

Key Neuroscience Concepts Relevant for Brain Exercises

PHYSICAL HEALTH & LEARNING: Exercise, breathing and hydration have enormous influence on learning. (Howard Hughes Medical Institute. "Exercise Improves Learning And Memory." *Science Daily*, 10 November 1999.)

The brain is activated during physical activity. Research has shown that sitting for more than 10min reduces concentration and increases fatigue. Movement, on the other hand, increases blood vessel activity allowing for the delivery of oxygen and glucose to the brain.

ACTIVITIES : Toe touching, squats, flying eagle, clapping, push up, Stretch

PLASTICITY: Experience changes the brain's structure and chemistry. (Hölzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., & Lazar, S. W. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research: Neuroimaging*, 191(1), 36-43.; Luders, E., Toga, A. W., Lepore, N., & Gaser, C. (2009). The underlying anatomical correlates of long-term mindfulness training: larger hippocampal and frontal volumes of gray matter. *Neuroimage*, 45(3), 672-678.

NEUROGENESIS: The brain grows new cells at any age. (Gage: "Neurogenesis in the Adult Brain;" *Journal of Neuroscience*)

LEARNING & MEMORY: Memory for content can be strengthened through the right teaching strategies. (Mariale Edelman, "Brain Targeted Teaching")

Brain can produce new nerve cells (a process termed "neurogenesis") in some areas of the brain related to memory. In addition, research shows that prolonged stress negatively impacts the hippocampus, the region of the brain that regulates memory.

ACTIVITIES : Brain Screen, Speed Brain, Memory Game

ATTENTION (Focus) & LEARNING: Attention can be enhanced through the physical environment and specific training. (Eric Jensen, "Enriching the Brain: How to Maximize Every Learner's Potential")

Research has shown that improvements in brain function occur when there is increased coordination between the 2 hemispheres of the brain. Balanced activity between the two hemispheres improves coordination, focus and memory.

ACTIVITIES : Tap & Sweep, Pinky-Thumb, Harmony Clap, Infinity & Brain Circuit Drawing

EMOTIONS & LEARNING: Emotions can enhance or impair learning. (Caprara, G.V., Barbaranelli, C.P., Bandura, A., & Zimbardo, P.G. (2000). Prosocial foundations of children's academic achievement. *Psychological Science*, 11, 302-306.)

Although a certain amount of stress is healthy, too much stress can cause a decrease in blood flow and oxygen to the brain. Over time, this can actually cause certain parts of the brain to shrink.

ACTIVITIES : Relaxation & Breathing, Happy Face, Laughing Exercise, Happy Actions