DEVELOPMENT OF A FORCED EXERCISE PROGRAM IN RATS FOR THE STUDY OF THE EFFECTS OF PHYSICAL ACTIVITY ON THE BRAIN

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The neurobiology of exercise has been virtually absent from public health discourse, despite the evidence suggesting that physical activity promotes mental health. Difficulty in the standardization of satisfactory animal responses during forced exercise protocols is one of the main obstacles for the development of this type of studies. Only a few published reports have obtained accurate and reliable responses from rodents during forced exercise, but with low physical demands for the animal and with the addition of aversive stimuli. The aim of our present study was to develop a feasible program of forced physical training in rats that avoids aversive stimuli, using only motorized running wheels and a reliable and repeatable physical condition test, which will be used for studying the impact of physical exercise on the central nervous system during adolescence.

We used male Sprague-Dawley rats (n=41), randomly separated in two groups: experimental (runners, n=22) and control (non-runners, n=19). The experimental group was subjected to a physical exercise program spanning 18 days, of which 8 were devoted to familiarization with the running wheel apparatus, and 10 days for the forced training program (adolescent period, P35 to P44). A total number of 30 sessions was established during this period, including morning and afternoon sessions, in which both the intensity and volume of exercise followed a progressive incremental pattern. Animals received food and water ad libitum and Dark/Light cycle was inverted to develop the running program under dark conditions. We evaluated the amount of exercise activity and the associated change in body weight. In addition, we designed a separate incremental test in order to determine the relevance of the familiarization phase for the exercise activity. For that aim we used male Sprague-Dawley rats (n=32), randomly separated in two groups: experimental (familiarized, n=16) and control (non-familiarized, n=16).

100% of the animals completed the running familiarization period, in both the training program and the incremental test; whereas only 68.3% of rodents completed the forced training plan scheduled. The remaining 31.7% left about 2 days of the program uncompleted. The total distance covered during the training period was 14.1 km. The highest speed reached was 20.7 m/min during a stretch of 50 min. We found differences in daily weight between runner and control rats. Regarding the incremental test, the experimental group responded statistically better than individuals who didn’t carry out the familiarization phase. We have obtained a successful and repeatable forced training program, which exceeds the minimal expected running distance needed to cause detectable molecular and physiological changes in the central nervous system. This program will be the starting point for future analysis of the effects of exercise on the central nervous system during the postnatal life of rodents. Supported by a grant from the Mapfre Foundation to JLF (17313).