Pre-training caffeine exposure impairs long-term and location memory ameliorated by swimming exercise in middle-aged Wistar rats

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Introduction: The cognitive function decline is related with brain changes generated by advancing age. Physical activity is considered one of the most important and accessible factors to prevent and protect brain functions. The ability of caffeine to prevent memory impairment has been reported in animal models and humans. This study was designated to investigate whether swimming exercise and sub-chronic exposure with caffeine enhance memory deficit caused by aging in rats.

Materials and methods: Middle-aged male (18 month-old) Wistar rats were submitted to the object recognition test to assess the short (STM) and long-term memory (LTM) and object location test (OLT) after exercise training and caffeine (CAF) exposure. The animals were divided into four groups: sedentary group, sedentary + CAF group, exercise group and exercise + CAF group. Rats were treated by gavage with CAF (30 mg/kg, 30 min before training) or vehicle, 5 days per week. The period of treatment was 4 weeks. For the groups exercise and exercise + CAF, the rats were subjected to swimming training with a workload (3% of body weight, 20 min per day for 4 weeks).

Results and discussion: There was no significant difference among groups in the total time exploring both objects during training and in the time exploring the novel object during the STM test ($P=0.228$). Exposure of rats with CAF impaired recognition index ameliorated by swimming exercise in the LTM test ($F_{(1,27)}= 4.29; p<0.05$). Swimming exercise reduced the recognition index ameliorated by administration of CAF to middle-aged rats in the OLT test ($F_{(1,27)}= 14.41; p<0.0007$).

Conclusion: These results suggest that swimming exercise improved the impairment of memory in LTM and OLT. Sub-chronic CAF administration ameliorated memory impairment caused by aging in the OLT. Pre-training CAF exposure impaired long-term and location memory ameliorated by swimming exercise in middle-aged rats.

Keywords: caffeine, memory, object recognition, middle-aged, exercise.

Supported by: UFSM, CAPES.