Tassinari, H., Hudson, T. E. & Landy, M. S. (2007). Optimality of reaches under risk with visually induced motor noise. Program No. 281.6. 2007 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience. Online.

ABSTRACT

How well do humans estimate their motor variance? Previous research indicates that subjects plan optimal movements in the face of explicit costs and benefits for motor outcomes (Trommershaeuser, Maloney & Landy, JOSA A, 20, 1419-1433, 2003). To accomplish this, subjects needed to take into account task-relevant response variance resulting from perceptual and motor noise and, for the reaches toward a screen that they employed, response variance was isotropic. Can subjects take into account 2-D endpoint noise when an anisotropy is introduced experimentally? Here, we impose anisotropic noise using the Manual Following Response (MFR: Saijo, Murakami, Nishida & Gomi, J NeuroSci, 25, 4941-4951, 2005), in which large-field visual motion leads to an involuntary rapid shift in reach direction. Design: Subjects performed speeded reaching movements to a small target circle with a nearby, partially overlapping penalty circle. Penalty location was either above, below, left, or right of the target. Once subjects began the reach, a vertical sine wave grating was displayed, replacing the target-penalty display. Two sessions were run on different days in counterbalanced order. In one session, the grating was stationary; in the other, it drifted rightward or leftward (chosen randomly on each trial). Upon completion of the reach, the target and penalty circles were redisplayed with an on-screen indication of the reach endpoint. Hits on the target earned 1 point; hits on the penalty region incurred a loss (0, -2 or -5 points in separate blocks of trials). Slow reaches (> 450 ms) resulted in a 7-point penalty. Subjects were paid for points earned. Results: Reach endpoint variance was fit with a bivariate Gaussian. Horizontal endpoint variance increased reliably as a result of the MFR to the drifting grating that had unpredictable drift direction. In response, most subjects shifted farther from the penalty regions during drifting-grating sessions. We compare observed endpoint shifts to those predicted by an ideal movement planner with full information concerning endpoint variance.

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