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Bursts of exercise boost cognitive function, UCSB neuroscientists find

Decades of exercise research data support the common view that steady workouts over the long haul produce not only physical benefits but also improved brain function. But what about single bursts of exercise? A team of scientists at UC Santa Barbara has taken a closer look.

Their study, “A systematic review and Bayesian meta-analysis provide evidence for an effect of acute physical activity on cognition in young adults,” was recently published in Communications Psychology.

“One of the most consistent findings in the literature is that exercise interventions — something like a program that you would engage in, say, three times a week over several months or years — improve cognition and can even promote neurogenesis (the process by which new neurons are formed in the brain),” said Barry Giesbrecht, a professor in the Department of Psychological & Brain Sciences and senior author of the study. “But studies looking at the effects of single, acute bouts of exercise are much more mixed.”

Focusing on subjects between 18–45 years old, first author Jordan Garrett — who graduated with his Ph.D. from the department in June — and Giesbrecht's team at the UCSB Attention Lab screened thousands of exercise studies published between 1995 and 2023 to determine the consistent trends in the literature. Based on the

results of their modeling approach, cycling and high intensity interval training (HIIT) produced the most consistent effects in improvement of memory, attention, executive function, information processing and other cognitive functions.

“We found that vigorous activities had the largest effects,” Giesbrecht said.

“Also, the effects were strongest for studies that tested cognition after exercise, as opposed to during exercise," he added. "And lastly, the effects of exercise less than 30 minutes in duration were bigger than those that went beyond 30 minutes. Our work showed the strongest evidence for a positive effect of single bouts of exercise on cognition and that this evidence was impacted by a variety of factors.”

Also among their findings, the team — including project scientist Tom Bullock and graduate student Carly Chak — discovered that executive functioning was the key cognitive domain impacted by vigorous exercise, such as HIIT protocols.

“I think that the other intriguing result is that the overall effect of a single bout of exercise was generally on the small side,” Giesbrecht said, noting that besides the variability across the experiments, the enhancements may also be small because they are typically measured when the physical activity is not related to the cognitive task. This raises the “intriguing” hypothesis, he added, that perhaps using tasks that require the integration of actions of our body and cognitive systems may result in more pronounced benefits.

Giesbrecht and his team are planning to put this idea to the test “using a combination of lab tasks and real-world activities,” he said.

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Data Science

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