

# Physical Activity Enhances Learning

## Moving and thinking are connected

The largest area of the brain is the cerebrum, which is the thinking part of the brain, but it also has an area that controls the voluntary muscles.<sup>1</sup>

The cerebellum is an area of the brain commonly linked to movement because it controls balance, movement and coordination, and plays a role in thinking.<sup>1</sup>

## Physical activity is necessary for efficient brain functioning<sup>2</sup>

When a person is active, the number of breaths taken each minute increases and breathing becomes deeper. Blood, now rich with oxygen, moves through the system more quickly. This increase in oxygen to the brain improves focus and concentration.

When one is sitting for a long period of time:

- Blood pools in the hip area
- Breathing becomes shallow and slow
- Less oxygen enters the blood stream, thus less blood reaches the brain

Brain function is less efficient after long periods of sitting, and as a result, one's learning and performance can suffer. In addition, under these conditions it is increasingly difficult to collect and remember additional information. The hippocampus, which receives and temporarily stores all explicit information, shuts down when it receives too much information.<sup>3</sup>

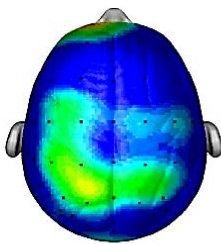
## To optimize learning, combine a 20-minute learning segment with 2-5 minutes of movement.<sup>4</sup>

### Physical activity maximizes brain functioning:

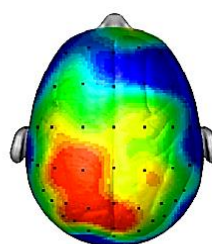
- Exercise prepares the brain to receive and retain additional information.<sup>2</sup>
- Movement stimulates growth and greater connections between nerve cells.<sup>5</sup>
- In a recent study, 10 elementary school students walked for 20 minutes while another 10 sat quietly. Then, all 20 students took the same test. Conclusions indicate a single bout of moderately intense aerobic exercise (e.g. walking) improves the cognitive control of attention as a contributing factor for increasing **attention** and **academic performance**. These data suggest that single bouts of exercise may be necessary for effective functioning across the lifespan (see above brain scan image).<sup>6</sup>

Average Composite of 20 Students Taking Same Test

Brain after sitting quietly



Brain after 20 minute walk



Research/scan Dr. Chuck Hillman University of Illinois, 2009

**“One of the best ways to maximize the brain is through exercise and movement,”**

**-Dr. John Ratey, renowned brain researcher<sup>7</sup>**

- 1 Rutherford K. Kids Health. The Brain is the Boss page. Available at: [http://www.kidshealth.org/kid/body/brain\\_SW.html](http://www.kidshealth.org/kid/body/brain_SW.html). Accessed June 21, 2005.
- 2 McCracken B. Creating an environment for learning. *The State Education Standard*. 2002; 3 (4): 47-51.
- 3 Vasquez J. Remember this: Tips to help improve your memory. Today's Hint. 2005 (April 25). Available at: <http://www.todayshint.com/health/>. Accessed on June 21, 2005
- 4 Sousa, David A. *How the Brain Learns*. Thousand Oaks, CA: Corwin Press, 2001.
- 5 Hannaford C. *Smart Moves: Why Learning Is Not All In Your Head*. Arlington, VA: Great Ocean Publishers; 1995.
- 6 Hillman, C., Pontifex, M., Raine, L., Castelli, D., Hall, E., Kramer, A., (2009). University of Illinois The effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. *Neuroscience*. 159, 3: 1044-1054.
- 7 Kong D. Exercise seen boosting children's brain function. *The Boston Globe*. 1999 (November 9): A1
- 8 Shepard, Rl. Curricular physical activity and academic performance. *Pediatric Exercise Science*. 1997; 9:113-126.
- 9 Kahn EB et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am Prev Med*. 2002; 22(4S):73-107.
- 10 Donnelly JE, Jacobsen DJ, Watley JE, et al. Nutrition and physical activity program to attenuate obesity and promote physical and metabolic fitness in elementary school children. *Obesity Research*. 1996; 4: 229-43.
- 11 Edmunson E, et al. The effects of the Child and Adolescent Trial for Cardiovascular Health upon psychosocial determinants of diet and physical activity behavior. *Prev Med* 1996; 25:442-454.
- 12 McKenzie TL, Nader PR, Strikmiller PK, et al. School physical education: Effect of the Child and Adolescent Trail for Cardiovascular Health. *Prev Med* 1996; 25:423-31.
- 13 Sallis JF, McKenzie TI, Alcaraz JE, et al. The effects of a 2-year physical, education program (SPARK) on physical activity and fitness in elementary school students. *Sports, Play and Active Recreation for Kids*. *Am J Pub Health*. 1997; 87: 1328-1334.
- 14 Wendt M. Cited in McCracken B. Creating an environment for learning. *The State Education Standard*. 2002; 3(4): 47-51.
- 15 Barros Romina M., Silver Ellen J., Stein Ruth E. K. (2009). School Recess and Group Classroom Behavior. *Pediatrics*. 123:431-436.
- 16 Centers for Disease Control and Prevention. (2010). *Association between school-based physical activity, including physical education, and academic performance*. Atlanta, GA: U.S. Department of Health and Human Services; 2010.

# School-Based Physical Activity Provides Health and Learning Benefits

## Health Benefits:

Studies demonstrate that physical activity in schools is associated with increased:

- Energy use or expenditure of calories<sup>8,9,10</sup>
- Flexibility<sup>11,12</sup>
- Muscular Endurance<sup>12,13</sup>
- Knowledge about exercise, nutrition, and fitness<sup>11</sup>
- Participation in physical activity outside of school<sup>9</sup>



## Classroom Behavior Benefits:

**Physical activity has been associated with better classroom behavior, which facilitates an optimal classroom environment.**<sup>14</sup>

### Physical activity improves student behavior.

- Providing recess to 8- to 9-year-old students is associated with better teacher ratings of class behavior scores.<sup>15</sup>
- Eight of eight studies found one or more positive associations between recess and indicators of student cognitive skills, attitudes, and academic behavior including attention, concentration, and/or on-task classroom behavior.<sup>16</sup>
- Exercise affects mood, vitality, alertness, and feelings of well-being.<sup>17</sup>

## Learning Benefits:

**Research studies found increasing physical activity improves classroom behavior, concentration, time on task, and academic achievement.**<sup>15,21-26</sup>

### There is a strong positive relationship between physical fitness and the academic achievement of students.<sup>19-20</sup>

- Physical fitness may enhance academic achievement of children by improving their attention and memory skills.<sup>18,19</sup>
- Students passing all health-related fitness tests tend to score higher on academic achievement tests.<sup>20</sup>

### Providing more opportunity for increased physical activity during the school day does not lead to a decrease in academic test scores and may even result an increase in test scores.<sup>21,22,26</sup>

- Increasing physical activity in school
  - ✓ Improves academic achievement<sup>21,22</sup>
  - ✓ Improves classroom behavior<sup>23</sup>
  - ✓ Increases concentration<sup>24</sup>
  - ✓ Increases time on task<sup>15,21,23,25,26</sup>



- 17 Lawrence J. Train Your Brain With Exercise: Not only is exercise smart for your heart and weight, but it can make you smarter and better at what you do. WebMD Feature. July 28, 2003. Available at: <http://my.webmd.com/content/article/67/79909.htm>. Accessed June 22
- 18 Mitchell M. Physically fit children appear to do better in classroom, researchers say. News Bureau-University of Illinois at Urbana-Champaign. October 18, 2004. Available at: <http://www.news.uiuc.edu/news/04/1018fitness.html> Accessed on June 21, 2005.
- 19 Warner J. Fit children may make better students: physical fitness linked to a academic achievement in children. WebMD Medical News. October 22, 2004. Available at: <http://my.webmd.com/content/article/95/103479.htm>. Accessed on June 25, 2005
- 20 California Department of Education. California Physical Fitness Test: A Study of the Relationship Between Physical Fitness and Academic Achievement in California using 2004 Test Results. Sacramento, CA: California Department of Education; 2005. Available at: <http://www.cde.ca.gov/ta/tg/pi/documents/2004pftresults.doc>. Accessed June 22, 2005.
- 21 Kibbe Debra L., Hackett Jacqueline, Hurley Melissa, McFarland Allen, Godburn Schubert Kathryn, Schultz, Amy, & Harris, Suzanne. (2011) *Preventive Medicine* 52:S43-S50.
- 22 Donnelly, Joseph E., & Lambourne, Kate. (2011). *Preventive Medicine* 52: S36-S42.
- 23 Jarrett OS, Maxwell DM, Dickerson C, Hoge P, Davies G, Yetley A. (1998). Impact of recess on classroom behavior: Group effects and individual differences. *Journal of Educational Research*. 92(2):121-126.
- 24 Maeda JK, Randall LM. (2003). Can academic success come from five minutes of physical activity? *Brock Education*. 13(1):14-22.
- 25 Mahar, Matthew T., Murphy Shelia K., Rowe David A., Golden, Jeannie, Shields, Tamlyn & Raedeke, Thomas D. (2006). Effects of a Classroom-Based Program on Physical Activity and On-Task Behavior. *Medicine & Science in Sports & Exercise*. 38(12), 2086-2094
- 26 Whitt-Glover MC, Ham SA, & Yancey, AK. (2011). *Progress in Community Health Partnerships: Research, Education, and Action*. 5(3) 289-297.
- 27 Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, Stone EJ, MW Rajab, Corso P. The effectiveness of interventions to increase physical activity: A systematic review. In: U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services, 3rd Edition: Recommendations and Systematic Evidence Reviews, Guide to Community Preventive Services*. Washington, DC: National Library of Medicine; 2000.