

Influence of viewing distance on aberrations related to multifocal soft lens wear

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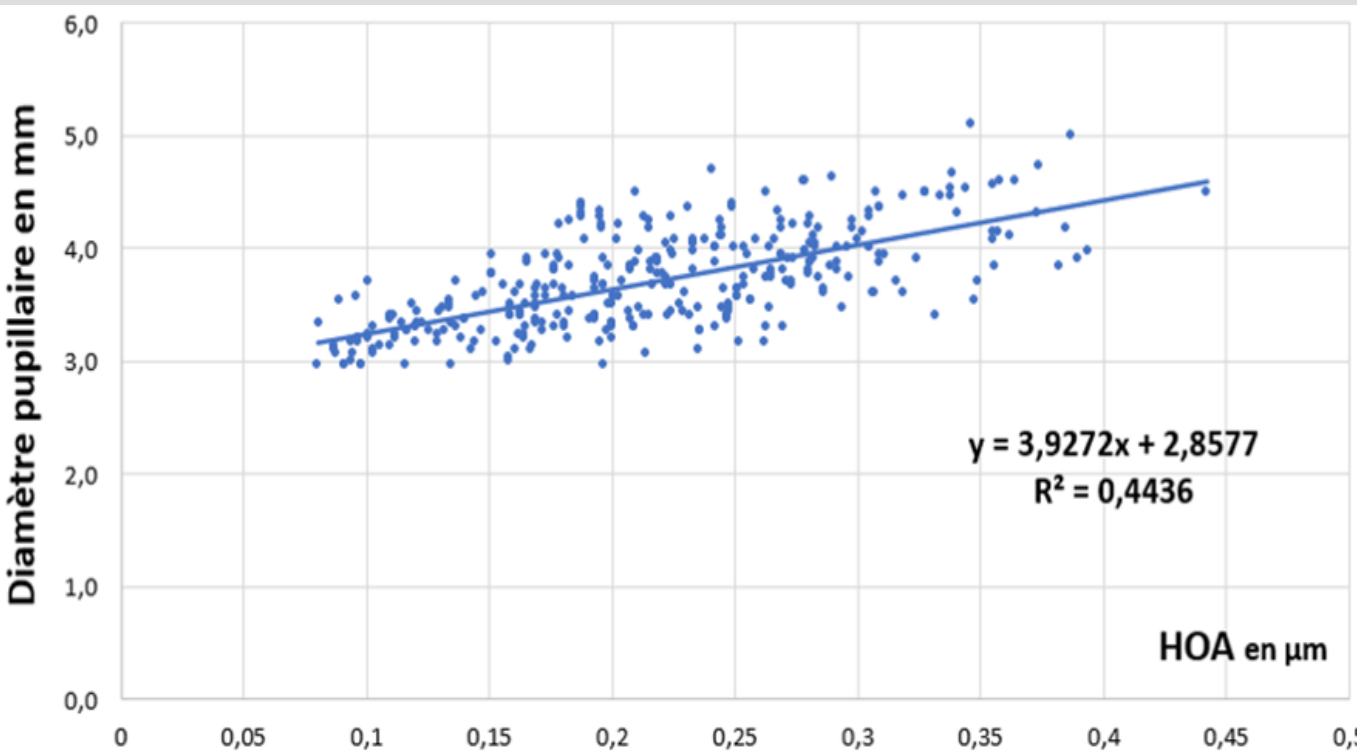
PURPOSE

To compare HOAs (total, spherical and coma) induced by 3 different soft multifocal lenses (SMFL) at different distances and to determine for each distance the relationship between the pupil diameter and HOAs vs lenses used.

METHODS

Myopic young adults were randomly fitted with 3 types of SMFL (L1- Etafilcon A ; L2- Omafilcon A ; L3- Comfilcon A) . A 30 minutes break is observed between each test. Total HOAs, spherical aberrations (SA) and coma (C) are evaluated (OPD Scan, Nidek) without lenses, and while wearing each lens. Measurements are taken at distance, 50 ,33 and 20 cm . The measurement of the pupil in dynamics was carried out with an open field refractor (Grand Seiko, Wam 5500) in photopic condition.

Data from just one eye per participant is kept for analysis (random). Statistical anlysis was done by performing a two-factor within-subjects (3x4) repeated measures Anova. A post-hoc test is performed when significant differences are found. A Pearson correlation is established between aberrations, pupillary diameter, at each distance.



RESULTS

The clinical population consisted of 10 M/18 F, aged 25.1 ± 1.6 years; being -2.75 ± 0.5 D. There is a significant increase in total HOAs with SMFL vs. naked eye. Every lens shows a reduction in HOAs with shorter reading distance.($F(2,54)=15.6$; $p < 0.01$; $\omega^2 = 0.151$) L3 demonstrates lower levels vs L1 and L2. There is a significant difference in total HOAs between all distances, except between 50 and 33 cm ($F(1,5 ;42,3)=30,4$; $p < 0.01$; $\omega^2 = 0,072$.)

HOAs correlate strongly with pupil diameter ($r^2=0.44$, $p < 0.001$), for all lenses. SA seems to vary vs lens type. L3 generates less SA than L1 and L2, but this is not statistically significant. ($F(1.5; 41.6)=3.0$; $p=0.07$). SA is significantly reduced for all distances except between 50 and 33 cm (AS: $F(1.9; 49.3)=24.6$; $p < 0.01$; $\omega^2 = 0.04$.) For C, the lens influences the results ($F(1,6 ;43,8)=8,7$; $p < 0.01$; $\omega^2 = 0,13$.) L2 has lower levels than L1 and L3, the latter two being statistically similar.

Descriptives HOAs			
Lenses	Distance	Mean	SD
L3	20 cm	0.160	0.059
	33 cm	0.182	0.058
	50 cm	0.183	0.063
	Dist	0.200	0.073
L2	20 cm	0.226	0.056
	33 cm	0.248	0.056
	50 cm	0.252	0.057
	Dist	0.268	0.054
L1	20 cm	0.199	0.068
	33 cm	0.225	0.076
	50 cm	0.232	0.081
	Dist	0.246	0.091

DESCRIPTIVE HOAs

Post Hoc Comparisons - Distance

		Mean Difference	SE	t	p bonf	p holm
Dist	X50.cm	0.015	0.005	3.386	0.007**	0.002**
	X33.cm	0.019	0.005	4.262	< .001***	< .001***
	X20.cm	0.043	0.005	9.420	< .001***	< .001***
X50.cm	X33.cm	0.004	0.005	0.876	1.000	0.384
	X20.cm	0.027	0.005	6.034	< .001***	< .001***
X33.cm	X20.cm	0.023	0.005	5.159	< .001***	< .001***

** p < .01, *** p < .001

Note. P-value adjusted for comparing a family of 6

Note. Results are averaged over the levels of: Lentille

Post Hoc Comparisons - Lenses

		Mean Difference	SE	t	p bonf	p holm
L3	L1	-0.044	0.012	-3.618	0.002**	0.001**
	L2	-0.067	0.012	-5.503	< .001***	< .001***
L1	L2	-0.023	0.012	-1.885	0.194	0.065

** p < .01, *** p < .001

Note. P-value adjusted for comparing a family of 3

Note. Results are averaged over the levels of: Distance

DISCUSSION

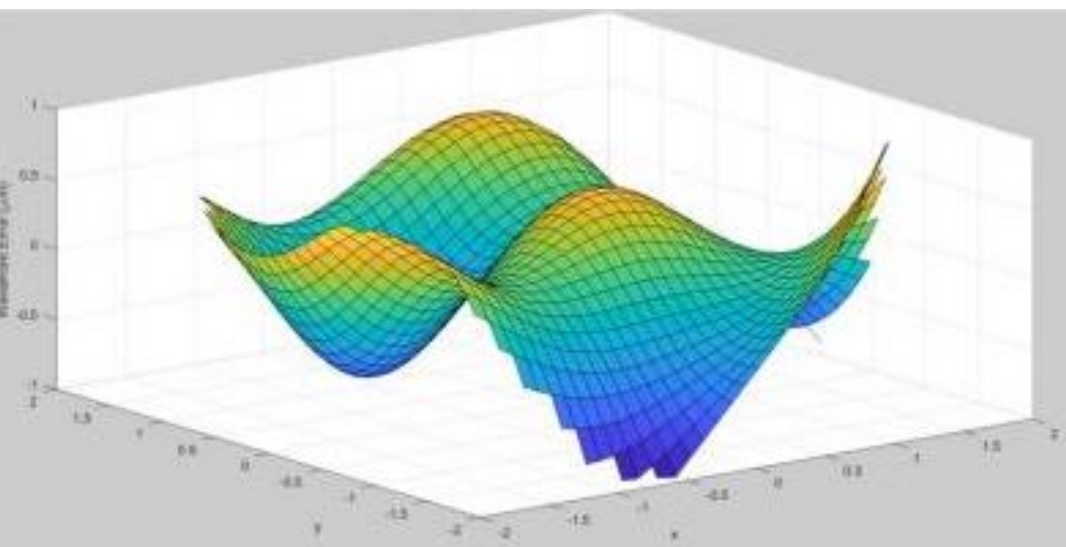
Lens design and reading distance influence the levels of aberrations induced in the eye.

In terms of design, the relationship of the add area vs. the pupil seems to be more important than the add power itself.

For distance, it seems that reading at < 33 cm reduces aberrations considerably.

CONCLUSION

These results may influence how soft multifocal lenses are designed and used in a young adult myopic population.



Reid S. Softspecialedition.com/winter-2021.html

CONTACT /SUPPORT

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