Endurance training enhances BDNF release from the human brain

Seifert T, Brassard P, Wissenberg M, Rasmussen P, Nordby P, Stalknecht B, Adser H, Jakobsen AH, Pilegaard H, Nielsen HB, Secher NH. Endurance training enhances BDNF release from the human brain. Am J Physiol Regul Integr Comp Physiol 298: R372-R377, 2010. First published November 18, 2009; doi:10.1152/ajpregu.00525.2009.-The circulating level of brain-derived neurotrophic factor (BDNF) is reduced in patients with major depression and type-2 diabetes. Because acute exercise increases BDNF production in the hippocampus and cerebral cortex, we hypothesized that endurance training would enhance the release of BDNF from the human brain as detected from arterial and internal jugular venous blood samples. In a randomized controlled study, 12 healthy sedentary males carried out 3 mo of endurance training (n = 7) or served as controls (n = 5). Before and after the intervention, blood samples were obtained at rest and during exercise. At baseline, the training group (58 +/- 106 ng.100 g(-1).min(-1), means +/- SD) and the control group (12 +/- 17 ng.100 g(-1).min(-1)) had a similar release of BDNF from the brain at rest. Three months of endurance training enhanced the resting release of BDNF to 206 +/- 108 ng.100 g(-1).min(-1) (P <0.05), with no significant change in the control subjects, but there was no training-induced increase in the release of BDNF during exercise. Additionally, eight mice completed a 5-wk treadmill running training protocol that increased the BDNF mRNA expression in the hippocampus (4.5 +/- 1.6 vs. 1.4 +/- 1.1 mRNA/ssDNA; P <0.05), but not in the cerebral cortex (4.0 +/- 1.4 vs. 4.6 +/- 1.4 mRNA/ssDNA) compared with untrained mice. The increased BDNF expression in the hippocampus and the enhanced release of BDNF from the human brain following training suggest that endurance training promotes brain health.
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