MYAH®
CLINICAL COMPENDIUM

Summary of peer-reviewed clinical research

TOPCON Healthcare

PREFACE

At Topcon Healthcare, our vision is to empower providers with smart and efficient technologies for enhanced patient care. MYAH® is a versatile optical biometer and corneal topographer that provides key clinical measurements such as axial length, corneal topography, anterior corneal aberrometry, dynamic pupillometry, and meibography. In particular, axial length measurements taken with MYAH demonstrate a strong level of agreement with other commercially available biometers.[1-3] This is supported by several peer-reviewed studies, including those focused on pediatric populations.[2,3] MYAH's capabilities can be utilized in various clinical applications, including myopia management and contact lens fittings, substantiating its adaptability as a multifunctional diagnostic tool.

In addition to exploring this clinical compendium, we encourage you to learn more about our portfolio and dedication to research and science at www.topconhealthcare.com.

NOTE: Not all products and services are available in all markets.

1. Lal B, Cantrell A, Ostrin LA. Repeatability and agreement of the MYAH and Lenstar. Optom Vis Sci. 2024 Mar 1;101(3):157-163. doi: 10.1097/OPX.0000000000002113.
2. Sabur H, Takes O. Agreement of axial length and anterior segment parameters measured with the MYAH device compared to Pentacam AXL and IOLMaster 700 in myopic children. Int Ophthalmol. 2023 Feb;43(2):475-482. doi: 10.1007/s10792-022-02444-w. Epub 2022 Jul 31.
3. Aldaba M, Ochando P, Vila-Vidal N, Vinuela-Navarro V, Guisasola L, Perez-Corral J. Precision and agreement of axial length in pediatric population measured with MYAH and AL-Scan biometers. Clin Exp Optom. 2024 Sep;107(7):748-753. doi: 10.1080/08164622.2023.2277287. Epub 2023 Nov 13.

Table of Contents

14 **Astigmatism and maternal myopia as important factors affecting success rate of DIMS lens treatment**

Domsa P, Bankó ÉM, Körtvélyes J, Meigen C, Széchey R, Lantos K, Nagy ZZ, Csutak A. BMJ Open Ophthalmol. 2024 Mar 7;9(1):e001499. doi: 10.1136/bmjophth-2023-001499.

15 **The Repeatability and Agreement of Ocular Parameters Measured with the MYAH and Myopia Master Devices between Expert and Non-Expert Practitioners**

Ortiz-Toquero S., Sanchez I., Gurrea C., Recio A., Balsa D., Martin R. Life. 2024 Mar 19;14(3):407. doi: 10.3390/life14030407

16 **Comparison between IOL MASTER 500 and MYAH with vector analysis in low and mild anterior corneal astigmatism**

Camellin U, Franchina F, Latino G, Ninotta I, Palino P, Meduri A, Aragona P. Comparison between IOL MASTER 500 and MYAH with vector analysis in low and mild anterior corneal astigmatism. Eur J Ophthalmol. 2024 Jul;34(4):1046-1052. doi: 10.1177/11206721231210895. Epub 2023 Nov 3.

17 **Suitability of multifunction devices Myah and Myopia Master for monitoring myopia progression in children and adults**

Chow AHY, Mungalsingh MA, Thai D, Selimos Z, Yan SK, Xu H, Jones DA. Ophthalmic Physiol Opt. 2024 Jul;44(5):1017-1030. doi: 10.1111/opo.13332. Epub 2024 May 17

18 **Precision and agreement of axial length in paediatric population measured with MYAH and AL-Scan biometers**

Aldaba M, Ochando P, Vila-Vidal N, Vinuela-Navarro V, Guisasola L, Perez-Corral J. Precision and agreement of axial length in paediatric population measured with MYAH and AL-Scan biometers. Clin Exp Optom. 2024 Sep;107(7):748-753. doi: 10.1080/08164622.2023.2277287. Epub 2023 Nov 13.

19 CONGRESS PRESENTATIONS AND POSTERS

Comparison of Axial Length Measurements from three Biometric Instruments in Myopic Children

Kumar, A., Chan, A. W., Bohan, D., Chit, S. W., & Sun, C. H. Invest. Ophthalmol. Vis. Sci. 2023;64(8):5014;
https://iovs.arvojournals.org/article.aspx?articleid=2791119

Repeatability of the MYAH US Optical Biometer and Agreement with the Lenstar

Cantrell, A., & Ostrin, L. Invest. Ophthalmol. Vis. Sci. 2023;64(8):4955;
https://iovs.arvojournals.org/article.aspx?articleid=2790634

The Effect of Wearing Contact Lenses on Axial Length and Choroidal Thickness Measured with Swept-source Optical Coherence Tomography (SS-OCT)

Jung, L, Hwang, J, El-Nimri, N, Liu, M, Paper presented at: Annual Meeting of the American Academy of Optometry; October 11-14, 2024; New Orleans, LA.
Past Meeting Abstract Archives – American Academy of Optometry (aaopt.org)

Repeatability of Pupil Size Measurements Using a Multimodal Diagnostic Device

Sun, J., Dave, H., Luccitti, L. J., Arias, J. D., Durbin, M., & El-Nimri, N. W. Invest. Ophthalmol. Vis. Sci. 2024;65(7):6615;

https://iovs.arvojournals.org/article.aspx?articleid=2795351

Repeatability evaluation of a New Optical Biometer for Myopia Control in medical students

Leon, M. G., De la Orta Fuentes, N. V., Villarreal, C. D. V., Torres, A. T., Robles, E. A. G., & Garza-Garza, L. A. Invest. Ophthalmol. Vis. Sci. 2024;65(7):6616;
https://iovs.arvojournals.org/article.aspx?articleid=2799778

PEER-REVIEWED PUBLICATIONS

Clinical validation of a new optical biometer for myopia control in a healthy pediatric population

AUTHORS: Martínez-Plaza, E., Molina-Martín, A., Arias-Puente, A., & Piñero, D.P.

PUBLICATION: Children (Basel). 2022 Nov 9;9(11):1713. doi: 10.3390/children9111713.

STUDY PURPOSE

To assess the clinical validation of the Myah device in a pediatric population by evaluating the repeatability of biometric evaluations and analyzing its agreement with the Myopia Master system

OVERVIEW

STUDY DESIGN

Observational single-visit study

STUDY DEVICE(S)

- Myah® (Topcon Healthcare Inc., Tokyo, Japan)
- Myopia Master® (Oculus GmBH, Wetzlar, Germany)

OF EYES/PATIENTS

- 51 children (51 eyes); mean age of 10.80 ± 3.40 years (range 5 to 18 years)
- Subgroup of 30 eyes used for agreement analysis; mean age of 9.93 ± 2.97 (range 5 to 18 years

OUTCOME MEASURES

Repeatability of biometric measurements of flat (K1) and steep (K2) corneal radius, white-to-white (WTW) distance, and axial length (AL) and agreement of these parameters to a second device

RESULTS

- Repeated measurements of K1, K2 and WTW performed with the Myah device showed an excellent intraclass correlation coefficient (ICC), equal to or higher than 0.97 in all cases, obtaining an intrasubject standard deviation (Sw) of 0.02 mm, 0.02 mm, and 0.07 mm, respectively (Table 2)
- For AL measurements, the repeatability of the Myah device was even better than that of the previous parameters (K1, K2, WTW), showing a Sw of 0.02 mm and an ICC of 1 (Table 2)
- The mean values and standard deviation were 7.85 ± 0.23 mm and 7.87 ± 0.23 mm for the K1 measurements; 7.67 ± 0.23 mm and 7.73 ± 0.23 mm for the K2 measurements; 12.19 ± 0.40 mm and 11.99 ± 0.30 mm for the WTW measurements; and 23.86 ± 0.97 mm and 23.83 ± 0.94 mm for the AL measurements using the Myah and Myopia Master devices, respectively
- No significant differences were found for the K1 measurement between both devices ($p = 0.16$). Contrarily, the mean value of K2 was significantly higher for the Myopia Master device ($p < 0.001$), and the mean values of WTW and AL were significantly higher for the Myah device ($p < 0.001$ and $p = 0.009$, respectively)

Table 1

Mean values and standard deviation of the repeated measurements performed with the Myah device.

Parameter	1st Measurement (Mean ± SD)	2nd Measurement (Mean ± SD)	3rd Measurement (Mean ± SD)	*p*-Value
K1 (mm)	7.90 ± 0.27	7.90 ± 0.27	-	0.29
K2 (mm)	7.71 ± 0.27	7.71 ± 0.27	-	0.85
WTW (mm)	12.13 ± 0.41	12.12 ± 0.42	-	0.58
AL (mm)	23.87 ± 1.27	23.87 ± 1.27	23.87 ± 1.27	0.89

AL: axial length; K1: flat corneal radius; K2: steep corneal radius; SD: standard deviation; WTW: white-to-white.

Adapted from Children (Basel). 2022 Nov 9;9(11):1713. doi: 10.3390/children9111713.

Table 2

Intrasubject repeatability for axial length measurement obtained with the Myah device.

Parameter	Sw (95% CI)	Precision (95% CI)	Repeatability (95% CI)	CoV % (95% CI)	ICC
AL (mm)	0.02 (0.01/0.02)	0.03 (0.02/0.04)	0.05 (0.03/0.06)	0.07 (0.05/0.09)	1.00 (1.00/1.00)

AL: axial length; CI: confidence interval; CoV: coefficient of variation; D: diopters: ICC: intraclass correlation coefficient; K1: flat corneal radius; K2 : steep corneal radius; Sw: intrasubject standard deviation; WTW: white-to-white.

Adapted from Children (Basel). 2022 Nov 9;9(11):1713. doi: 10.3390/children9111713.

CONCLUSIONS

- Myah device provides consistent measurements of corneal radius, WTW distance and AL in a healthy pediatric population, validating their usefulness in clinical practice
- Repeatability found for measuring AL with the Myah device in children is comparable with that of other biometers available in the market. Eye care practitioners involved in myopia control can be confident in using the Myah device to evaluate the progression of myopia in children

Agreement of axial length and anterior segment parameters measured with the MYAH device compared to Pentacam AXL and IOLMaster 700 in myopic children

AUTHORS: Sabur, H., Takes, O.

PUBLICATION: Int Ophthalmol. 2023 Feb;43(2):475-482. doi: 10.1007/s10792-022-02444-w. Epub 2022 Jul 31.

STUDY PURPOSE

To compare the difference and agreement of axial length (AL) and anterior segment parameters obtained from the MYAH device with Pentacam AXL and IOLMaster 700 in myopic children

OVERVIEW

STUDY DESIGN

Retrospective comparative study

STUDY DEVICE(S)

- MYAH (Topcon EU, Visia Imaging, Japan)
- IOLMaster® 700 (Carl Zeiss Meditec AG, Germany)
- Pentacam® AXL (Oculus Optikgerate GmbH, Germany)

OF EYES/PATIENTS

60 eyes of 60 myopic children; aged 7–16 years, mean age was 10.2 ± 1.8 years

OUTCOME MEASURES

Difference between devices in measurements of mean axial length value (AL), mean steep keratometry (steep K), flat K, mean K, and horizontal corneal diameter (CD)

RESULTS

- No statistically significant difference was determined between the Pentacam AXL, IOLMaster 700, and MYAH devices in terms of mean AL values
- The mean AL values were measured as 23.61 ± 1.42 mm (21.74 - 28.22 mm) for the Pentacam AXL, 23.62 ± 1.45 mm (21.77 to 28.23 mm) for the IOLMaster 700, and 23.61 ± 1.42 mm (21.76–28.22) for the MYAH
- A significantly strong agreement was determined between the three devices with the ICC and Bland–Altman plots [r = 0.999 (0.999–1.00)] (Figure 1)

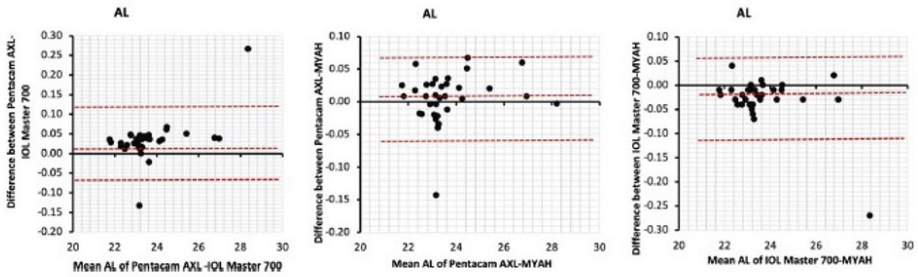

Fig. 1 Bland–Altman plots of AL measurements, with dotted lines showing the mean and 95% confidence intervals

Adapted from Int Ophthalmol. 2023 Feb;43(2):475-482. doi: 10.1007/s10792-022-02444-w. Epub 2022 Jul 31.

- The difference between devices in the mean steep K, flat K, mean K, and CD was statistically significant but clinically insignificant (steep K; 44.45 ± 1.25, 44.59 ± 1.23, 44.51 ± 1.24, flat K; 43.29 ± 1.28, 43.43 ± 1.29, 43.35 ± 1.30, mean K; 43.85 ± 1.21, 44.00 ± 1.19, 43.94 ± 1.20, and CD; 11.90 ± 0.34, 12.11 ± 0.38, 11.96 ± 0.31, respectively; $p < 0.05$)
- ICC and Bland–Altman plot analysis revealed a high correlation between the three devices in AL, steep K, flat K, mean K, and CD

CONCLUSIONS

- This study shows good agreement between the MYAH, Pentacam AXL, and IOLMaster 700 devices regarding AL and anterior segment parameters
- MYAH provides reliable measurements and will be a good option in the diagnosis of and follow- up with myopic children

Non-invasive assessment of the tear film after LASIK

AUTHORS: Yesilkaya E.C., Burke Z., Oksar M.T., Iritas I., Tanriverdi C., Karaca Y., Kilic A.

PUBLICATION: Eur Rev Med Pharmacol Sci. 2023 Oct;27(19):9034-9042. doi: 10.26355/eurrev_202310_33928

STUDY PURPOSE

To assess noninvasive tear film measurements during the early postoperative period of LASIK using the keratoscopy-based MYAH device and to compare the results with those obtained using conventional methods

OVERVIEW

STUDY DESIGN

Cross-sectional, single-center observational study

STUDY DEVICE(S)

MYAH (Topcon EU, Visia Imaging, Japan)

OF EYES/PATIENTS

80 eyes of 40 patients, mean age of 26.6 ± 5.9 years (18-40 years), who underwent bilateral primary LASIK

OUTCOME METRICS

Tear film and ocular surface evaluation performed at baseline, postoperative week 1, and month 1. Measurements obtained using the Schirmer I test and invasive tear-film breakup time (I-TBT) compared with non-invasive evaluation of the tear break-up time (NITBT), tear meniscus height (TMH) and blink analysis obtained using the MYAH device [(Total TBT duration, first TBT, 5% level TBT, interblink interval (IBI), and ocular protection index (OPI)]

RESULTS

- There was a significant decrease in Schirmer I test between the preoperative and week 1 and month 1 postoperative examinations (19.21±8.4 vs. 16.61±9.1 vs. 14.69±9.86, p= 0.02, respectively
- The results also revealed that there was a significant decrease between the preoperative and week 1 and month 1 postoperative examinations on I-TBT values (8.59 ± 3.4 vs.7.4 ± 3.25 vs. 6.17 ± 3.01, p= 0.03, respectively)
- Significant reductions were seen in 5% NITBT at week 1 and month 1 from baseline. However, the total TBT duration and first TBT were not statistically different at all follow-up times
- OPI decreased significantly at week 1 (p=0.009) and month 1 (p < 0.004)
- No significant difference in the IBI score was detectable between the baseline and week 1 and month 1 (p = 0.124)
- Although TMH increased non-significantly at week 1, the value was lower at month 1 compared to baseline (0.2 ±0.05 vs. 0.21 ± 0.05 vs. 0.18 ± 0.08, p= 0.04, respectively)

CONCLUSIONS

- This study showed that the objective non-invasive measurements of ocular surface metrics using the newly developed keratoscopy-based MYAH device provided useful, objective, and non-invasive data about the ocular surface after LASIK, though not all the measurements correlated with the class tests
- The findings of this study demonstrate that the MYAH device can detect disruption of the ocular surface and tear film from 1-week to 1-month after surgery

A Comparison of Optical Biometers Used in Children for Myopia Control

AUTHORS: Mattern, A. I., Neller, K., Devenijn, M., Schwahn, H., Langenbucher, A., Seitz, B., & Kaymak H.

PUBLICATION: Klin Monbl Augenheilkd. 2023 Nov;240(11):1306-1313. doi: 10.1055/a-2117-9335. Epub 2023 Jun 26.

STUDY PURPOSE

To analyze the repeatability and reproducibility of biometric data obtained with the IOLMaster 700, Myopia Master, Myah, and Lenstar LS900

OVERVIEW

STUDY DESIGN

Retrospective study

STUDY DEVICE(S)

- MYAH (Topcon, Tokyo, Japan)
- Myopia Master® (Oculus Optikgeräte, Wetzlar, Germany)
- IOLMaster® 700 (Carl Zeiss Meditec, Oberkochen, Germany)
- Lenstar LS900® (Haag-Streit, Koeniz, Switzerland)

OF EYES/PATIENTS

- 44 eyes of myopic children (11.1 ± 2.4 yr) with a spherical equivalent of − 3.53 ± 2.35 D
- Subset of 16 subjects used to assess repeatability of devices

OUTCOME METRICS

Repeatability and intra-subject reproducibility of biometric data, axial length (AL) and corneal parameters (steepK, flatK, meanK, vectors J0, J45), for the 4 devices

RESULTS

- All eyes (n = 44) were measured with the IOLMaster at least once. This biometer was chosen as the reference for the comparison and to assess reproducibility
- All biometers showed good repeatability in AL measurement, with values ranging between 0.04 to 0.06mm. Any AL measured with the Lenstar was, on average, longer by 0.02mm compared to the AL measured by the IOLMaster ($p < 0.001$) (Table 1)
- For reproducibility of AL measurement, Myopia Master and Myah were in close agreement with the IOLMaster, except for Lenstar, which significantly deviated from the IOLMaster by 0.02 mm ($p < 0.001$)
- In the assessment of corneal power (meanK), only Myopia Master deviated from the IOLMaster by 0.21 D (95% CI: − 0.36 D to 0.78 D), on average ($p < 0.001$). The vector assessments (J0, J45) did not deviate from each other to a clinically relevant degree, i.e., differences were less than 0.10 D

			Measurement interval required to reliably detect axial growth [months]			
Device	**SD [mm] (95% CI)**	**Repeatability (2.77*SD) [mm] (95% CI)**	**0.05 mm/yr (95% CI)**	**0.1 mm/yr (95% CI)**	**0.2 mm/yr (95% CI)**	**0.3 mm/yr (95% CI)**
IOLMaster 700	0.02 (0.01 – 0.02)	0.05 (0.03 - 0.06)	11.3 (7.4 – 15.2)	5.6 (3.7 – 7.6)	2.8 (1.8 – 3.8)	1.9 (1.2 – 2.5)
Myopia Master	0.02 (0.01 – 0.03)	0.06 (0.03 - 0.08)	13.2 (8.0 – 18.4)	6.6 (4.0 – 9.2)	3.3 (2.0 – 4.6)	2.2 (1.3 – 3.1)
Myah	0.02 (0.01 – 0.03)	0.06 (0.04 - 0.08)	13.4 (8.6 – 18.2)	6.7 (3.6 – 9.1)	3.3 (2.1 – 4.5)	2.2 (1.4 – 3.0)
Lenstar	0.02 (0.01 – 0.02)	0.04 (0.03 - 0.06)	10.0 (6.4 – 13.7)	5.0 (3.2 – 6.8)	2.5 (1.6 – 3.4)	1.7 (1.1 – 2.3)

TABLE 1. Overview of the intra-subject SD, intra-subject repeatability (2.77*SD), and the calculated time interval required between two axial length measurements for different axial growth rates to be reliably detectable. Adapted from Klin Monbl Augenheilkd. 2023 Nov;240(11):1306-1313. doi: 10.1055/a-2117-9335. Epub 2023 Jun 26.

CONCLUSIONS

- Good agreement was observed between all the biometers
- When assessing myopia progression in children, a time frame of at least 6 months between the AL measurements is advisable in order to reliably determine any deviation from a normal growth pattern

Dynamic Pupillary Response in Multiple Sclerosis Patients with and without Optic Neuritis

AUTHORS: Gil-Casas A, Piñero DP, Molina-Martín A.

PUBLICATION: Biomedicines. 2023 Dec 17;11(12):3332. doi: 10.3390/biomedicines11123332

STUDY PURPOSE

To assess different parameters of the pupillary response in Multiple Sclerosis (MS) subjects with and without previous optic neuritis (ON) using a pupillometry module integrated into a topographer device and to compare these results with those obtained in an aged-matched sample of healthy subjects

OVERVIEW

STUDY DESIGN

Prospective study

STUDY DEVICE(S)

MYAH topographer (Topcon EU, Tokyo, Japan)

OF EYES/PATIENTS

24 eyes of healthy age-matched subjects (control group), 22 eyes of subjects with MS (MS group), and 13 subjects with MS with previous ON (MSON group)

OUTCOME METRICS

Pupillary parameters: ratio pupil max/min; latency; velocity and duration; contraction and dilation; and amplitude of contraction

RESULTS

- The control group showed a relative maximum pupil size slightly higher (46.38 7.62%) than the MS (42.39 8.32%) and MSON group (41.82 8.24%), but they were still very similar (p > 0.05)
- The amplitude of pupil contraction in the MSON group (40.71 6.73%) was reduced with respect to the control group (45.22 3.29%) (p = 0.01) but not compared to the MS group (43.75 5.02%) (p = 0.23)
- When comparing the latency of pupil contraction between groups, the MSON group spent more time (0.35 ± 0.13 s) than the control group (0.26 ± 0.05 s) initiating the constriction reaction (p = 0.03)
- In terms of the dilatation function, none of the analyzed parameters (velocity, latency, and duration) showed statistically significant differences between the three study groups. Even so, the speed of dilation was faster in the control group (0.89 ± 0.34 mm/s), with no statistically significant differences between the MS and MSON groups (0.74 ± 0.29 mm/s and 0.64 ± 0.26 mm/s, respectively)

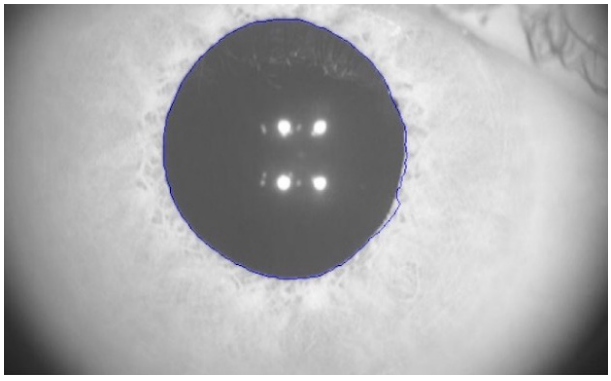

FIGURE 1. Real image taken by MYAH topograher with the pupillometry module. The pupillary diameter is automatically detected and outlined in blue.

Adapted from Biomedicines. 2023 Dec 17;11(12):3332. doi: 10.3390/biomedicines11123332

CONCLUSIONS

- The results obtained in the present paper showed that most of the pupillary parameters in MS subjects (without ON and normal CDVA) were comparable to those of healthy age matched controls
- Based on the results of this study, the contraction process, especially latency and amplitude, were found to be affected in subjects with MS and previous ON

Associations between Ocular Biometry, Refractive Error, and Body Characteristics

AUTHORS: Noya-Padin V, Nores-Palmas N, Garcia-Queiruga J, Giraldez MJ, Pena-Verdeal H, Yebra-Pimentel E.

PUBLICATION: Photonics 2024, 11(2), 165; https://doi.org/10.3390/photonics11020165

STUDY PURPOSE

To evaluate the relationships between axial length, body height, refractive error, and sex

OVERVIEW

STUDY DESIGN

Prospective study

STUDY DEVICE(S)

- Topcon MYAH biometer (Topcon, Tokyo, Japan),
- Shin-Nippon NVISION-K 5001 (Rexxam Co., Kagawa, Japan)

OF EYES/PATIENTS

72 eyes of 36 myopic subjects (19 girls and 17 boys); mean age of 11.1 ± 1.42 years, (ranging from 8 to 14 years)

OUTCOME MEASURES

Correlations between refractive parameters, AL, body height, and age, and between refractive parameters, AL, and age based on sex

Differences in body height and ocular refraction based on AL, differences in AL and ocular refraction based on body height percentile, and differences in body height, AL, and ocular refraction based on the sex of the participants

RESULTS

- AL was negatively and moderately correlated with sphere power and SE (Spearman's correlation, $r \leq -0.571$, both $p < 0.001$). No significant correlations were found with other refractive components (Spearman's correlation, all $p \geq 0.208$) (Table 1)
- AL was also positively and weakly correlated with body height (Spearman's correlation, $r = 0.283$, $p = 0.016$) (Table 1)
- Age was strongly correlated with body height (Spearman's correlation, $r = 0.839$, $p < 0.001$) but not with refractive parameters or AL (Spearman's correlation, all $p \geq 0.223$) (Table 1)
- There were no significant correlations between AL and age in either the female or male participants (Spearman's correlation, both $p \geq 0.223$)

		Sph Power	Cyl Power	Cyl Axis	SE	J0	J45	AL	Height
AL	r_s	−0.558 *	−0.150	0.119	−0.571 *	−0.138	−0.080		
	p	<0.001	0.208	0.321	<0.001	0.248	0.506		
Height	r_s	−0.303 *	−0.157	−0.004	−0.315 *	−0.276 *	0.012	0.283 *	
	p	0.010	0.188	0.973	0.007	0.019	0.923	0.016	
Age	r_s	−0.134	−0.096	0.008	−0.145	−0.219	0.008	0.143	0.839 *
	p	0.260	0.423	0.949	0.223	0.065	0.950	0.231	<0.001

AL = Axial Length; Cyl Axis = Cylinder Axis; Cyl Power = Cylinder Power; SE = Spherical Equivalent; Sph Power = Sphere Power; r_s = Spearman Correlation. * Statistically significant.

TABLE 1. Correlation between refractive parameters, AL, body height, and age. Adapted from Photonics 2024, 11(2), 165

CONCLUSIONS

- In summary, there is a relationship between the AL of the eye and its refractive status
- In addition, individual anatomical characteristics such as body height and sex also play a role in these parameters. It was observed that AL and myopic refractive error are higher in the taller and male subjects

Repeatability and agreement of the MYAH and Lenstar

AUTHORS: Lal B., Cantrell A., Ostrin L.A.

PUBLICATION: Optom Vis Sci. 2024 Mar 1;101(3):157-163. doi: 10.1097/OPX.0000000000002113

Lisa A Ostrin: Commercial Relationship(s): Code F (Financial Support): Topcon Medical Systems.

STUDY PURPOSE

To investigate intersession repeatability of the MYAH optical biometer and corneal topographer and examine agreement with the Lenstar LS900 optical biometer in healthy young adults

OVERVIEW

STUDY DESIGN

Prospective study

STUDY DEVICE(S)

- MYAH (Topcon Healthcare Inc., Tokyo, Japan)
- Lenstar LS900® (Haag-Streit, Köniz, Switzerland)

OF EYES/PATIENTS

Right eyes of 40 subjects (mean age, 25.2 ± 3.1 years) measured at two visits, 2 to 4 days apart, scheduled during a similar time window to account for diurnal variation

OUTCOME METRICS

Intrasession agreement between each device for measurement of axial length, corneal power, white-to-white distance, and pupil diameter and intersession repeatability of the 2 devices

RESULTS

- Good agreement between the MYAH and Lenstar for all parameters, although significant differences were found between the MYAH and Lenstar for axial length (−0.01 ± 0.03 mm, p=0.004), white-to-white distance (−0.13 ± 0.15 mm, p<0.001), and pupil diameter (0.27 ± 0.54 mm, p=0.003)
- Axial length, corneal power, and white-to-white distance were not significantly different between the right and left eyes for both instruments (p>0.05 for all)
- MYAH and Lenstar demonstrated good intersession repeatability (Table 1)

Device	Parameter	CoV	ICC (95% CI)	p*
MYAH	Axial length (mm)	0.06	>0.99 (>0.99 to 1.00)	0.94
	Corneal power (D)	0.18	>0.99 (>0.99 to 1.00)	0.20
	White-to-white distance (mm)	0.56	0.96 (0.93 to 0.98)	0.16
	Pupil diameter (mm)	6.96	0.76 (0.59 to 0.87)	0.56
Lenstar	Axial length (mm)	0.05	>0.99 (>0.99 to >0.99)	0.64
	Corneal power (D)	0.16	>0.99 (>0.99 to >0.99)	0.55
	White-to-white distance (mm)	0.61	0.96 (0.92 to 0.98)	0.15
	Pupil diameter (mm)	5.57	0.87 (0.77 to 0.93)	0.90

*Paired *t* test; CI = confided t test; CI = confidence interval; CoV = coefficient of variation; ICC = intraclass correlation coefficient

TABLE 1. CoV, ICC with 95% CI), and the P value for ocular parameters measured at visit 1 and visit 2 for the MYAH and Lenstar. Adapted from Optom Vis Sci. 2024 Mar 1;101(3):157-163.

Parameter	Mean difference ± SD (MYAH − Lenstar)	95% LoA	p*
Axial length (mm)	−0.01 ± 0.03	−0.07 to 0.04	0.004
Corneal power (D)	0.02 ± 0.09	−0.15 to 0.19	0.20
White-to-white distance (mm)	−0.13 ± 0.15	−0.43 to 0.17	<0.001
Pupil diameter (mm)	0.27 ± 0.54	−0.79 to 1.33	0.003

*Paired *t* test. LoAs, limits of lard deviation.

TABLE 2. Mean difference, 95% LoAs, and the p value for ocular parameters measured with the MYAH and Lenstar. Adapted from Optom Vis Sci. 2024 Mar 1;101(3):157-163.

CONCLUSIONS

- This study found good agreement between the MYAH and Lenstar for measuring axial length, corneal power, and white-to-white distance in young adults
- The study also showed high intersession repeatability of the MYAH for all measured parameters, although caution should be exercised for comparing pupil diameter across sessions, likely due to its dynamic nature
- These findings support the use of the MYAH in research and clinical practice

Astigmatism and maternal myopia as important factors affecting success rate of DIMS lens treatment

AUTHORS: Domsa P, Bankó ÉM, Körtvélyes J, Meigen C, Széchey R, Lantos K, Nagy ZZ, Csutak A.

PUBLICATION: BMJ Open Ophthalmol. 2024 Mar 7;9(1):e001499. doi: 10.1136/bmjophth-2023-001499

STUDY PURPOSE

To assess the effectiveness of DIMS (defocus incorporated multiple segments) lenses in attenuating myopia progression within a European paediatric cohort, encompassing a diverse dioptre range from −0.88 spherical equivalent refraction (SER) to −8.25 SER with special focus on investigating the impact of baseline optic parameters as well as parental myopia on the efficacy of DIMS lenses

OVERVIEW

STUDY DESIGN

Retrospective observational study

STUDY DEVICE(S)

- Topcon KR-800 (Tokyo, Japan)
- Topcon Myah (Visia Imaging, Italy)

OF EYES/PATIENTS

62 individuals of Caucasian descent, aged 4–17 years (mean ±SD: 10.21±2.70) with progressing myopia but without ocular pathology, with a range of −0.88 to −8.25 D spherical equivalent refraction (SER) (−3.73±1.56), coupled with astigmatism up to −3.25 D cylindrical

OUTCOME MEASURES

Cycloplegic SER, measured for all participants, and axial length (AL), assessed in a subset of patients, recorded at baseline, 6 months and 12 months

RESULTS

- The mean (±SE) unadjusted myopia progression (SER) over the 1-year period for the whole study group (N=62) was −0.40±0.05 D, with 31 (50%) patients showing no progression at the end of the 1-year period
- The extent of axial elongation was significantly dependent on patients' age ($F(1,27)=10.42$, $p=0.003$), with younger patients showing more pronounced elongation, while the effect of parental myopia only showed a non-significant trend ($F(1,27)=3.32$, $p=0.079$ and $F(1,27)=2.77$, $p=0.11$ for maternal and paternal myopic dioptres, respectively). Baseline AL had no effect ($F(1,27)=0.021$, $p=0.65$)
- The presence of astigmatism had a significant effect on axial elongation as well ($F(1,27)=4.73$, $p=0.039$; 0.20±0.05 mm vs 0.12±0.04 mm for patients with and without astigmatism, respectively)
- While the axial elongation was also dependent on patients' age ($F(1,182)=46.94$, $p<0.0001$), with younger patients progressing at a larger rate, the presence of astigmatism had absolutely no effect on myopia progression ($F(1,182)=0.003$, $p=0.96$; 0.12±0.02 mm vs 0.11±0.01 mm for patients with and without astigmatism, respectively)

CONCLUSIONS

- The presence of astigmatism in the group of patients with myopia resulted in larger progression compared with patients with purely axial myopia, potentially diminishing the effects of DIMS lenses in slowing myopia progression
- Patients with severe maternal myopia also experienced a significantly more pronounced progression
- Younger age was associated with faster progression, which, unlike that of older children, did not slow down after 6 months, achieving larger progression at 12 months

The repeatability and agreement of ocular parameters measured with the MYAH and Myopia Master devices between expert and non-expert practitioners

AUTHORS: Ortiz-Toquero S., Sanchez I., Gurrea C., Recio A., Balsa D., Martin R.

PUBLICATION: Life. 2024 Mar 19;14(3):407. doi: 10.3390/life14030407

STUDY PURPOSE

To analyse the repeatability and agreement between expert and non-expert practitioners in ocular parameters measured by the MYAH and Myopia Master

OVERVIEW

STUDY DESIGN

Prospective cross-sectional study

STUDY DEVICE(S)

- MYAH (Topcon Healthcare Inc., Tokyo, Japan)
- Oculus Myopia Master® (Oculus GmBH, Wetzlar, Germany)

OF EYES/PATIENTS

42 right eyes of 42 patients; mean age of 24.7± 5.80 years (range 19 to 38 years) and a mean spherical equivalent refractive error of -2.18 ± 1.88 D (range −0.25 to −6.00 D)

OUTCOME MEASURES

Intraobserver repeatability and the interdevice and interobserver agreement of relevant biometric eye parameters: axial length (AL), flat (K1) and steep (K2) corneal curvature, and white-to white (WTW) distance

RESULTS

- The intraobserver repeatability was practically identical in all parameters between the expert and non-expert with both the MYAH and the Myopia Master devices. AL measurements showed the best repeatability results with the MYAH and Myopia Master (ICC = 1.0; CV ≤ 0.06% for both observers), while the WTW distance presented poorer results (ICC ≤ 0.991; CV ≤ 0.52%)
- For interdevice agreement, AL measurement showed a non-statistically significant difference (p ≥ 0.10) between the MYAH and Myopia Master in both the expert and and non-expert observer
- The Myopia Master significantly underestimated (p ≤ 0.01) K1 and K2 (providing flatter or lower corneal power) and WTW distance values compared with the MYAH
- For interobserver agreement, a high correlation between the measurements of the expert and the non-expert observer was found for all variables (Figure 1)

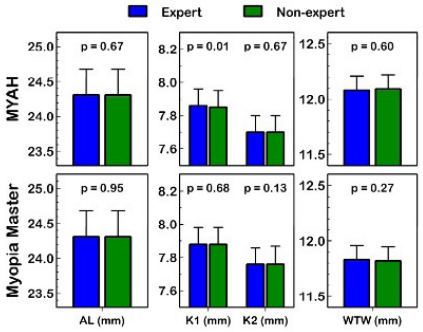

FIGURE 1 Summary of AL (axial length), K1 (flat keratometry), K2 (steep keratometry), and WTW (white-to-white) distance measured by expert and non-expert observers with MYAH and Myopia Master. The paired t test p value and 95% confidence interval are presented. Adapted from Life. 2024 Mar 19;14(3):407.

CONCLUSIONS

- The MYAH and Myopia Master are highly repeatable devices that provide consistent measurements of the AL, K1, K2, and WTW distance in a healthy adult population regardless of the previous clinical practice experience of the observer who performs the measurements
- The agreement between both instruments was excellent for AL measurements by both the expert and the non-expert observer, which indicates that the measurements could be used interchangeably
- The measurements of corneal curvature and WTW distance provided by both devices could be used interchangeably with caution in clinical practice (though not in research) because both devices provide significantly different outcomes

Comparison between IOL MASTER 500 and MYAH with vector analysis in low and mild anterior corneal astigmatism

AUTHORS: Camellin U., Franchina F., Latino G., Ninotta I., Palino P., Meduri A., Aragona P.

PUBLICATION: Eur J Ophthalmol. 2024 Jul;34(4):1046-1052. doi: 10.1177/11206721231210895. Epub 2023 Nov 3.

STUDY PURPOSE

To evaluate the agreement between two biometers in measuring axial length, keratometry, and anterior corneal astigmatism

OVERVIEW

STUDY DESIGN

Prospective, single-center, cross-sectional study

STUDY DEVICE(S)

- MYAH (Topcon EU, Visia Imaging, Japan)
- IOL Master 500 (Carl Zeiss Meditec AG, Germany)

OF EYES/PATIENTS

40 eyes (right eye 25, left eye 15) of 40 patients; mean age of 32.15 ±7.38 years (range from 22 up to 42 years)

OUTCOME METRICS

Agreement of the 2 devices for measurements of axial length (AL), keratometry (K1, K2), and anterior corneal astigmatism (ACA). AL, mean K(Kavg), and magnitude of ACA were compared

RESULTS

- Mean and standard deviation with IOL Master 500 and with MYAH device was for AL 24.25 ± 1.22 mm and 24.45 ± 1.22 mm (p = .99), for Kavg 42.75 ± 1.53 D and 42.85 ± 1.52 D (p = .78), for the magnitude of ACA 1.00 ± 0.58 D and 0.89 ± 0.56 D (p = .38) respectively
- Bland-Altman analysis of the two devices found high agreement and absence of proportional bias were found between the two assessments for AL (bias=−0.0005 mm, p=.93), Kavg (bias=0.0955 D, p=.76) and ACA (bias=0.11 D, p=.41). Limit of agreement (upper/lower LoA, 95%CI) were respectively +0.057/−0.058 mm for AL,+0.29/ −0.09 D for Kavg and +0.49/−0.27 D for ACA
- ACA polar vectorial analysis between IOL Master 500 and MYAH demonstrated a small difference that is not statistically significant for the magnitude of error (0.11 D) with an angle of error between −5° to +5°in 55% of eyes; 28% of eyes were between −5° to−15°

Table 1. Comparison of mean ± standard deviation, median (interquartile range), and mean difference with limit of agreement (LoA) of AL, Kavg, K1, K2, ACA and Cartesian vector component of ACA (x,y) between IOL Master and MYAH.

Data	IOL Master 500 mean ± SD, median (interquartile range)	MYAH mean ± SD, median (interquartile range)	p-value	Mean difference_MYAH - IOL Master (upper/lower LoA)
AL (mm)	24.25 ± 1.22 24.16 (23.41; 24.85)	24.25 ± 1.22 24.16 (23.39; 24.83)	**.99**	−0.0005 (+0.057/−0.058)
Kavg (D)	42.75 ± 1.53 42.83 (42.26; 43.92)	42.85 ± 1.52 42.99 (42.34; 43.97)	**.78**	0.0955 (+0.29/−0.09)
K1 (D)	42.35 ± 1.50 42.43 (41.65; 43.60)	42.31 ± 1.52 42.34 (41.73; 43.54)	**.90**	-0.04 (+0.30/−0.22)
K2 (D)	43.35 ± 1.60 43.52 (42.70; 44.48)	43.20 ± 1.59 43.29 (42.53; 44.29)	**.67**	-0.15 (+0.43/−0.13)
ACA (D)	1.00 ± 0.58 0.89 (0.58; 1.24)	0.89 ± 0.56 0.73 (0.53; 1.09)	**.38**	-0.11 (+0.49/−0.27)
Cartesian Vector component "x" of ACA (mm)	0.01 ± 0.28 0.04 (−0.027; 0.15)	−0.04 ± 0.28 0.00 (−0.089; 0.082)	**0.143***	-0.049 (+0.30/−0.20)
Cartesian Vector component "y" of ACA (mm)	0.96 ± 0.58 0.89 (0.58; 1.19)	0.86 ± 0.54 0.74 (0.53; 1.04)	**0.308***	-0.10 (+0.46/−0.25)

AL = axial length, Kavg = K average, K1 = K flat, K2 = K steep, ACA = anterior corneal astigmatism.
*p-value with Kruskal-Wallis test for non-parametric data distribution.

Adapted from Eur J Ophthalmol. 2024 Jul;34(4):1046-1052. doi: 10.1177/11206721231210895. Epub 2023 Nov 3.

CONCLUSIONS

- The authors report that no differences were found between MYAH and IOL Master 500 in terms of AL, Kavg, K flat, K steep and ACA in their study
- The instruments appear to be interchangeable for measurements of AL, keratometry, and magnitude of ACA with high agreement between the two devices. Also, in the presence of low astigmatism, the two instruments give the same results in terms of ACA

Suitability of multifunction devices Myah and Myopia Master for monitoring myopia progression in children and adults

AUTHORS: Chow AHY, Mungalsingh MA, Thai D, Selimos Z, Yan SK, Xu H, Jones DA.

PUBLICATION: Ophthalmic Physiol Opt. 2024 Jul;44(5):1017-1030. doi: 10.1111/opo.13332. Epub 2024 May 17

STUDY PURPOSE

To assess the feasibility of using multifunction instruments to measure axial length for monitoring myopia progression in children and adults

OVERVIEW

STUDY DESIGN

Prospective study

STUDY DEVICE(S)

- MYAH (Topcon)
- Myopia Master® (Oculus Optikgeräte GmbH)
- IOLMaster® 700 (Carl Zeiss Meditec AG)
- Lenstar LS900® (Haag-Streit)

OF EYES/PATIENTS

120 right eyes; 60 children (aged 6–18 years) and 60 adults (aged 19–50 years)

OUTCOME MEASURES

Repeatability and reproducibility of mean axial length measurement, inter-instrument agreement computed as intraclass correlation coefficients, and time taken to obtain a measurement

RESULTS

- In children, reproducibility fell within 0.1 mm 95% of the time for the Myah, Myopia Master and IOLMaster 700
- Agreement among all devices was classified as excellent (ICC 0.999; 95% CI 0.998–0.999)
- The strongest agreement was found between the Myah and the IOLMaster 700, giving the smallest mean difference and narrow limits of agreement (−0.003mm; −0.065 to 0.060)
- Measurements for children were significantly faster with the Myah than the IOLMaster 700 (mean difference [SE] −21.90 s [6.01], t117 = −3.65, p = 0.009), Myopia Master (mean difference [SE] −27.14 s [6.659], t117 = −4.52, p < 0.001) and Lenstar LS900 (−85.22 s [6.01], t117 = −14.19, p < 0.001)
- In adults, measurement times were similar among the Myah, Myopia Master and IOLMaster 700 (Myah and Myopia Master mean difference [SE] −5.94 s [6.34], t110 = −0.94, p > 0.99; Myah and IOLMaster 700 mean difference [SE] −14.36 s [6.34], t110 = −2.27, p = 0.68; Myopia Master and IOLMaster 700 mean difference [SE] −8.42 s[6.34], t110 = −1.33, p > 0.99)
- Measuring adults with the Lenstar LS900 took significantly longer than the Myah, Myopia Master, and the IOL Master 700 (Figure 1)

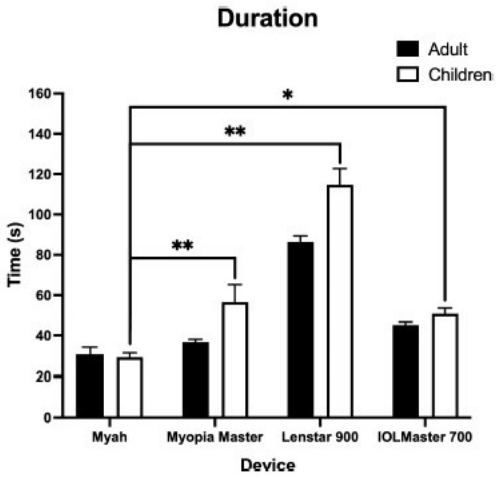

FIGURE 1. Time to obtain a measurement for all devices split by age group. Significant pairwise comparisons are shown for children only (*p < 0.01; **p < 0.001). Measurements with the Lenstar LS900 took significantly longer than the other three biometers in both children and adults. Adapted from Ophthalmic Physiol Opt. 2024 Jul;44(5):1017-1030.

CONCLUSIONS

- Myah and Myopia Master multifunction instruments demonstrated good repeatability and reproducibility, and their accuracy was comparable to stand-alone biometers
- Axial length measurements using different instruments can be considered interchangeable but should be compared with some caution
- The multifunctional instruments Myah and Myopia Master are as well suited for monitoring myopia progression in children as the stand-alone biometers IOLMaster 700 and Lenstar LS900

Precision and agreement of axial length in paediatric population measured with MYAH and AL-Scan biometers

AUTHORS: Aldaba, M., Ochando, P., Vila-Vidal, N., Vinuela-Navarro, V., Guisasola, L., & Perez-Corral, J.

PUBLICATION: Clin Exp Optom. 2024 Sep;107(7):748-753. doi: 10.1080/08164622.2023.2277287. Epub 2023 Nov 13.

Joan Perez-Corral: Commercial Relationship(s) Code C (Consultant) Topcon Europe Medical B.V.

STUDY PURPOSE

To assess the precision (repeatability and reproducibility) and agreement of the MYAH and AL-Scan biometers in a paediatric population

OVERVIEW

STUDY DESIGN

Prospective study

STUDY DEVICE(S)

- MYAH (Topcon, Japan)
- AL-Scan (Nidek, Japan)

OF EYES/PATIENTS

Right eyes of 187 subjects; mean age was 8.5 ± 0.3 years, ranging from 7.9 to 9.8 years

OUTCOME METRICS

Repeatability and reproducibility of mean axial length measurements and agreement of the 2 devices

RESULTS

- For the repeatability study, the within-subject standard deviation was 0.01 mm, and the repeatability limit was 0.04 mm for both instruments, with no statistically significant differences among repeated measures ($p = 0.162$ for MYAH and $p = 0.774$ for AL-Scan)
- For the reproducibility study, the within-subject standard deviation was 0.01 mm and the repeatability limit was 0.04 mm. There were statistically significant differences for the repeated measures for the AL-Scan ($p = 0.002$) but not for the MYAH ($p = 0.643$)
- For the agreement study between both instruments, the 95% limit of agreement ranged from −0.04 to 0.05 mm, and the differences were statistically significant ($p = 0.021$). The comparison has a LoA of approximately ±0.04 mm, and thus the difference among instruments was less than this value in 95% of the cases

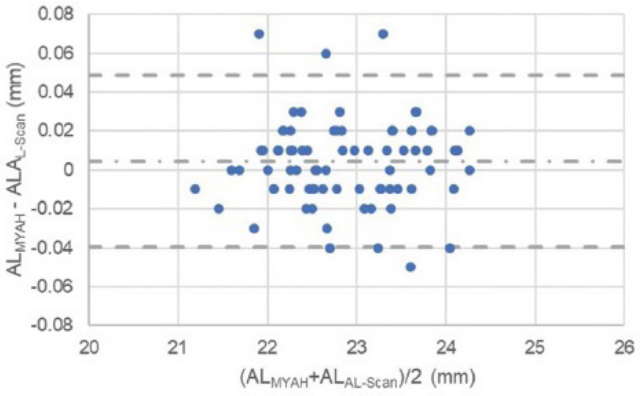

FIGURE 1. Bland and Altman plot for the agreement study between MYAH and AL-Scan. The difference between measurements (MYAH minus AL-Scan) is plotted against the mean value of both measurements. The dash-dotted line indicates the mean difference and the dashed lines the upper and lower LoA. Adapted from Clin Exp Optom. 2024 Sep;107(7):748-753. doi: 10.1080/08164622.2023.2277287. Epub 2023 Nov 13.

CONCLUSIONS

- In the analysis of the precision of the MYAH and AL-Scan in paediatric population, the repeatability and reproducibility have been found to be equal
- The good agreement between instruments suggests that the two devices can be used interchangeably for myopia control

CONGRESS PRESENTATIONS AND POSTERS

Comparison of Axial Length Measurements from three Biometric Instruments in Myopic Children

Kumar, A., Chan, A. W., Bohan, D., Chit, S. W., & Sun, C. H. Invest. Ophthalmol. Vis. Sci. 2023;64(8):5014; https://iovs.arvojournals.org/article.aspx?articleid=2791119

Repeatability of the MYAH US Optical Biometer and Agreement with the Lenstar

Cantrell, A., & Ostrin, L. Invest. Ophthalmol. Vis. Sci. 2023;64(8):4955; https://iovs.arvojournals.org/article.aspx?articleid=2790634

The Effect of Wearing Contact Lenses on Axial Length and Choroidal Thickness Measured with Swept-source Optical Coherence Tomography (SS-OCT)

Jung, L, Hwang, J, El-Nimri, N, Liu, M, Paper presented at: Annual Meeting of the American Academy of Optometry; October 11-14, 2024; New Orleans, LA.
Past Meeting Abstract Archives – American Academy of Optometry (aaopt.org)

Repeatability of Pupil Size Measurements Using a Multimodal Diagnostic Device

Sun, J., Dave, H., Luccitti, L. J., Arias, J. D., Durbin, M., & El-Nimri, N. W.* Invest. Ophthalmol. Vis. Sci. 2024;65(7):6615; https://iovs.arvojournals.org/article.aspx?articleid=2795351

Repetitibility evaluation of a New Optical Biometer for Myopia Control in medical students

Leon, M. G., De la Orta Fuentes, N. V., Villarreal, C. D. V., Torres, A. T., Robles, E. A. G., & Garza-Garza, L. A. Invest. Ophthalmol. Vis. Sci. 2024;65(7):6616; https://iovs.arvojournals.org/article.aspx?articleid=2799778

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