

The Top 18 Milestones in Brain Research Regarding Active Learning

<h3><i>Activity and Neurogenesis</i></h3> <p>Study suggests running and other aerobic activity promotes brain cell generation.</p> <p><i>Dr. H. Van Praag, Dr. F. Gage. The Salk Institute (1999)</i></p>	<h3><i>Long Term Potentiation (LTP)</i></h3> <p>Long term potentiation (LTP) is the way cells communicate with each other.</p> <p>The discovery that running mice in the SALK study are capable of sustaining stronger LTP than sedentary mice may be one of the reasons they learn more readily.</p> <p><i>F. Gage (2000)</i></p>
<h3><i>Cerebellum...Our Brain's Sleeping Giant</i></h3> <p>The cerebellum takes up just 1/10th of the brain by volume, but contains over half of all its neurons.</p> <p>It has some 40 million nerve fibers, 40 times more than even the highly complex optical tract.</p> <p>Those fibers not only feed information from the cortex to the cerebellum, but they feed them back to the cortex.</p> <p><i>H. Leiner, A. Leiner, STANFORD (1980), Ratey HARVARD (2001)</i></p>	<h3><i>Increases of Cognition with BDNF</i></h3> <p>Aerobic activity promotes brain cell generation.</p> <p>Brain-derived neurotrophic factor (BDNF) promotes neuronal survival and growth, in addition to protecting neurons against deterioration.</p> <p>An important role in the hippocampus. UCLA study showed that rats performed regular voluntary exercise consistently learned faster and scored higher on tests with increased BDNF levels in the hippocampus.</p> <p><i>P. Kesslak (1997), Gomez-Pinilla UCLA (2001)</i></p>
<h3><i>Oxygen to the Brain Brain uses 1/5 of body's oxygen.</i></h3> <p>A lack of oxygen to the brain results in disorientation, confusion, fatigue, sluggishness, concentration, and memory problems.</p> <p><i>L. Bernardi, E. Jensen (2000)</i></p>	<h3><i>Glucocorticoids and Learning</i></h3> <p>The researchers found that obesity stimulate the over-production of a complex set of stress hormones called glucocorticoids.</p> <p>Overexposure to glucocorticoids damages and destroys neurons in the hippocampus.</p> <p><i>J. Raber (1998)</i></p>

<h2><i>Impact of Obesity on Learning</i></h2> <p>The damaging effect of glucocorticoids on the hippocampus may be the reason why below-average cognitive results were noted in studies of persons with obesity and heart disease.</p> <p><i>L. Kilander (1997), K. Nolan, J. Blass (1992)</i></p>	<h2><i>Aerobic Activity and Cognition</i></h2> <p>Hogervorst study indicated that athletes who had trained for endurance outperformed on complex word tests.</p> <p>Japan study suggest that regular exercise can improve cognitive function and increase levels of BDNF. 2nd half of study, bad diet contributed to a cognitive decline ... exercise could compensate for the negative decline.</p> <p><i>E. Hogervorst (1996), Kubota (2001)</i></p>
<h2><i>Standardized Testing and Fitness</i></h2> <p>Reading and mathematic scores were matched with fitness scores (close to 1 million 5th, 7th, and 9th graders).</p> <p><u>Key findings:</u></p> <ul style="list-style-type: none"> Higher achievement with higher levels of fitness. Students who met minimum fitness levels in 3 or more fitness areas showed the greatest gains in academic achievement in all grades. Females showed the highest gains. Mathematics showed the biggest increases. <p><i>California Department of Education CDE (2001)</i></p>	<h2><i>Violence and a Lack of Movement</i></h2> <p><i>Deprivation from touch/movement may not develop the movement-pleasure link in the brain.</i></p> <p><i>Fewer connections</i> are made between the cerebellum and the brain's pleasure centers.</p> <p><i>R. Kotulak (1996)</i></p>
<h2><i>Vestibular System and Reading</i></h2> <p>Efficient eye teaming enables the student to focus, track and concentrate when reading.</p> <p>As the eye muscles strengthen and move more in concert with each other, more connections to the brain are developed and available.</p> <p><i>M. Albalos, G. Dennison (1995)</i></p>	<h2><i>Strengthening Immature Brain Regions</i></h2> <p>Less spinning activities ... more learning disabilities.</p> <p>The studies suggest that certain spinning activities led to alertness, attention and relaxation in the classroom.</p> <p>Strengthens immature brain regions controlling motor and spatial functions.</p>

	C. Clarke, Ohio State (1980), F. Secadas (1984)
White and Grey Matter Density <p>Aerobic exercise helps preserve white and gray matter density in the brain's frontal, temporal and parietal cortices, areas vital to higher-order thinking.</p> <p>Colcombe (2003); Thompson (2003)</p>	Exercise Increases Neuronal Growth <p>Voluntary exercise showed a strong positive correlation between running distance and new cell number, as well as improved learning.</p> <p>R.E. Rhodes (2003)</p>
Social Environments and Play <p>These findings demonstrated that social environments and play can increase LTP in groups and significantly reduce when isolated.</p> <p>Lu L, Bao G, Chen H. (2003)</p>	Traumatic Brain Injury and Voluntary Exercise <p>This study focused on voluntary exercise and the upregulation of BDNF (good stuff for neurons to grow).</p> <p>Griesbach, Hovda, (2004)</p>
High-Fat Diet and Harmful Effects on BDNF <p>Exercise reverses the harmful effects of consumption of a high-fat diet on BDNF, a predictor of learning efficacy.</p> <p>Molteni, Wu, Vaynman, Ying (2004)</p>	Exercise and New Natural Stem Cells <p>The survival of new neurons is improved depending on the environmental conditions and physical exercise.</p> <p>Griesbach, Hovda, (2004)</p>