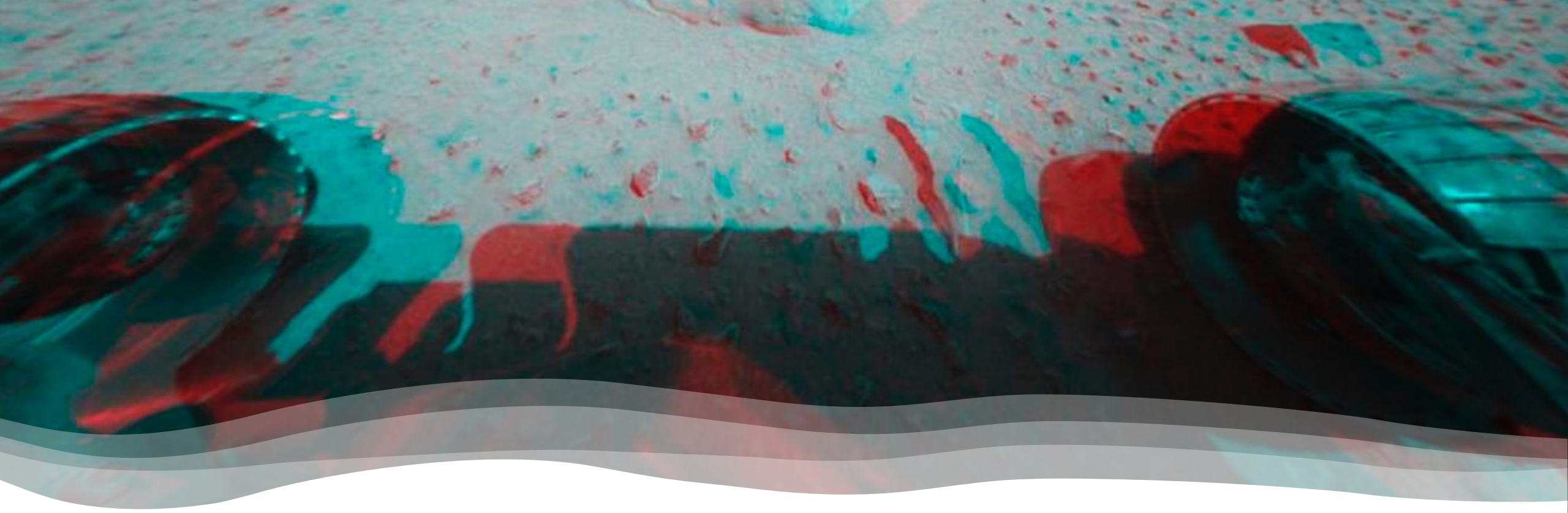

Human 3D vision - Stereopsis

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Burlo Garofolo di Trieste

BURLO

IRCCS: Scientific Institute for Research, Hospitalization and Healthcare

The name of IRCCS indicates institutions of relevant national interest, which drive clinical assistance in strong relation to research activities. Their mission is the continuous upgrade of healthcare.

NIH

National Eye Institute

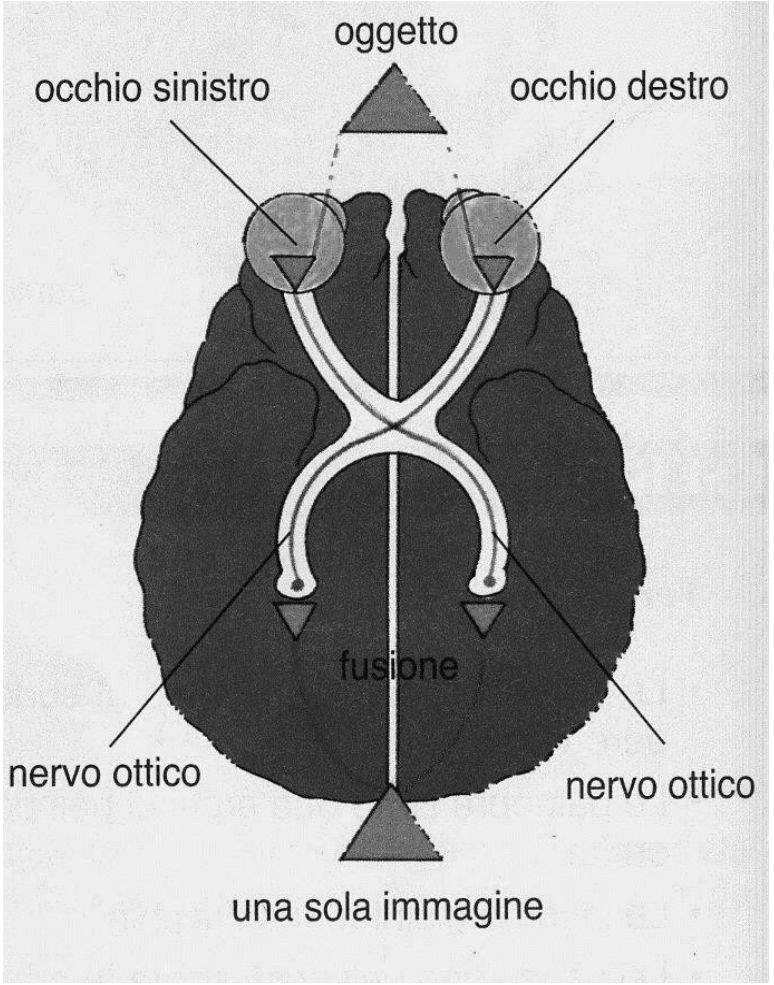
The National Institutes of Health is the primary agency of the United States government responsible for biomedical and public health research.

Binocular vision & Stereopsis (stereo or 3D vision)

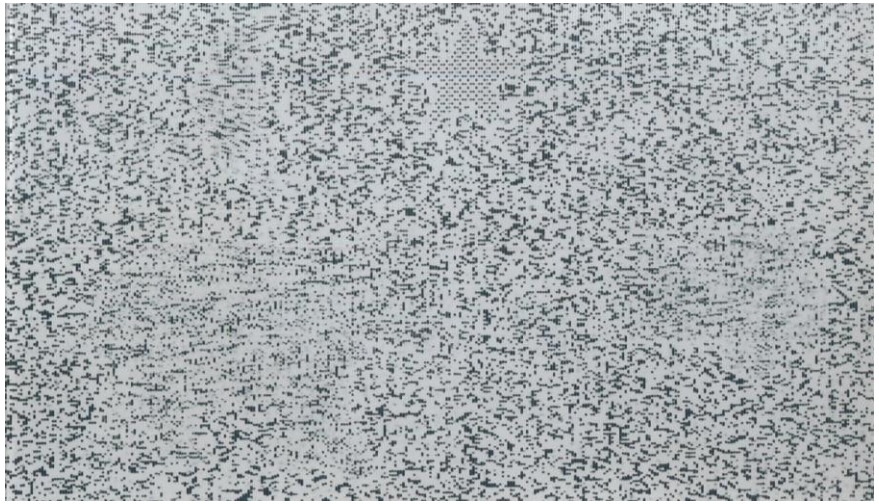
Binocular vision is the ability to fuse the images from the two eyes to create a single percept in-depth (stereopsis); it relies on extracting differences between the locations of matching features on the retinae (binocular disparity).

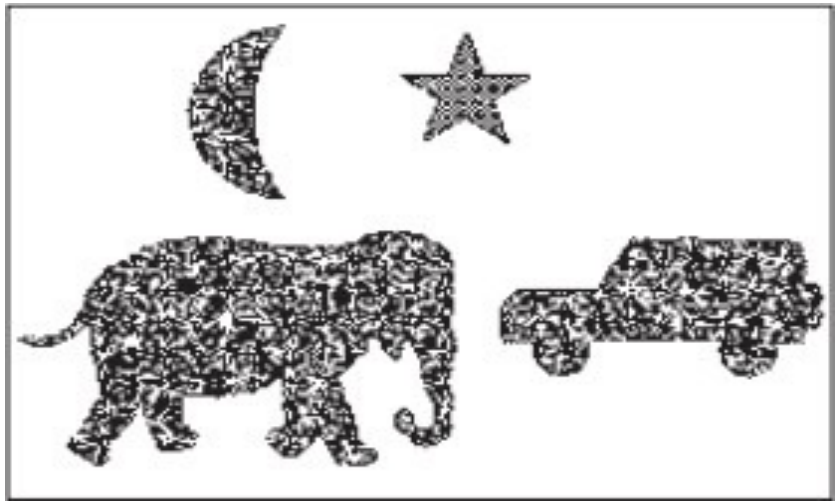
Forward-facing eyes result in largely overlapping monocular visual fields, vastly increasing the importance of binocular disparity for depth perception, especially at near distance

Stereopsis is the perception of depth and 3D structure through binocular vision, the combined visual information from two eyes



Stereoblidnes tests





Moon 200’’; Car 400’’; Elephant 600”.
Measuring distance: 40cm

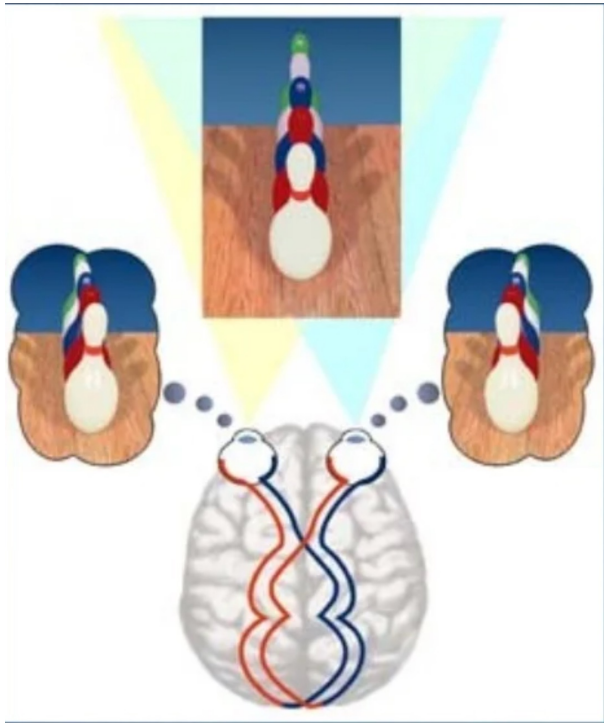
Stereoblindness, the inability to use binocular disparity to sense depth, often associated with strabismus and amblyopia, is an irreversible central nervous system disorder in which the brain fails to process inputs from one eye and over time favors the other eye

Ocular following responses (OFRs)

Ocular following responses (OFRs) are reflexive, short-latency eye movements induced by the sudden motion of a **large textured pattern in the visual field**. It has been proposed that they help the translational **vestibulo-ocular reflex** system in the stabilization of gaze.

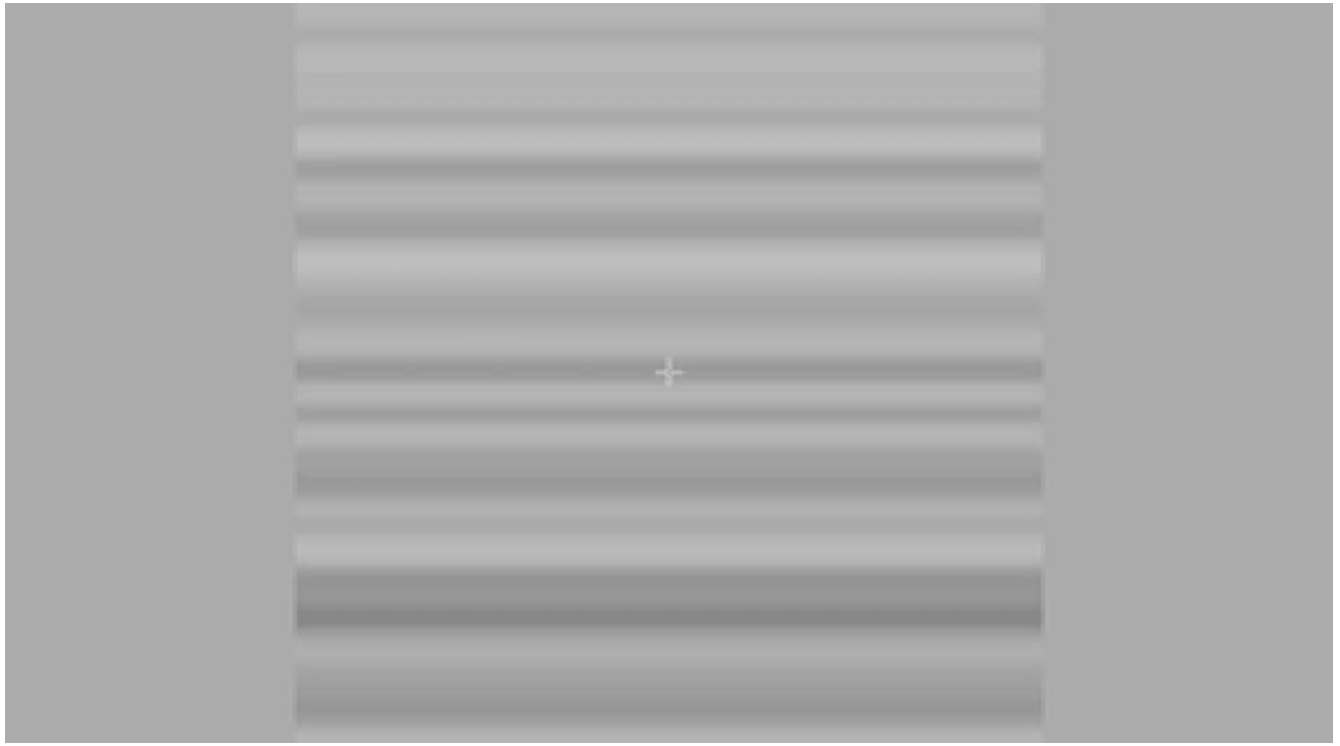
Binocular summation is exquisitely sensitive to the interocular correlation between the images presented to the two eyes under binocular stimulation. This indicates that, in particpants with normal stereovision, OFRs are mediated by disparity-sensitive cortical neurons.

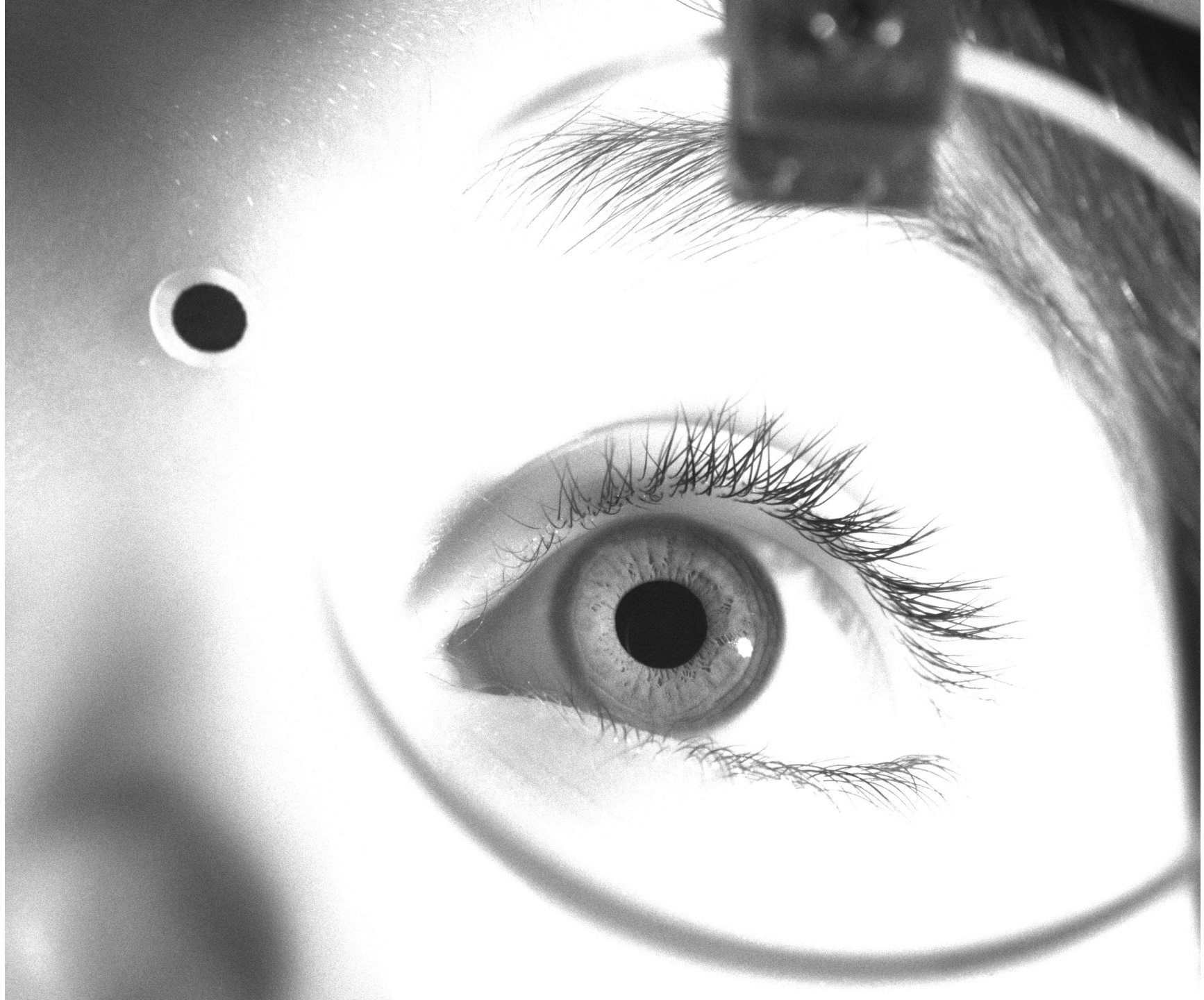
If this is indeed the case, **one would expect OFRs in stereodeficient participants is also affected.**

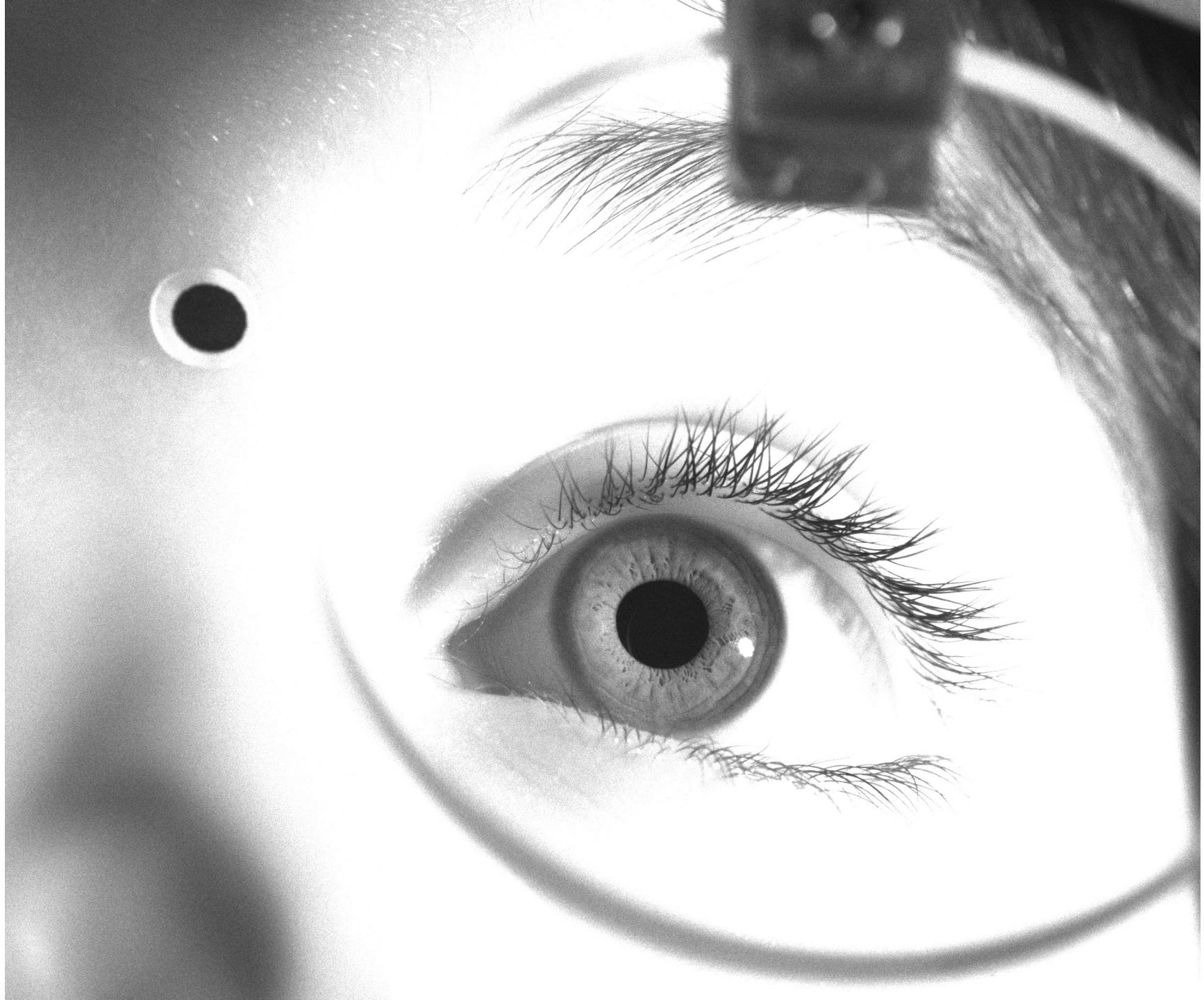


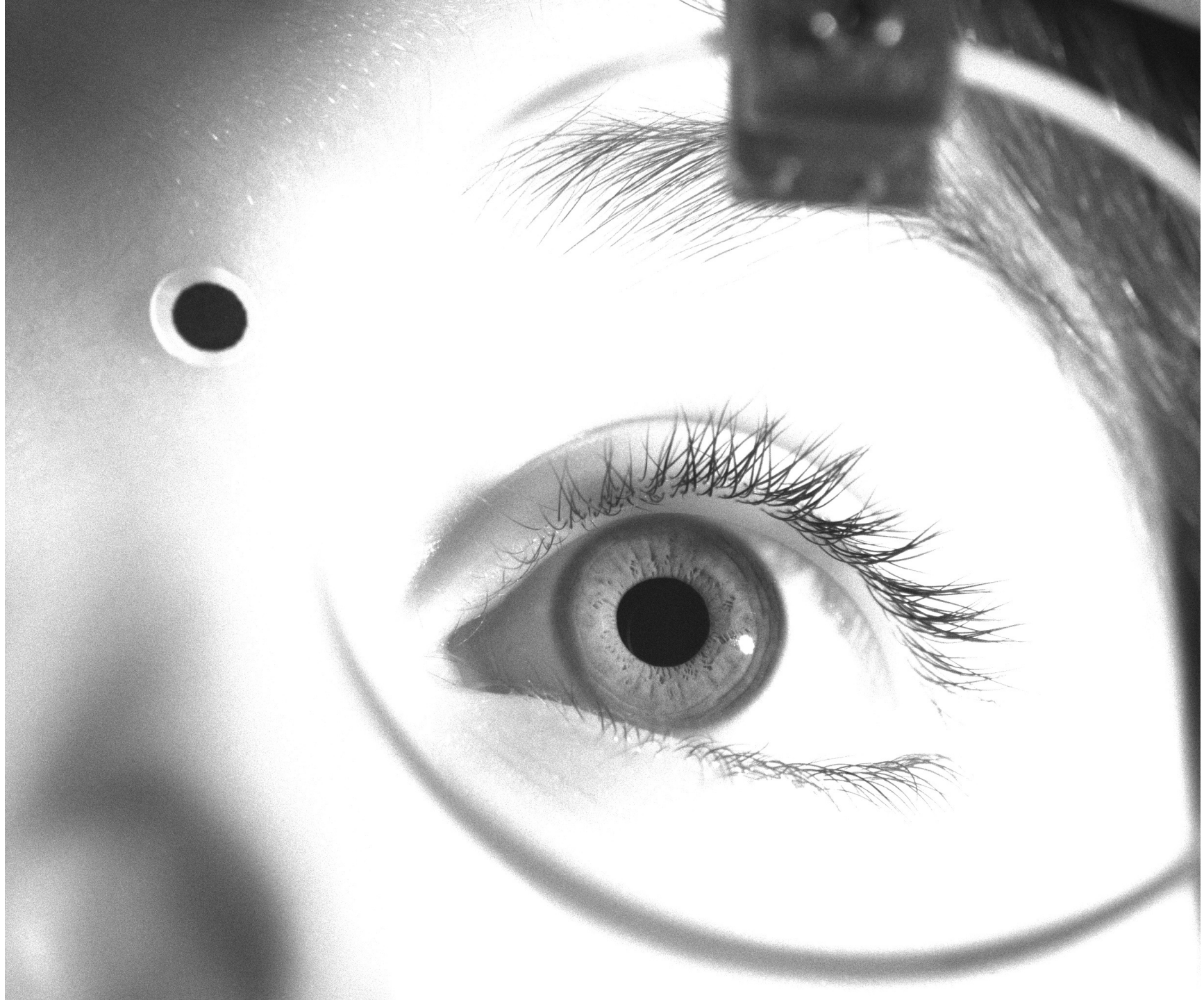
Can we mesure stereopsis by measuring eye-movemnts i.e. Ocular following responses (OFRs)?

Behaviour paradigm to induce OFRs

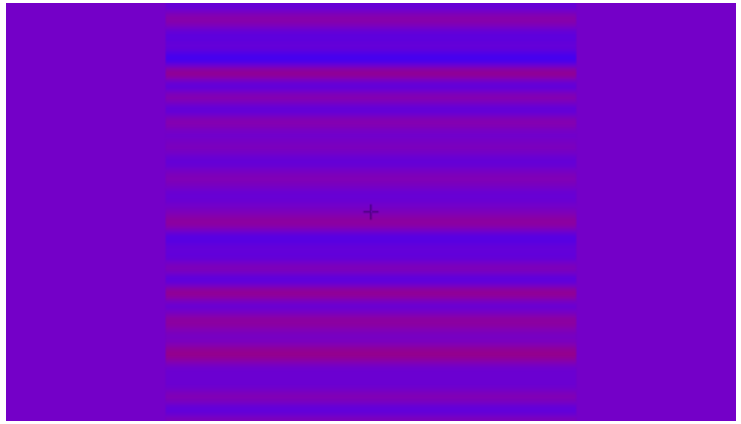


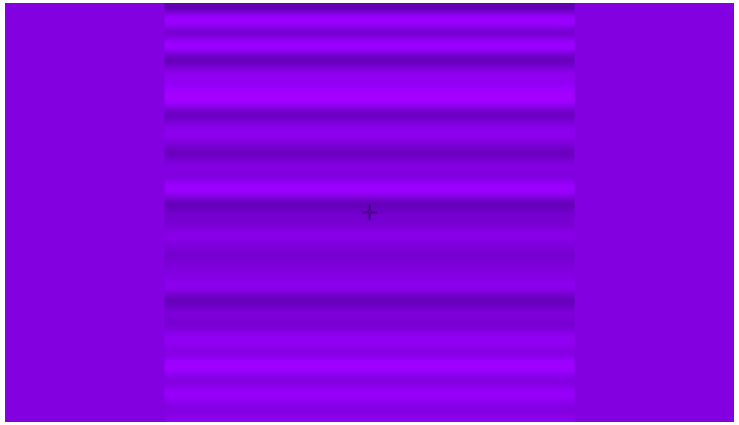




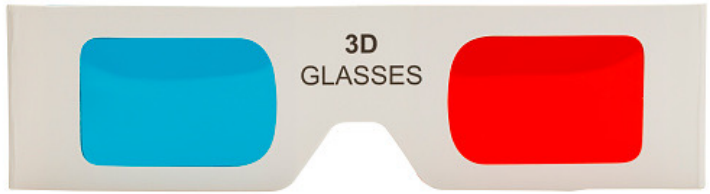


Behaviour paradigm to induce OFRs

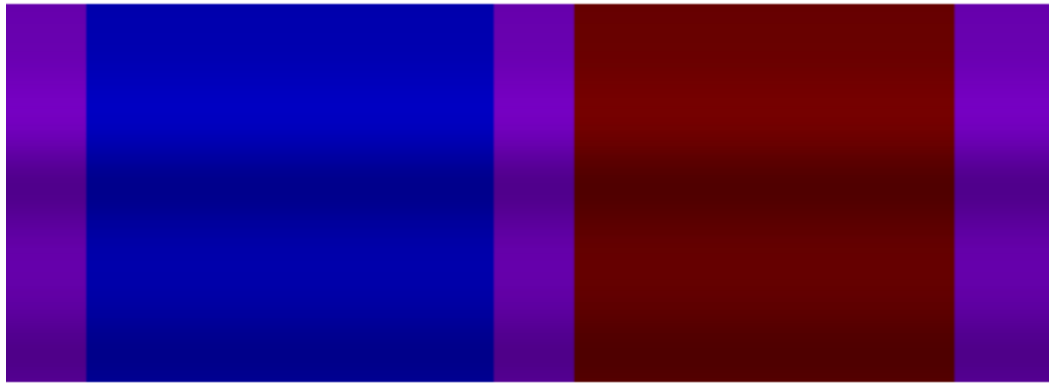




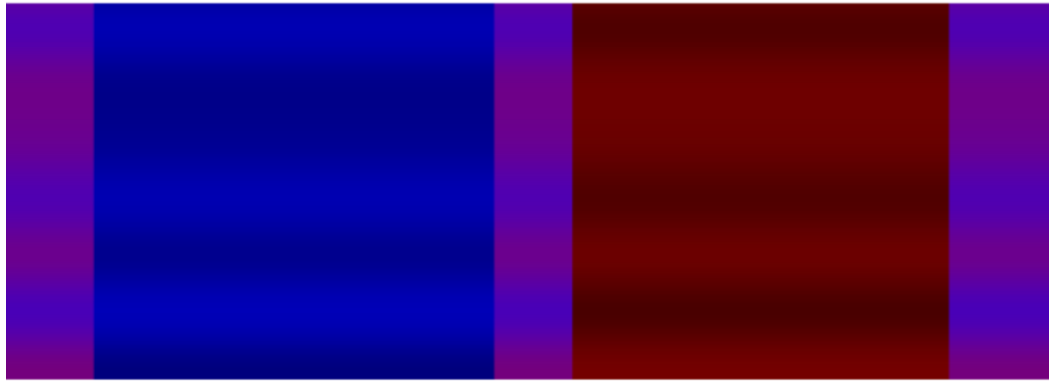
Behaviour paradigm to induce OFRs



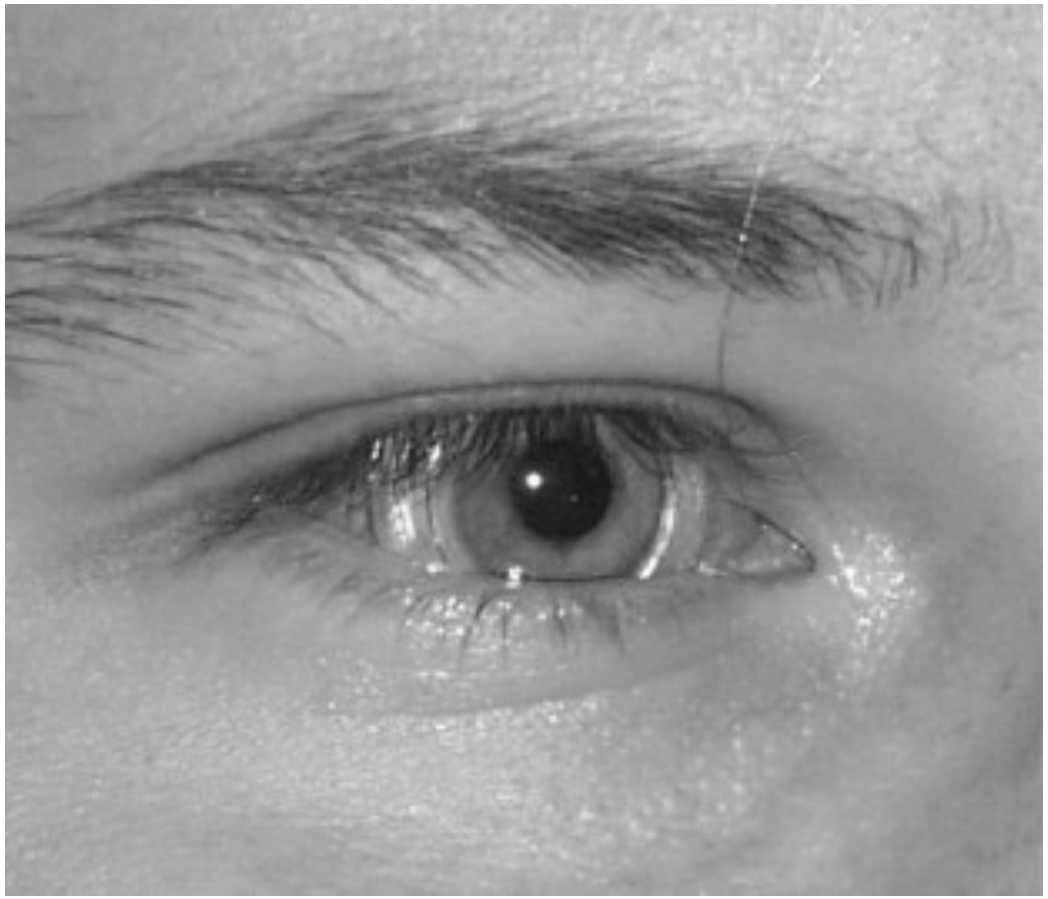
Correlated



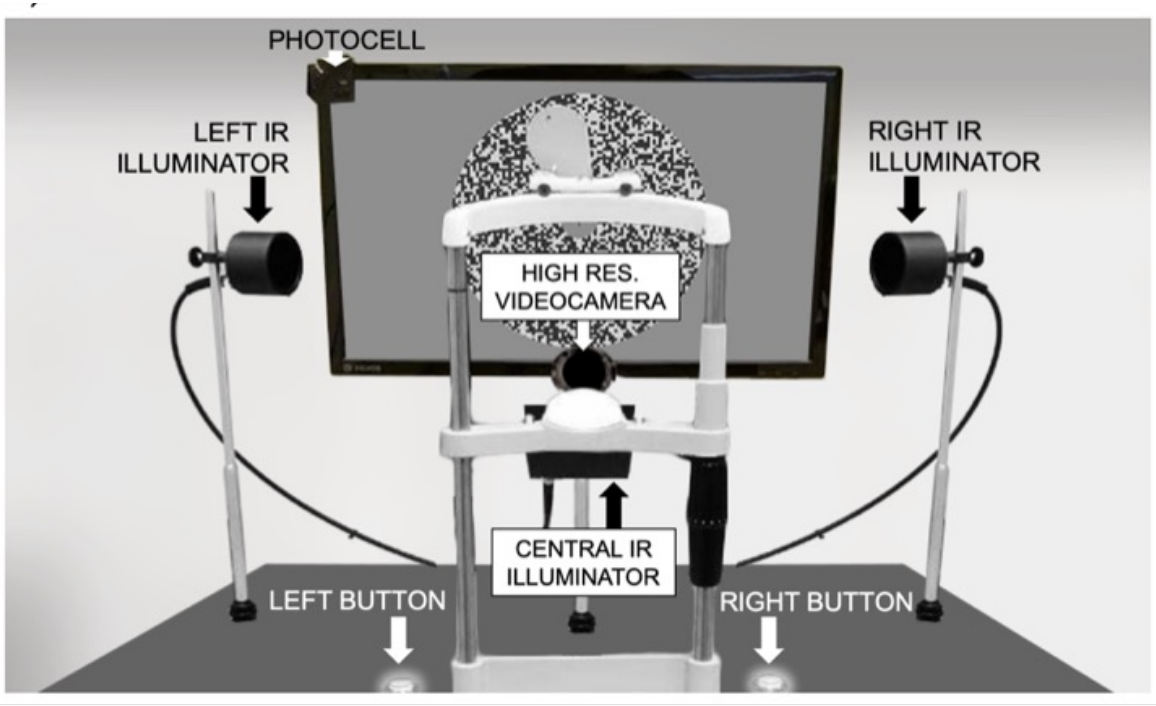
Anti-correlated

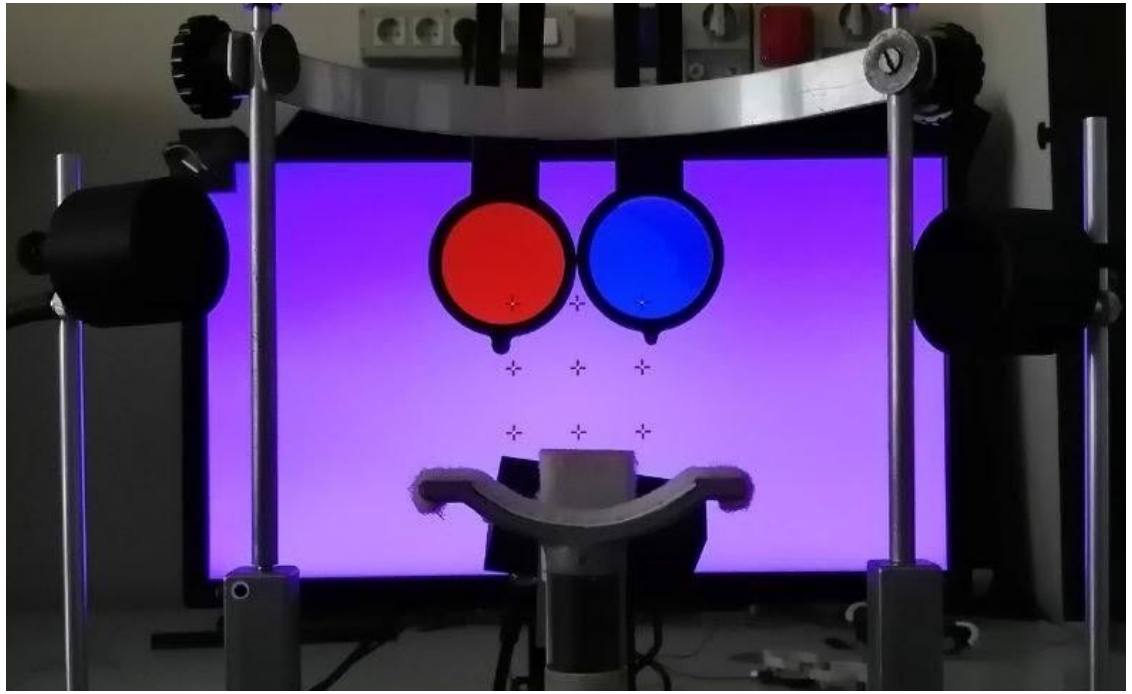


Magnetic scleral search coil



High resolution VOG

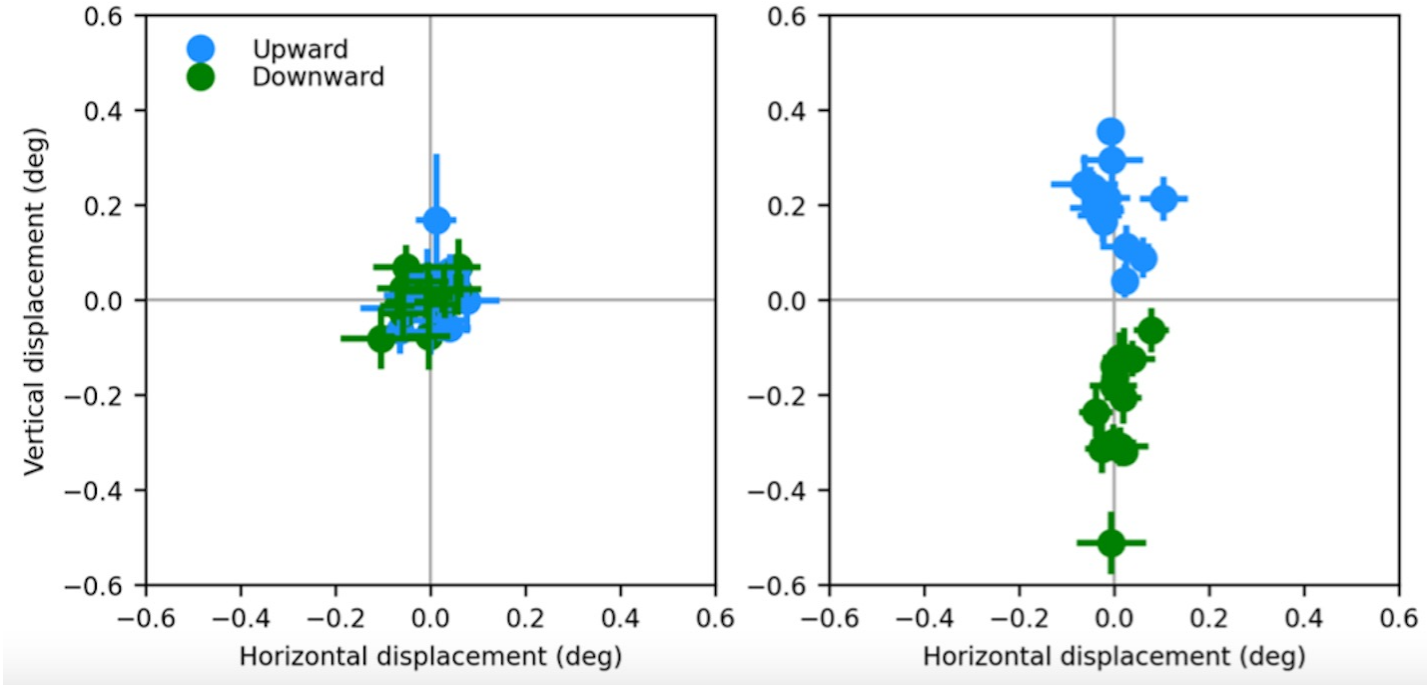




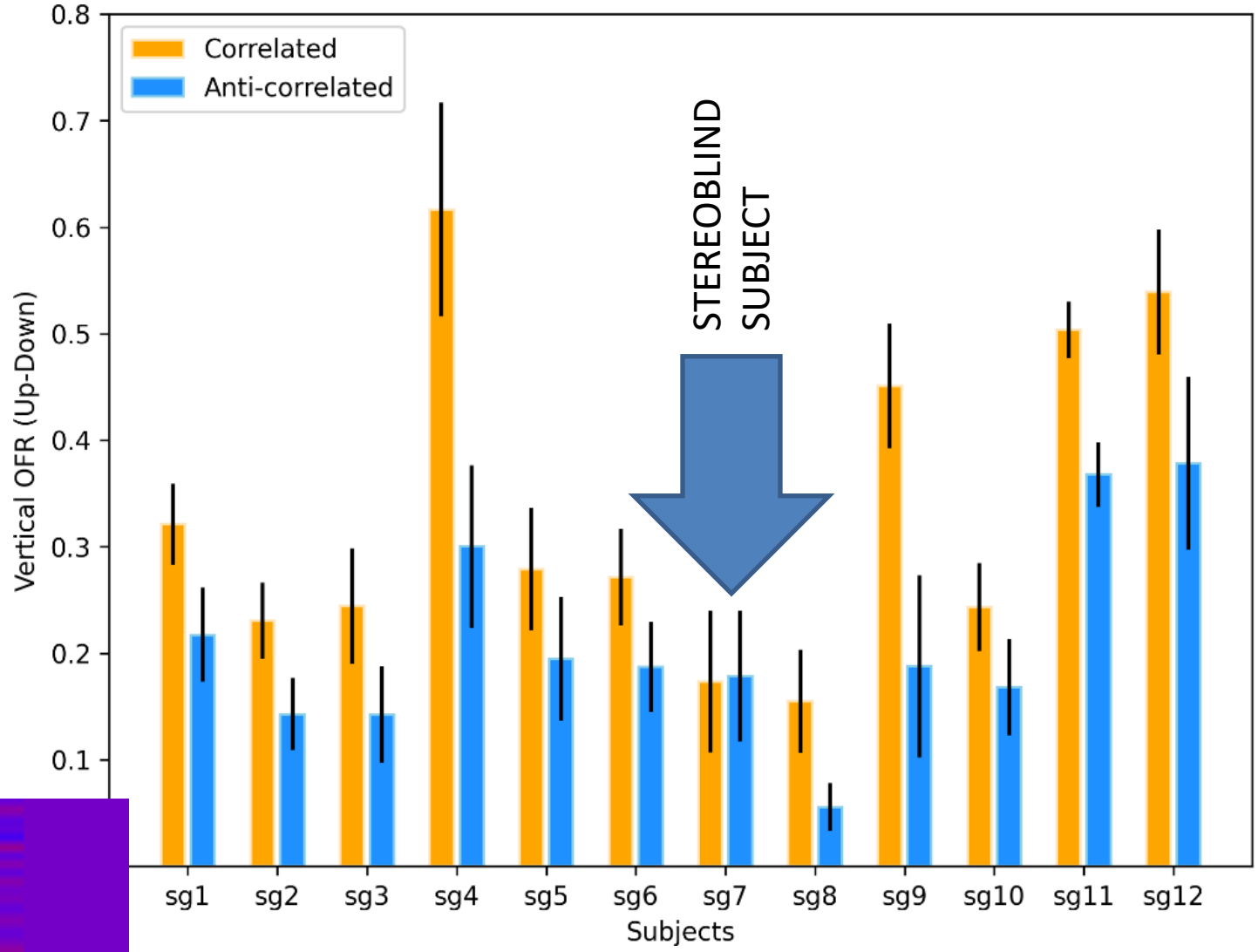
Tasks

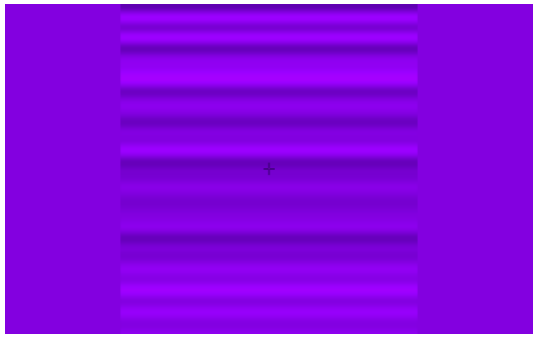
1) validation of HR-VOG (@NIH) - <0.1° (15μm)
2) study of if OFRs are innate or acquired (@Burlo Hospital)
3) study of dicoptic OFRs in stereoblind vs normal participants (@Burlo Hospital)

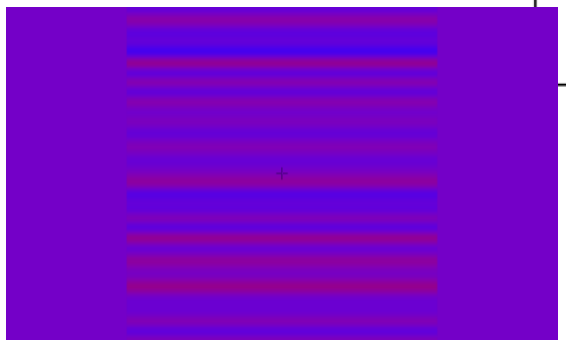
Children and OFRs



Stereopsis via binocular summation







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