Bidirectional audiovisual interactions: Evidence from a computerized fishing game

Seth Bensussen¹, Kenny Chou¹, Lenny A. Varghese², Yile Sun³, Robert Sekuler³, David C. Somers⁴ and Barbara G. Shinn-Cunningham²

¹Department of Biomedical Engineering, Boston University
²Center for Computational Neuroscience and Neural Technology, Boston University
³Volen Center for Complex Systems, Brandeis University
⁴Department of Psychology, Boston University

We used a specially-designed computer game to examine behavioral consequences of audiovisual integration. Target stimuli (animated fish swimming across the computer screen) were modulated in size and/or emitted an amplitude-modulated sound. Modulations, visual or auditory, were at 6 or 7 Hz (corresponding to "slow" and "fast"). In one game, subjects were instructed to categorize successive fish as "slow" or "fast" based on the auditory modulations; in another game, they categorized fish based on visual modulation rate. In each game, subjects were instructed to ignore input from the task-irrelevant modality. In each game, modulations could be (1) present only in the modality of interest, (2) present and matching in both modalities, or (3) present but mismatched between modalities. While reaction times were similar across games, accuracy was highest when auditory modulation was the basis for categorizing fish. Accuracy and reaction times improved when cross-modal modulation rates matched, and worsened when modulation rates conflicted. Additionally, accuracy was more strongly affected by between-modality congruence/incongruence when subjects attended to visual modulations than when they attended to auditory ones. Results indicate that audiovisual integration is not entirely under volitional control, and that competition between sensory modalities adversely impacts perception in dynamic environments.