Scanning and detection of static and moving pedestrians by drivers with hemianopia in a simulator

Concetta F. Alberti, P Matthew Bronstad, Alex Hwang, Amanda Albu, Egor Ananev, Robert Goldstein, Eli Peli, Alex R. Bowers
Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School, Boston, MA.

PURPOSE: In our previous simulator study of drivers with hemianopia (Bowers et al., 2009), we reported large detection deficits for stationary pedestrians that appeared in the blind hemifield. Using a more realistic hazard, we are now evaluating detection of pedestrians that move on a collision course toward the car’s heading direction. We predicted that blindside detection rates would be higher for moving pedestrians (as they maintain an approximately constant eccentricity with respect to the car) than for static pedestrians (eccentricity of the pedestrian increases rapidly as the car approaches, thus moving the hazard further into the blind hemifield). In addition, we are evaluating the relationship between gaze behaviors and detection performance.

METHODS: 12 participants with complete homonymous hemianopia have performed the pedestrian detection task while driving along 10 pre-determined routes. Static and moving pedestrians were presented. The proportion of untimely detections (either failed to detect or reaction time was too long to avoid a potential collision) was calculated for each participant. Eye and head movements were tracked.

RESULTS: Although blindside detection rates were higher for moving (73%) than static pedestrians (66%), [especially at 14° eccentricities; 64% and 49%, respectively; p = 0.01], reaction times were longer for moving (2.2 s) than static pedestrians (1.5 s; p = 0.03), resulting in a similar proportion of untimely detections (30%). Seeing side detection rates were 100% and reaction times 1.1 s for both pedestrian types. As expected, detection of blindside pedestrians only occurred when head/eye scanning took gaze sufficiently far into the blind hemifield for the pedestrian to be fixated.
CONCLUSIONS: Even in a realistic hazard detection task with pedestrian figures on a collision course with participants, our findings suggest that drivers with hemianopia have significant blindside detection deficits.

REFERENCES: