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# Changes in relative peripheral refraction, HOAs and optical quality using a soft multifocal contact lens with different additions and optical zones


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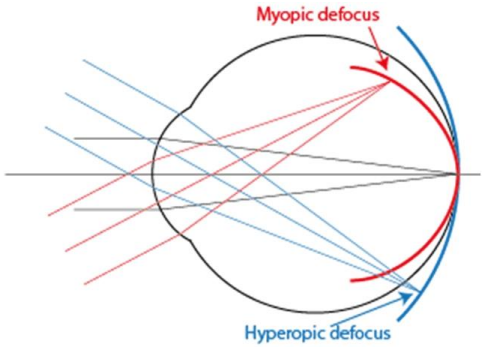
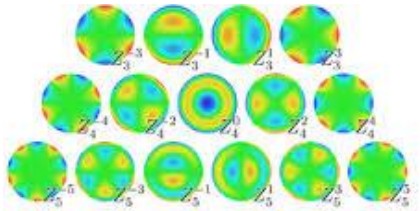
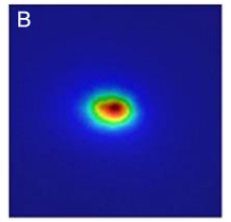
# Purpose

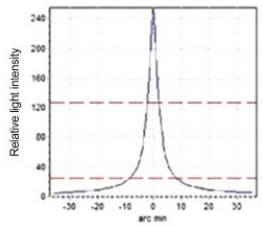
The purpose of this study was to investigate the effects of different additions and central optical zones diameters (COZD) of a Center Distance soft multifocal contact lens on:

- *relative peripheral refraction (RPR) across the horizontal visual field*
- *high order aberrations (HOAs)*
- *objective optical quality of retinal image*
- *high and low contrast visual acuity*



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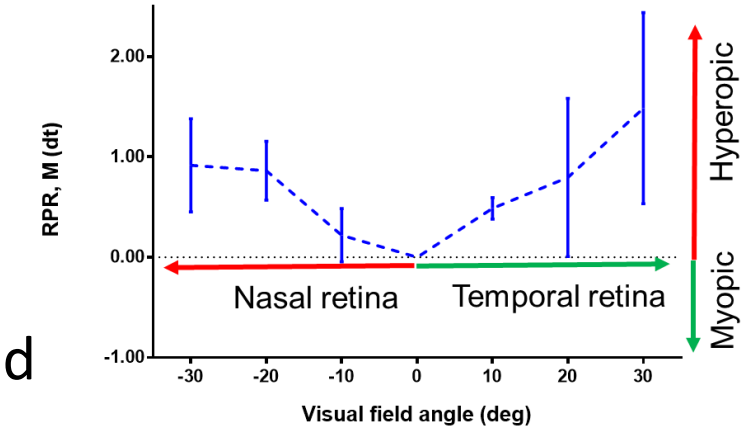
# Methods

Fifteen young adults (range age 20–26 years) with spherical refractive error of -0.50 to -4.00D, a refractive astigmatism >0,75D and a pupillary diameter <6mm in dim light were selected. In each participant's RE was measured non-cycloplegic: *axial (ARE) and peripheral (PRE) refractive error at 10, 20 and 30° temporally and nasally from the line of sight.*

Considering the measurement transposed in vectors (M, $J_0$ and $J_{45}$ ) relative peripheral refraction (RPR) values were calculated by subtracting ARE from PRE. The RPR values were plotted also as a function of the off-axis angle in degrees over the horizontal visual field



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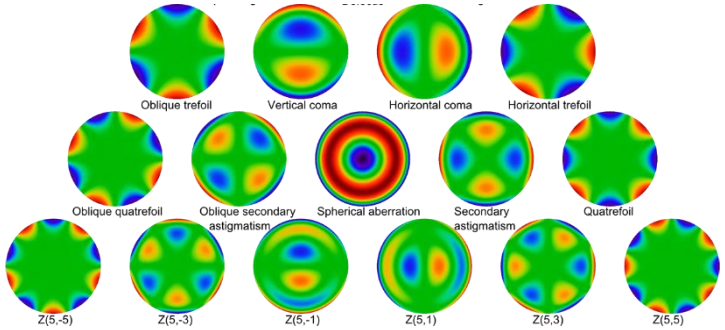
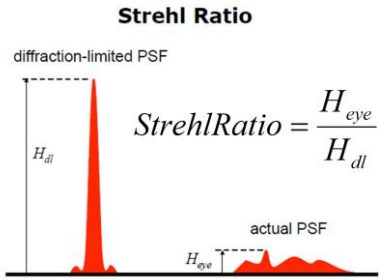
# Methods

Ocular wavefront aberrations were measured, for a pupillary diameter of 4mm and 6mm, along the line of sight and RMS of coma, spherical aberration (SA) and HOAs considered for the study. Objective optical quality considering the Strehl ratio (SR) was measured for a pupillary diameter of 4mm).

With the best spectacle refraction high and low contrast (HCVA and LCVA) visual acuity were evaluated.

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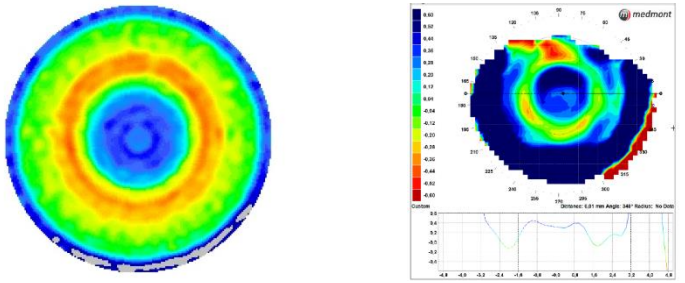
# Methods

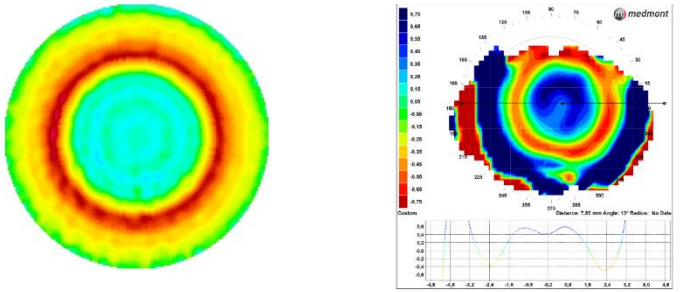
All measurement were repeated using a custom made soft multifocal CL (RELAX, SwissLens) with two different additions (+1.50/+2.50D) introduced by a peripheral polynomial progression and three central distant optical zones (CDOZ: 3.50/4.50/5.50 mm).

All lenses were realized in GM3 58% (Contamac Ltd), OAD 14.2 mm and base curve 8.60 mm.

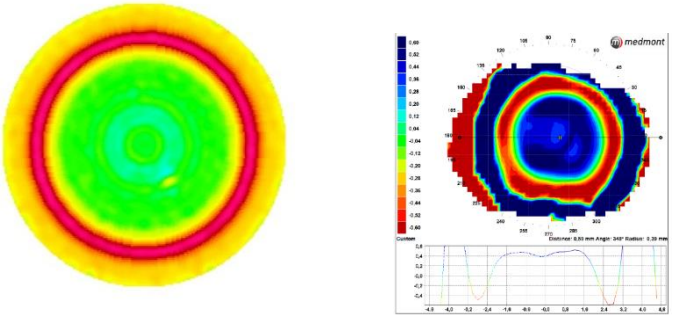
**ADD 2,5 D CDOZ 3,5 mm**



**ADD 2,5 D CDOZ 4,5 mm**



**ADD 2,5 D CDOZ 5,5 mm**



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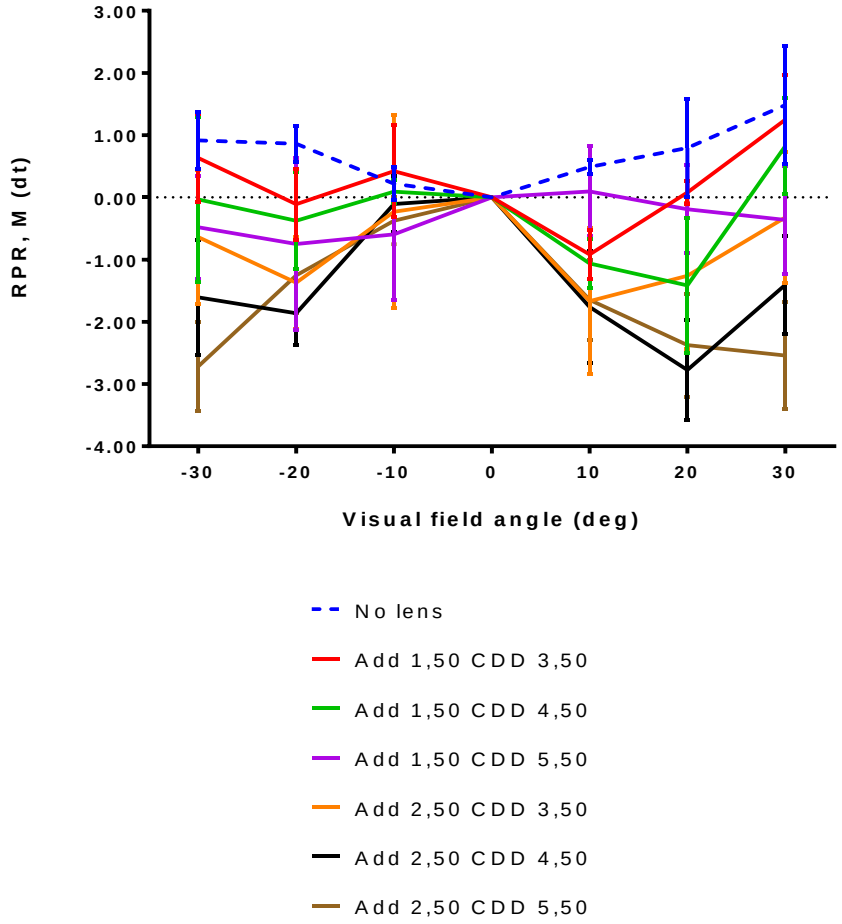
# Results

All uncorrected eyes presented an average hyperopic RPR for M across all eccentricities with the higher values at 30°.

All CLs modified peripheral refraction even if only with 2,5 add the RPR values presented a MD with all CDOZ used.

The CDOZ influenced the position of maximum MD: CDOZ 3,5 presented a maximum MD at 20°N and at 10°T, CDOZ 4,5 at 20°N and at 20°T and CDOZ 5,5 at 30°N and at 30°T

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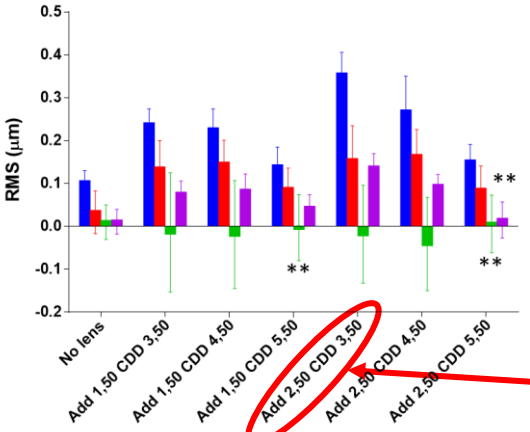
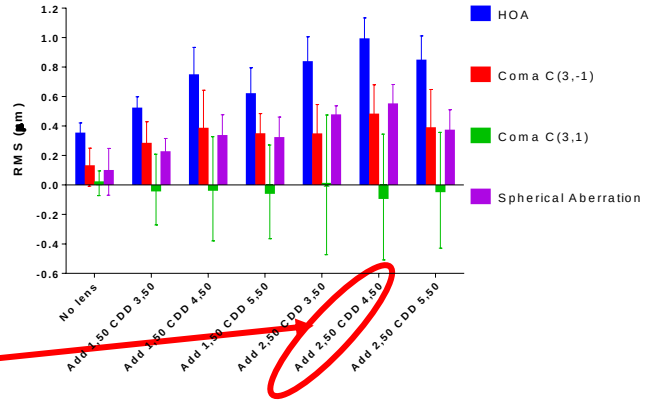
# Results

**pupillary diameter 4 mm**

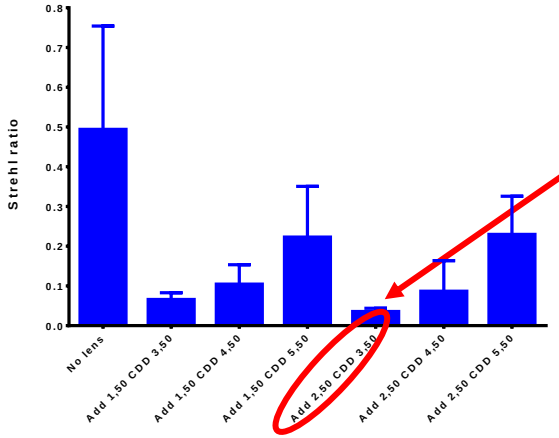



High order aberrations

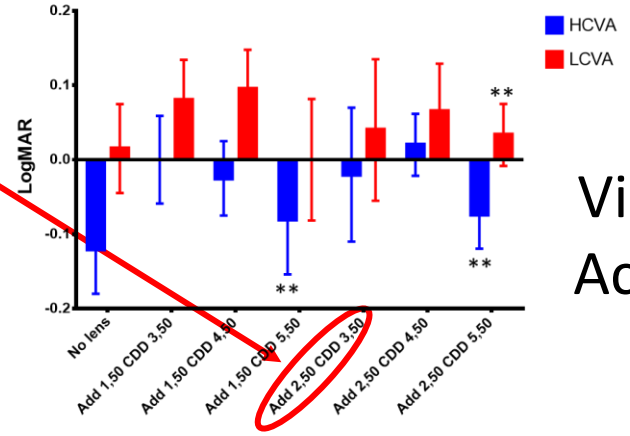
**pupillary diameter 6 mm**




**Lenses with higher changes on parameters measured**




Strehl ratio




Visual Acuity

** t test not significant with *respect to baseline:* p>0,05

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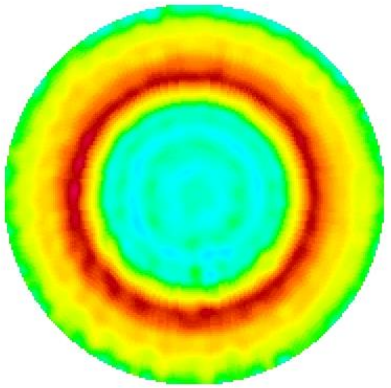
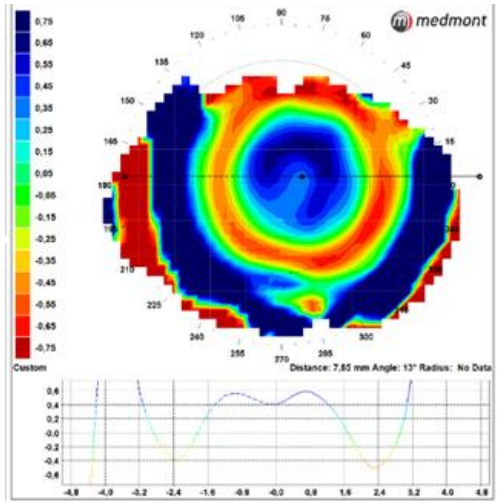
# Conclusion

CLs tested with 2,50D of addition are effective to introduce a peripheral MD. The COZD has an important effect to control the location of higher myopic defocus and the effects on HOAs and quality of vision. To consider the possible use of this design for myopia control to obtain the best balance between the higher myopic defocus with higher increase of positive SA we suggested the use of 2,50D addition with 4,5 mm CDOZ even though this could be associated to a mild reduction of quality of vision.






**ADD 2,5 D CDOZ 4,5 mm**