**Incomplete compensation for self-motion in the visual perception of object velocity in presence of a visual-vestibular conflict**

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When observing a moving target while an observer is moving, the same retinal speeds can correspond to vastly different physical velocities. When an observer moves in the same direction as the target, the retinal speed is partially cancelled out, and vice-versa. Observers must thus obtain an accurate estimate of their own velocity, and subtract it from or add it to the retinal speed elicited by the target to obtain an accurate estimate of the object velocity. Estimating the observers’ speed should be facilitated when visual and vestibular cues are congruent. When self-motion, on the contrary, is experienced visually only, this compensation is likely to be incomplete, leading to biases in judgments of object speed during visual self-motion (Hypothesis 1). Furthermore, such added compensatory computations should decrease precision (Hypothesis 2). To test these hypotheses, we presented two motion intervals in a 3D virtual environment; one in which a target moved linearly to the left or to the right in the fronto-parallel plane, and one that consisted in a cloud of ­smaller targets travelling in the same direction. The single target moved at one of two constant speeds (6.6 or 8m/s, 6m from the observer), while the speed of the cloud was determined by a PEST staircase. While observing the single moving target, participants were moved visually in the same direction, in the opposite direction, or remained static. Participants were then asked to judge which motion was faster. In support of Hypothesis 1, we found differences in accuracy between static, congruent and incongruent motion; target motion during congruent self-motion was judged as slower than in the static condition and vice-versa, indicating inadequate compensation for the observer’s motion. Furthermore, we found that self-motion during target motion observation decreases precision compared to the static condition in support of Hypothesis 2. Further research is necessary to determine how the availability of vestibular cues can remedy accuracy or precision losses during self-motion.

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