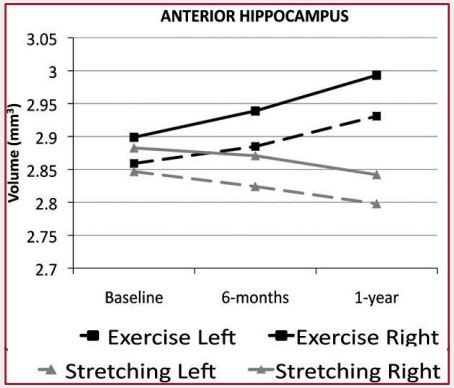
Healthy Bodies Make Healthy Brains

A Review of the Neuroprotective Qualities of Regular Aerobic Exercise

Justin Patty, University of Arkansas for Medical Sciences College of Medicine

Aerobic Exercise Improves Cognitive Function



Aerobic exercise causes brain volumes to increase, particularly in regions associated with memory.[1] Exercise also increases levels of molecules responsible for neuron growth, development, and survival.[2]

Sedentary behavior has been linked to reduced cognitive function throughout the lifespan, but previously sedentary adults can see improvement in function and brain volumes after just 6 weeks of aerobic exercise. However, returning to a sedentary lifestyle for only 6 weeks is enough to reverse these changes.[3],[4]

In the elderly, a 12 week moderate-intensity walking program resulted in increased thickness of the brain's cortex; this was seen in both individuals with mild cognitive impairment and their healthy counterparts.[5]

Aerobic Exercise Reduces Dementia Risk

Cardiovascular fitness in midlife is inversely correlated to one's risk of developing dementia later in life. Those with high fitness have a significantly reduced incidence of all-cause dementia, and, in those who did develop dementia, a mean age of onset ten years later than in medium and low fitness groups.[6] By contrast, a sedentary lifestyle has been shown to increase one's odds of developing dementia by 30%.[7]

Average time per day spent sedentary is related to one's risk for all-cause dementia, and this result holds regardless of daily physical activity. Over 10 hours per day of sedentary time, one's dementia risk increases exponentially with each additional hour.[8]

Preventing Cognitive Decline and Dementia

All exercise confers some cognitive benefit, but certain types of exercise are superior. Research suggests open skill exercise provides the greatest cognitive benefit due to the dynamic, unpredictable environment and increased cognitive demand and decision-making involved.[9]

The WHO recommends adults participate in 150 minutes of moderate-intensity or 75 minutes of high-intensity exercise per week to reduce all-cause mortality and risk of developing or dying from dementia.[10] For inactive individuals, just 30 minutes of high-intensity activity per week can yield significant benefits.[11] Consistency over the lifespan is essential, so it is important to find activities that are enjoyable and accessible.

Healthy Bodies Make Healthy Brains

A Review of the Neuroprotective Qualities of Regular Aerobic Exercise

Justin Patty, University of Arkansas for Medical Sciences College of Medicine

Citations

1. Erickson KI, Voss MW, Prakash RS, Basak C, Szabo A, Chaddock L, Kim JS, Heo S, Alves H, White SM, Wojcicki TR, Mailey E, Vieira VJ, Martin SA, Pence BD, Woods JA, McAuley E, Kramer AF. Exercise training increases size of hippocampus and improves memory. *Proc Natl Acad Sci USA*. 2011 Feb 15;108(7):3017-22. doi: 10.1073/pnas.1015950108. Epub 2011 Jan 31. PMID: 21282661; PMCID: PMC3041121.
2. Tari A, Walker T, Huuha A et al. Neuroprotective mechanisms of exercise and the importance of fitness for healthy brain ageing. *The Lancet*, 2025;405, 1093-1118
3. Falck RS, Davis JC, Liu-Ambrose T. What is the association between sedentary behaviour and cognitive function? A systematic review. *British Journal of Sports Medicine* 2017;51:800-811.
4. Thomas AG, Dennis A, Rawlings NB, Stagg CJ, Matthews L, Morris M, Kolind SH, Foxley S, Jenkinson M, Nichols TE, Dawes H, Bandettini PA, Johansen-Berg H. Multi-modal characterization of rapid anterior hippocampal volume increase associated with aerobic exercise. *Neuroimage*. 2016 May 1;131:162-70. doi: 10.1016/j.neuroimage.2015.10.090. Epub 2015 Dec 2. PMID: 26654786; PMCID: PMC4848119.
5. Reiter K, Nielson KA, Smith TJ, Weiss LR, Alfini AJ, Smith JC. Improved Cardiorespiratory Fitness Is Associated with Increased Cortical Thickness in Mild Cognitive Impairment. *J Int Neuropsychol Soc*. 2015 Nov;21(10):757-67. doi: 10.1017/S135561771500079X. PMID: 26581788; PMCID: PMC4822501.
6. Hörder H, Johansson L, Guo X, Grimby G, Kern S, Östling S, Skoog I. Midlife cardiovascular fitness and dementia: A 44-year longitudinal population study in women. *Neurology*. 2018 Apr 10;90(15):e1298-e1305. doi: 10.1212/WNL.0000000000005290. Epub 2018 Mar 14. PMID: 29540588; PMCID: PMC5894933.
7. Yan S, Fu W, Wang C, Mao J, Liu B, Zou L, Lv C. Association between sedentary behavior and the risk of dementia: a systematic review and meta-analysis. *Transl Psychiatry*. 2020 Apr 21;10(1):112. doi: 10.1038/s41398-020-0799-5. Erratum in: Transl Psychiatry. 2020 Jul 6;10(1):216. doi: 10.1038/s41398-020-00891-6. PMID: 32317627; PMCID: PMC7174309.
8. Raichlen DA, Aslan DH, Sayre MK, et al. Sedentary Behavior and Incident Dementia Among Older Adults. *JAMA*. 2023;330(10):934–940. doi:10.1001/jama.2023.15231
9. Yamasaki T. Preventive Strategies for Cognitive Decline and Dementia: Benefits of Aerobic Physical Activity, Especially Open-Skill Exercise. *Brain Sci*. 2023 Mar 21;13(3):521. doi: 10.3390/brainsci13030521. PMID: 36979331; PMCID: PMC10046723.
10. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, Carty C, Chaput JP, Chastin S, Chou R, Dempsey PC, DiPietro L, Ekelund U, Firth J, Friedenreich CM, Garcia L, Gichu M, Jago R, Katzmarzyk PT, Lambert E, Leitzmann M, Milton K, Ortega FB, Ranasinghe C, Stamatakis E, Tiedemann A, Troiano RP, van der Ploeg HP, Wari V, Willumsen JF. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med*. 2020 Dec;54(24):1451-1462. doi: 10.1136/bjsports-2020-102955. PMID: 33239350; PMCID: PMC7719906.
11. Stamatakis E, Ahmadi MN, Gill JMR, Thøgersen-Ntoumani C, Gibala MJ, Doherty A, Hamer M. Association of wearable device-measured vigorous intermittent lifestyle physical activity with mortality. *Nat Med*. 2022 Dec;28(12):2521-2529. doi: 10.1038/s41591-022-02100-x. Epub 2022 Dec 8. PMID: 36482104; PMCID: PMC9800274.