

Tracking with the mind's eye

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Abstract

The two components of tracking eye movements in primates, pursuit and saccades, are generally viewed as relatively independent oculomotor subsystems that each use retinal information as an error signal to move the eyes. However, both psychophysical and physiological studies provide compelling evidence that pursuit and saccades are guided by higher-order visual processes related to perception and cognition, rather than driven directly by the retinal stimulus. Pursuit and saccades also do not appear to be independent subsystems, but involve shared neural mechanisms that may be important for directing eye movements toward the same selected visual target. Together, these studies argue that pursuit and saccades are not driven by separate systems each with its own dedicated low-level visual processing and segregated motor machinery, but are linked by common inputs related to visual perception and by overlapping output pathways. Given the inherent ambiguity of real-world visual images and the danger this uncertainty poses in the guidance of motor behaviors, the common link with perception may represent an explicit strategy for ensuring that voluntary motor actions are guided by a single visual interpretation.