Abstract

Background. A Head Mounted Display (HMD) is unlike all other displays fixed to the head, making eye movements the sole option to scan the display. While the largest saccades easily exceed 50 deg (Collewijn et al., 1988), naturally occurring saccades typically stay within 15 degrees (Adler & Stark, 1975). While attractive for many applications, a HMD also forms a liability: large-FoV HMDs are known to cause eye-strain (Kooi, 1997) and the rate of information uptake is expected to decrease towards the edges. Methods. We measured the ability of 12 subjects to quickly determine the orientation (⊤ vs ⊥) of a target T surrounded by 4 randomly oriented (up, down, left, right) flanker T's as a function of 1) target-flanker spacing or 'crowding' (small / medium/large), 2) flanker polarity, and 3) eccentricity (15/30/45 deg). The one-hour test was repeated in reverse order after a 15 min break. Visual comfort was assessed with questionnaires. Results. Reaction time increased with crowding, symbol eccentricity, and decreased with opposite target-flanker polarity (all p values < 0.001). Contrary to our expectations, reaction time decreased after the break, suggesting saccadic motility improves over time (Parsons & Ivry, 2018). Eye strain showed a small increase with eccentricity ($p < 0.037$). Conclusions. These results confirm that ocular motility appears to be trainable. The dynamics of HMD information uptake resembles Fitts' law. Practical implications. Initial training reduces eye strain. Combined with the ocular motility data from the references, a 30 deg Field-of-View is a compromise between maximal overall symbology uptake and minimal eye strain.