TITLE: Assessment of Viewing Behavior with Contrast Modulation Myopia Control Spectacle Lenses

AUTHORS: Tristan Long, Ryan Webster, Jayme Long, Kate Bonnen, Pete Kollbaum

PURPOSE: Most myopia control spectacle lens designs feature a central zone providing full refractive correction, surrounded by a treatment zone. Little investigation has examined whether these treatment zones alter viewing behavior, such as head and eye position. Any compensatory changes could alter the relative optics in front of the pupil and potentially affect treatment effectiveness.

METHODS: This study compared viewing behavior during various visual tasks between myopia control spectacle lenses (Diffusion Optic Technology™ (DOT), SightGlass Vision) and standard single vision (SV) spectacle lenses. Sixteen participants, split into two age cohorts - eight younger children (7-10 years; mean: 9.1; 6M/2F) and eight older children (11-14 years; mean: 13.0; 2M/6F) - were fitted with a Neon (Pupil Labs) eye-tracking frame. Participants were masked to lens design, and testing orders were randomized.

RESULTS: High Overlap Coefficients (OVLs) demonstrated that eye and head movement patterns were strongly preserved between lens types and age groups. Probability density plots comparing the percentage of time viewing at radial distances from the optical center of SV vs. DOT lenses yielded high OVLs for lecture, reading, gaming, and walking in both young (0.79, 0.77, 0.68, 0.90) and older cohorts (0.80, 0.74, 0.65, 0.90). Step-plots comparing time spent within DOT coverage zones across age cohorts showed excellent agreement (OVLs: 0.95, 0.93, 0.92, 0.92). Head departure from the Frankfort plane was also on average highly consistent between lenses across all cohorts and tasks (horizontal OVL: 0.79; vertical OVL 0.86).

CONCLUSION: Children's gaze and head movements remained highly consistent across a variety of everyday activities. Compared with standard single-vision lenses, the DOT lens did not produce compensatory changes in head or gaze behavior. DOT lens treatment zone coverage also remained high across activities in both younger and older children.