Influence of Previous Visual Stimulus or Saccade on Saccadic Reaction Times in Monkey

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Influence of previous visual stimulus or saccade on saccadic reaction times in monkey. J. Neurophysiol. 81: 2429–2436, 1999. Saccadic reaction times (SRTs) to suddenly ap-pearing targets are influenced by neural processes that occur before and after target presentation. The majority of previous studies have focused on how posttarget factors, such as target attributes or changes in task complexity, affect SRTs. Studies of pretarget factors have focused on how prior knowledge of the timing or location of the impending target, gathered through cueing or probabilistic informa-tion, affects SRTs. Our goal was to investigate additional pretarget factors to determine whether SRTs can also be influenced by the history of saccadic and visual activity even when these factors are spatially unpredictive as to the location of impending saccadic targets. Monkeys were trained on two paradigms. In the saccade-saccade paradigm, monkeys were required to follow a saccadic target that stepped from a central location, to an eccentric location, back to center, and finally to a second eccentric location. The stimulus-saccade paradigm was similar, except the central fixation target re-mained illuminated during presentation of the first eccentric stimulus; the monkey was required to maintain central fixation and to make a saccade to the second eccentric stimulus only on disappearance of the fixation point. In both paradigms, the first eccentric stimulus was presented at the same, opposite, or orthogonal location with respect to the final target location in a given trial. We measured SRTs to the final target under conditions in which all parameters were identical except for the location of the first eccentric stimulus. In the saccade-saccade paradigm, we found that the SRT to the final target was slowest when it was presented opposite to the initial saccadic target, whereas in the stimulus-saccade paradigm the SRT to the final target was slowest when it was presented at the same location as the initial stimulus. In both paradigms, these increases in SRTs were greatest during the shortest intervals between presentation of successive eccentric stimuli, yet these effects remained present for the longest intervals employed in this study. SRTs became faster as the direction and eccentricity of the two successive stimuli became increasingly misaligned from that which produced the maximal SRT slowing in each paradigm. The results of the stimulus-saccade paradigm are similar to the phenom-enon of inhibition of return (IOR) in which human subjects are slower to respond to stimuli that are presented at previously cued locations. We interpret these findings in terms of overlapping representations of visuospatial and oculomotor activity in the same neural structures.