Hudson, T. E., Tassinari, H. & Landy, M. S. (2007). Force adaptation of speeded reaches in the absence of a force perturbation. Program No. 618.13. 2007 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience. Online.

ABSTRACT

How do subjects adapt to visually induced perturbations of manual reaches? Subjects performed rapid reaching movements at a visual target. Reaches were perturbed by inducing 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. Adaptation to the perturbation could be (1) via the addition of compensatory torques (an energy-inefficient method, since no external torques were imposed), (2) via a reduction of the visual-motor feedback gain, or (3) by co-contraction. Design: Subjects viewed a fixation circle and a target (a vertical bar). Subjects were instructed to touch the target within 350-450 ms of reach initiation. After reach initiation, the entire screen, except for the fixation circle, was replaced by a vertical sine wave grating. During the initial 11-20 reaches, the grating was stationary. During the following 50-60 reaches, the grating drifted to the right at constant speed. During the final 12 reaches, the grating was again stationary. Upon completion of the reach, the grating was removed, and the stimulus bar was presented along with an on-screen indication of the reach endpoint. Results: Initial reach endpoints produced in the drifting-grating trials were offset to the right (typical of the MFR). Following the first 5-10 such reaches, endpoints returned to baseline values, indicating that subjects were capable of eliminating this non-force perturbation from their reach endpoints. During the final stationary-grating reaches, a negative aftereffect was observed: Reach endpoints were initially offset to the left, and returned to baseline values within 10 reaches. Such negative aftereffects are the hallmark of adaptation. This indicates that torques were predictively added to the reach to null the non-force perturbation produced by grating drift; the offset was not eliminated by reduction of feedback gain nor by co-contraction. In a control experiment, we also show that the negative motor aftereffect observed here was not due to a visual motion aftereffect.

Support: NIH EY08266