Vision Science III – Ocular motility and binocular vision

Lab 1 Feedback

Experiment 1. Locating the egocenter

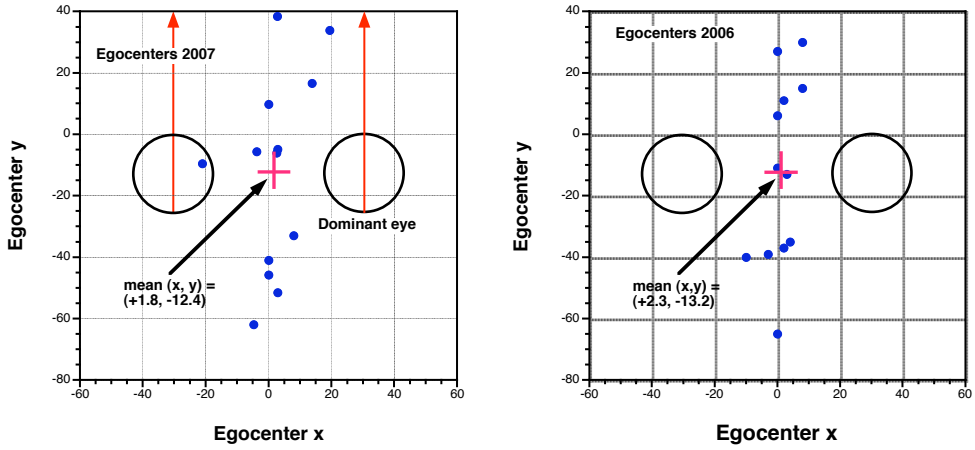


Figure 1. L. Distribution of egocenters for the class, scaled to a PD=64 and with dominant eye flipped, as needed to make OD dominant. R. Last year's plot shown for comparison.

Comments:

- Egocenters were distributed near the midline, but some were in front, some between and some behind the eyes.
- Mean location (x,y) = (+1.8,-12.4). One outlier (BS) was removed. The mean results was within 1 mm of last year's mean.
- There was a slight skew toward the dominant eye.
- Note the importance of recording data with the correct sign convention.

Experiment 2. Ocular orientation and perceived binocular direction

Recall that binocular visual direction (egocentric visual direction) is determined by

- Retinal location (oculocentric direction) and
- Orientation of the eyes

An object, located straight ahead, was optically shifted to the right using base-left yoked prism. The subject maintained bifoveal fixation (oculocentric straight ahead). In all cases the object appeared to have shifted to the right. Mean ratio = 1.01±0.39 (range 0.32 to 2.04).

This demonstrates the second bullet above—that ocular orientation is taken into account when computing binocular visual direction.

Clinical application:

When the eyes move, objects appear to move in the same direction that the eyes move.

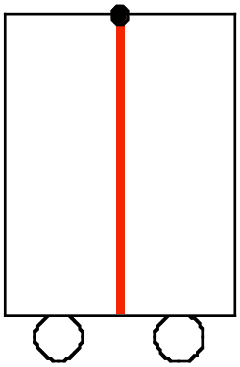
Experiment 3. Application of Hering's laws of visual direction.

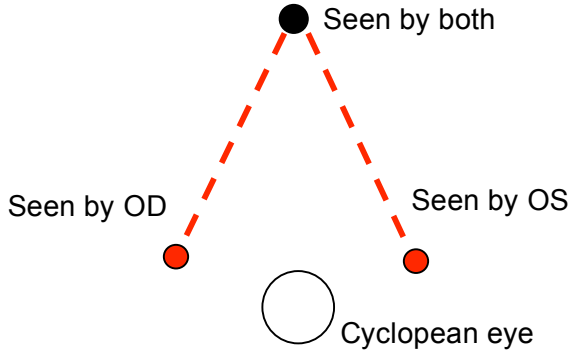
Hering's laws of egocentric (cyclopean) visual direction can explain what you should see.

- The positions of all objects in space are judged as if seen by the cyclopean eye.
- An object on the primary visual line of either eye will appear to be on the primary visual line of the cyclopean eye.
- If a peripheral object and its visual line make some angle with the primary visual line in one eye, it will appear to make the same angle with a corresponding visual line relative to the cyclopean eye primary visual line.

Example A. Each eye fixates on the black dot.

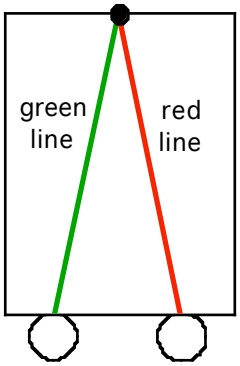
- OD sees the dot straight ahead (foveally fixated)
- OD sees the near end of the line to its left
- Connect the dots
- Transfer these visual directions to the cyclopean eye.
- OS sees the dot straight ahead, like OD
- OS sees the near end of the line to its right
- Connect the dots
- Transfer these directions to the cyclopean eye.

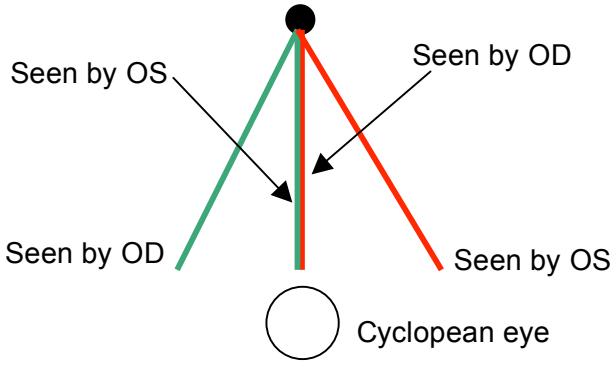




Example B. Each eye fixates on the black dot, and sees two lines (red and green).

- OD sees the dot straight ahead.
- OD sees the red line straight ahead.
- OD sees the green line to the left.
- Transfer these visual directions to the cyclopean eye.
- OS sees the dot straight ahead.
- OS see the green line straight ahead.
- OS see the red line to the right.
- Transfer these to the cyclopean eye.





It's possible that in binocular viewing a person could see either three or four lines. Why?