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How Physical Fitness May Promote School Success

By [GRETCHEN REYNOLDS](#)

Children who are physically fit absorb and retain new information more effectively than children who are out of shape, a new study finds, raising timely questions about the wisdom of slashing physical education programs at schools.

Parents and exercise scientists (who, not infrequently, are the same people) have known for a long time that physical activity helps young people to settle and pay attention in school or at home, with salutary effects on academic performance. A representative study, presented in May at the American College of Sports Medicine, found that fourth- and fifth-grade students who ran around and otherwise exercised vigorously for at least 10 minutes before a math test scored higher than children who had sat quietly before the exam.

More generally, in a [large-scale study of almost 12,000 Nebraska schoolchildren](#) published in August in *The Journal of Pediatrics*, researchers compiled each child's physical fitness, as measured by a timed run, body mass index and academic achievement in English and math, based on the state's standardized test scores. Better fitness proved to be linked to significantly higher achievement scores, while, interestingly, body size had almost no role. Students who were overweight but relatively fit had higher test scores than lighter, less-fit children.

To date, however, no study specifically had examined whether and in what ways physical fitness might affect how children learn. So researchers at the University of Illinois at Urbana-Champaign recently stepped into that breach, recruiting a group of local 9- and 10-year-old boys and girls, testing their aerobic fitness on a treadmill, and then asking 24 of the most fit and 24 of the least fit to come into the exercise physiology lab and work on some difficult memorization tasks.

Learning is, of course, a complex process, involving not only the taking in and storing of new information in the form of memories, a process known as encoding, but also recalling that information later. Information that cannot be recalled has not really been learned.

Earlier studies of children's learning styles have shown that most learn more readily if they are tested on material while they are in the process of learning it. In effect, if they are quizzed while memorizing, they remember more easily. Straight memorization, without intermittent reinforcement during the process, is tougher, although it is also how most children study.

In this case, the researchers opted to use both approaches to learning, by providing their young volunteers with iPads onto which several maps of imaginary lands had been loaded. The maps were demarcated into regions, each with a four-letter name. During one learning session, the children were shown these names in place for six seconds. The names then appeared on the map in their correct position six additional times while children stared at and tried to memorize them.

In a separate learning session, region names appeared on a different map in their proper location, then moved to the margins of the map. The children were asked to tap on a name and match it with the correct region, providing in-session testing as they memorized.

A day later, all of the children returned to the lab and were asked to correctly label the various maps' regions.

The results, [published last week in PLoS One](#), show that, over all, the children performed similarly when they were asked to recall names for the map when their memorization was reinforced by testing.

But when the recall involved the more difficult type of learning — memorizing without intermittent testing — the children who were in better aerobic condition significantly outperformed the less-fit group, remembering about 40 percent of the regions' names accurately, compared with barely 25 percent accuracy for the out-of-shape kids.

This finding suggests that “higher levels of fitness have their greatest impact in the most challenging situations” that children face intellectually, the study’s authors write. The more difficult something is to learn, the more physical fitness may aid children in learning it.

Of course, this study did not focus specifically on the kind of active exercise typical of recess, but on longer-term, overall physical fitness in young children. But in doing so, it subtly reinforces the importance of recess and similar physical activity programs in schools, its authors believe.

If children are to develop and maintain the kind of aerobic fitness that amplifies their ability to learn, said co-author Charles Hillman, a professor of kinesiology at the University of Illinois and a fellow at the university’s Beckman Institute for Advanced Science and Technology, they should engage in “at least an hour a day” of vigorous physical activity. Schools, where children spend so many of their waking hours, provide the most logical and logistically plausible place for them to get such exercise, he said.

Or as he and his co-authors dryly note in the study: “Reducing or eliminating physical education in schools, as is often done in tight financial times, may not be the best way to ensure educational success among our young people.”

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