

Pupillary light reflex can be inhibited by multisensory signals

11 August 2021, by Zhang Nannan

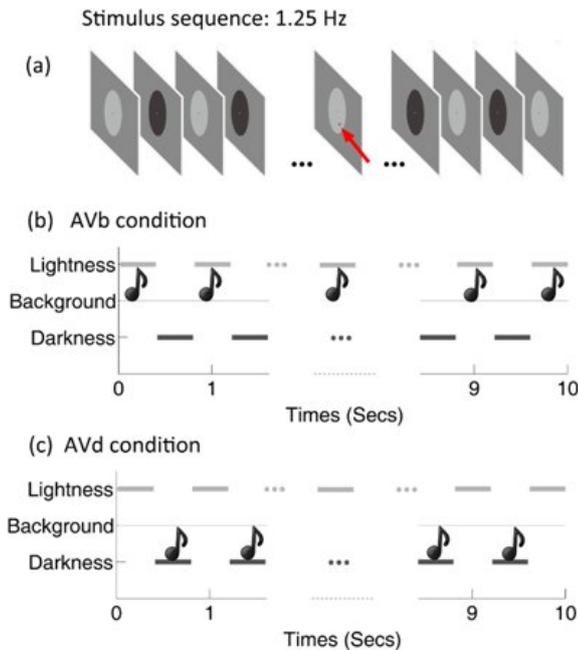


Fig.1. The procedure of Experiment 1. Credit: Yuan Xiangyong

Multisensory integration has been recently shown to produce a larger pupil size than unisensory constituents. Superior colliculus (SC), an important laminar nucleus in the midbrain, not only engages in spatial attention and saccadic eye movements, neurons in whose intermediate layer can also modulate pupil size. Given neurons in the deeper layers of SC are able to integrate multimodal signals, it is thus assumed that the multimodal inputs, relative to unimodal stimuli, may modulate pupil size as well.

In a recent study, Dr. Yuan Xiangyong and his colleagues from the Institute of Psychology of the Chinese Academy of Sciences systematically examined how multisensory signals modulate [pupil](#) size by measuring the pupillary light reflex (PLR),

which refers to the rapid pupil constriction in response to light.

Using a novel pupil [oscillation](#) paradigm, the luminance of the visual stimulus was alternatively changed, which induced a periodic oscillation of pupil size. With fast Fourier transform algorithm, the researchers extracted oscillatory amplitude of the pupil size at the tagging frequency (1.25 Hz). The oscillatory amplitude reflects the strength of PLR.

By presenting a simultaneous tone with the bright or the dark phase of the visual stimulus, the researchers assessed the modulation of the coupled multisensory signals on the pupil oscillation induced by PLR.

They found that the induced pupil size oscillation was substantially attenuated when the bright but not the dark phase of the visual flicker was periodically and synchronously presented with a burst of tones.

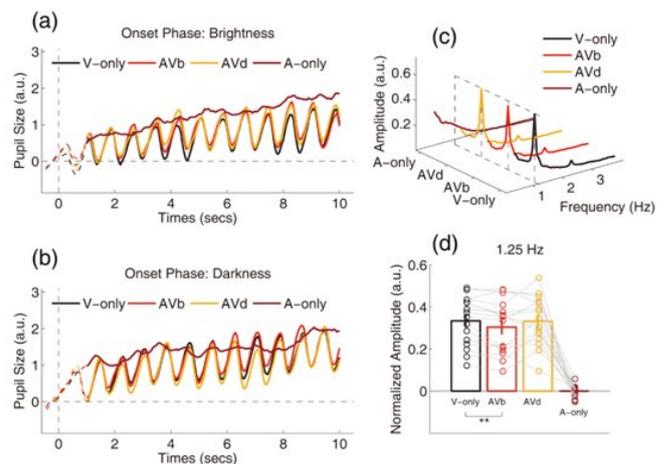


Fig.2. The results of Experiment 1. Credit: YUAN Xiangyong

This finding was replicated when the researchers repeatedly presented a brighter stimulus accompanied by a tone pulse against the background. This inhibition effect persisted when the visual flicker was task-irrelevant and out of attentional focus, but disappeared when the visual flicker was moved from the central field to the periphery.

Together, this study not only offers a comprehensive characterization of the multisensory impact on pupil response to light, but also provides valuable clues about the individual contributions of the sympathetic and parasympathetic pathways to multisensory modulation of pupil size.

The study entitled "Multisensory signals inhibit pupillary light reflex: Evidence from pupil oscillation" has been published in *Psychophysiology*.

More information: Xiangyong Yuan et al, Multisensory signals inhibit pupillary light reflex: Evidence from pupil oscillation, *Psychophysiology* (2021). DOI: [10.1111/psyp.13848](https://doi.org/10.1111/psyp.13848)

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