Supplementary Results

Comparisons of Fellow Untreated Eyes across groups

In addition to the effects lens treatment on treated eyes, Tables 2-4 also shows the significant differences (with a symbol "†") in refractive (Table 2) / axial (Table 3) /corneal shape parameters of the fellow untreated eye of the sphero-cylindrical lens-wear group, when compared to that of the spherical lens-wear group. Lens treatments produced significant impacts in the fellow untreated eyes of three refractive parameters (M, LMM and MMM; One-way ANOVAs, all $p<0.001$) and the majority of axial parameters except LT, VCD, and CT (One-way ANOVAs, all $p<0.05$). Bonferroni post-hoc tests revealed that, when compared to the untreated eyes of −10D group, untreated eyes of several sphero-cylindrical lens-wear groups had significantly more myopic M and MMM (H180, H90 & L180; all $p<0.05$, Table 2), and more myopic LMM (H180 and H90; both $p<0.01$). Untreated fellow eyes of sphero-cylindrical lens-wear groups had thicker central corneal thickness (H180, H90 and L180; One-way ANOVA with Bonferroni's post-hoc tests, all $p<0.05$, Table 3), shorter ACD (H90 and L180; One-way ANOVA with Bonferroni's post-hoc tests, both $p<0.05$), thicker retinal thickness (H135, One-way ANOVA with Bonferroni's post-hoc tests, $p<0.05$) and thinner scleral thickness (H45, One-way ANOVA with Bonferroni's post-hoc tests, $p<0.05$). There were no significant impacts of lens-wear on any of the corneal shape parameters in the untreated eyes.

Resultant astigmatism and its departure from the target end point

To compare the magnitude of compensatory astigmatic change in response to the imposed astigmatism, the distance between the induced (resultant) and imposed astigmatism was calculated using vector analysis[51]. Supplementary Figure 1A shows the distribution of resultant astigmatism, in J0 and J45 coordinates, induced by the eight sphero-cylindrical lenses (open symbols, low magnitude; filled symbols, high magnitude). As an example of the calculation of compensatory astigmatic change, the distance ("d" in Supplementary Figure 1A) between the resultant astigmatism (blue open square) and the astigmatism imposed (blue cross hair) by wearing −8.00/−4.00x90 lens was calculated by Pythagorean Theorem, after decomposing the refractive error into vectoral coordinates. Supplementary Figure 1B shows the result of this distance (mean±SEM) across the eight groups of birds. Both the axis and magnitude of astigmatism showed significant main effects (Two-way ANOVA, both $p<0.001$) on the distance, but there were no interaction effects. In general, groups treated with 90° cylindrical axis showed the highest compensation (i.e., shortest distance): For the two magnitudes of astigmatism imposed, orienting cylindrical axis at 90° resulted in the smallest vectoral distance compared to the other three orientations (Two-way ANOVAs with Bonferroni's multiple post-hoc comparisons, all $p\leq0.01$). For all four orientations, the vectoral distance was consistently shorter for lower magnitude of astigmatism imposed (Two-way

ANOVA with Bonferroni's multiple post-hoc comparisons, all $p \leq 0.001$). In addition, H45 and L45 also induced significantly shorter vectoral distances than H180 and L135, respectively (Two-way ANOVA with Bonferroni's multiple post-hoc comparisons, all $p \leq 0.05$).

Supplementary Tables

Groups (n)	H45 (19)	H90 (24)	H135 (21)	H180 (22)	L45 (21)	L90 (22)	L135 (25)	L180 (25)	LIM (14)
M (D)	– 5.84±0.35***	– 5.97±0.36***	– 5.66±0.36***	– 7.56±0.73**	– 7.71±0.45***	– 6.91±0.40***	– 6.63±0.41***	– 8.85±0.58	– 10.29±0.22
LMM (D)	– 4.43±0.37***	– 4.18±0.34***	– 4.12±0.36***	– 6.77±0.72***	– 5.88±0.47***	– 5.35±0.45***	– 5.11±0.41***	– 7.89±0.54	– 10.06±0.24
MMM (D)	– 7.24±0.36**	– 7.85±0.45*	– 7.20±0.38***	– 8.37±0.75	– 8.46±0.44	– 8.46±0.36	– 8.15±0.42	– 9.94±0.62	– 10.51±0.20
RA (D)	– 2.82±0.19***	– 3.67±0.23***	– 3.08±0.17***	– 1.62±0.12**	– 2.57±0.13***	– 3.10±0.20***	– 3.04±0.13***	– 2.06±0.21***	– 0.46±0.08
RJ0 (D)	– 0.86±0.15	– 1.50±0.18***	– 1.28±0.07***	+0.20±0.16	– 1.06±0.07**	– 1.39±0.13***	– 1.41±0.06***	– 0.13±0.22	– 0.20±0.04
RJ45 (D)	+0.91±0.10***	+0.33±0.10	– 0.65±0.13**	+0.03±0.09	+0.66±0.07***	+0.23±0.09	– 0.27±0.10	– 0.07±0.09	– 0.02±0.03

Supplementary Table 1. Effects of the presence of astigmatism on refractive parameters when compared to LIM group. Comparisons of the six refractive parameters (mean ± SEM) in the treated eyes across the nine treated groups, including those treated with spherical lenses (-10D, LIM) and those treated with sphero-cylindrical lenses of different astigmatic magnitudes (High, “H”; Low, “L”) and axes (45°, 90°, 135°, and 180°). M, spherical equivalent; LMM, least myopic meridian; MMM, most myopic meridian; RA, refractive astigmatism; RJ0, refractive J0; and RJ45, refractive J45. The levels of significance between LIM and individual groups (Bonferroni’s pairwise post-hoc comparisons) are represented by asterisk: *p<0.05, **p<0.01 and ***p<0.001.

Groups (n)	H45 (16)	H90 (13)	H135 (18)	H180 (13)	L45 (13)	L90 (13)	L135 (19)	L180 (19)	LIM (14)
CCT (µm)	186.2±3.05	189.4±3.08*	183.7±1.66	186.5±2.61	190.4±3.07**	186.2±3.08	189.9±2.80**	189.5±2.47**	175.5±2.62
ACD (mm)	1.28±0.02	1.29±0.03	1.28±0.02	1.34±0.04	1.29±0.03	1.32±0.03	1.28±0.02	1.32±0.02	1.35±0.03
LT (mm)	2.07±0.01	2.05±0.02	2.07±0.02	2.08±0.02	2.07±0.01	2.07±0.02	2.06±0.01	2.08±0.03	2.06±0.02
VCD (mm)	5.40±0.03*	5.42±0.04	5.48±0.04	5.35±0.05**	5.53±0.05	5.33±0.05***	5.50±0.04	5.42±0.03	5.58±0.02
RT (mm)	0.25±0.00	0.25±0.00	0.25±0.00	0.25±0.01	0.24±0.01	0.25±0.01	0.25±0.00	0.25±0.01	0.23±0.01
CT (mm)	0.23±0.01**	0.22±0.01	0.23±0.01*	0.23±0.00	0.23±0.01**	0.22±0.01	0.20±0.01	0.23±0.01**	0.19±0.01
ST (mm)	0.12±0.00	0.11±0.01	0.12±0.01	0.12±0.00	0.12±0.01	0.12±0.00	0.13±0.01	0.11±0.00	0.12±0.00
AXL (mm)	9.54±0.04	9.53±0.05	9.61±0.04	9.56±0.08	9.68±0.06	9.50±0.07	9.61±0.04	9.58±0.03	9.71±0.02

Supplementary Table 2. **Effects of spherical and sphero-cylindrical lens-wear on axial parameters.** Comparisons of the eight axial dimensions (mean ± SEM) from treated eyes across the groups treated with spherical lenses (-10D, LIM) and those treated with sphero-cylindrical lenses of different astigmatic magnitudes (High, "H"; Low, "L") and axes (45°, 90°, 135°, and 180°). CCT, central corneal thickness; ACD, anterior chamber depth; LT, lens thickness; VCD, vitreous chamber depth; RT, retinal thickness; CT, choroidal thickness; ST, scleral thickness; Axl, axial length. The levels of significance between LIM and individual groups (Bonferroni's pairwise post-hoc comparisons) are represented by asterisk: *p<0.05, **p<0.01 and ***p<0.001.

Groups (n)	H45 (16)	H90 (13)	H135 (18)	H180 (13)	L45 (13)	L90 (13)	L135 (19)	L180 (19)	LIM (14)
FCR(mm)	3.15±0.02	3.17±0.03	3.21±0.02	3.16±0.03	3.21±0.02	3.14±0.03	3.19±0.02	3.14±0.01	3.15±0.01
SCR(mm)	3.12±0.01	3.12±0.03	3.17±0.02	3.13±0.03	3.16±0.02	3.10±0.02	3.14±0.02	3.11±0.02	3.11±0.02
CR (mm)	3.14±0.01	3.14±0.03	3.19±0.02	3.14±0.03	3.18±0.02	3.12±0.02	3.17±0.02	3.12±0.01	3.13±0.02
CA (D)	– 1.21±0.12	– 1.62±0.25	– 1.64±0.13	– 1.09±0.12	– 1.47±0.10	– 1.56±0.18	– 1.61±0.12	– 1.06±0.12	– 1.40±0.14
C-J0 (D)	– 0.48±0.07	– 0.71±0.11	– 0.37±0.08	– 0.08±0.09	– 0.52±0.13	– 0.56±0.13	– 0.54±0.06	– 0.24±0.07	– 0.43±0.07
C-J45 (D)	+0.10±0.09***	– 0.23±0.11	– 0.67±0.07	– 0.33±0.10	+0.00±0.09**	– 0.25±0.10	– 0.55±0.06	– 0.30±0.07	– 0.48±0.08

Supplementary Table 3. Effects of spherical and sphero-cylindrical lens wear on the corneal shape parameters. Comparisons of the six corneal shape parameters (mean ± SEM) from the treated eyes across the groups treated with spherical lenses (-10D, LIM) and those treated with sphero-cylindrical lenses of different astigmatic magnitudes (High, "H"; Low, "L") and axes (45°, 90°, 135°, and 180°). FR, flattest corneal radius; SR, steepest corneal radius; MR, mean corneal radius; CA, corneal astigmatism; CJ0, corneal J0; and CJ45,corneal J45 . The levels of significance between LIM and individual groups (Bonferroni's pairwise post-hoc comparisons) are represented by asterisk: *p<0.05, **p<0.01 and ***p<0.001.