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The sound of silent motion: converging support for a disinhibition account of visual-to-auditory synaesthesia

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We have been investigating a little-known phenomenon whereby visual motion and flashes can evoke illusory sounds. Converging evidence supports a disinhibition explanation of this visually-evoked auditory response (vEAR).

In a lab study, 20% of normal participants reported 'hearing' our flash stimuli. In a large-scale internet survey of >4000 participants, 20% responded 'Yes' when asked whether they ever experienced auditory sensations from visual movement.

vEAR reports were associated with the opposite phenomenon of auditory-evoked phosphenes, musical imagery and tinnitus-like experiences. Reduced cortical inhibition (or elevated excitability) might explain these diverse phenomena better than specific anatomical abnormalities, often proposed for other forms of synaesthesia. Auditory vividness ratings of silent videos also correlated with schizotypal personality, which has independently been associated with reduced inhibition in sensorimotor areas.

We also found that visual sequence discrimination could be disrupted by 40Hz transcranial Alternating Current Stimulation to either occipital or temporal sites, which presumably interrupts latent cross-modal crosstalk between visual and auditory cortices. In contrast, 10Hz stimulation revealed a push-pull pattern of mutual inhibition between vision and audition in non-vEAR participants, but no stimulation effect in vEAR. This is again consistent with reduced cortical inhibition in vEAR.

Canonical forms of synaesthesia (e.g. grapheme-colour) are rare and have thus often been attributed to aberrant cross-activations between specific sensory brain areas. However the relatively high prevalence of vEAR and its association with other diverse phenomena, along with effects of disrupting inhibition mediated by alpha oscillations, provides converging evidence that vEAR reflects generally reduced inhibition of normally-occurring cross-modal cross-activations.