

# Children with better physical fitness levels have greater volume of gray matter

November 21, 2017, University of Granada

Researchers from the University of Granada (UGR) have proven that physical fitness in children may affect their brain structure, which in turn may have an influence on their academic performance. More specifically, the researchers have confirmed that physical fitness in children is associated with a greater volume of gray matter in several cortical and subcortical brain regions.

▶ In particular, aerobic capacity is associated with greater gray matter volume in frontal regions (premotor cortex and supplementary motor cortex), subcortical regions (hippocampus and caudate nucleus), temporal regions (inferior temporal gyrus and parahippocampal gyrus) and the calcarine cortex. All of those regions are important for the executive function as well as for learning, motor and visual processes.

This study has been published in *NeuroImage*, and is part of the ActiveBrains project, which is a randomized clinical trial involving more than 100 overweight/obese children led by Francisco B. Ortega.

"Our work aims at answering questions such as whether the brain of children with better physical fitness is different from that of children with worse physical fitness and if this affects their academic performance," Ortega explains.

"The answer is short and forceful: yes, physical fitness in children is linked in a direct way to important brain structure differences, and such differences are reflected in the children's academic performance."

Additionally, the UGR research associates motor ability with higher gray matter volume in two regions essential for language processing and reading: the inferior frontal gyrus and the superior temporal gyrus. However, muscular strength didn't show any independent association with gray matter volume in any brain region.

According to Irene Esteban-Cornejo, postdoctoral researcher at the University of Granada and main author of this paper, gray matter volume in the cortical and subcortical regions influenced by physical fitness improves in turn the children's academic performance.

Moreover, "physical fitness is a factor that can be modified through physical exercise, and combining exercises that improve the aerobic capacity and the motor ability would be an effective approach to stimulate brain development and academic performance in overweight/obese children."

This scientific paper is an important contribution which should be taken into account by educational and public health institutions. "We appeal both to politicians, who make educational laws that are increasingly more focused on

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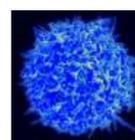
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instrumental subjects, and to teachers, who are the final link in the chain and teach Physical Education day after day. School is the only entity that gathers every children in a mandatory way for a period of at least 10 years, and as such, it's the ideal context for applying such recommendations," the researchers write.

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**More information:** Irene Esteban-Cornejo et al. A whole brain volumetric approach in overweight/obese children: Examining the association with different physical fitness components and academic performance. The ActiveBrains project, *NeuroImage* (2017). DOI: [10.1016/j.neuroimage.2017.08.011](https://doi.org/10.1016/j.neuroimage.2017.08.011)

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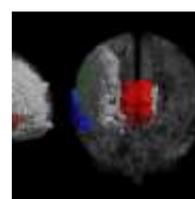
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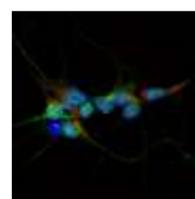
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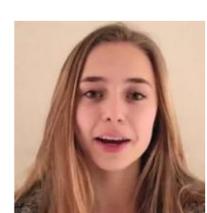
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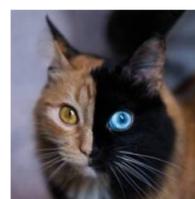
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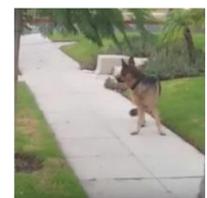
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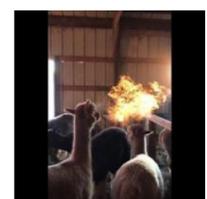
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