METABOLIC AND HORMONAL RESPONSES TO STARVATION-INDUCED HYPERACTIVITY IN RATS

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Many athletes whose sports involve aesthetics, weight categories and endurance activities have to maintain a low body weight for performance, and tend to use pathogenic methods for weight maintenance, putting them at greater risks of eating disorders than the general population. Hyperactivity is believed to be a major symptom in anorexia. Although not representative of the complexity of human anorexia nervosa, an experimental animal model referred to as a semi-starvation-induced hyperactivity model by some authors is associated with the two behaviors seen in this pathology. To better understand eating disorders in athletes, we used in this study this model. Thus, the main objective of this investigation was to study the effects of food restriction and wheel running on muscle mass, adipose tissue, and substrate and hormonal responses involved in energy metabolism in rats. 56 wistars were randomly assigned to either an ad lib sedentary group (S), a control wheel activity group (WAL), a food restriction-induced hyperactivity group (1h30/day ad lib food, 22h30/day ad lib wheel access) (WR), and a food-restricted sedentary group (SR). After 8 days of food-restriction or when an animal had lost 25% of its free feeding weight, it was sacrificed by anaesthetic (pentobarbital) and aortic puncture. Despite a significant increase in running activity, no concomitant reduction in food intake was seen in the starved hyperactive rats. Exercise alone also decreased brown and white adipose tissue weights. No significant differences were found between the groups with respect to the heart, liver, adrenal and thymus mass. Wheel activity also significantly decreased the FFA concentrations, however glucose and urea remained unchanged. Leptin concentrations were found to be significantly higher in sedentary animals. No significant differences were found for corticosterone concentrations. The WR and SR groups exhibited a decreased thymus, white and brown adipose tissue weights and an increased adrenal weight. Food restriction also significantly decreased insulin, and leptin values, and increased ghrelin values. No change in corticosterone concentrations was noted. when thymus weight of food-restricted sedentary rats and food-restricted running rats were compared on the day of sacrifice, a synergistic effect of food restriction and running activity on thymus weight was observed. Total wheel activity was correlated with relative thymus weight and final adipose weight in WR.

In conclusion, our data support the hypothesis of a link between higher HPA axis activation and higher running associated with food restriction. Moreover, our study is in agreement with the hypothesis that fat mass plays a role in the stimulation of running. Further investigations seem necessary to better understand the parameters involving in the hyperactivity seen in ABA and to identify the interactions between leptin, HPA axis and increased running activity during food restriction.