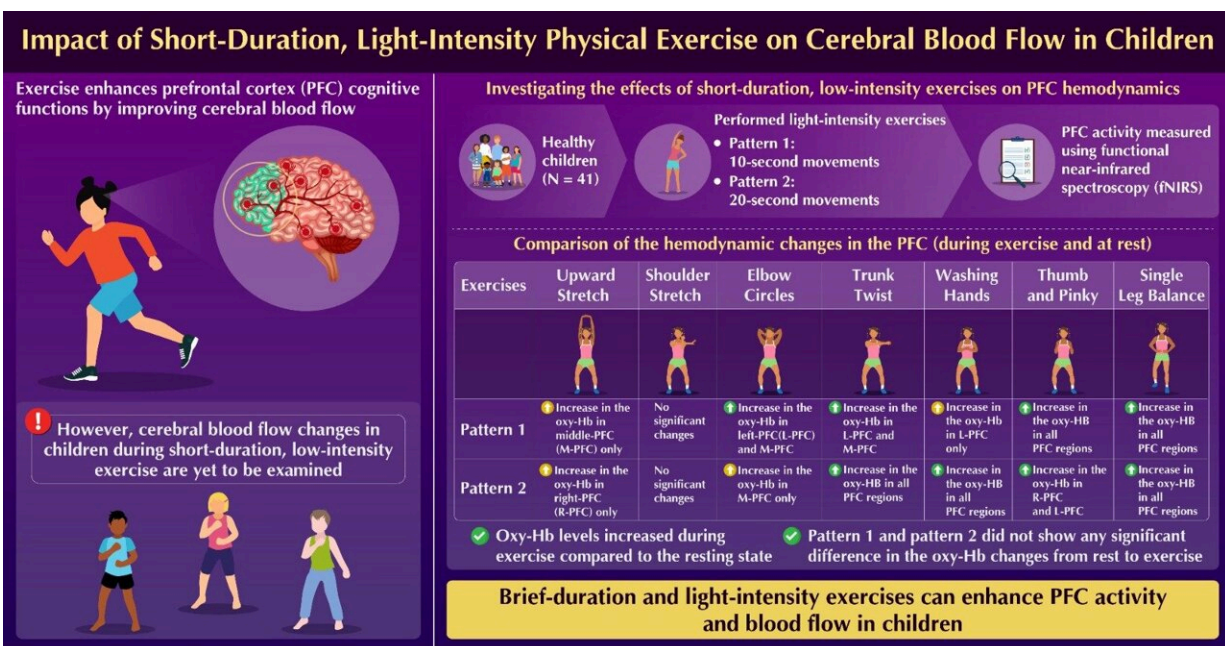


Short-duration, light-intensity exercises improve cerebral blood flow in children, research reveals

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Hemodynamics of short-duration light-intensity physical exercise in the prefrontal cortex of children: A functional near-infrared spectroscopy study
Naito et al. (2024) | *Scientific Reports* | DOI: 10.1038/s41598-024-66598-6



Researchers from Waseda University investigated the effects of seven types of light-intensity, short-duration exercises and found that all exercises, except static stretching with monotonous movements, enhance cerebral blood flow and activate multiple regions of the PFC. Credit: Takashi Naito / Graduate School of Sport Sciences, Waseda University

Cognitive functions, also known as intellectual functions, encompass

thinking, understanding, memory, language, computation, and judgment, and are performed in the cerebrum. The prefrontal cortex (PFC), located in the frontal lobe of the cerebral cortex, handles these functions.

Studies have shown that exercise improves cognitive function through mechanisms such as enhanced cerebral blood flow, structural changes in the brain, and promotion of neurogenesis.

However, 81% of children globally do not engage in enough physical activity, leading to high levels of sedentary behavior and insufficient exercise. This lack of physical activity raises concerns about its negative impact on children's healthy brain development and cognitive function.

A study [published](#) on July 6, 2024 in *Scientific Reports*, by doctoral student Takashi Naito from the Graduate School of Sport Sciences, Waseda University, along with Professors Kaori Ishii and Koichiro Oka from the Faculty of Sport Sciences, Waseda University, offers insights into potential solutions.

The study investigated the effects of short-duration and light-intensity exercise on increasing cerebral blood flow in children.

"Our goal is to develop a light-intensity exercise program that is accessible to everyone, aiming to enhance brain function and reduce children's sedentary behavior. We hope to promote and implement this program in schools through collaborative efforts," says Naito.

To enhance cognitive performance, it is essential to develop exercise programs that increase cerebral blood flow. While previous studies have established the benefits of moderate-to-vigorous exercise for cognitive functions, changes in cerebral blood flow during light-intensity exercise, particularly in children, had not yet been investigated.

To address this gap, the team conducted an experimental study to examine the effects of short-term, light-intensity exercises on prefrontal cortex (PFC) hemodynamics. They focused on exercises that can be easily performed on the spot without special equipment, such as stretching. Functional near-infrared spectroscopy (fNIRS), an imaging technique that measures changes in cerebral blood flow through oxy-Hb concentrations, was used for this purpose.

The study enrolled 41 healthy children ranging from fifth-grade elementary to third-year junior high school students. The children were taught seven different types of low-intensity exercises along with associated safety measures. These exercises included Upward Stretch, Shoulder Stretch, Elbow Circles, Trunk Twist, Washing Hands, Thumb and Pinky, and Single-leg Balance.

The exercises were performed while seated except Single-leg Balance, with movement patterns lasting for 10 and 20 seconds. Researchers recorded and compared oxy-Hb levels at rest and during exercise.

The study's results were highly promising, showing a significant increase in oxy-Hb levels in multiple regions of the PFC during all forms of exercise compared to the resting state. However, no significant change in oxy-Hb levels was observed during static stretching with movement in one direction.

"By combining the types of exercise that easily increase blood flow in the PFC identified in this study, it is possible to develop an exercise program that everyone can easily engage in to improve children's executive functions. It may also be used in the future to prevent cognitive decline in adults and the elderly," explains Naito.

In conclusion, this study represents a significant step forward in combating sedentary lifestyles and activating brain functions in children,

thereby supporting their physical and mental growth.

Although this study demonstrated that even short-duration, low-intensity [exercise](#) can increase [cerebral blood flow](#) in the [prefrontal cortex](#), future research is needed to confirm whether such exercises actually lead to improved cognitive function.

More information: Takashi Naito et al, Hemodynamics of short-duration light-intensity physical exercise in the prefrontal cortex of children: a functional near-infrared spectroscopy study, *Scientific Reports* (2024). [DOI: 10.1038/s41598-024-66598-6](https://doi.org/10.1038/s41598-024-66598-6)

Provided by Waseda University

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