



## Physical Education: Integral to Student Success

Over 90 percent of school districts have adopted a policy on physical education yet, in 2006, only 3.8 percent of elementary schools (excluding kindergarten), 7.9 percent of middle schools, and 2.1 percent of high schools provided daily physical education.<sup>1</sup> Reports attribute reductions in physical education to budget cuts and pressure to perform on standardized tests. Since the passage of No Child Left Behind, 44 percent of school administrators reported cutting physical education, art, music, and recess to devote more time to reading and math.<sup>2</sup> Unfortunately, districts that choose to balance budgets by eliminating physical education or increasing instruction in literacy, math, and science over physical education do so at the expense of student success.

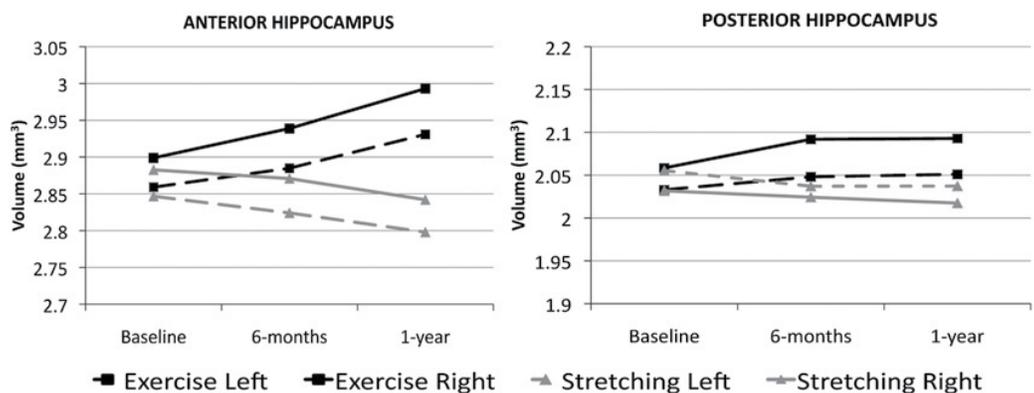
Over the past 30 years, childhood obesity rates have tripled—nearly one in three children is overweight or obese.<sup>3</sup> Moreover, in 2011-2012, 16.9 percent of 2- to 19-year-olds were obese.<sup>4</sup> Obesity can lead to heart disease, high blood pressure, cancer, and asthma.<sup>5</sup> Aside from the health benefits of physical education, mandatory courses in physical education positively impact student learning, memory, executive function, and test scores.

### Learning

In a 2007 randomized controlled trial (RCT), researchers examined the link between vigorous exercise and learning among 27 male students. The study revealed that vocabulary learning after intense physical exercise was 20 percent faster compared to being sedentary and engaging in moderate running.<sup>6</sup>

### Memory

A RCT of 120 older adults revealed that aerobic exercise training increases the size of the anterior hippocampus, leading to improvements in spatial memory. Participants were assigned to engage in either moderate-intensity exercise or stretching and toning. Those in the exercise group exhibited an increase in hippocampal volume by 2 percent, which was also associated with increased serum levels of brain-derived neurotrophic factor (BDNF). BDNF is a secreted protein from the BDNF gene. The protein is responsible for neuron survival, differentiation, and maintenance. Furthermore, BDNF is critical in memory formation.



Source: Erickson, K.I. 2011. "Exercise training increases size of hippocampus and improves memory." *Proceedings of the National Academy of Sciences*, 108(7): 3017-3022.

## Executive Function

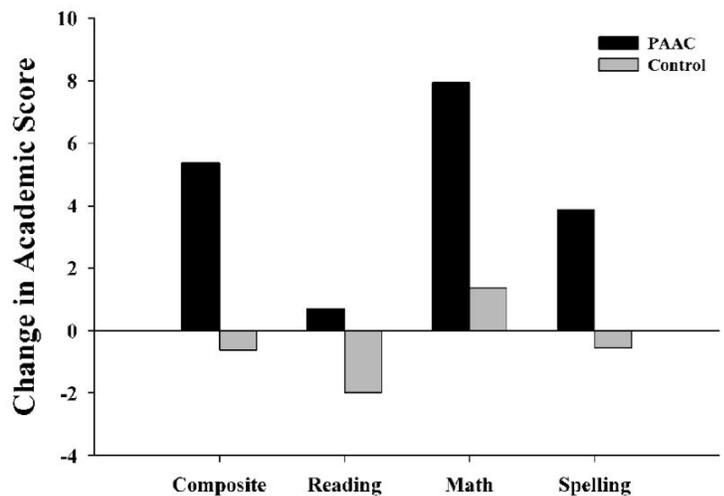
Executive function is a set of cognitive processes including self-monitoring and self-control; such skills are critical to goal-directed behavior and delaying gratification. In a 2004 study, researchers conducted two separate experiments: a cross-sectional assessment and a RCT with samples of 41 and 29 adults, respectively. Those in the clinical trial were randomly assigned to participate in either a cardiovascular fitness training group or a control group. All those participating in the cross-sectional assessment underwent a battery of fitness tests. Participants in both groups were presented with cognitively challenging tasks. From both the cross-section and the RCT, researchers found that cardiovascular fitness training was associated with better performance on a test of executive functioning.<sup>8</sup>

In a 2007 study, Davis selected 94 sedentary, overweight children to be randomized to either a low-dose (20 min/day exercise), high-dose (40 min/day exercise), or control condition. Each group met five days a week for 15 weeks. A standardized test of cognitive processes was administered individually before and following intervention. The test revealed that the executive function scores for the high-dose group were significantly greater than those of the control group.<sup>9</sup>

## Test Scores

A cross-sectional study of data from 11,743 students among 47 public schools found that aerobically fit students had greater odds of passing the Nebraska State Accountability (NeSA) math and reading tests compared to their peers, regardless of Free and Reduced Price Lunch Status. Further, aerobically fit students receiving free and reduced price lunch had 1.68 times greater odds of passing the NeSA math test and 1.56 times greater odds of passing the NeSA reading test compared with aerobically unfit students receiving free and reduced price lunch.<sup>10</sup>

A 2009 longitudinal RCT conducted by Donnelly examined 24 elementary schools and cluster-randomized them to either the Physical Activity Across the Curriculum (PAAC) intervention or a control group. PAAC consisted of moderate to vigorous physical activity for 90 minutes a week. The PAAC was provided as a supplement to the 60 minutes a week physical education course students were already receiving. Donnelly found that those in the PAAC group improved achievement in math, reading, and spelling: “The average scores across the intervention showed a value of  $3.4 \pm 0.46$  for PAAC schools compared to  $2.1 \pm 0.19$  in control schools ( $p = 0.0001$ ).”<sup>11</sup>



Source: Donnelly, J.E. 2009. “Physical Activity Across the Curriculum (PAAC): A randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children.” *Preventive Medicine*, 49(4): 336-341.

## PE Has Not Been a Priority

The U.S. Department of Health and Human Services recommends children and adolescents participate in at least 60 minutes of moderate or vigorous activity per day. Further, the American Heart Association recommends a minimum physical education standard of 150 minutes per week for elementary students and 225 minutes per week for middle and high school students. Lamentably, physical education is not our nation’s priority; less than 64 percent of districts have a physical education coordinator, less than 33 per-

cent of districts mandate a maximum teacher-student ratio for physical education, less than 65 percent of states require newly hired PE staff to have an undergraduate or graduate degree in physical education, and less than 8 percent of schools at any level provide daily physical education.<sup>12</sup> It is clear that what is needed is a nationally funded mandate requiring physical education for all grades.

### NEA Supports a Federally Funded Mandate

Insufficient funding has stymied state efforts to require physical education as a core subject. In 2011, then-Virginia Governor McDonnell vetoed a physical education bill, citing a lack of funds.<sup>13</sup> The implementation of physical education courses would

require hiring full-time certified PE instructors and, in some cases, a lengthening of the school day. Such changes could cost districts millions of dollars a year. In 2006, Arizona implemented a physical education pilot program in four elementary schools; the cost of implementing a quality, daily physical education program cost one school \$47,500 annually.<sup>14</sup> Rather than divert resources from core subjects, schools have opted to sacrifice physical education and the arts. Cash-strapped districts need federal support. In a time when the federal government supports healthy school meals and physical activity, a federally funded mandate would be in alignment with the administration's goal to create healthy, active critical thinkers.

### Notes

<sup>1</sup> U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. 2013. *Results from the School Health Policies and Practices Study 2012*. Washington, DC: Author. Retrieved 3.15.14 from [http://www.cdc.gov/healthyyouth/shpps/2012/pdf/shpps-results\\_2012.pdf#page=39](http://www.cdc.gov/healthyyouth/shpps/2012/pdf/shpps-results_2012.pdf#page=39).

Lee, Sarah M. 2007. "Physical Education and Physical Activity: Results from the School Health Policies and Programs Study 2006." *The Journal of School Health*, 77(8): 435-463.

<sup>2</sup> National Research Council. 2013. *Educating the Student Body: Taking Physical Activity and Physical Education to School*. Washington, DC: National Academies Press.

<sup>3</sup> N.p. Retrieved 2.20.14 from <http://www.letsmove.gov/learn-facts/epidemic-childhood-obesity>.

<sup>4</sup> Ogden, C.L., M.D. Carroll, B.K. Kit, and K.M. Flegal. 2014. "Prevalence of Childhood and Adult Obesity in the United States, 2011-2012." *JAMA*, 311(8): 806-814.

<sup>5</sup> N.p. Retrieved 2.20.14 from <http://www.letsmove.gov/learn-facts/epidemic-childhood-obesity>.

<sup>6</sup> Winter, B. 2007. "High impact running improves learning." *Neurobiology of Learning and Memory*, 87(4): 597-609.

<sup>7</sup> Erickson, K.I. 2011. "Exercise training increases size of hippocampus and improves memory." *Proceedings of the National Academy of Sciences*, 108(7): 3017-3022.

<sup>8</sup> Colcombe, S.J. 2004. "Cardiovascular fitness, cortical plasticity, and aging." *Proceedings of the National Academy of Science*, 101(9): 3316.

<sup>9</sup> Davis, C.L. 2007. "Effects of Aerobic Exercise on Overweight Children's Cognitive Functioning: A Randomized Controlled Trial." *Research quarterly for exercise and sport*, 78(5): 510-519.

<sup>10</sup> Rauner, R.R. 2013. "Evidence that Aerobic Fitness Is More Salient than Weight Status in Predicting Standardized Math and Reading Outcomes in Fourth- through Eighth-Grade Students." *The Journal of Pediatrics*, 163(2): 344-348.

<sup>11</sup> Donnelly, J.E. 2009. "Physical Activity Across the Curriculum (PAAC): A randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children." *Preventive Medicine*, 49(4): 336-341.

<sup>12</sup> U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. 2013. *Results from the School Health Policies and Practices Study 2012*. Washington, DC: Author. Retrieved 3.15.14 from [http://www.cdc.gov/healthyyouth/shpps/2012/pdf/shpps-results\\_2012.pdf#page=39](http://www.cdc.gov/healthyyouth/shpps/2012/pdf/shpps-results_2012.pdf#page=39).

<sup>13</sup> Kumar, A. 2011. "Virginia Gov. Robert McDonnell vetoes PE Bill." *Washington Post*, March 24. Retrieved 3.15.14 from [http://www.washingtonpost.com/local/politics/virginia-gov-mcdonnell-vetoes-pe-bill/2011/03/24/ABzY8USB\\_story.html](http://www.washingtonpost.com/local/politics/virginia-gov-mcdonnell-vetoes-pe-bill/2011/03/24/ABzY8USB_story.html).

<sup>14</sup> Home, T. 2009. *Physical Education Pilot Program: Report Summary*. Phoenix, AZ: Arizona Department of Education.