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 University of Georgia College of Education



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Study: Exercise Improves Thinking, Reduces Diabetes Risk in Overweight Children

Collaborative research between UGA and Medical College of Georgia scientists shows that regular exercise can be an important method of enhancing children's cognitive and academic development.

TONI BAKER AND CATHARIN SHEPARD | OCT 24, 2007

Just three months of daily, vigorous physical activity in overweight children improves their

thinking and reduces their diabetes risk, Georgia researchers say. Studies of about 200 overweight, inactive children ages 7-11 also showed that a regular exercise program reduces body fat and improves bone density.

"Is exercise a magic wand that turns them into lean, healthy kids who are higher achievers? No. They are still overweight but less overweight with a healthier body composition and metabolism and an improved ability to handle life," says Catherine Davis, a clinical health psychologist at the Medical College of Georgia and lead investigator.

Just as importantly, researchers also found that children get a brain boost from exercise, which may play an important role in developing the skills they'll need to be successful throughout their lives.



"We hope these findings will help persuade policymakers, schools and communities that time spent being physically active enhances, rather than detracts, from learning," said Catharine Davis, a clinical health psychologist at the Medical College of Georgia.

"Aerobic exercise training showed benefits on executive function (decision-making) and possibly math achievement, in overweight children," said Philip Tomporowski, an associate professor of kinesiology in the University of Georgia's College of Education, and co-investigator in the study.

"Regular exercise may be a simple, important method of enhancing children's cognitive and academic development. These results may persuade educators to implement vigorous physical activity curricula during a childhood obesity epidemic," researchers wrote in an abstract presented during The Obesity Society's Annual Scientific Meeting this week in New Orleans.

All study participants learned about healthy nutrition and the benefits of physical activity; one third also exercised 20 minutes after school and another third exercised for 40 minutes. Children played hard, with running games, hula hoops and jump ropes, getting their heart rates up to 79 percent of maximum, which is considered vigorous.



These results may persuade educators to implement vigorous physical activity curricula during a childhood obesity epidemic, said Philip Tomporowski, an associate professor of kinesiology at UGA. Photo by Dot Paul

"Look what good it does when they exercise," says Davis. "This is an important public health issue we need to look at as a nation to help our children learn and keep them well."

Unprecedented obesity and inactivity rates in America's children are impacting academic achievement and health, including dramatic increases in the incidence of type 2 diabetes, a disease formerly known as adult-onset diabetes.

"Exercise may not influence overall IQ, but it helps you function better," says Davis. "We hope these findings will help persuade policymakers, schools and communities that time spent being physically active enhances, rather than detracts, from learning."

For this study, researchers gave the children tests that look at their "executive function," a term used to describe the decision-making processes. In what they believe to be the first of such studies in children, the researchers found small to moderate improvements in the executive function of children who exercised as well as evidence of increased math achievement.

"We have a number of studies conducted with animals that examined what influence physical activity has on blood flow, metabolic activity, brain function, glucose regulation, lots of things like that and they all demonstrate the same theme: that physical activity done on a regular basis has a sort of protective effect," says Tomporowski. "It doesn't take too much to make the leap that it might influence developing children as well."

"We also know that if you stop exercising, you lose all the benefits," adds Davis. "Exercise works if you do it."

Looking at the children's insulin resistance, a precursor of type 2 diabetes in which it takes more insulin to convert glucose into energy, researchers found levels dropped 15 percent in the 20-minute exercise group and 21 percent in the 40-minute group. The control group stayed about the same.

"Increasing volume of regular aerobic exercise shows increased benefits on insulin resistance in overweight children, indicating reduced risk of type 2 diabetes, regardless of sex or race," they write.

Even when the children did not lose fat exercising, their insulin resistance decreased, Davis says. Adult studies have yielded comparable findings regarding exercise's impact on insulin resistance and cognition.

The researchers did oral glucose tolerance tests, where children drink a small amount of glucose and their insulin response is measured, before and after the studies. "Once your glucose levels start to rise, it's called impaired glucose tolerance and that is a precursor of diabetes. It's called pre-diabetes now," says Davis, noting that overweight children typically have higher insulin resistance than their leaner peers.

Growth associated with puberty can temporarily increase insulin resistance, Davis notes, so although most the children were pre-pubertal, they made adjustments for the level of sex hormones in those already experiencing puberty.

DEXA scanning, which uses a small amount of radiation to quantify bone, tissue and fat, was used to get an accurate body composition. Executive function was measured using the Cognitive Assessment System and math skills using the Woodcock Johnson Test of Achievement III.

Functional magnetic resonance imaging studies, which show the brain at work, also were done on a percentage of the children in each group and found the children who exercised had increased activity in the frontal area of their brains, where decision-making function resides.

"If physical education were ideal, which it's not – it's not daily and it's not active – then children could achieve this within the school day," Davis says, pointing to benefits derived by children exercising just 20 minutes a day. "We are not there. To achieve maximum benefit, we were able to show it will take more than PE."

The studies were funded by the National Institute of Health. The researchers are submitting grants that will enable further studies.

The research was reported nationally in:

Science Daily

Medical News Today

Eureka Alert

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