What Works Clearinghouse

ies INSTITUTE OF EDUCATION SCIENCES

March 2012

WWC Quick Review of the Report "Exercise Improves Executive Function and Achievement and Alters Brain Activation in Overweight Children: A Randomized, Controlled Trial"[1]

What is this study about?

The study examined whether exercise offered to sedentary, overweight children ages 7 to 11 improved executive function—defined as strategy execution when presented with a novel task—and academic performance in reading and math.

The study authors analyzed data on about 170 students from Georgia who were recruited in five cohorts from 2003 to 2006. Of all students who participated, 56% were female, and 61% were African American. Students in the study sample were assigned randomly to one of three treatments: a low-dose exercise program, a high-dose exercise program, or no program.

Executive function was measured by the Planning subscale of the Cognitive Assessment System. Academic performance was measured by the Broad Reading and Broad Math sections of the Woodcock-Johnson Tests of Achievement III.

The effects of the exercise programs were estimated by separately comparing the outcomes of students assigned to the low-dose or high-dose exercise program with the outcomes of those assigned to no program.

Features of the Exercise Programs

Students from selected schools were eligible for the study if the following conditions were met: their body mass index was above the 85th percentile, they had regular physical activity of less than one hour a week, and they had no medical condition that would affect the study results or limit physical activity.

Students randomly assigned to one of the exercise programs were transported daily to an after-school site where they participated in either a 20-minute (low-dose) or 40-minute (high-dose) per day exercise program. The program lasted for approximately 13 weeks.

Both exercise programs included 20-minute, equally intense exercise periods. The high-dose program consisted of two 20-minute exercise periods, and the low-dose program consisted of one 20-minute exercise period and one 20-minute sedentary period that did not include tutoring.

Daily attendance was approximately 85% in both the low- and high-dose exercise programs.

(continued)

[1] Davis, C. L., Tomporowski, P. D., McDowell, J. E., Austin, B. P., Miller, P. H., Yanasak, N. E., Allison, J. D., & Naglieri, J. A. (2011). Exercise improves executive function and achievement and alters brain activation in overweight children: A randomized, controlled trial. *Health Psychology, 30*(1), 91–98.

What did the study find?

The study found that students assigned to the high-dose exercise program had statistically significantly higher math achievement and executive function than students not in an exercise program. WWC calculations indicate the magnitude of the difference is approximately 0.30 standard deviations in math and 0.24 standard deviations in executive function, which is roughly equivalent to moving a student from the 50th to the 62nd percentile in math and from the 50th to the 60th percentile in executive function.[2]

Reading achievement was not significantly different between students assigned to the high-dose exercise program and students assigned to no program. In addition, there were no statistically significant differences in executive function or in reading and math achievement between students assigned to the low-dose exercise program and students assigned to no program.

WWC Rating

The research described in this report meets WWC evidence standards

Strengths: The study is a well-executed randomized controlled trial with low attrition of students.

Cautions: The analysis sample included seven students for whom executive function outcomes were imputed rather than observed.

[2] The study presented pre- and posttest scores for students in each of the study groups. To assist in interpreting the magnitudes of the impacts, the WWC calculated effect sizes. The calculated effect sizes use the original impacts reported in the study and standard deviations provided by the author through an author query response. The impacts from the study include scores that were imputed, while the standard deviations from the author query response exclude imputed scores. The estimated impacts are statistically significant whether or not the study sample includes cases for whom the outcome data were imputed rather than observed.