Postoperative Evaluation of Bilateral Reading Performance With Two Intraocular Lenses: Twelve-Month Results

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Purpose: The aim of this study was to compare the bilateral reading performances within the first 12 months after the implantation of two intraocular lens (IOL) models.

Methods: The patients involved in this research had bilateral phacoemulsification and implantation of the Acriva Reviol MFM 613 IOL (group 1) or AcrySof ReSTOR SN6AD1 apodized multifocal IOL (group 2). The bilateral reading performance was evaluated preoperatively and postoperatively using the MNREAD acuity charts. The reading speed, critical print size, and reading acuity were measured binocularly at 40 and 60 cm. In addition, the binocular uncorrected visual acuities (far, UDVA; intermediate, UIVA; and near, UNVA) were also measured.

Results: Each IOL model was implanted in 30 eyes (15 patients), and 60 patients were included in this study. Overall, there were no statistically significant postoperative differences in the mean UDVA, UIVA and mean ($P>0.05$). There were statistically significant postoperative differences in the mean reading acuity (group 1, 0.07±0.10 logMAR; group 2, 0.02±0.08 logMAR; $P=0.019$) at 40 cm. When tested at 60 cm, the reading acuity (0.13±0.10 logMAR and 0.21±0.11 logMAR, respectively; $P=0.021$) and critical print size (0.25±0.13 logMAR and 0.39±0.16 logMAR, respectively; $P=0.005$) were significantly better in group 1 than in group 2.

Conclusion: Both of the IOLs achieved good visual performances. However, the Acriva Reviol MFM 613 IOL performed better than the AcrySof ReSTOR SN6AD1 at an intermediate distance, whereas the AcrySof ReSTOR SN6AD1 provided better near distance results.

Key Words: Cataract—MNREAD acuity chart—Multifocal intraocular lenses.

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The ability to read is an essential task in modern life, and losing this ability has an impact on everyday activities, limiting a patient's independence.[1] Presbyopia and the development of cataracts can negatively affect reading performance; however, certain surgical procedures can reestablish reading ability without any form of additional reading aids. One option is cataract surgery with the implantation of intraocular lenses (IOLs), including multifocal and accommodating IOLs.[2–5] The assessment of reading performance gives us significant information about the functional vision of the patient, because simple optical outcomes are not adequate indicators of the clinical performance of multifocal IOLs.[3] The tests used most often for this purpose are the MNREAD test (Minnesota Laboratory for Low Vision Research, University of Minnesota, Minneapolis, MN) and the Radner Reading Charts (by the Salzburg Reading Desk).[2,6,7]

The purpose of this prospective study was to compare the binocular reading performances within the first 12 months after the implantation of 2 multifocal IOLs with different designs. To the best of our knowledge, there is a paucity of data regarding the near reading performance with these designs, and none for the intermediate distance.

METHODS

This prospective randomized comparative clinical study included consecutive patients referred to the Department of Ophthalmology, at the University of Marmara, for cataract surgery and bilateral IOL implantation inside the capsular bag. All of the patients were informed about the research and signed consent forms. The study adhered to the tenets of the Declaration of Helsinki and was approved by the local ethical committee. The inclusion criteria were bilateral cataracts, corneal astigmatism <1.0 diopter (D), and the capability to understand and sign the informed consent. The exclusion criteria were <18 or >65 years, a history of amblyopia, previous intraocular surgery, and ocular comorbidities such as glaucoma, retinal abnormalities, or corneal opacities. The intraoperative exclusion criterion was not being able to implant the IOL inside the capsular bag.

The cataract patients were randomized (random integer generator; www.random.org/integers) to receive bilateral implantation of one of the two IOL models: the full diffractive Acriva Reviol MFM 613 IOL with +3.75 D added (VSY Biotechnology, Amsterdam, the Netherlands) (group 1) or the apodized diffractive and refractive Alcon AcrySof IQ ReSTOR SN6AD1 with +3.00 D added (Alcon Laboratories, Inc., Irvine, CA) (group 2). All of the patients received the same IOL model in both eyes. Table 1 shows the characteristics of the IOLs.

The biometric measurements were obtained using optical low coherence reflectometry (LENSTAR LS 900; Haag-Streit AG, Bern, Switzerland). In addition, the emmetropic IOL power was calculated using the SRK/T formula, whereas the pupillary diameter was measured with a pupilometer (MonPack3; Metrovision, Perenchies, France) under photopic conditions (100.0 cd/m^2), mesopic conditions (10.0 cd/m^2), and scotopic conditions (1.0 cd/m^2).

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TABLE 1. *General Intraocular Lens (IOL) Characteristics*

Parameter	Acriva Reviol MFM 613	AcrySof ReSTOR (SN6AD1)
Material	Hydrophilic acrylic (25%) with hydrophobic surface	Hydrophobic surface
Diameter, mm		
Optic	6.0	6.0
Total	13.0	13.0
A-constant	118.0	118.9
Diopter range	0.0–+45.0	+6.0–+34.0
Lens design	Diffractive	Apodized diffractive
Haptic design	360° sharp edge	STABLEFORCE Modified-L

Preoperative and Postoperative Examinations

Preoperatively, all of the patients had full ophthalmological examinations, including binocular uncorrected far (UDVA), intermediate (UIVA), and near (UNVA) visual acuities, anterior segment slitlamp examinations, keratometric values (Pentacam's Scheimpflug; Oculus Optikgeräte *GmbH*, Wetzlar, Germany), tonometry, and fundoscopy. The near and intermediate visual acuities were evaluated with the Colenbrander Mixed Contrast Card Set (Precision Vision, La Salle, IL).

The binocular uncorrected reading performance was evaluated using a Turkish version of the MNREAD test (Minnesota Laboratory for Low-Vision Research, University of Minnesota, Minneapolis, MN) under bright light conditions.[8] The MNREAD eye charts were used to evaluate the maximum reading speed (MRS), critical print size (CPS), and reading acuity (RA) at 40 and 60 cm, based on the following definitions: (1) The MRS was the reading speed that was not limited by the print size. For the reading speed, the patient read the sentences on the chart aloud, beginning with the largest characters, and continued to read the sentences at each character size, while the time (seconds) required for reading was recorded. The reading speed in words per minute (wpm) for each sentence was calculated as 600/reading time (seconds). (2) The CPS was the smallest print size that a participant could read with their MRS. (3) The RA was the smallest print size that a participant could read without making significant reading errors, and was calculated using the following formula: RA=1.4 − (sentences × 0.1) + (errors × 0.01).

The reading chart contained sentences that consisted of 10 to 14 words, written in 19 print sizes. Each sentence consisted of 3 lines and 60 characters (including spaces between the words and at the end of each line). The charts included 19 logarithmic sentences in the logMAR range of −0.5 to 1.3, with 0.1 logarithmic intervals. These MNREAD charts also showed the equivalent Snellen and M values, in addition to the logMAR.

All of the patients had follow-ups of 6 months or longer. The postoperative examinations were scheduled on day 1 and at 1, 3, 6, and 12 months. The preoperative protocol was followed at 1, 3, 6, and 12 months.

Surgery

After obtaining informed consent, all of the surgeries were performed by the same surgeon (E.T.). Standard sutureless cataract surgery was performed under topical anesthesia through a 2.2-mm clear corneal incision, and the main incision was placed on the steep corneal axis. The AcrySof IQ ReSTOR SN6AD1 was implanted using a Monarch II injector (Alcon laboratories Inc.), and the Acriva Reviol MFM 613 IOL was implanted using the Viscoject LP604350, 2.2 injector set (Medicel AG).

Statistical Analysis

The statistical analyses were performed using the SPSS for Windows software (version 17.0, SPSS Inc.). First, the normal distribution of all of the data samples was checked by the Kolmogorov–Smirnov test. For the normally distributed data, a paired *t* test for the within group comparisons and an unpaired *t* test for the between group comparisons were used. For the non-normal distributions, within-group comparisons were made with the Wilcoxon paired test, and between-group comparisons were made with the Mann–Whitney *U* test. When considering the comparisons between the visits, the repeated measures ANOVA was used when a parametric analysis was possible. If the variances were not homogeneous, the Friedman test was used. In all cases, the level of significance was the same ($P<0.05$).

RESULTS

This study enrolled 60 eyes of 30 patients, and Table 2 shows the preoperative data of the 2 groups. There were no statistically significant differences between the groups, except in the gender distribution ($P=0.032$), and this difference was the result of the randomization process.

The binocular uncorrected visual acuities (UDVA, UIVA, and UNVA) and refractive outcomes recorded preoperatively, and at 1, 3, 6, and 12 months after surgery are presented in Table 3. Both IOL groups showed significant improvements in the UDVAs, UIVAs, and UNVAs during the follow-up ($P<0.0001$). However, there were no significant differences in the manifest cylinder and spherical equivalents between the IOL groups postoperatively with regard to the subjective refraction. The binocular UDVA showed no statistical significance between the two groups during the follow-up.

The mean values of the UNVA and UIVA (0.01±0.03 logMAR and 0.13±0.09 logMAR, respectively) in the group 2 eyes were significantly better than in the group 1 eyes (0.07±0.10 logMAR and 0.18±0.09 logMAR, respectively) at 3 months ($P=0.0004$ and $P=0.017$, respectively), but no statistical differences were

TABLE 2. *Patient Characteristics and Preoperative Data*

Parameter	Group 1 (±SD)	Group 2 (±SD)	*P*
Patients/Eyes	15/30	15/30	1.000
Mean age, y	51.47±15.59	58.00±9.23	0.054
Gender (M/F)	7/8	11/4	0.032
Spherical equivalent, D	−0.59±1.66	−0.37±1.61	0.671
Cylinder, D	−0.54±0.75	−0.41±0.66	0.560
K1 (±SD), D	43.18±1.79	43.36±1.54	0.665
K2 (±SD), D	43.88±1.93	43.84±1.57	0.931
IOL power	20.60±3.44	21.93±1.90	0.070
AL, mm	23.47±1.24	23.36±0.65	0.665
ACD	3.01±0.39	3.03±0.35	0.815
CCT	542.43±37.21	543.27±22.16	0.917
Pupil diameter (photopic), mm	1.95±0.28	2.01±0.42	0.517
Pupil diameter (mesopic), mm	2.84±0.53	3.00±0.66	0.286
Pupil diameter (scotopic), mm	5.22±0.56	4.99±0.71	0.168

TABLE 3. *Comparison of Postoperative Visual Outcomes Between the Intraocular Lens (IOL) Groups*

	Postoperative					
Binocular	Preoperative	1 Month	3 Months	6 Months	12 Months	*P*
UDVA						
Group 1	0.52±0.25	0.03±0.06	0.04±0.07	0.05±0.07	0.04±0.07	<0.0001
Group 2	0.29±0.19	0.02±0.04	0.01±0.03	0.01±0.03	0.01±0.03	
P	0.000	0.469	0.088	0.09	0.103	
UIVA						
Group 1	0.53±0.22	0.18±0.11	0.18±0.09	0.17±0.12	0.11±0.06	<0.0001
Group 2	0.59±0.22	0.18±0.08	0.13±0.09	0.14±0.07	0.13±0.05	
P	0.349	0.456	0.017	0.312	0.251	
UNVA						
Group 1	0.48±0.23	0.07±0.10	0.07±0.10	0.06±0.13	0.01±0.05	<0.0001
Group 2	0.52±0.20	0.06±0.09	0.01±0.03	0.02±0.04	0.01±0.04	
P	0.367	0.866	0.0004	0.117	0.464	
Cylinder						
Group 1	−0.54±0.75	0.02±0.59	−0.06±0.57	−0.13±0.59	−0.14±0.47	0.025
Group 2	0.41±0.66	0.04±0.34	0.1±0.24	0.00±0.32	0.00±0.36	0.0004
P	0.401	0.634	0.645	0.300	0.384	
Spherical equivalent						
Group 1	−0.59±1.66	0.07±0.41	0.05±0.40	0.13±0.41	0.06±0.35	0.024
Group 2	0.37±1.61	0.02±0.21	0.07±0.20	0.02±0.18	0.03±0.21	0.348
P	0.671	0.489	0.291	0.347	0.735	

observed in the UIVAs at 12 months between the IOL groups (Table 3).

Reading Acuity

The RAs at 40 and 60 cm showed significant improvements for both IOL groups ($P<0.0001$). At 40 cm, group 2 had significantly better RAs than group 1 at 1 month, 6 months, and 12 months ($P=0.03$, $P=0.02$ and $P=0.019$, respectively) (Table 4). At 60 cm, there was a statistically significant difference in the RAs between the groups at 12 months ($P=0.021$) (Table 5). Overall, group 1 had better RAs than group 2 at 12 months.

Critical Print Size

There were no statistically significant differences in the CPSs between the two IOL groups during follow-up at 40 cm. At 60 cm, group 1 had a better CPS than group 2 at 12 months ($P=0.005$) (Table 5).

Maximum Reading Speed

There were no statistically significant differences in the MRSs between the IOL groups at 40 and 60 cm during the follow-up period ($P>0.05$).

DISCUSSION

In this prospective randomized clinical study, we compared the reading acuity, critical print size, and maximum reading speed of patients with bilateral Acriva Reviol MFM 613 (group 1, +3.75 D added) and AcrySof ReSTOR SN6AD1 (group 2, +3.00 D added) multifocal IOLs within the first 12 months after implantation. These parameters were evaluated with a Turkish version of the MNREAD acuity charts at both near (40 cm) and intermediate (60 cm) distances.

The multifocal IOLs simultaneously provide good near, intermediate, and far vision with one or multiple addition powers.[9] Although most multifocal IOL studies focus on visual performance, there are few studies on the reading ability of patients.[2,3,5,10–14] Reading ability, which is a combination of sensual (visual acuity and contrast sensitivity), motor (eye movement), and cognitive functions, is more complex than discriminating the single optotypes that near visual acuity tests are based on. Moreover, these continuous-text reading acuity charts allow for the evaluation of other important parameters, such as the critical print size, which affect the reading speed in patients with normal and low vision, and the maximum reading speed.[8,15]

TABLE 4. *Comparison of 12 Months Postoperative Reading Acuity, Critical Print Size, and Maximum Reading Speed Outcomes During Follow-up at 40 cm*

	Postoperative					
40 cm	Preoperative	1 Month	3 Months	6 Months	12 Months	*P*
Reading Acuity (RA)						
Group 1	0.27±0.15	0.09±0.10	0.07±0.10	0.07±0.08	0.07±0.10	<0.0001
Group 2	0.32±0.09	0.02±0.11	0.05±0.10	0.04±0.08	0.02±0.08	
P	0.021	0.030	0.778	0.020	0.019	
Critical Print Size (CPS)						
Group 1	0.49±0.16	0.30±0.16	0.22±0.10	0.26±0.12	0.25±0.16	<0.0001
Group 2	0.50±0.19	0.19±0.15	0.24±0.15	0.24±0.09	0.22±0.09	
P	0.558	0.944	0.565	0.720	0.277	
Maximum Reading Speed (MRS)						
Group 1	214.64±42.27	227.86±61.12	238.57±63.11	243.57±64.13	251.00±65.61	<0.0001
Group 2	228.00±41.56	238.67±42.65	246.33±41.21	247.00±37.22	242.00±42.25	
P	0.247	0.167	0.247	0.491	0.704	

TABLE 5. *Comparison of 12 Months Postoperative Reading Acuity, Critical Print Size and Maximum Reading Speed Outcomes During Follow-up at 60 cm*

	Postoperative					
60 cm	Preoperative	1 Month	3 Months	6 Months	12 Months	*P*
Reading Acuity (RA)						
Group 1	0.41±0.21	0.22±0.14	0.17±0.10	0.24±0.09	0.13±0.10	<0.0001
Group 2	0.43±0.12	0.21±0.15	0.20±0.15	0.21±0.15	0.21±0.11	
P	0.274	0.531	0.218	0.528	0.021	
Critical Print Size (CPS)						
Group 1	0.60±0.18	0.36±0.18	0.31±0.14	0.39±0.18	0.25±0.13	<0.0001
Group 2	0.68±0.18	0.35±0.14	0.35±0.16	0.41±0.18	0.39±0.16	
P	0.011	0.481	0.159	0.547	0.005	
Maximum Reading Speed (MRS)						
Group 1	211.79±39.70	227.14±51.12	235.00±49.10	240.36±46.92	241.00±48.00	<0.0001
Group 2	227.33±38.50	236.67±51.28	248.67±51.98	244.67±48.97	246.00±38.44	
P	0.221	0.925	0.492	0.975	0.827	

With regard to the visual performance, both groups achieved good-to-excellent binocular UDVAs, with no significant differences between the groups. This is because both the full diffractive Reviol multifocal IOL and the diffractive/refractive ReSTOR multifocal IOL behave similarly with respect to the light distribution (far and near) under bright light conditions. The refractive outcomes (spherical equivalent and astigmatism correction) showed no statistically significant differences between the groups.

The mean UNVAs and UIVAs were good in both groups during the follow-up. However, the binocular UIVAs and UNVAs at 3 months were significantly better in group 2 than in group 1. Although there was a trend toward better near vision at 40 cm in group 2, the results were not statistically significant at 12 months between the 2 groups. This finding can be explained by the neural adaptation to the multifocal foci generated by the multifocal IOLs. However, this neural adaptation may have been delayed in group 1.

One of the main findings in our study was that the RA at 40 cm was better in group 2, which is in accordance with the previous study of the peak near vision in patients with +3.00 D added. Santhiago et al.[7] compared the reading ability at 40 cm with bilateral AcrySof ReSTOR SN6AD1 multifocal IOLs with +3.00 D added and bilateral AcrySof ReSTOR SN6AD3 multifocal IOLs with +4.00 D added. They confirmed that the RA at 40 cm was better in the +3.00 D IOL group than in the +4.00 D IOL group. In addition, Kohnen et al.[4] found that the mean patient-preferred near distance was 41±4 cm, and that the defocus curve had a plateau of optimum near vision from 40 to 50 cm, after the bilateral implantation of the +3.00 D multifocal IOL. Moreover, a defocus curve was created with different levels of defocus, and the highest near-visual peak was −0.06 logMAR at a defocus level of −2.50 D (40 cm) in the AcrySof ReSTOR SN6AD1 (+3.00 D IOL).[10] This finding was confirmed by a previous study with a larger sample size.[16]

The evaluation of the reading parameters at an intermediate distance is more important for everyday tasks because those cataract patients who read from a tablet or mobile phone and use a computer are still of working-age. In the current study, group 1 had a better RA than group 2 at 12 months at 60 cm despite the intermediate visual acuity did not differ significantly between the two study groups (Table 5). To the best of our knowledge, the reading performance at an intermediate distance has not yet been reported. Furthermore, this is the first study comparing the differences in the outcomes for these two IOL designs. Gupta et al.[17] reported that reading acuity indicated the best near visual performance, but it is possible that true reading ability might be overestimated with the MNREAD chart owing to the design of charts. Evaluation of reading metrics is not only an evaluation of visual resolution but also is strongly related with cortical and nonvisual process. Wang et al.[10] compared three multifocal IOLs (Acriva Reviol BB MF 613 or BB MFM 611 [+3.75 D], AcrySof ReSTOR SN6AD1 [+3.00 D], and AcrySof ReSTOR SN6AD3 [+4.00 D]), and they reported that the best performance in intermediate visual acuity among the three groups was observed in the Acriva Reviol BB MF 613 or BB MFM 611 IOLs (+3.75 D). Besides, Can et al.[5] evaluated the clinical results of two diffractive MIOLs with similar properties (+3.75 add; Acri.Lisa 366D IOL [Carl Zeiss Meditec AG] and Acriva Reviol MFM 611 IOL [VSY Biotechnology]). They found that Acriva Reviol MIOL had better intermediate visual acuity than Acri.lisa 366D despite of having the same add power. They speculated that this might result from the difference in the number, height, interval, and width of its rings. Add power alone is not sufficient to determine the performance of MIOLs. Light distribution, pupil dependence, and quality of vision also have an effect on lens performance.

The maximum reading speed, which was performed at near (40 cm) and intermediate (60 cm) distances, was faster (227–251 wpm) in our study than the speed at which people usually read a book (160–200 wpm).[18] The reasons for this result were that the patients attempted to read as quickly as possible, and a basic Turkish schoolbook used by third graders was the basis for determining the words to be used in the sentences.[8] We also found improvement in the maximum reading speed for both groups during the follow-up. This finding can be explained by the learning curve effect because the patients took the same test repeatedly at the follow-up visits. Kaymak et al.[19] reported that the visual performance after the multifocal IOL implantation could be significantly accelerated by 2-week training programs and remained over a 6-month period. The mean reading speed values (227–251 wpm) in our study are comparable to those using other types of multifocal IOLs with MNREAD charts (350–263 wpm)[6,7] and other tests such as the Radner chart.[3]

The critical print size was significantly smaller at 60 cm in group 1 than in group 2 at 12 months in our study. One previous study has demonstrated that the smallest print size, assessed with Radner charts, was significantly larger in the diffractive multifocal group than in the apodized multifocal group.[3] In addition, our study showed that the reading acuity measured with the MNREAD chart, and near acuity measured with the Colenbrander test chart showed

no parallel changes at 40 cm. Gupta et al.[17] reported that the evaluation of the near visual acuity should conform to standards, including the logMAR uppercase-letter optotypes, CPS, and reading speed.

Testing the reading performance under fixed distances only is one limitation of this study. Therefore, we might have underestimated the accomplishable results.

In summary, those patients with bilateral AcrySof ReSTOR SN6AD1 multifocal IOLs with +3.00 D added, and those with bilateral Acriva Reviol BB MF 613 multifocal IOLs with +3.75 D added had similar visual performances, but there were differences in the reading ability. Overall, the intermediate vision (60 cm) was better with the Acriva Reviol MFM 613 IOL, and the near vision (40 cm) was better with the AcrySof ReSTOR SN6AD1.

REFERENCES

1. Richter-Mueksch S, Weghaupt H, Skorpik C, et al. Reading performance with a refractive multifocal and a diffractive bifocal intraocular lens. *J Cataract Refract Surg* 2002;28:1957–1963.
2. Rasp M, Bachernegg A, Seyeddain O, et al. Bilateral reading performance of 4 multifocal intraocular lens models and a monofocal intraocular lens under bright lighting conditions. *J Cataract Refract Surg* 2012;38:1950–1961.
3. Alio JL, Grabner G, Plaza-Puche AB, et al. Postoperative bilateral reading performance with 4 intraocular lens models: Six-month results. *J Cataract Refract Surg* 2011;37:842–852.
4. Kohnen T, Nuijts R, Levy P, et al. Visual function after bilateral implantation of apodized diffractive aspheric multifocal intraocular lenses with a +3.0 D addition. *J Cataract Refract Surg* 2009;35:2062–2069.
5. Can I, Bostanci Ceran B, Soyugelen G, et al. Comparison of clinical outcomes with 2 small-incision diffractive multifocal intraocular lenses. *J Cataract Refract Surg* 2012;38:60–67.
6. Cillino G, Casuccio A, Pasti M, et al. Working-age cataract patients: Visual results, reading performance, and quality of life with three diffractive multifocal intraocular lenses. *Ophthalmology* 2014;121:34–44.
7. Santhiago MR, Netto MV, Espindola RF, et al. Comparison of reading performance after bilateral implantation of multifocal intraocular lenses with +3.00 or +4.00 diopter addition. *J Cataract Refract Surg* 2010;36:1874–1879.
8. Idil A, Caliskan D, Idil N. MNREAD okuma kartlarının Türkçe versiyonunun geliştirilmesi ve validasyonu. *T OftGaz* 2009;39:84–90.
9. Bellucci R. Multifocal intraocular lenses. *Curr Opin Ophthalmol* 2005;16:33–37.
10. Wang M, Corpuz CC, Fujiwara M, et al. Visual and optical performances of multifocal intraocular lenses with three different near additions: 6-month follow-up. *Open Ophthalmol J* 2015;9:1–7.
11. Baykara M, Akova YA, Arslan OS, et al. Visual outcomes at 12 Months in patients following implantation of a diffractive multifocal intraocular lens. *Ophthalmol Ther* 2015;4:21–32.
12. Toto L, Carpineto P, Falconio G, et al. Comparative study of Acrysof ReSTOR multifocal intraocular lenses +4.00 D and +3.00 D: Visual performance and wavefront error. *Clin Exp Optom* 2013;96:295–302.
13. de Vries NE, Webers CA, Montes-Mico R, et al. Visual outcomes after cataract surgery with implantation of a +3.00 D or +4.00 D aspheric diffractive multifocal intraocular lens: Comparative study. *J Cataract Refract Surg* 2010;36:1316–1322.
14. Peng C, Zhao J, Ma L, et al. Optical performance after bilateral implantation of apodized aspheric diffractive multifocal intraocular lenses with +3.00-D addition power. *Acta Ophthalmologica* 2012;90:e586–e593.
15. Legge GE, Rubin GS, Pelli DG, et al. Psychophysics of reading–II. Low vision. *Vis Res* 1985;25:253–265.
16. Maxwell WA, Cionni RJ, Lehmann RP, et al. Functional outcomes after bilateral implantation of apodized diffractive aspheric acrylic intraocular lenses with a +3.0 or +4.0 diopter addition power Randomized multicenter clinical study. *J Cataract Refract Surg* 2009;35:2054–2061.
17. Gupta N, Wolffsohn JS, Naroo SA. Comparison of near visual acuity and reading metrics in presbyopia correction. *J Cataract Refract Surg* 2009;35:1401–1409.
18. Legge GE, Pelli DG, Rubin GS, et al. Psychophysics of reading–I. Normal vision. *Vis Res* 1985;25:239–252.
19. Kaymak H, Fahle M, Ott G, et al. Intraindividual comparison of the effect of training on visual performance with ReSTOR and Tecnis diffractive multifocal IOLs. *J Refract Surg* 2008;24:287–293.

