

Housing conditions modulate spontaneous physical activity and aerobic running capacity in C57/BL6J mice

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Spontaneous physical activity (SPA) refers to daily living activities such as fidgeting, spontaneous muscle contractions, posture maintenance and ambulation. Thus, SPA provides an important portion of the total daily energy expenditure. There is evidence of increased SPA in rodents living in a large cage (LC) as compared to animals housed in small cages (SC). Because activities included within SPA may generate a high amount of muscle contractions, it is not surprising that an improvement of SPA may be able to enhance aerobic capacity performance. For this reason our main hypothesis was that aerobic running capacity would be elevated in mice living in LC. The relationship between SPA and components of physical fitness (i.e. aerobic fitness) need be further investigated. We examined the effects of eight weeks LC exposure on SPA and aerobic running capacity in adult C57B1/6 mice. Male mice were housed in cages ($n=10$ *per* cage) of two different sizes for 8 weeks: a small (SC, $n=10$) and large (LC $n=10$) cages with 1320 cm² and 4800 cm² floor space, respectively. SPA was measured gravimetrically in a daily routine. The aerobic capacity was evaluated by the critical velocity protocol which is based on mathematical analysis from the relationship between exercise intensity (four exhaustive efforts) and time to achieve the exhaustion. In each test, mice ran on a treadmill at constant speed. Exercise intensities ranging 10 to 30 m.min⁻¹ were individually selected so that the time to was not more than 15 minutes and not less than 1 minute. Distance traveled (D) and time to exhaustion (TE) data obtained from the four tests were plotted in a regression. The CV was calculated from the slope (angular coefficient) of a linear equation between D and TE. Mice had CV evaluated at the beginning and at the end of study (8th week). All data are presented in means and standard error of the mean. ANOVA results showed that LC-mice were more active than SC-mice by considering all SPA values obtained in the entire period of 8 weeks. The LC-group showed significantly higher CV (m.min⁻¹) than SC-group at eighth week (SC: 16.8 ± 0.4 vs LC: 19.1 ± 0.5 , $p<0.01$). No difference was found between groups at baseline condition (SC: 14.7 ± 0.8 vs LC: 14.0 ± 0.5 , $p>0.05$). Our findings demonstrate that eight weeks of confinement in a large cage increases SPA of mice. This may be one of the reasons why LC-mice exhibit high aerobic fitness after 8 weeks. Our finding shows that large cage can be employed as an approach for stimulating SPA in rodents. Our study implies that SC limits SPA together aerobic fitness, possibly generating experimental artifacts in long-term rodent studies. FAPESP (proc. 17/10201-4).