

Pupil size during very light exercise predicts benefits to prefrontal function, study shows

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Recent studies have revealed that mild forms of exercise, such as yoga or walking, can improve mood and enhance executive function, which involves the brain's prefrontal cortex and refers to the ability to control one's behavior to achieve a goal. However, the specific neural activity in the human brain that leads to the improvement of executive function

during exercise has remained poorly understood due to technical limitations.

It is often said that the eyes are a part of the brain and can effectively reflect a person's mental state. In recent years, there has been growing interest in investigating pupil size variations as these are closely linked to the [neural activity](#) associated with the brain's noradrenergic arousal system.

Pupillometry, a noninvasive and contactless measurement technique, allows for the assessment of neural activity during [aerobic exercise](#) and could serve as an indicator of arousal neural activity. Based on this premise, a research team led by Kuwamizu Ryuta and Soya Hideaki hypothesized that changes in [pupil size](#) during very light [exercise](#) could predict improvement in prefrontal executive function after a single exercise session.

To test this theory, the research team asked a group of healthy young adults to participate in 10 minute very light exercise followed by an executive function task.

The findings revealed that pupils dilated during the exercise, and the extent of the dilation was an indicator of a subsequent improvement in executive function. Prefrontal cortex activity during the executive function task was examined using functional near-infrared spectroscopy, demonstrating an increase in the activity of the left dorsolateral prefrontal cortex, a region associated with executive function. The paper is published in the journal *NeuroImage*.

These results strongly suggest that the enhancement of prefrontal executive function resulting from very light exercise can be attributed to pupil-linked neural activity, specifically the activation of the brain's noradrenergic arousal system. Looking ahead, pupil diameter holds

promising potential as a novel biomarker that can be used to predict the effects of exercise on the brain.

More information: Ryuta Kuwamizu et al, Pupil dynamics during very light exercise predict benefits to prefrontal cognition, *NeuroImage* (2023). [DOI: 10.1016/j.neuroimage.2023.120244](https://doi.org/10.1016/j.neuroimage.2023.120244)

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