

Emotional and cognitive performance in response to mineralo-(MR) and glucocorticoid receptor (GR) activation in male C57BL/6J mice

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The effects of corticosteroids on emotion and cognition are mediated by two receptors. While MR is predominantly localized in hippocampus and prefrontal cortex, GR is found throughout the brain. We hypothesized that MR and GR contribute differentially, but in a coordinated way to information processing presented by emotional and learning/memory elements of the task. Continuous pharmacological activation of MR and GR was realized by implanting pellets with corticosterone (CORT) in adrenalectomized (ADX) mice. Sham-operated mice (sham) with intact endogenous CORT; ADX with continuous low CORT (MR only), low CORT 20% (ALC; normal MR/GR), high CORT 80 % (AHC; intense MR/GR). Mice were operated 3 days prior to 8 days of testing (3 trials/day) on the modified hole board (MHB). 3 almond-baited cylinders were marked with white rings, 7 cylinders with non-obtainable almonds marked with black rings, always at the same location. After 6 days of testing, baits remained but the rings were removed to test for spatial learning. Behaviors related to anxiety, exploration and arousal were scored together with cognitive parameters. ADX mice exhibited low anxiety and highly directed exploration during days 1-3 but low general exploration throughout the training. In contrast, AHC mice showed high anxiety, low directed exploration and a highly aroused state during days 1-3. Overall, ALC mice were least aroused. Learning curves indicated that sham and AHC mice learned slowly compared to ADX and ALC mice. ADX mice showed impaired working memory. Removal of the rings (discrimination) did not affect performance. At the end of training, ADX, ALC and AHC mice performed equally well.

In summary, manipulating MR/GR activation, affects both emotion and cognition.

Continuous predominant MR (and low GR) activation (ADX, ALC groups) directs emotional components to the benefit of cognition, while strong GR activation is associated with impaired learning.

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