A Comparative Analysis of the Ocular Refraction Assessment.

Obaid Aziza [1,2],Borghesi Alessandro [1,2], Rizzo Giulia Carlotta [1,2], Tavazzi Silvia [1,2], Fabrizio Zeri [1,2,3].

1 Department of Materials Science, University of Milano-Bicocca, Milan, Italy.
2 Research Centre in Optics and Optometry (COMiB), University of Milano-Bicocca, Milan, Italy.
3 College of Health and Life Sciences. Aston University, Birmingham, UK

Study Objective

To evaluate the agreement and reliability in spherocylindrical refraction measurement at far (monocular and binocular) of four non cycloplegic procedures:

- ✓ Subjective refraction
- ✓ Open field aberrometer (OFA-Osiris prototype; CSO, Italy)
- ✓ Open field autorefractor WAM-5500 (Grand Seiko, Japan)
- ✓ Closed field aberrometer Osiris (CSO, Italy).

Methods

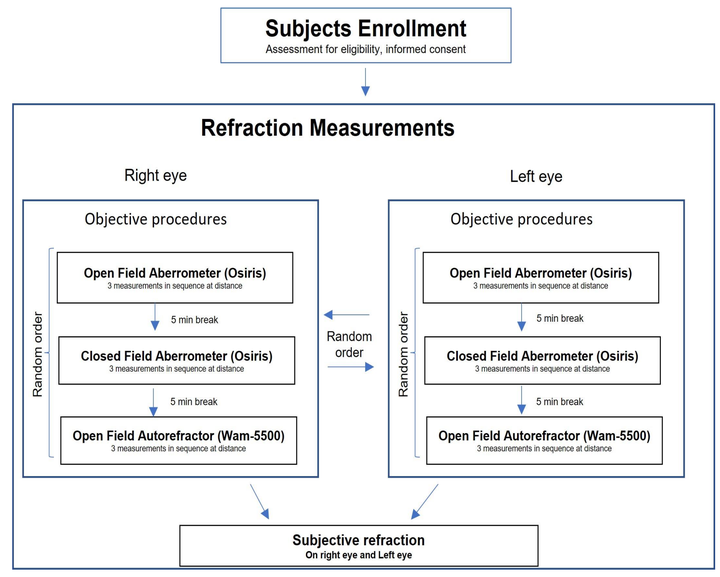
Prospective semi-randomized crossover study

Sixty–two (62) participants enrolled:
-33 presbyopes (54.7±8.2 years)
-29 young students (24.3±4.0 years)

Statistical analysis

Agreement between refraction assessments (Spherical Equivalent Refraction; SER) assessed with Friedman's test and Wilcoxon signed-rank tests.

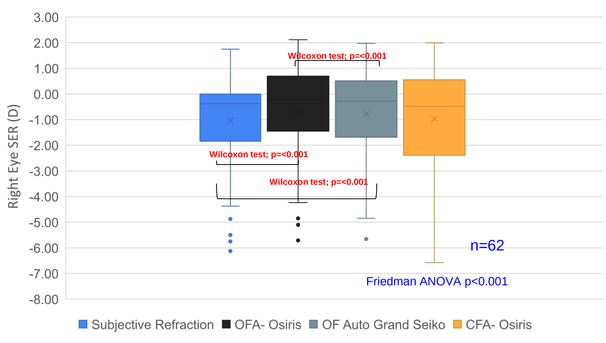
Correlation between several refraction assessments and between Monocular versus binocular refraction measurements compared using Wilcoxon signed-rank tests. [1]



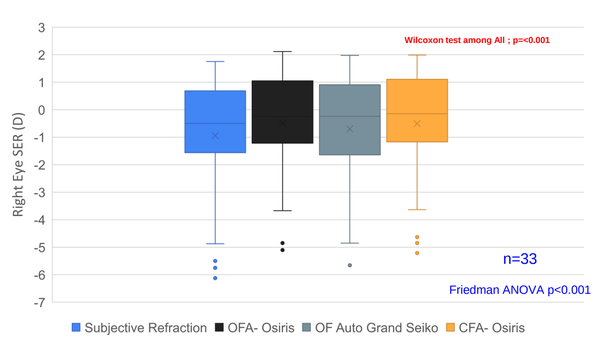
Results

(only right eye presented)

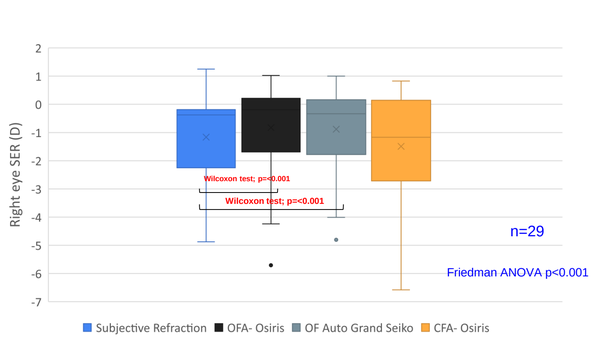
Agreement Between procedures (overall sample)



Agreement Between procedures (older subjects)

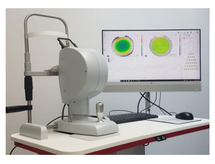


Agreement Between procedures (young subjects)



Reliability- Between procedures

OFA-Osiris



CP: 0.19
CR: 0.27

OFAutoref, Grand Seiko

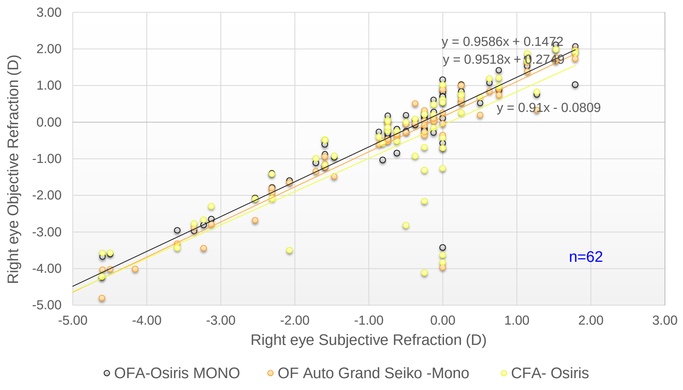
CP: 0.21
CR: 0.29

CFA-Osiris

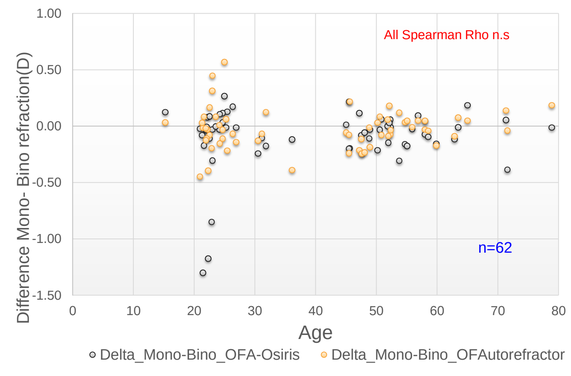
CP: 0.28
CR: 0.39

Coefficient of precision (CP): 1.96 * sw (sw is the within-subjects standard deviation for repeated measures).
Coefficient of repeatability (CR): 1.96 * √(2s2w),. value under which it would be the difference between two measurements in the 95% of probability [2].

Correlation Subjective and Objective procedures



Correlation Between age and Mono-Bino difference



Differences Between Monocular and Binocular Measurements (only open-field instruments)

Discussion

- ✓ No agreement was noticed among several procedures
- Significant differences were observed between monocular and binocular results for both right eye (RE) and left eye (LE) across all procedures, except for RE monocular Subjective Refraction with CFA-Osiris, indicating agreement.
- In older subjects (n=33), differences were noted in all procedures for both RE and LE, except for LE monocular OFA-OFAuto.
- Younger subjects displayed improved agreement in some procedures, yet discrepancies persisted, notably in RE and LE Subjective Refraction-OFAuto, and LE Sub-OFA.
- ✓ Almost all procedures measured significantly more positive refraction than subjective procedure.
- ✓ Good reliability of OFA-Osiris (similar to OFAutoref-Grand Seiko), which is in agreement with Bhatt et al., 2013[3]
- ✓ No differences between binocular and monocular refraction was found for OFA-Osiris (as Grand Seiko).

References:

1. Ruiss, M., Findl, O., Draschl, P., Harrer-Seely, A., & Hirnschall, N. (2021). Agreement and variability of subjective refraction, autorefraction, and wavefront aberrometry in pseudophakic patients. Journal of Cataract & Refractive Surgery, 47(8), 1056-1063.
2. Bland, J. M., & Altman, D. (1986). Statistical methods for assessing agreement between two methods of clinical measurement. The lancet, 327(8476), 307-310.
3. Bhatt, U. K., Sheppard, A. L., Shah, S., Dua, H. S., Mihashi, T., Yamaguchi, T., & Wolffsohn, J. S. (2013). Design and validity of a miniaturized open-field aberrometer. Journal of Cataract & Refractive Surgery, 39(1), 36-40.

https://comib.unimib.it/
a.obaid@campus.unimib.it

Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani
MUSA
Missione 4 - Istruzione e ricerca