

# Childhood peripheral retinal image quality over two years

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## Introduction

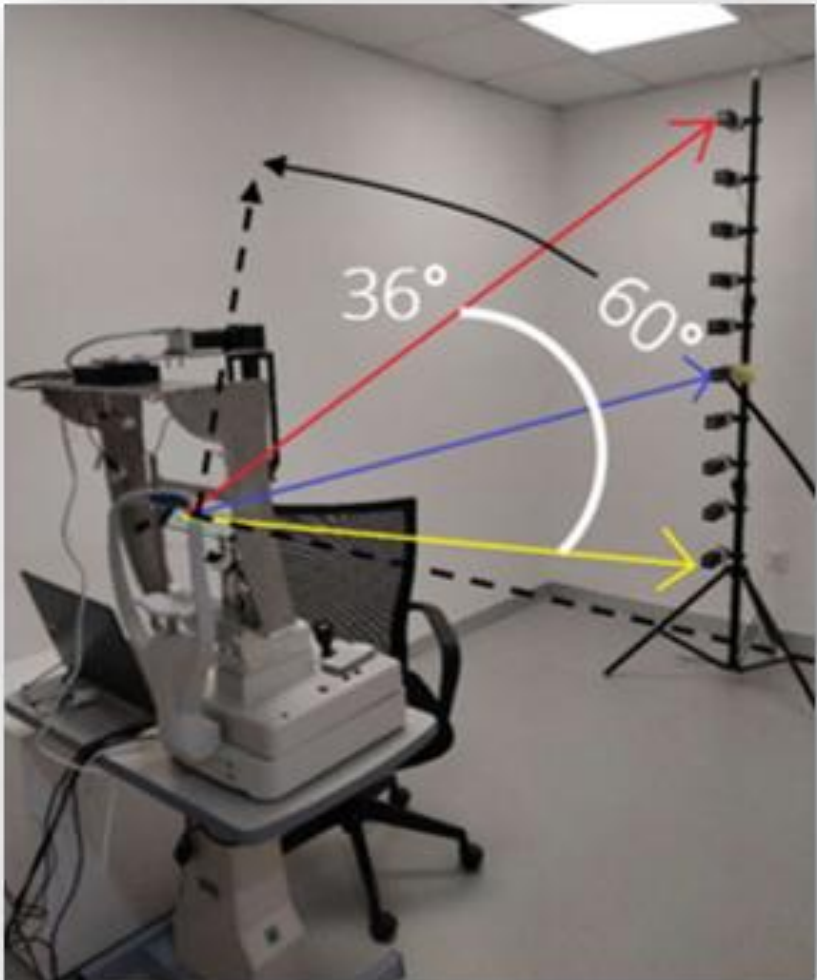
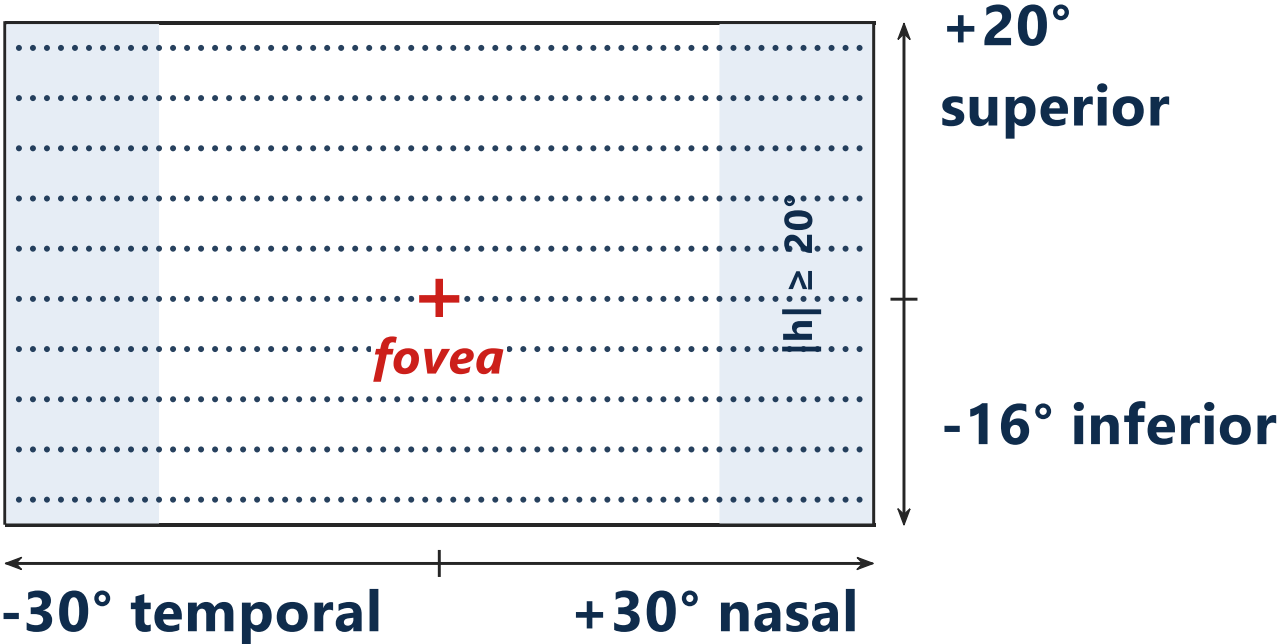
Myopia is increasingly common in children, but it remains unclear how features of retinal image quality, such as **contrast** and **blur orientation**, change throughout refractive development.

The goal of this study was to analyze wavefront aberrations, across the retina, measured longitudinally over two years in a large group of Chinese schoolchildren.

## Methods

### Wavefront Measurement

- Scanning Shack-Hartmann sensor
- Horizontal Retina: -30° to +30°, step 1°
- Vertical Retina: +20° to -16°, step 4°
- 610 locations over 60 × 36 deg [2]



### Wavefront Analysis

- 3mm pupil
- monochromatic (555 nm)

**Optical quality:** volume under the modulation transfer function (vMTF), normalized to the diffraction-limited eye.

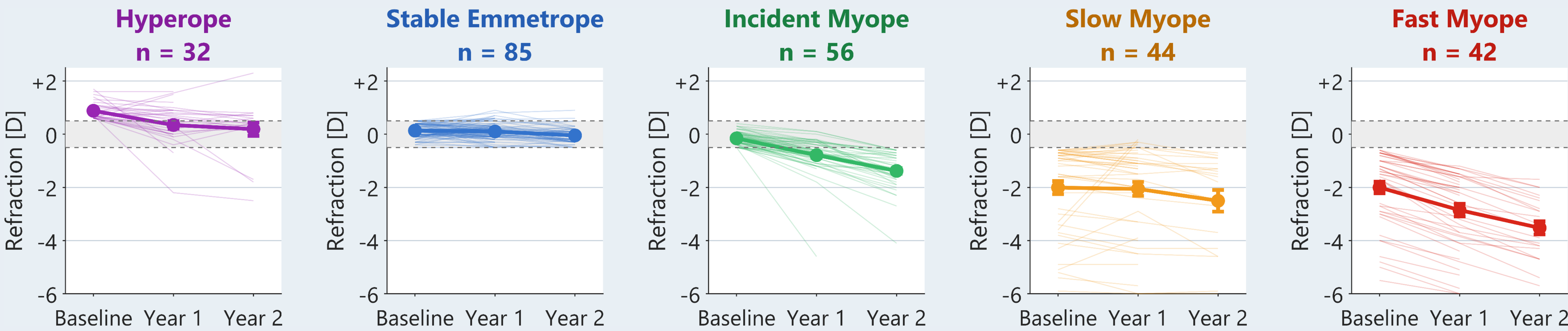
**High-contrast region:** the retinal area of those locations with high optical quality (vMTF ≥ 0.25).

**Optical anisotropy (OA):** ratio of radial to anti-radial MTF area, about the fovea; OA > 1 = anti-radial blur, < 1 = radial, = 1 = circular.

**Peripheral OA:** geometric mean over locations ≥ 20° horizontal from the fovea. [1,3]

## Subjects

N = 259 (53% female) · Age = 12.2±1.4 yrs · Right eye, cycloplegia · 3 visits: Baseline, Year 1 (12 or 15m), Year 2 (24m)

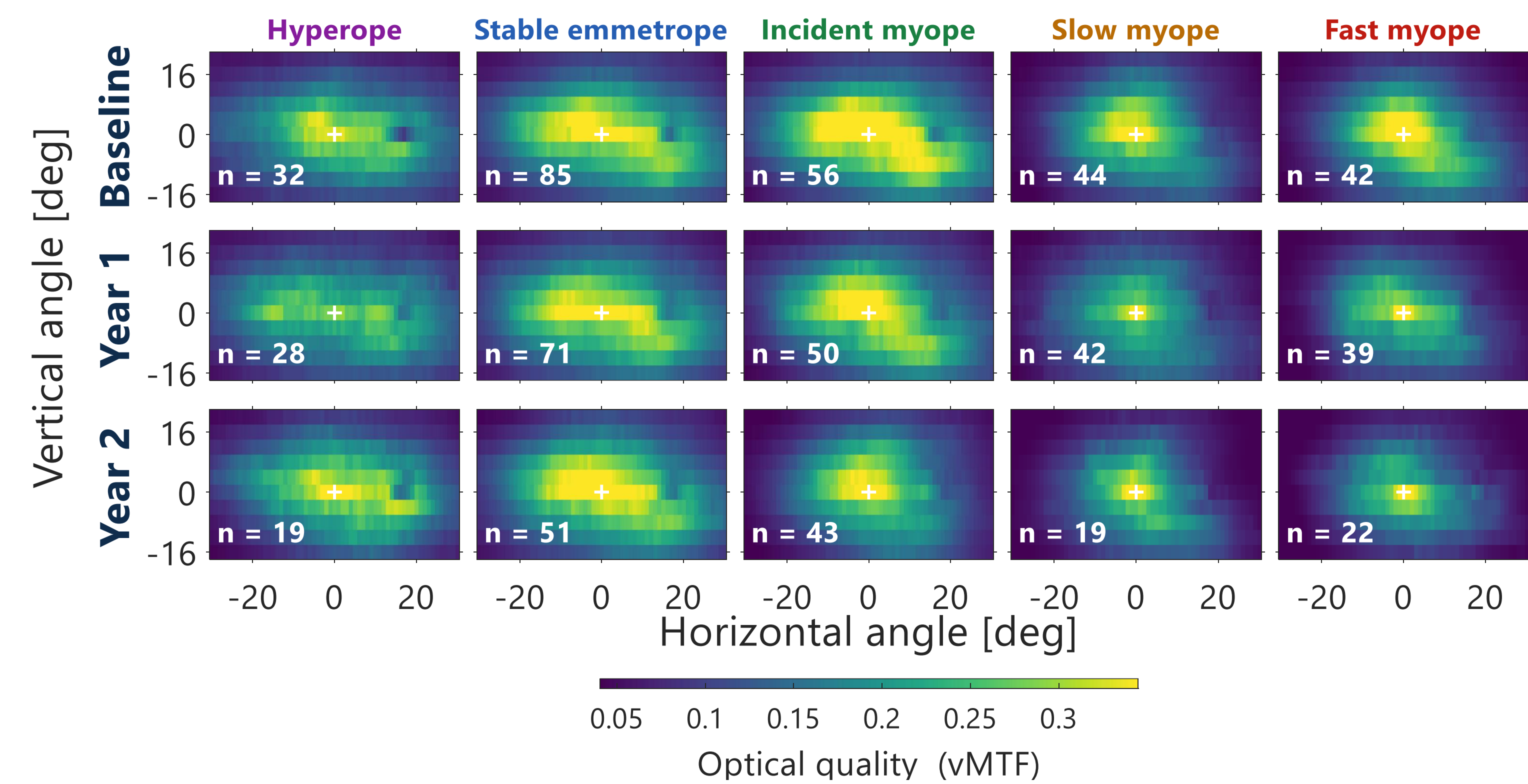


## Results

■ Hyperope ■ Stable emmetrope ■ Incident myope ■ Slow myope ■ Fast myope

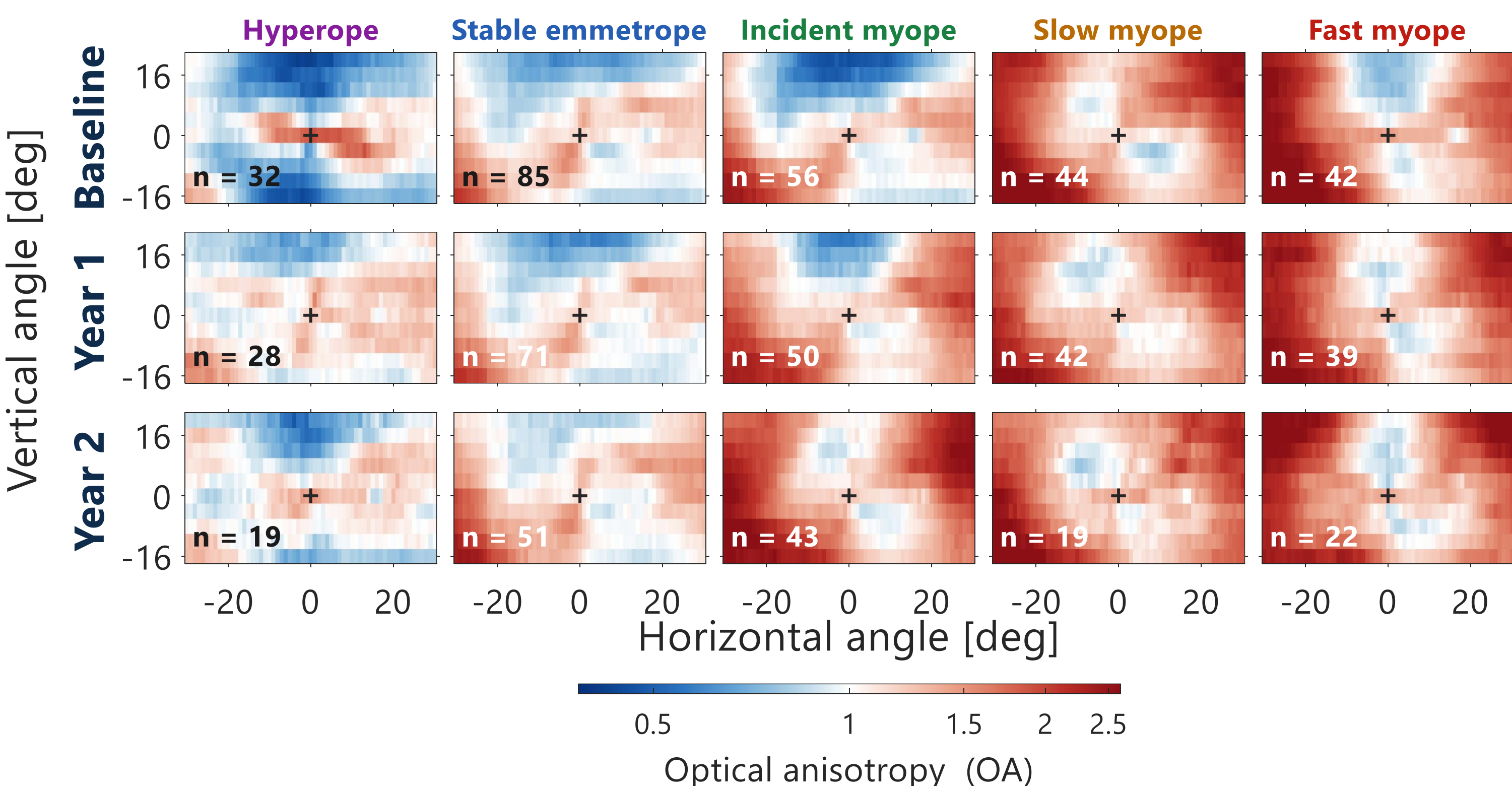
### Optical Quality

The high-contrast region contracts with myopia: Approximately one third smaller in slow and fast myopes than in emmetropes at the first visit. Reduced by 37% over two years in incident myopes, as compared to 1% in stable emmetropes.



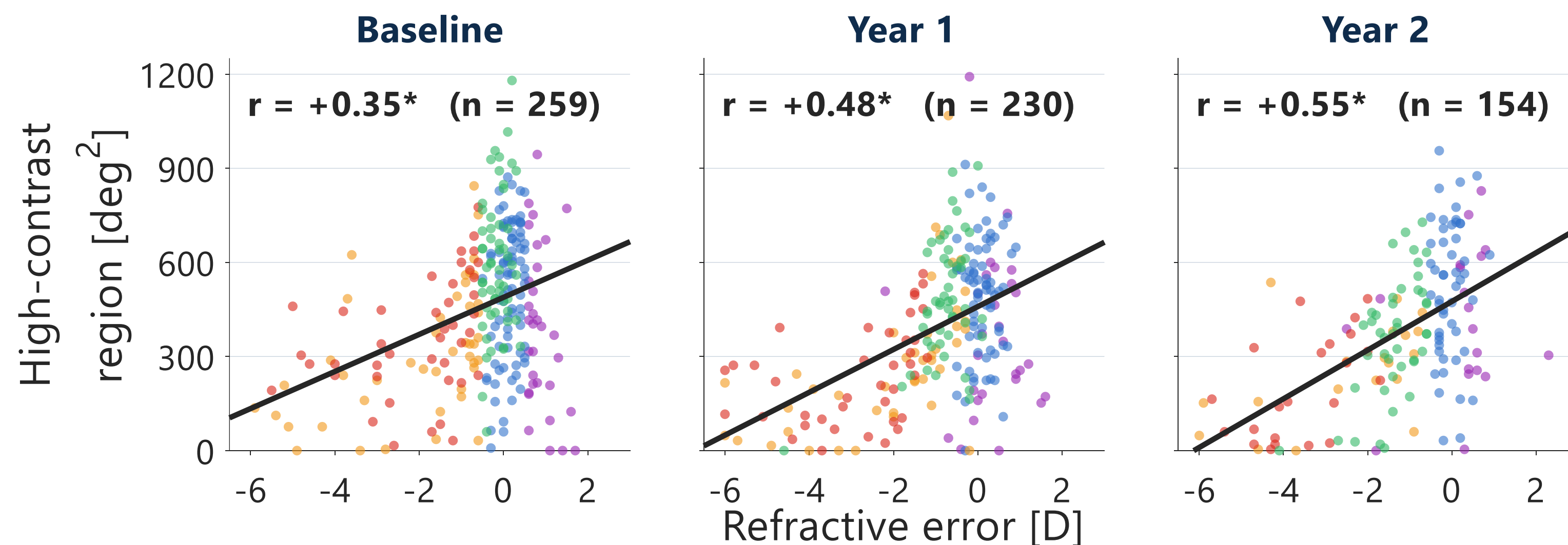
### Optical Anisotropy

Peripheral blur turns anti-radial with myopia: Radial in hyperopes (OA = 0.66), near-circular in emmetropes (0.91), anti-radial in slow and fast myopes (1.7 and 1.8) at baseline. Incident myopes began like emmetropes (1.00 against 0.91) and reached 1.74 by two years.



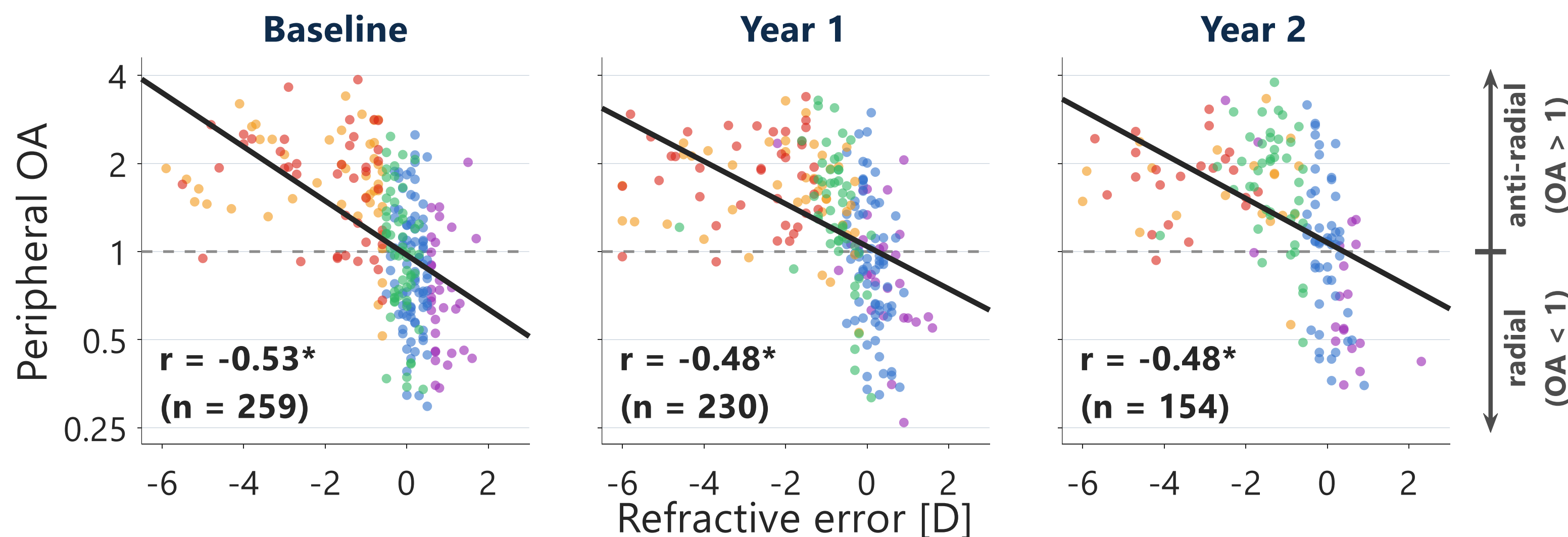
### High Contrast Region

Myopic eyes had a **smaller high-contrast region** at every visit. Incident myopes lost area as they converted.



### Optical Anisotropy at Horizontal Eccentricity ≥ 20°

Myopic eyes had **more anti-radial peripheral blur** at every visit. Incident myopes shifted that way as they converted.



## Conclusions

The degree of myopia was associated with a **smaller high-contrast region** of the central retina and **more anti-radial blur** in the peripheral retina.

Incident myopes resembled stable emmetropes at their first visit and **diverged only as they converted**. These changes appear to develop **alongside refractive change rather than preceding it**.

### REFERENCES

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