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The Effect of Environmental Enrichment on Anxiety and Stress Hormone in Maternally Separated Male Rats

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Abstract : The early postnatal period is critical for the development of cognitive and emotional functions. Maternal separation is a detrimental postnatal influence, whereas environmental enrichment is a therapeutic and protective agent. It is unclear if long-term environmental enrichment can compensate for the effects of maternal separation stress on anxiety behavior. This study was designed to examine how environmental enrichment affects anxiety levels and corticosterone levels in maternally separated rats. There are six main groups in this study: control (C), maternal separation+standard cage (MS), maternal separation+enriched environment (MSE), enriched environment (E), the maternal separation that decapitated at postnatal (PN) 21 (MS21), and standard cage that decapitated at PN21 (STD21). The maternal separation procedure consisted of PN for 21 days (between 09:00 a.m and 12:00 a.m). Enriched (E, MSE) or standard cage environment rats (MS, C) spent PN (22-55) days in either enriched cages or standard cages. Anxiety and locomotor activity were examined with the open field and elevated plus-maze test. Blood corticosterone level was evaluated by the enzyme-linked immunosorbent assay (ELISA) method. Results showed that maternal separation (MS) increased locomotor activity and anxiety. An enriched environment (E) did not change the locomotor activity. MSE group's anxiety and locomotor activity did not change. Corticosterone levels increased in the maternal separation group that decapitated at the PN 21 days. Maternal separation increases anxiety. Environmental enrichment alone was insufficient to cause alterations in the anxiety level. In addition, environmental enrichment did not ameliorate the anxiety level in maternally separated rats. However, environmental enrichment decreased the locomotor activity in the maternally separated rats.

Keywords : maternal separation, environment enrichment, stress, hippocampus, anxiety, memory, rat
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