

WELLCHPs
Your reward for healthy choices

The Healthy Brain & Exercise

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The Benefits of Exercise

INCREASED BLOOD FLOW

INCREASED SYNAPSES

ENHANCED NEUROGENESIS

ENHANCED COGNITION

INCREASED GROWTH FACTORS

CHANGED GENETIC PATTERNS

REDUCED GREY MATTER LOSS

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Strengthening synapses:

- o Physical activity = increased neural cell production
- o Mental activity = increased synaptic activity
- o Aerobic Exercise = continued reinforcement and strength of synaptic connections.
- o Same molecular mechanism believed to underlie long-term memory formation.
 - o Winter B et al. (2007). High Impact Running Improves Learning. *Neurobiology of Learning & Memory*. 37(4). Pages 597-609
 - o Hollmann W. (2000) Brain function, mind, mood, nutrition, and exercise *Nutrition*, Volume 16, Issue 7, Pages 516-519
 - o Ratey, J (2008). *Spark: The Revolutionary New Science of Exercise and the Brain*. [Little, Brown & Co. Publishers]

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Improved concentration and attention:

- Brain imaging studies = highly-fit older adults have faster reaction times than their less-fit counterparts.
- Exercisers better able to focus on relevant information and ignore irrelevant cues, indicating better attention.

○ Thompson, A. M., Humbert, M. L., Minwold, R. L. (2003). A longitudinal study of the impact of childhood and adolescent physical activity experiences on adult physical activity perception and behaviors. *Qualitative Health Research*, 13(3), 356-77

○ Kramer AF, Hahn S, Cohen NJ, Barich MT, McAuley E, Harrison CR, et al. (1999) Ageing, fitness and neurocognitive function. *Nature*, 400(6743): 418-419.



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Attenuated Grey Matter Loss

- Highly fit people = less decrease in cortical gray matter than is normally seen with aging, which may suggest a protective effect of exercise against nerve cell death.
- Most pronounced in areas involved in executive cognition that typically decline most with aging.

○ Colcombe, Stanley J., Erickson, Kirk I., Raz, Nafiseh, Webb, Andrew G., Cohen, Neal J., McAuley, Edward, & Kramer, Arthur F. (2003). Aerobic fitness reduces brain tissue loss in aging humans. *Journal of Gerontology: Medical Sciences*, 58A(2), 176-80.

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Changing gene patterns:

- Exercise = changes in the expression patterns of a wide array of genes, with some becoming more active and some showing less activity.
- Genes (i.e. VGF) that become more active usually ones that aid structure and adaptability of synapses, suggesting a direct role for exercise in synapse density.

○ Hunsberger JC et al. (2007) Antidepressant actions of the exercise-regulated gene VGF *Nature Medicine* 13, 1476 - 1482



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Increased Brain-derived Neurotrophic Factors (BDNF)

- o Growth factors = (neurotrophins) play vital roles in nourishing and supporting nerve cells.
- o BDNF (for brain-derived neurotrophic factor)= a protein that builds and maintains the brain's cell circuitry & increases significantly during voluntary exercise.
- o Gómez-Pinilla F, et al. Voluntary Exercise Induces a BDNF-Mediated Mechanism That Promotes Neuroplasticity J Neurophysiol (November 1, 2002), 10.1152/jn.00152.2002


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Exercise promotes neurogenesis:

- o Neurogenesis =
 - o production of new nerve cells
- o Significant increases occur in the hippocampus (the area of the brain involved in short term memory)..



- Black JE, Isaacs KR, Anderson BJ, Alcantara AA, Greenough WT. Learning causes synaptogenesis, whereas motor activity causes angiogenesis, in cerebral cortex of adult rats. Proceedings of the National Academy of Sciences USA, 1996; 87:5068-5072.

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Exercise Enhances brain blood flow:

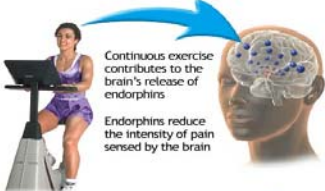
- o Exercise = increased density & size of brain capillaries for increased O2
- o Supports survival of new neurons & facilitates faster "firing" by neurons.
- o Increases neurotransmitters i.e. serotonin
- o Mood elevation
- o Herholz K, Buskies W, Rist M, et al. Regional cerebral blood flow in man at rest and during exercise. J Neurol 1987;234:9
- o Sittu, der HK, Holmann W, Platen P, et al. Effects of exercise intensity on free typtophan to branched-chain amino acids ratio and plasma prolactin during endurance exercise. Can J Appl Physiol 1997;22:280

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Exercise Benefit: Pain Management?



Continuous exercise contributes to the brain's release of endorphins

Endorphins reduce the intensity of pain sensed by the brain

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ADAM

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Just Remember!: Mental Activity

- o Stimulating mental activity = reading a book, listening to a lecture, playing a board game, anything that promotes mental stimulation.
- o New complex ideas

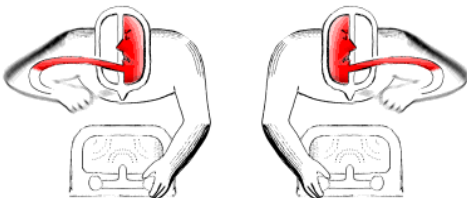
FOCUS

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Change your physical routine to keep challenging your brain!




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Just Remember!: Physical Activity

- o Being physically active is just as important as mental activity
- o Changes chemicals in the brain that repair and protect it
- o 4-5 x week 30 -45 minutes a day good for heart and mind

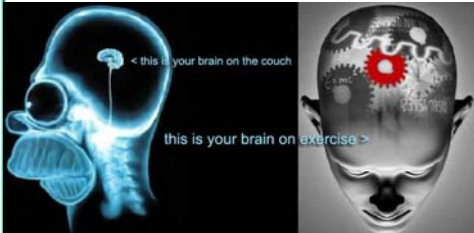


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WHICH ONE IS YOUR BRAIN?



< this is your brain on the couch


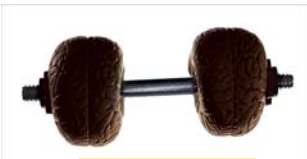
this is your brain on exercise >

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QUESTION & ANSWERS



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