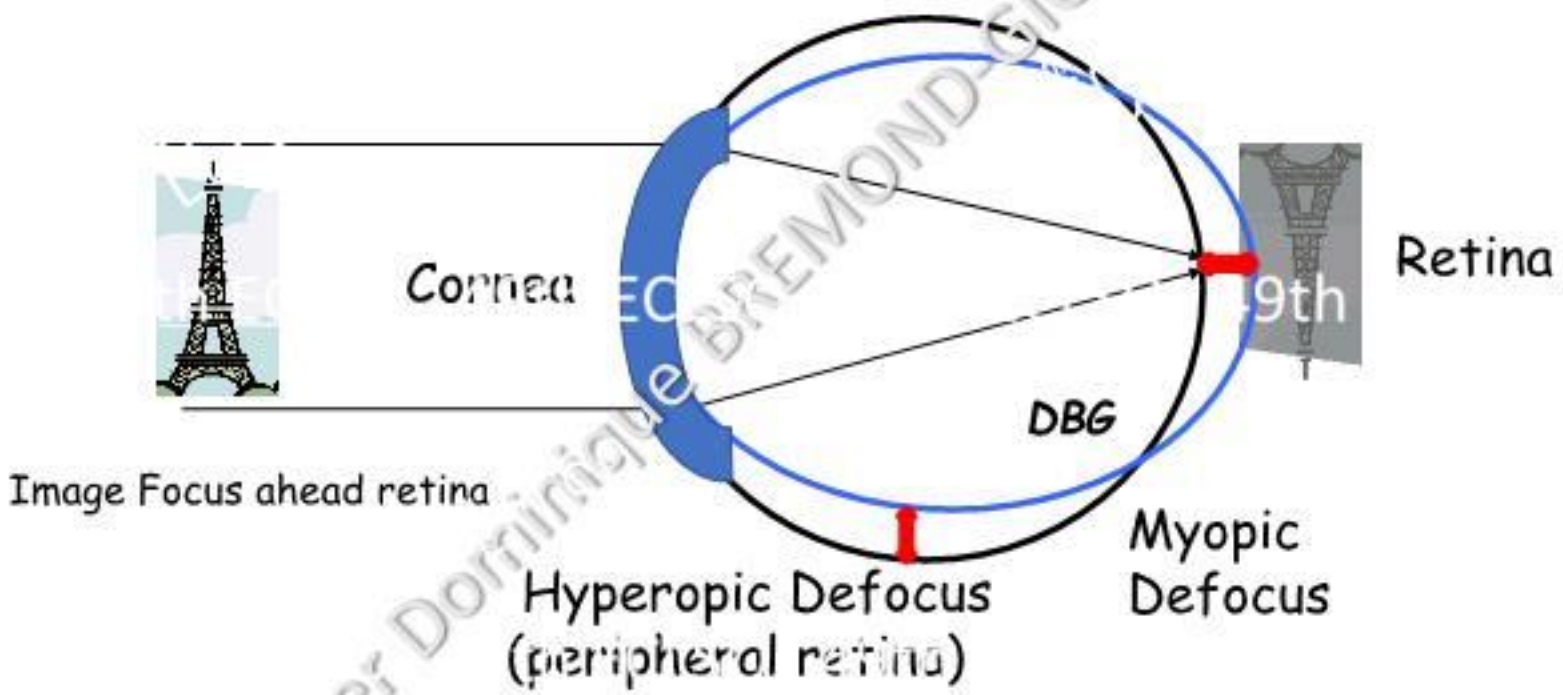
- Initial diagnosis of myopia in children
  - Refraction : -0,5D, Orthoptic check-up
  - Increased axial length, Optical measure
  - Cycloplegia mandatory+++
  - Eliminate juvenile glaucoma
  - Full optical correction is mandatory

Juvenile glaucoma

Ultra wild field fundus



Physiopathology of myopic eye



Principle of the defocusing lens create a non-hypermetropic defocus on the average peripheral while maintaining an optimal myopic optical correction in the central zone of vision of the lens

Different Defocus spectacle lenses systems

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DIMS System MiYOSMART® (HOYA)

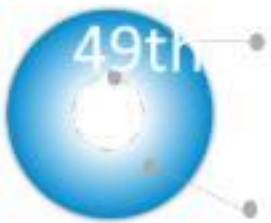
Technology Defocus Incorporated Multiple Segments

HALT System Stellest ® (Essilor)

Technology Highly Aspherical Lenslet Target

MyoVision ACE® (Zeiss)

Technology Defocus system with power gradient



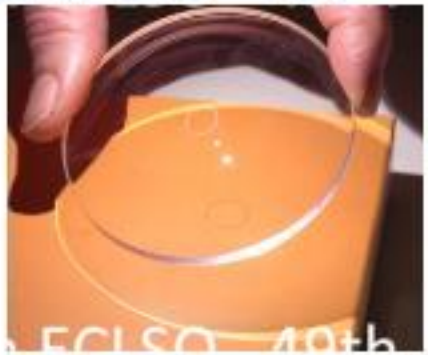
Spectacle lenses MiYOSMART

- DIMS System

Technology

Defocus Incorporated Multiple Segments

-3,5D de defocus



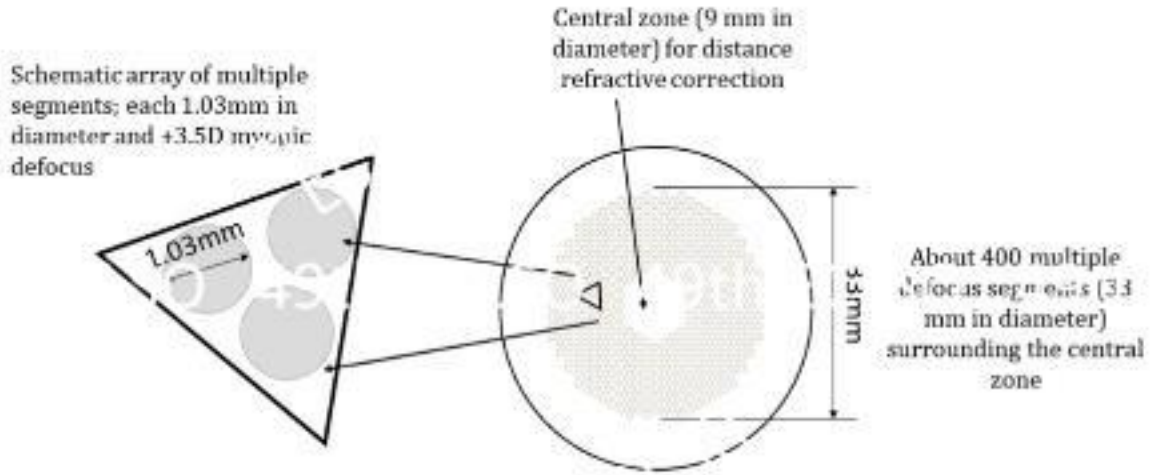


Figure 1 The design of the Defocus Incorporated Multiple Segment (DIMS) spectacle lens.

Defocus spectacle lenses DIMS System

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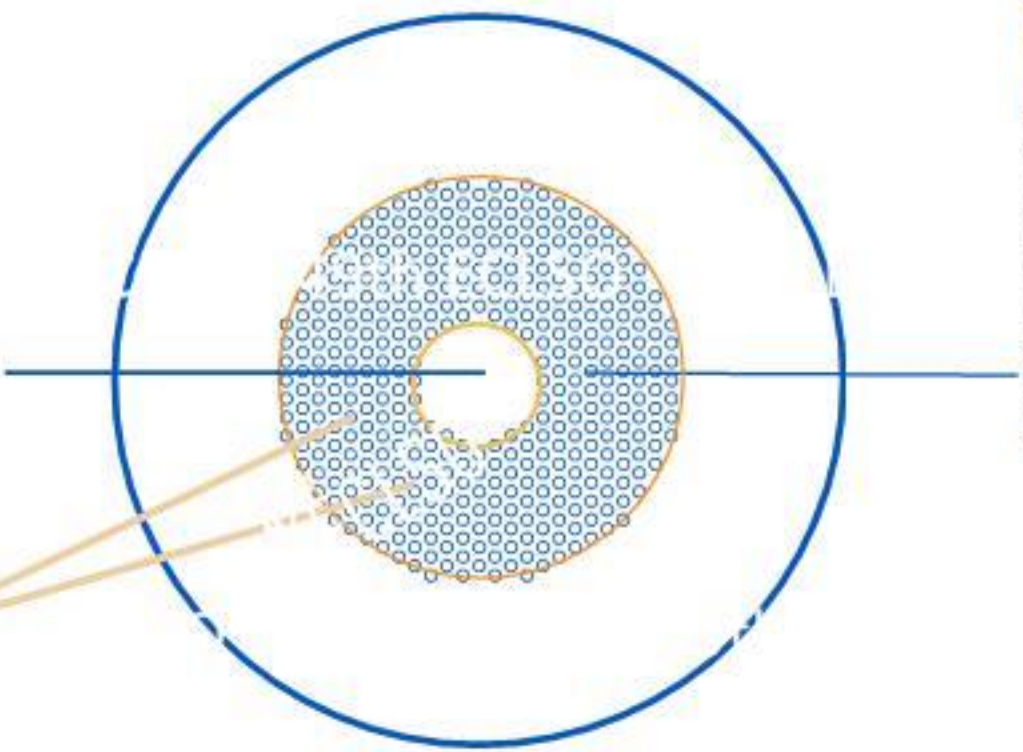
CENTRAL ZONE OF FAR VISION

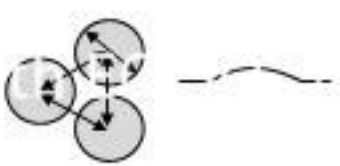
DIMS spectacle lens has a central part of 9,40 mm without defocus segment.



TREATMENT ZONE

Unique structure of DIMS lens, protected by a licence, allows normal visual perception (i.e maximal visual acuity) and gestion of myopia at the same time.

Lens has multiple defocus systems distributed in a honeycomb high density structure with a diameter of 33 mm. Fach islet acture a **defocus of 3,5D**.

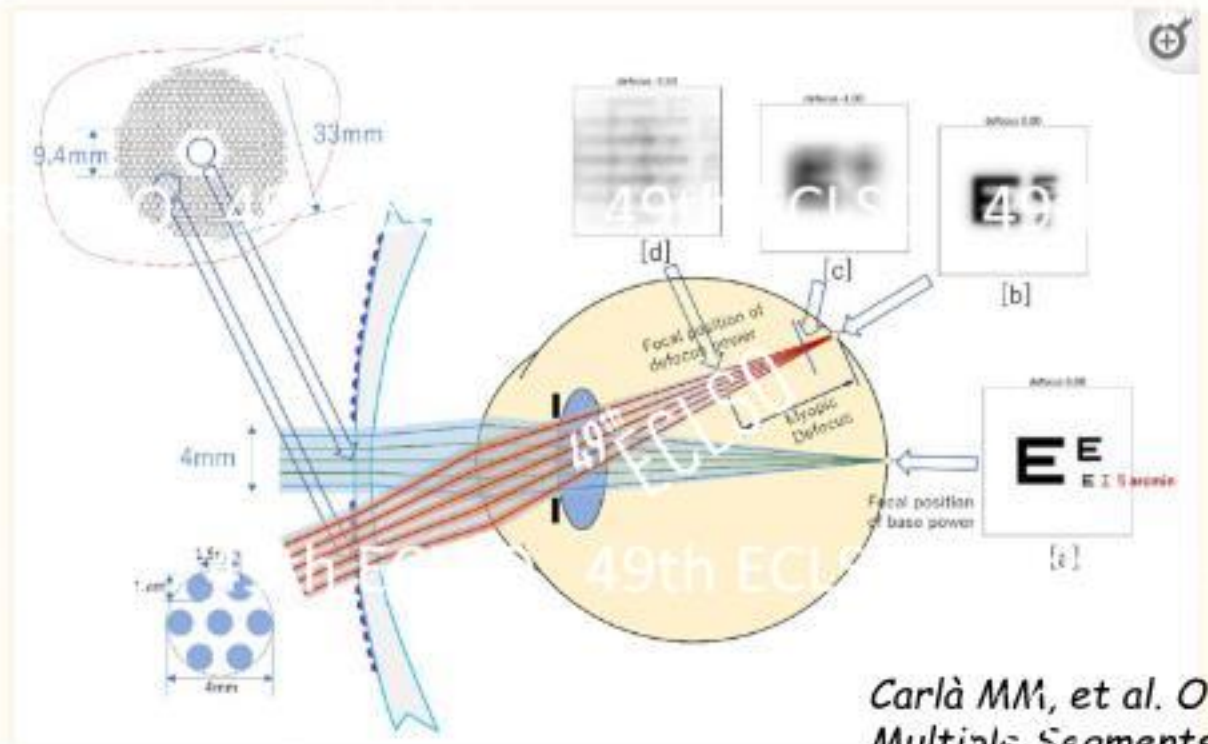


Pupil

11/05/2022

Defocus spectacle lenses MiYOSMART®

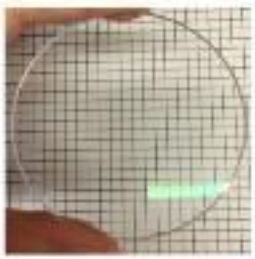
- DIMS System

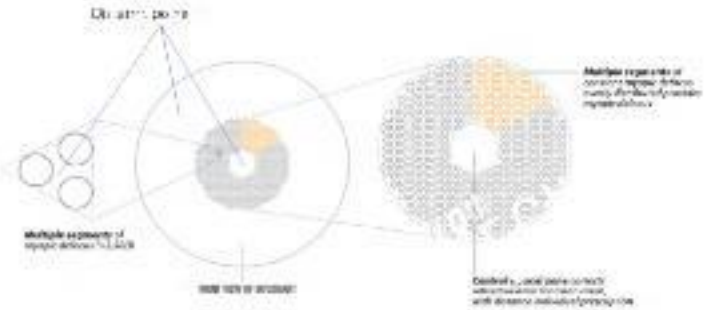


Carlà MM, et al. Overview on Defocus Incorporated Multiple Segments Lenses: A Novel Perspective in Myopia Progression Management. Vision (Basel). 2022

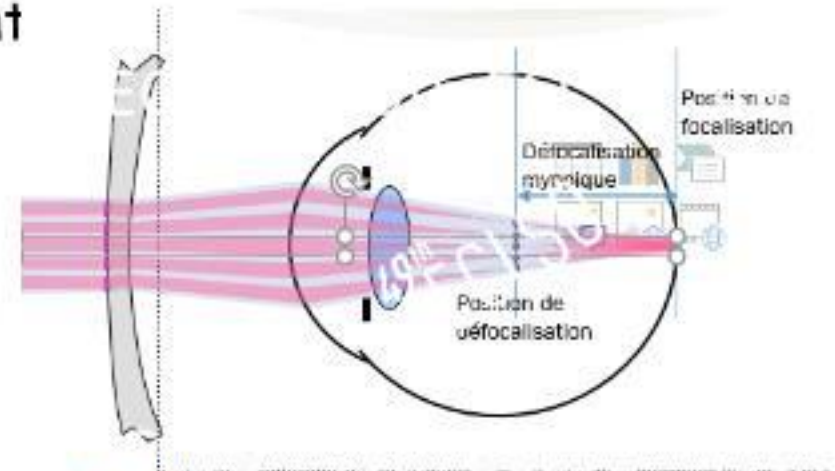
Defocus spectacle lenses

- Defocus
  - MiYOSMART® Hoya
  - D.I.M.S. Technology
    Defocus Incorporated Multiple Segment





Monofocal Zone: 9,5mm



HOYA

1. Lam CS, Tang WC, Lee PH, Zhang HY, Qi H, Hasegawa K, To CH. Myopia control effect of defocus incorporated multiple segments (DIMS) spectacle lens in Chinese children: results of a 3-year follow-up study. Br J Ophthalmol. 2021 Mar

Defocus spectacle lenses Stellest®

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- HALT System

Highly Aspherical Lenslet Target

Defocus lens Stellest®

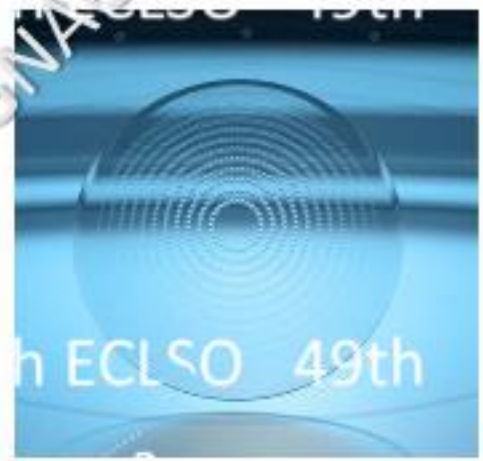
- HALT Defocus

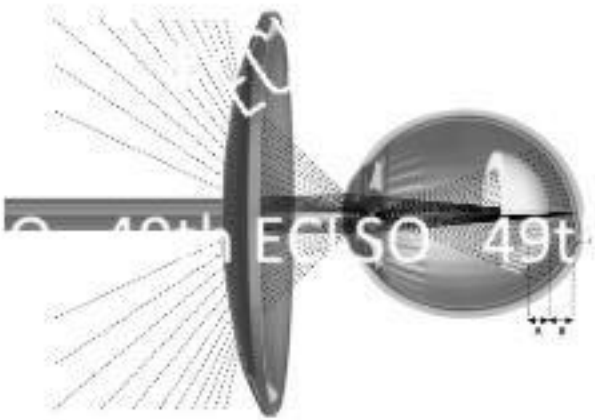
Highly Aspherical Lenslet Target

- STELLEST® Essilor
- Radial HALT

(Highly Aspherical Lenslet Target)

constellation of aspherical lenslets on 11 rings with a volume of defocus signal





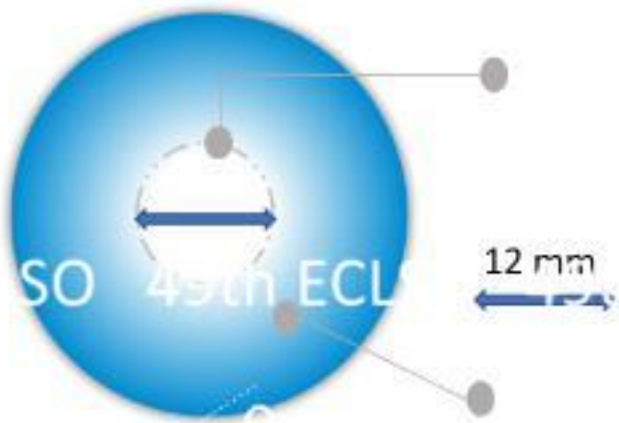
1. Bao J, Yang A, Huang Y, Li X, Pan Y, Ding C, Lim EW, Zheng J, Spiegel DP, Drobe B, Lu F, Chen H. One-year myopia control efficacy of spectacle lenses with aspherical lenslets. Br J Ophthalmol. 2021 Apr

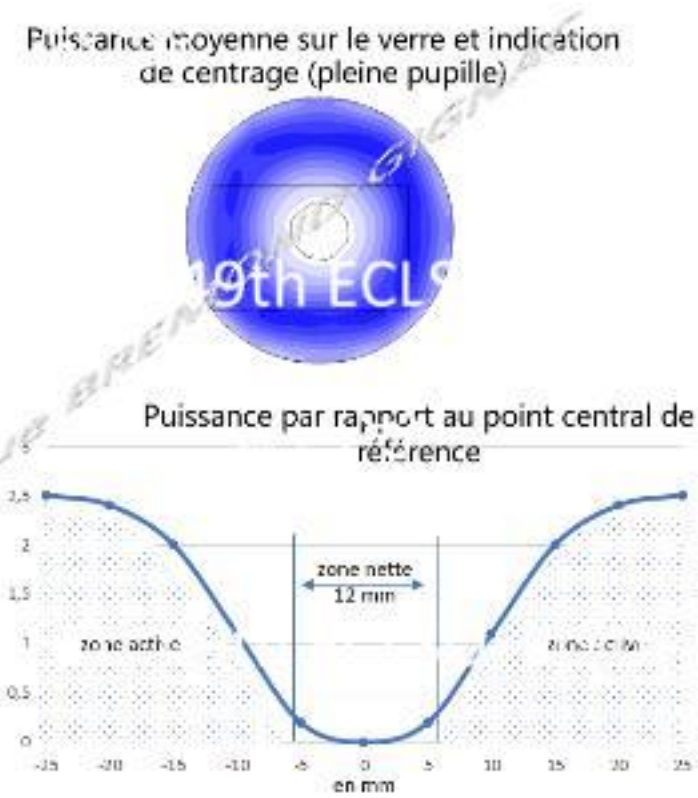
Defocus spectacle lenses MyoVision ACE®

- Peripheral Defocus system with power gradient
  - MyoVision ACE® Zeiss
  - 12mm monofocal central then defocus by power gradient until 2,5D in periphery
  - Progressive peripheral blur Lenses
  - Allow solar lenses, thinned lenses and high astigmatism

Defocus spectacle lenses MyoVision ACE®

- Defocus
  - Defocus by power gradient until 2,5D in periphery
  - Lenses with progressive peripheral blur





Study Defocus spectacle lenses MyoVision ACE®

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- ACE system, power gradient until 2,5D in periphery
- No publication available
- Study Ongoing, recruiting

Study Defocus lens Stellest®

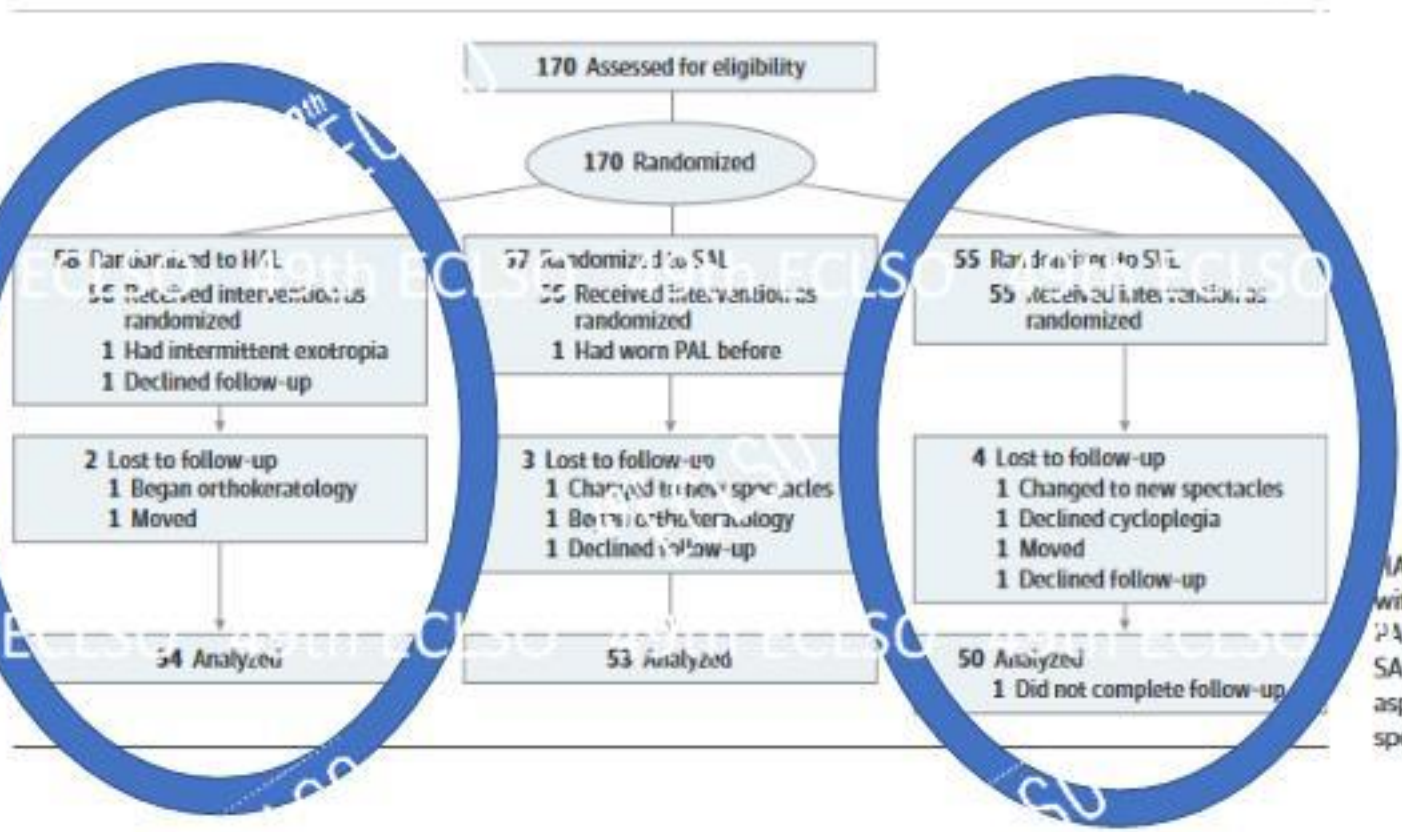
- HALT System

Highly Aspherical Lenslet Target

- Defocus
  - 2 years published
  - 161 (54 Stellest HALT/53 SAL/50) children
  - Myopia control 55%/ Ax length 51%

1. *Bao J, Yang A, & al. One-year myopia control efficacy of spectacle lenses with aspherical lenslets. Br J Ophthalmol. 2021 Apr*
2. *Bao J, Huang Y, & al. Spectacle Lenses With Aspherical Lenslets for Myopia Control vs Single-Vision Spectacle Lenses: A Randomized Clinical Trial JAMA Ophthalmol. 2022 Mar*

Study Defocus spectacles lenses Stellest®



AL indicates spectacle lenses with highly aspherical lenslets; SAL, spectacle lenses with slightly aspherical lenslets; SVL, single-vision spectacle lenses.

Study Defocus spectacles lenses Stellest®

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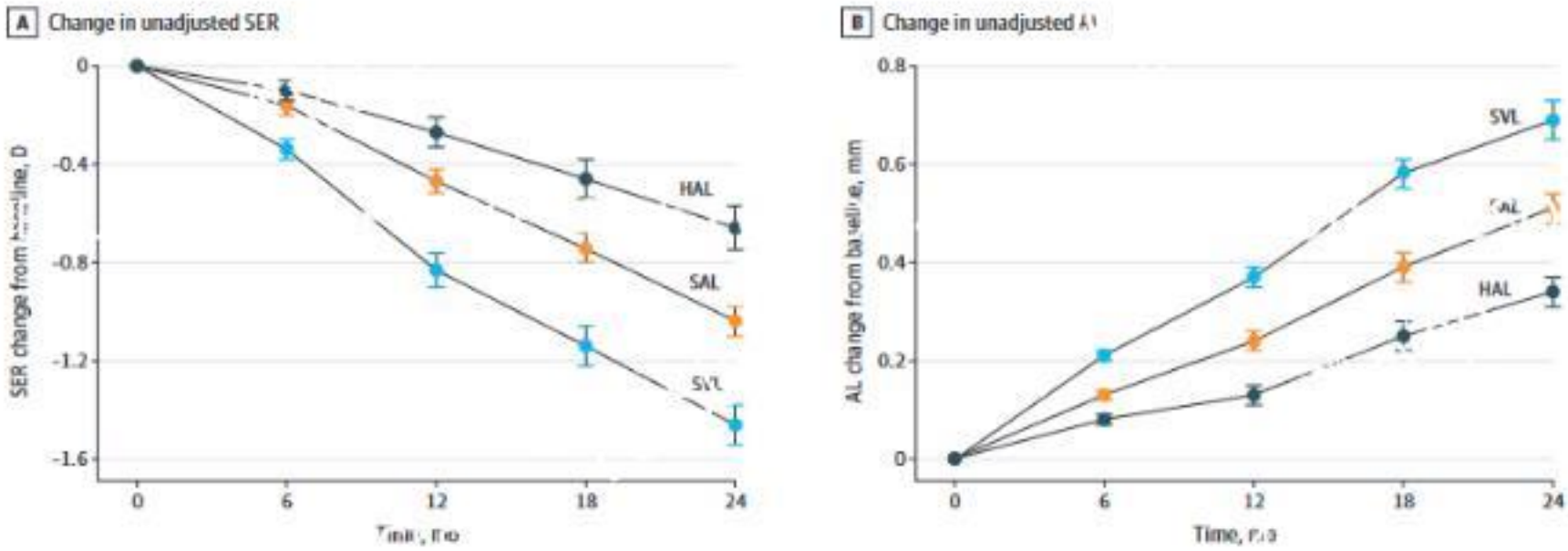

Error bars represent standard errors of the mean. HAL indicates spectacle lenses with highly aspherical lenslets; SAL, spectacle lenses with slightly aspherical lenslets; SVL, single-vision spectacle lenses.

Study Defocus lenses Stellest®

Table 2. Comparisons of Myopia Progression and Axial Elongation Between Full- and Part-time Wearers

Clinical value	Mean (SE)		
	HAL[a]	SAL[a]	SVL[a]
Change in SER, D			
Full-time wearers	−0.48 (0.10)	−0.95 (0.08)	−1.44 (0.10)
Part-time wearers	−0.92 (0.13)	−1.15 (0.10)	−1.56 (0.15)
P value	.01	.11	.77
Change in AL, mm			
Full-time wearers	0.28 (0.04)	0.46 (0.04)	0.69 (0.04)
Part-time wearers	0.43 (0.06)	0.57 (0.04)	0.70 (0.07)
P value	.03	.10	.92

Abbreviations: AL, axial length; HAL, spectacle lenses with highly aspherical lenslets; SAL, spectacle lenses with slightly aspherical lenslets; SER, spherical equivalent refraction; SVL, single-vision spectacle lenses.

[a] Full-time wearers wore lenses at least 12 hours per day, and part-time wearers wore lenses less than 12 hours per day. In the HAL group, there were 32 full-time wearers and 22 part-time wearers. In the SAL group, there were 30 full-time wearers and 23 part-time wearers. In the SVL group, there were 34 full-time wearers and 16 part-time wearers.

Study Defocus lenses MiYOSMART®

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- System DIMS
- Technology

  Defocus Incorporated Multiple Segments

Study Defocus lens MiYOSMART®

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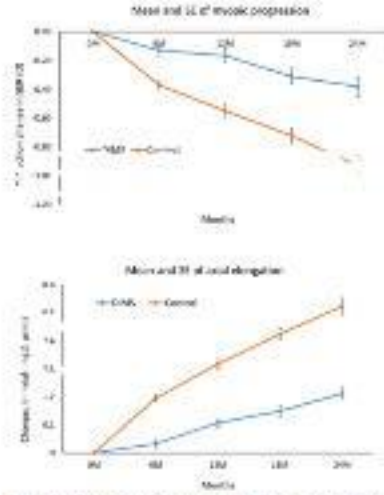
- Asian children followed on 2 years

MiYOSMART® Hoya

- 183 children (93/90)
- Control myopia on 2 years
  - Control myopia of 59 % (mean)
  - Eye axial Length of 60% (en moyenne)



Clinical science

OPEN ACCESS

Defocus Incorporated Multiple Segments (DIMS) spectacle lenses slow myopia progression: a 2-year randomised clinical trial

Carly Siu Yin Lam, Wing Chun Tang, Dennis Yan-yin Tse, Roger Pak-Kin Lee, Rachel Ka-Man Chun, Keigo Hasegawa, Hua Qi, Takashi Hatanaka, Chi Ho To

ABSTRACT
Aim To determine if Defocus Incorporated Multiple Segments (DIMS) spectacle lenses slow childhood myopia progression.
Methods A 2-year double-masked randomised ...
Results 160 children completed the study, n=75 in the DIMS group and n=81 in the SV group. Average (SD) myopia progression over 2 years were −0.81 (0.63) D in the DIMS group and −1.30 (0.81) D in the SV group (mean difference −0.49 (95% CI −0.73 to −0.25), p<0.0001). Mean (SE) axial elongation was 0.56 (0.04) mm in the DIMS group and 0.97 (0.05) mm in the SV group (mean difference −0.41 (95% CI −0.56 to −0.26), p<0.0001). Myopia progressed 52% more slowly in children wearing DIMS lenses compared with those in the SV group (mean difference −0.44±0.08 D, 95% CI −0.72 to −0.27, p<0.0001). Likewise, children in the DIMS group had less axial elongation by 62% than those in the SV group (mean difference 0.56±0.04 mm, 95% CI 0.22 to 0.31, p<0.0001). 21.5% children who were DIMS lenses had no myopia progression over 2 years, but only 3.4% for those who wore SV lenses.
Conclusions ... DIMS lenses were effective in slowing myopia progression in Asian children. ...

Lam CSY, Tang WC, Tse DY, Lee RPK, Chun RKM, Hasegawa K, Qi H, Hatanaka T, To CH. Defocus Incorporated Multiple Segments (DIMS) spectacle lenses slow myopia progression: a 2-year randomised clinical trial. Br J Ophthalmol. 2020 Mar;104(3):363-368.

Study Defocus lens MiYOSMART®

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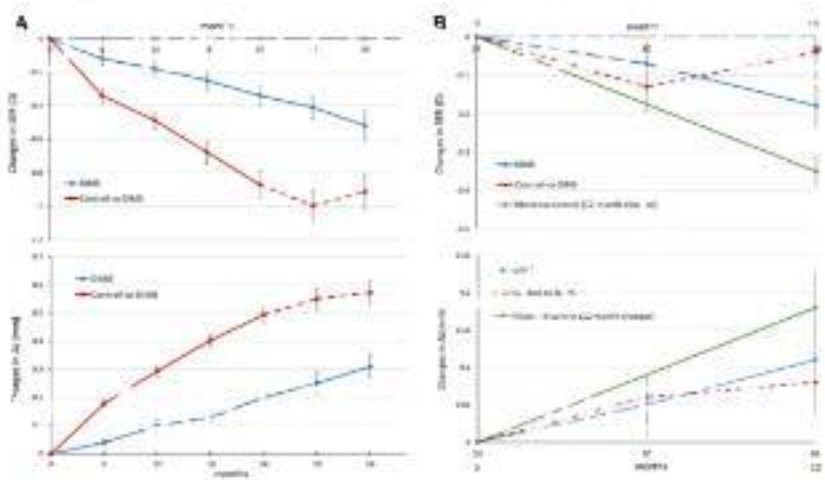
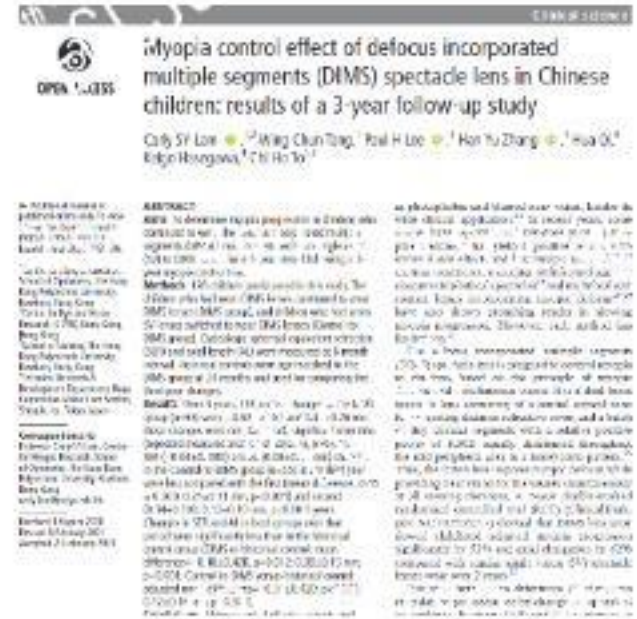
- Asian study on 3 years
  - 128 patients
  - Myopia control on 3 years





Myopia control effect of defocus incorporated multiple segments (DIMS) spectacle lens in Chinese children: results of a 3-year follow-up study

Lam CS, Tang WC, Lee PH, Zhang HY, Qi H, Hasegawa K, To CH. Myopia control effect of defocus incorporated multiple segments (DIMS) spectacle lens in Chinese children: results of a 3-year follow-up study. Br J Ophthalmol. 2021 Mars

Study Defocus lens MiYOSMART®

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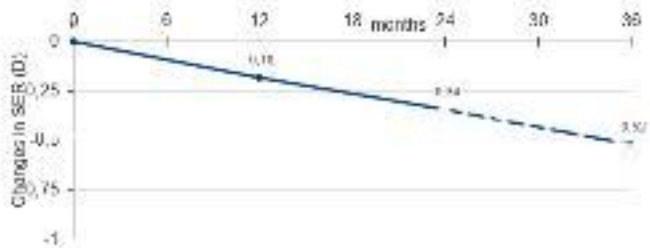
Asian study on 3 years

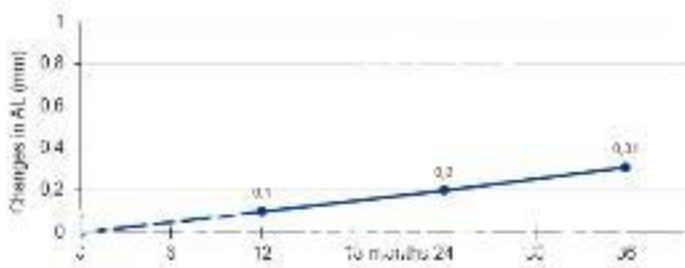
CONCLUSION

Myopia control by defocus spectacle lenses MiYOSMART stable on 3 years and :

- Annual Progression dioptrique (SER):
  - 1st year -0.18D
  - 2nd year -0.18D
  - 3rd year -0.18D



- Annual Progression AL (AL)
  - 1st year 0.1 mm
  - 2nd year 0.1 mm
  - 3rd year 0.11 mm



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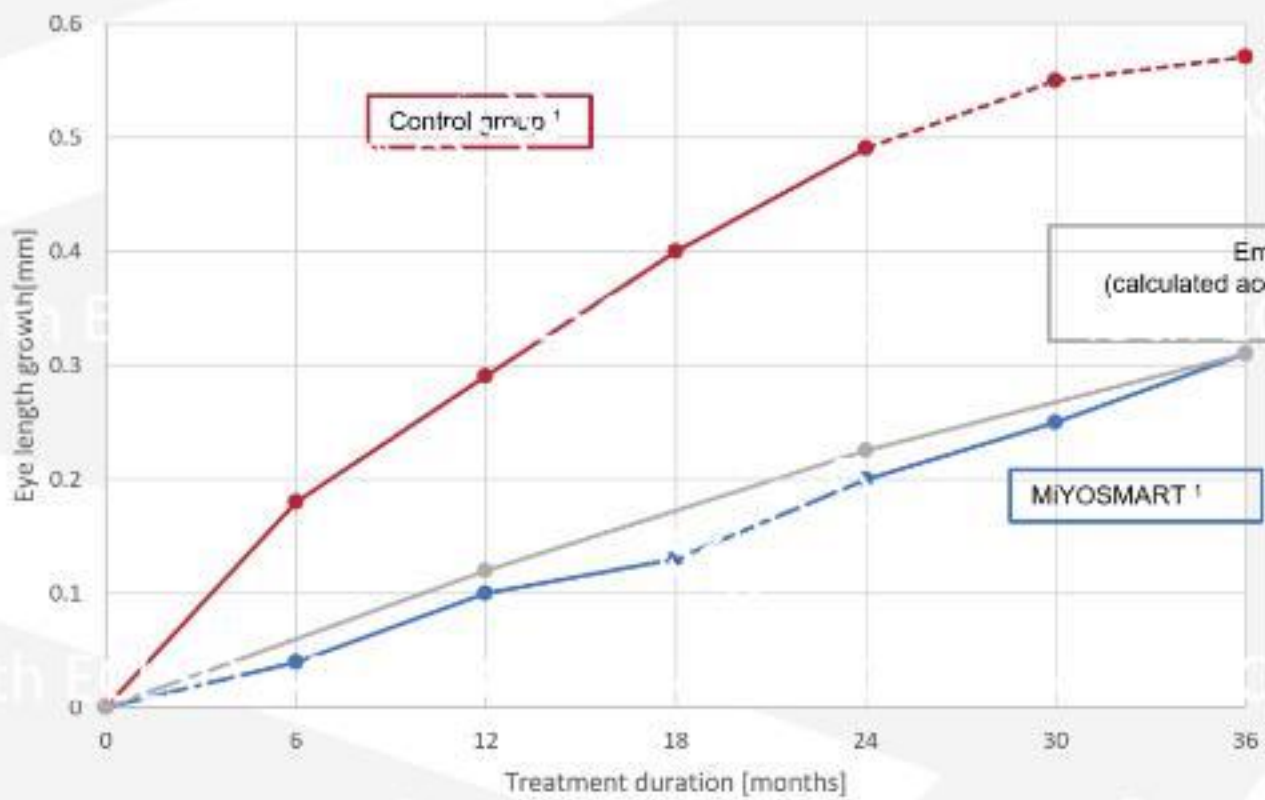
Increased Axial Length DIMS on 3 years



Longitudinal analysis of axial length growth in a German cohort of healthy children and adolescents

Carolin Truckenbrod[1], Christof Meigen[1], Manuela Brandt[1], Mandy Vogel[1], Pablo Sanz Diez[2,3], Siegfried Wahl[2,3], Anne Jurkutat[1] and Wieland Kiess[1,4,5]

1 Data on file: Lam CSY, Tang WC, Tse DY, Lee RPK, Chun RKM, Hasegawa K, Qi H, Hatanaka T, To CH. Defocus Incorporated Multiple Segments (DIMS) spectacle lenses slow myopia progression: a 2-year randomised clinical trial. British Journal of Ophthalmology. Published Online First: 29 May 2019. doi: 10.1136/bjophthalmol-2018-313739

Lam CSY, et al. Br J Ophthalmol 2021;0:1–5. doi:10.1136/bjophthalmol-2020-317664

Different groups & number of subjects [3]

	GROUP 1 (n=36)	GROUP 2 (n=14)	GROUP 3 (n=22)	GROUP 4 (n=18)	p - value
Age at enrolment (yrs)	9.75 ± 1.42	10.21 ± 1.53	10.50 ± 1.41	10.33 ± 1.71	0.265
Gender, % (no.)					
Male	47% (17)	79% (11)	45% (10)	50% (9)	
Female	53% (19)	21% (3)	55% (12)	50% (9)	0.195

[3] Lam CS, et al. Myopia control in children wearing DIMS spectacle lens: 6 years results. Invest Ophthalmol Vis Sci. 2022;63:ARVO E-Abstract 4247

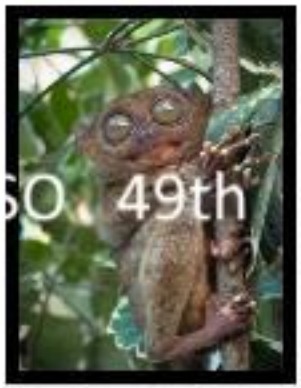
Defocus lenses

Type of defocus lens	Optical Company	Defocus system	Monofocus central Zone	Power of defocus	Clinical studies
MIYOSMART	HOYA OPTICS	D.I.M.S (Defocus Incorporated Multiple Segments) (400 microlenses)	9,40mm	3,5D	YES
STELLEST	ESSILOR LUXOTTICA	HALT (Highly Aspherical Lenslet Target) 1021 microlenslets	9mm		YES
MyoVision ACE	ZEISS	Defocus with power gradient	12mm	2,5D	ONGOING

Defocus lenses

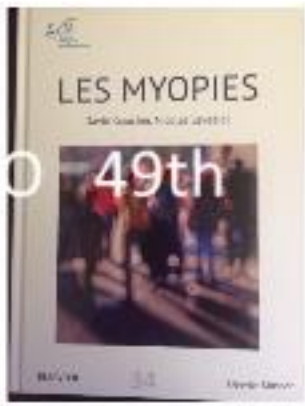
Type of defocus lens	Defocus system	Clinical studies published	Nb patients treated included/ control	Nb patients/Nb control	Conclusion
MIYOSMART	D.I.M.S (Defocus Incorporated Multiple Segments) (400 microlens)	6 years study 2 and 3 years studies Myopia control 50% myopia diopters 60% Axial Length 6 years study	183 children (93 Miyosmart/ 90)	3 years studies 120 (65 / 55) 6 ans years Prog 0,92D AL 0,60mm	6 years study Control 59% in D 60% in AL
STELLEST	HALT (Highly Aspherical Lenslet Target) 1021 microlenslets	2 years study Myopia control 55% myopia diopters 51% axial Length	161/106 children (54 Stellest/ 55/52) children	2 years studies 106 children (54 Stellest/ 52)	2 years study 55% in D 51% in AL
MyoVision ACE	Defocus with power gradient	Studies ongoing No publication	Recruiting	Ongoing	No results available

Take home messages



- Environmental Measures
- Differents treatments by defocus systems: all differents
  - Defocus lenses MiYOSMART® (6 years study, 2014)
  - Defocus lenses STELLEST® (2 ans years study, 2018)
  - Defocus lenses Myovision ACE® (Ongoing study)
- Defocus lenses we need to consider

- Published clinical studies, double mask, with proved efficacy
- Long studies to evaluate long efficacy and rebound



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