Transitional Role of Feedback in Visually-Occluded Three-Dimensional Reaching Tasks under Ride Motion.

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To submit to Experimental Brain Research

The inverse relationship between the speed and accuracy of rapid target-directed movements may be the result of the combined use of visual and somatosensory feedback systems. The effective contribution of each feedback mechanism was investigated through evaluation of rapid, visually-occluded reaching tasks under random whole-body vibration. Participants (N=10) performed three-dimensional rapid pointing tasks to three touch screen displays with random delays inserted between target stimulus and motion onset in 500 ms intervals between 0 and 2 seconds. End effector trajectories, and endpoint variability were used to infer movement planning strategies. Endpoint accuracy was highly dependent on the availability of visual feedback. However, near-zero correlation of spatial deviations of the fingertip at peak velocity and at reach endpoint suggests that proprioception, and not central planning, is utilized in rapid, visually-occluded pointing tasks. Whole-body vibration contributed to longer reaction times, longer movement times, and increased endpoint variability. Endpoint variability in motion-delayed conditions provides evidence of an inability to shift from an egocentric to an exocentric reference frame without visual feedback. This study underscores the need to design controls and tasks to allow visual guidance of the finger in reaching tasks to touch screen displays.

abs2006_02