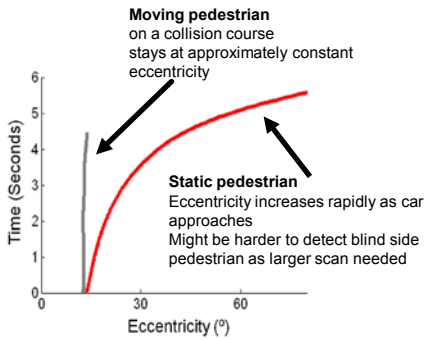
Scanning and detection of static and moving pedestrians by drivers with hemianopia in a simulator

Concetta F. Alberti, P Matthew Bronstad, Alex Hwang, Amanda Albu, Egor Ananev, Bob Goldstein, Eli Peli, Alex R. Bowers

Schepens Eye Research Institute, Mass Eye and Ear, Dept Ophthalmology, Harvard Med School, Boston, MA

Hemianopia impacts detection

- Hemianopia causes difficulty in detecting objects on the blind side.
- Failed to detect 55% of pedestrians on blind side in our previous simulator study (Bowers et al., 2009)
- **But the pedestrians were static**



Prediction

Lower rate of failing to detect (miss) moving than static blind side pedestrians especially at larger eccentricities.

Methods

Participants:

- 6 left hemianopia
- 6 right hemianopia

High-fidelity driving simulator (FOV: 225° horizontally, 32° vertically)

Eye and head movements recorded with SmartEye remote IR tracking system

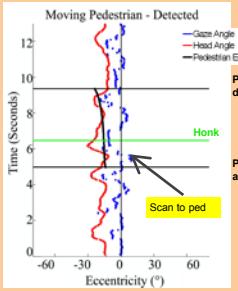
Pedestrian detection task

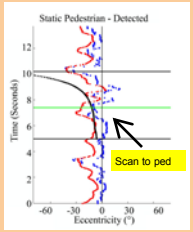
Press the horn when pedestrian seen

Two simulator sessions:
- Static pedestrians
- Moving pedestrians

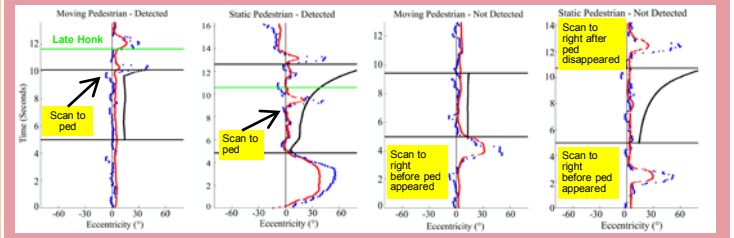
Pedestrians appeared at 4° or 14° on right or left, relative to car heading

Subj1: Left hemi.
Large and frequent scans
Very few blind side misses; Quick reactions

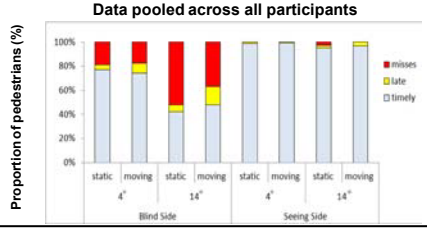




Subj2: Right hemi.
Large but infrequent head and eye scans
Missed 40% to 50% of blind side peds; Longer reactions to moving than static

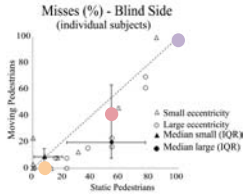


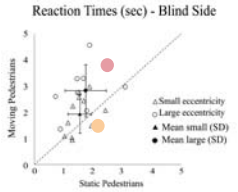
Data pooled across all participants



Were reactions timely?
(reacted with sufficient time to stop)

At the large eccentricity on the blind side:
The proportion of misses (failed detections) was lower in the moving condition,
but the proportion of late reactions was higher

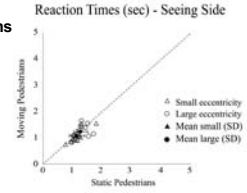




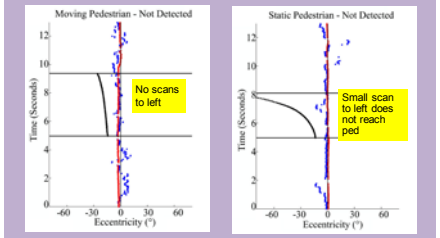
Subj 1 Large and frequent scans

Subj 2 Large but Infrequent head and eye scans

Subj 3 No head scanning and very little eye scanning



Subj3: Left hemi.
No head scanning and very little eye scanning
Missed all blind side pedestrians



Conclusions

- At the large eccentricity on the blind side, detection failures were lower for moving than static pedestrians
- But reaction times were longer, with a higher proportion that were too late
- **Thus the overall proportion of untimely reactions was similar for moving and static pedestrians**
- **Better scanning (more frequent and larger magnitude) was related to better detection performance**

References

Bowers AR, Mandel AJ, Goldstein RB, Peli E (2009). Driving with hemianopia, I: Detection performance in a driving simulator. Invest Ophthal Vis Sci, 50(5): 5137.

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Contact

concetta.alberti@schepens.harvard.edu

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