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Influences of the adolescent exposure to an enriched environment on cognitive function and hippocampal and prefrontal cortex BDNF level in adult male and female rats

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Background and Aim : A growing body of evidence demonstrated that an enriched environment (EE) exposure improves cognitive functions, synaptic plasticity, neurogenesis, and induction of brain-derived neurotrophic factor (BDNF) in multiple brain regions of laboratory animal models. Also, studies on the sex-dependent effects of exposure to EE during adolescence on adult cognitive functions are less. This is important since the beneficial effects of EE may be predominant in the adolescence stage. Therefore, the present study was designed to compare the effects of EE during adolescence (PND21-PND60) on novel object recognition memory and hippocampal and prefrontal cortex BDNF mRNA level in the adult male and female rats.

Methods : Assessment of novel object recognition memory has been done by novel objective recognition tasks. The expression of BDNF mRNA level was also evaluated by quantitative RT-PCR.

Results : Our findings demonstrated that housing in the EE during adolescence improves novel object recognition memory in adult male rats. Additionally, our results indicated an augmented BDNF level in the hippocampus of adult male and female rats following adolescent EE exposure, meanwhile BDNF mRNA expression up-regulates only in the prefrontal cortex of female animals.

Conclusion : BDNF is an important factor that can mediate the beneficial effects of EE and running exercise on cognitive functions. Further research concerning the precise mechanisms underlying the sex hormone-dependent production of BDNF is critical.

Keywords : Enriched environment, Sex differences, Brain-derived neurotrophic factor (BDNF), Recognition memory, Hippocampus, Prefrontal cortex