

Title: The Spatial Double Flash Illusion: Audition-Induced Spatial Displacement

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Abstract: *Background:* The spatial double flash illusion is generated by the brief presentation of a central visual stimulus (a small rectangular target; a “flash”) in conjunction with a short auditory stimulus (a “beep”) that is physically displaced to the left (or right) of the central (peripheral) flash, followed by a second identical auditory stimulus that is physically displaced to the right (or left) of the single flash. The second beep generates an illusory flash that is perceived to be displaced in the direction of the auditory beep sequence. This illusion is a variant of the original double flash illusion with no audio displacement (Shams, *et al.*, 2000).

Methods: A 17 ms flash of a white rectangle against a grey background is presented centrally, displaced by 11.5° vertically below a fixation cross, in conjunction with a 7 ms 800 Hz audio tone (beep). A second beep is generated 57 ms following the first beep. The two speakers used to present the beeps are displaced to the left and right of a centrally located monitor. Participants ($N = 10$) were asked to report the number of flashes perceived, whether or not the two flashes were collocated or displaced, and if displaced, in which direction.

Results: Participants reported significantly more illusory flashes displaced in the direction of the auditory beep sequence than in the opposite direction (Left to right, $p = 0.011$; Right to left, $p = 0.036$).

Discussion: The illusory flash following the presented flash was perceived to be displaced laterally in space in the same direction as the sequence of audio stimuli predominantly more often than it was perceived to be displaced in the opposite direction. As such, both the generation of the illusory flash *and* its location are modified by auditory input, an unusual example of crossmodal interaction in which audition dominates over vision.