The active pupil: The role of pupil size in active vision

Fact Sheet

Project Information

ACTPUP

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Objective

The pupil is a volatile surface. It shrinks when we step out into the sun, and expands when we get aroused or exert mental or physical effort. These basic pupillary responses have been recognized at least since Roman times, and have been the focus of systematic investigation since the 18th century. Currently, pupil-size measurement, or pupillometry, is an established tool for diagnosing visual defects, and is widely used as a marker of arousal or effort in psychological experiments and clinical applications.

Yet our understanding of pupillary responses is still largely descriptive: It is clear that arousal triggers pupillary dilation—but why? The pupil clearly constricts in response to light—but how is the light response linked to visual perception and cognition? These questions have so far received little attention. Yet they are crucial, not only to our understanding of pupillary responses, but to our understanding of visual
perception in general. The purpose of the present proposal is to study pupillary responses from a cognitive-neuroscience perspective. We aim to understand how pupil size interacts with cognitive factors such as visual attention and awareness, and how pupillary responses help us to perceive the environment more clearly, or rather more adaptively. We will employ a multidisciplinary approach, in which we use behavioral eye-tracking experiments, informed by insights from neurophysiology, and formalize our results through computational modeling.

Our main thesis can be summarized as follows: Pupillary responses are part of active visual exploration and reflect the demands of the environment as well as the cognitive state of the organism.

This project is a collaboration between Dr. Sebastiaan Mathôt (applicant, Netherlands) and Dr. Françoise Vitu (scientist in charge, France), director of the Attention and Perception group at the Laboratoire de Psychologie Cognitive, Aix-Marseille Université.

Programme(s)

Topic(s)

Call for proposal

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Funding Scheme

MC-IEF - Intra-European Fellowships (IEF)

Coordinator

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

Address

Rue Michel Ange 3
75794 Paris
France

Website

EU contribution

€ 194 046,60

Administrative Contact

Younis Hermes (Mr.)