Effects of Intracerebroventricular Injection of Ghrelin and Aerobic Exercise on Passive Avoidance Memory and Anxiety in Adult Male Wistar Rats

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Abstract : Ghrelin plays a considerable role in important neurological effects related to food intake and energy homeostasis. As was found, regular physical activity may make available significant improvements to cognitive functions in various behavioral situations. Anxiety is one of the main concerns of the modern world, affecting millions of individuals' health. There are contradictory results regarding ghrelin's effects on anxiety-like behavior, and the plasma level of this peptide is increased during physical activity. Here we aimed to evaluate the coincident effects of exogenous ghrelin and aerobic exercise on anxiety-like behavior and passive avoidance memory in Wistar rats. Forty-five male Wistar rats (250 ± 20 g) were divided into 9 groups (n=5) and received intra-hippocampal injections of 3.0 nmol ghrelin and performed aerobic exercise training for 8 weeks. Control groups received the same volume of saline and diazepam as negative and positive control groups, respectively. Learning and memory were estimated using a shuttle box apparatus, and anxiety-like behavior was recorded by an elevated plus-maze test (EPM). Data were analyzed by ANOVA test, and $p<0.05$ was considered significant. Our findings showed that the combined effect of ghrelin and aerobic exercise improves the acquisition, consolidation, and retrieval of passive avoidance memory in Wistar rats. Furthermore, it is supposed that the ghrelin receiving group spent less time in open arms and fewer open arms entries compared with the control group ($p<0.05$). However, exercising Wistar rats spent more time in the open arm zone in comparison with the control group ($p<0.05$). The exercise + Ghrelin administration established reduced anxiety ($p<0.05$). The results of this study demonstrate that aerobic exercise contributes to an increase in the endogenous production of ghrelin, and physical activity alleviates anxiety-related behaviors induced by intra-hippocampal injection of ghrelin. In general, exercise and ghrelin can reduce anxiety and improve memory.

Keywords : anxiety, ghrelin, aerobic exercise, learning, passive avoidance memory
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