



CONTACT INFO
ravidro@jmc.ac.il

ASSESSING VISUAL PERFORMANCE IN PRESBYOPES USING DYNAMIC FOCAL SUNGLASSES



Ravid Doron^{1,2}, Zeev Bomzon² and Yoav Yadin²

¹Dept of Optometry, Jerusalem Multidisciplinary College, Israel, ²Deep Optics Ltd, Israel

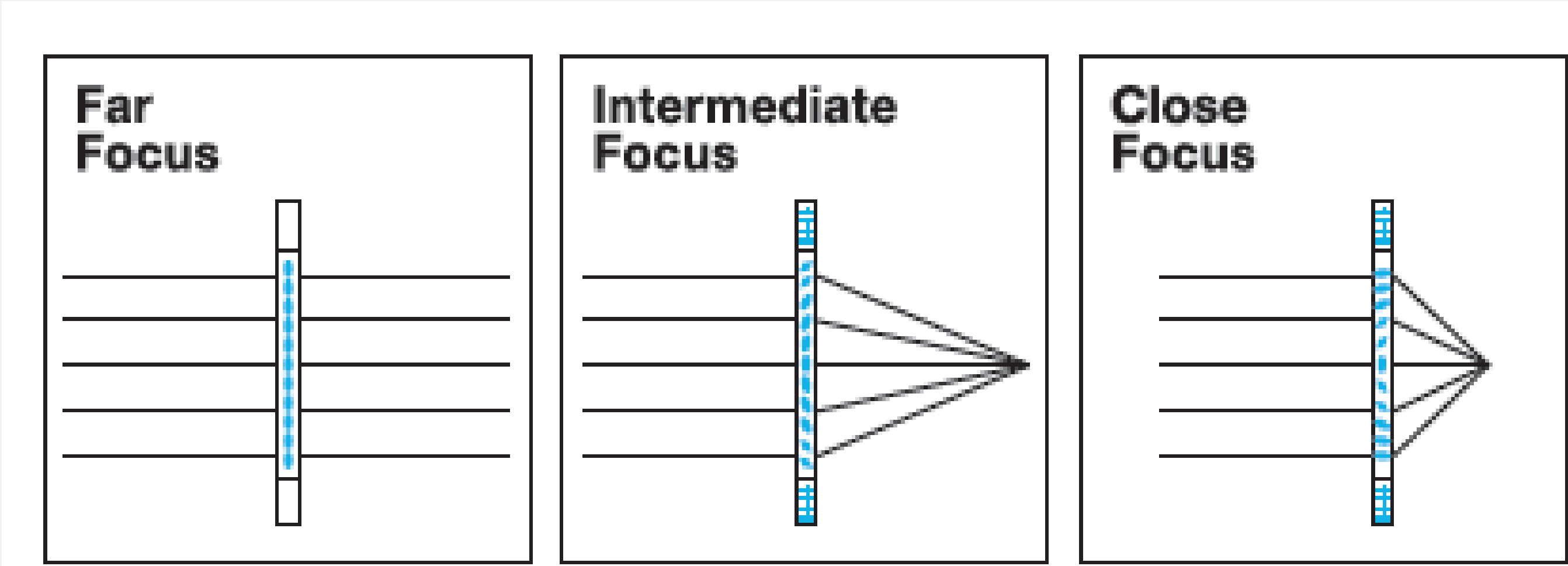
PURPOSE:

- Presbyopes (emmetropic or contact lens users for distance) often switch between reading glasses and sunglasses or use plano multifocal sunglasses for near tasks outdoors.
- Dynamic focal sunglasses, using Liquid Crystal technology, offer an electrically tunable lens adjusting from plano to a near correction of up to +2.50 D, without mechanical components.
- This study compares basic visual functions between dynamic sunglasses and identical sunglasses with static correction.

HOW DOES IT WORK?

- Liquid Crystal is a birefringent material.
- Applying voltage on the Liquid Crystal layer rotates the molecules, thus changing the effective refractive index of the material for a given polarization.
- The local refractive index in each point across the panel can be controlled by splitting the panel into pixels and applying different voltages in each pixel.
- Optically, changing the local refractive index is equivalent to changing the local lens thickness in standard lenses.
- By independently controlling the local refractive index at each point of the panel, lenses of different optical powers can be implemented.

Example of Pixelated Liquid Crystal lenses in action:



METHODS:

Inclusion Criteria:

- Autorefraction and subjective exams ensured emmetropic corrections within ± 0.50 D SPH and ≤ -0.50 D CYL.
- Uncorrected distance visual acuity of at least 0.67 decimal.
- Habitual near correction up to +2.50D.
- Habitual near correction of less than 0.50D SPH between the two eyes.
- Habitual near correction with visual acuity of at least 1.00 decimal.

METHODS:

Study Design (at 40 cm):

Reading correction was tested with dynamic sunglasses and identical sunglasses featuring static correction.

Dynamic Sunglasses



Static Sunglasses



- Visual assessments included:
 - Visual acuity (ETDRS charts) and contrast sensitivity (Pelli-Robson charts).
 - Reading acuity and maximum reading speed (MNREAD Charts).
- Tests were conducted randomly under outdoor simulation lighting conditions (6000 lux).
- **Statistical Analysis:** Mann-Whitney U test.

RESULTS:

N = 10 Participants (7 women, 3 men)

	Uncorrected Distance Visual Acuity (Decimal)	Uncorrected Near Visual Acuity (Decimal)	Spherical Equivalent (Diopter)	Near Correction (Diopter)
Age (Years)				
50.7 \pm 5.4	0.92 \pm 0.12	0.38 \pm 0.13	0.17 \pm 0.46	1.54 \pm 0.37

No significant differences in near visual function

	Dynamic Sunglasses	Static Sunglasses	P Value
Near Visual Acuity (Decimal)	0.93 \pm 0.06	0.95 \pm 0.04	0.95
Near Contrast Sensitivity (Log)	1.71 \pm 0.23	1.69 \pm 0.24	0.94
Reading Acuity (LogMar)	0.02 \pm 0.02	0.03 \pm 0.02	0.56
Maximum Reading Speed (WPM)	154.60 \pm 21.70	154.40 \pm 15.35	0.79

DISCUSSION:

- Dynamic sunglasses offer similar performance in the visual functions that were tested compared to static correction sunglasses in emmetropic presbyopes.
- Preliminary findings suggest the potential of this technology for near vision correction.