PURSUIT AND DIRECTION PERCEPTION ARE DRIVEN BY SIMILAR AND LARGELY VERIDICAL OBJECT-MOTION SIGNALS.

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Purpose. Physiological and psychophysical evidence suggests that motion processing for both pursuit and perception is performed in areas MT and MST. These areas are thought to integrate local motions to determine global object motion, but the rule used to combine the local signals remains unclear. Do pursuit and perception use a similar object motion signal, and is this signal veridical (IOC) or instead a simple vector average (VA)? **Methods.** For three subjects (one naive), we simultaneously measured pursuit and perception of a line-figure diamond moving in an oscillating linear trajectory (A = 2.7° , TF = 0.94 Hz) behind two vertical bar apertures (3.3° x 18°). The diamond's corners were always occluded and only four moving line segments (93 cd/m^2) were visible within either dark (0.2 cd/m^2) or light (equiluminant with the 38 cd/m^2 surround) apertures. Three types of elongated diamonds were constructed by rotating a horizontal diamond (vertex angles of 40° & 140°) by ±30°. Each moved ±10 ° from straight down. While the IOC direction for each is veridical, the VA direction for the +30° diamond is always rightward and the VA direction for the -30° is always leftward. Observers judged whether the motion appeared leftward or rightward of straight down. Saccade-free portions of the x and y eye-movement traces were fit to sinusoids and the pursuit direction computed from the fits. **Results.** For dark apertures, observers perceived and pursued the motion largely veridically. The perceptual judgments were 98, 99, 96% correct for the -30, 0, +30° conditions, while VA predicts 50, 100, 50%. Similarly pursuit was in the appropriate direction for 93, 98, 98% of the trials. The mean pursuit direction errors were 3.8, 2.5, and 1.3° for the -30, 0, and +30 conditions, and the average standard deviation for each condition was 3°. For the invisible (light) apertures, the stimulus was perceived as incoherent and its direction therefore ambiguous. Pursuit more closely followed the segments, and the direction errors more than doubled. **Conclusions.** Our results suggest that pursuit and perception share a common motion processing stage (perhaps MT or MST), that combines local motion signals using an IOC-like rule to compute global object motion instead of using simple vector averaging.

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