Timing cue reliability

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Multiple cues are integrated by weighting individual cue estimates according to their reliabilities. This has been shown repeatedly under static, prolonged viewing conditions, but in real-world situations viewing conditions may change and the reliability of cues can vary over time. Here we ask whether the perceptual system instantaneously detects reliability changes and adapts the cue weights accordingly.

Subjects binocularly viewed a spinning surface slanted in depth. In the display there was a slight discrepancy between the slant specified by the stereoscopic cue and the one specified by motion. We modulated the reliability of the motion cue by changing the speed of rotation. Increasing the speed of rotation increased the reliability of the motion cue and consequently biased the perceived slant towards the slant defined by the motion cue. This manipulation, however, did not affect the magnitude of slant specified by the motion cue. By modulating the rotation speed at different frequencies the surface was perceived to oscillate in depth.

Perceived oscillation amplitude decreased with higher modulation frequency and phase shift between rotation modulation and perceived oscillation increased. As a control, we simulated an actual oscillation of the surface and we did not obtain such response pattern. This result indicates that quick changes of reliability, defined by changes in rotation speed, have smaller perceptual consequences. Cue weights do not change instantaneously, likely because there is latency in updating the reliability of the motion cue when the spinning surface changes its speed of rotation.

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