



Effects of housing space on aerobic performance in chronically exercised rats

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There are some evidences suggesting that physical performance may be hampered in trained rodents because of captivity-induced problems (limited cage space). Here, our objective was to evaluate the effects of housing space on aerobic performance in chronically exercised rats. We used healthy adult male rats (*Rattus norvegicus Albinus, Wistar*), which were kept in a room with a controlled environment, including the temperature (23 ± 1 °C), relative humidity (45-55%), noise (< 80 decibels) and a photoperiod with a 12:00 h light/dark cycle. The rats were divided into two types of housing space: standard housing (SH) and wide housing (WH). Within each housing condition, the rats were subdivided into two groups: the control group (Co) and the aerobic training group (Tr). In the SH condition (five rats *per* cage), the solo area and the total volume were 1666 cm^2 and 26656 cm^3 , respectively. In the WH (twenty rats *per* cage), the solo area was of 30000 cm^2 and the total volume was 1000000 cm^3 . Thus, the area of WH was 18.0-fold higher than that of SH and the volume was 37.5-fold higher than that of SH. The Tr rats swam for 40min/day (5 days/week), with an overload equivalent to 80% of the lactate minimum intensity, determined by the lactate minimum test (LMT). After 12 weeks of experimentation, animals from each group were submitted to the LMT for the determination of lactate minimum intensity, which is regarded as an index of aerobic performance. Additionally, sixty days old rats (baseline group) were evaluated by LMT before the experimental period to characterize the baseline values for the study. Comparisons among all groups ($n=4-10$) were performed using ANOVA analyses. Newman-Keuls post hoc test was used to locate group's difference. Statistical significance was set at $p<0.05$. The lactate minimum intensity relative to the animal's body mass (bm) was correspondent to 5.11 ± 0.42 , 4.24 ± 0.46 , 4.49 ± 0.22 , 4.39 ± 0.55 and $4.86 \pm 0.28\%$ bm to the baseline, Co-SH, Tr -SH, Co-WH and Tr-WH groups, respectively. We found that lactate minimum intensity decreased from baseline to 12 weeks in Tr-SH group, but not in the Tr-WH group. Also, Tr-WH group showed significantly higher lactate minimum intensity than Co-SH group. These results suggest that exercise training-mediated adaptations can be inhibited in rats housed in typical cages. We suppose that when we put animals in a small cage, in true, we submitted the animals to a compulsory sedentary status, resulting in deterioration of components of physical performance such as aerobic performance. Thus, the "wide housing" allows to the animals expand their physical performance by exploring their natural movements. It is possible to conclude that housing space affects the aerobic performance in rats, especially of those submitted to chronic exercise interventions. Our study is not only of theoretical interest but important in disseminating the impact of housing conditions in animal models.

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