

MANIPULATIONS OF GLUCOCORTICOID INDUCED STRESS RESPONSE MAY DIFFERENTLY AFFECT THE ACQUISITION OF A REWARD-FACILITATED SPATIAL/VISUAL LEARNING TASK

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Activation of glucocorticoids is related to emotional and stressful experiences which in turn regulate learning and memory storage (1). This study wanted to investigate the effects of a single intense prenatal stress, and of the administration of metyrapone (Met), on learning performance, in adult male and female progeny, in order to elucidate whether manipulations of corticosterone levels can determine the strength of spatial information acquisition. Prenatal stress procedure consisted in a single 2-hour immobilization at day 16 of gestation. Cognitive abilities were assessed using the Can Test (2), a reward-facilitated spatial/visual learning task, consisting in a 2-day habituation period followed by a 4-day training (BT) in which water-deprived rats learned to drink from a rewarded can (correct responses). Metyrapone (at 50 mg/kg i.p.) was administered 2 hours before the first day of the BT, in order to suppress stress-induced corticosterone secretion. Furthermore behavioural reactivity was also measured in the open field (OF). Our results show that in male rats, prenatal stress induced an increase in the number of correct responses in the Can test along the BT ($p < 0.05$). Met produced a significant decrease in learning performance in the first day of the experimental sessions ($p < 0.01$). This effect disappeared 24 hours later. Met was not active in prenatally stressed (PS) groups, along the experimental days, compared to respective controls. In female rats, on the first day of the BT, no differences appeared among the experimental groups, while during the following days, an increase in the number of correct responses was observed in PS-, Met- and PS+Met- treated rats ($p < 0.05$). Results from OF show that in male rats, PS rats explore more the central areas of the arena ($p < 0.05$), while Met decreased this parameter significantly in control rats of both sexes ($p < 0.01$). In summary, our data show that prenatal stress has a facilitatory effect on learning performance in male rats, while it does not exert a similar effect in female rats, probably due to a lower sensitivity to the gestational stressful paradigm, in the female progeny. The capability of Met to decrease learning performance and exploration of the central areas of the OF in control male rats, suggest that corticosterone levels are instrumental in the acquisition and retention of spatial memory task, and also crucial in determining driving for exploration and processing information about the environment.

1) Akirav I. et al (2004) Learning and Memory, 11, 188-195

2) Popovich M. et al. (2001) Beh. Br. Res., 122, 201-207