

The exercise-induced expression of BDNF within the hippocampus varies across life-span

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Abstract

Voluntary exercise increases hippocampal brain-derived neurotrophic factor (BDNF) expression in young animals. In this investigation we examined the induction of BDNF protein in the hippocampus of young (2 months), late middle-aged (15 months) and old (24 months) animals over 4 weeks of exercise. Average running distances decreased with age, with the old animals also maintaining a constant level of activity over time, whereas the other groups tended to increase their average running distance. All animals demonstrated a biphasic profile of BDNF protein induction, with a significant ($P < 0.05$) increase after 1 week of exercise followed by a decrease to near sedentary levels at 2 weeks. After this, BDNF protein levels increased significantly ($P < 0.05$), as compared to baseline, primarily only in the young animals. In whole hippocampal homogenates, only particular BDNF mRNA exons were significantly ($P < 0.05$) changed as a result of exercise, with the largest induction occurring in young animals. BDNF protein induction may, therefore, not be directly correlated with significant mRNA changes. Exercise may represent a therapeutic tool for disorders which involve a decrease in BDNF.

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