

Session PSTR107 - Animal Behavior and Social Cognition II PSTR107.17 / Web Only - Long-term voluntary exercise promotes empathy-like behavior through the activation of oxytocin neurons in rats

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Abstract

Regular exercise has been reported a significant benefit for our physical and psychological health through changes in brain activity. In sporting activities, especially team sports, the empathy skills of individuals might be important. Empathy is the recognition and internalization of feelings, states, or behavior of others, and important for the survival and maintenance of society. However, few studies experimentally examined the relationships between exercise and empathy, and the effects of regular exercise on empathic behavior. Our hypothesis is that long-term exercise promotes empathy-like behavior via facilitating neuronal activation of oxytocin (OXT), a physiological key player in empathy. To examine this hypothesis, in the present study, we performed a behavioral task of helping soaked conspecifics as an empathy-like behavior model, according to Sato et al. (2015), using male rats. Furthermore, we evaluated the activation of OXT neurons in the PVN during represented helping situation using immunohistochemistry. Helper rats were individually housed in the cage with running wheel (EX-G), or without running wheel (no-EX-G) for 4 weeks. Demonstrator rats (i.e., soaked rats) were housed in the normal cage with 3-4 rats for 4 weeks. After that, we performed the helping task in helper and demonstrator rats for 6 consecutive days (up to 5 min/day; HELP condition). We also performed a similar task to a helper rat without a soaked rat as the control (EMPTY condition). In each condition, we measured the time to the door-opening and the time spent in the interaction zone that is the area within 5 cm from the door to estimate the motivation for empathy-like behavior. Helper rats faced a different demonstrator every experimental session to exclude confounding factor by the familiarity, which is required for the expression of empathic behavior. In the HELP condition, the time to door-opening and the time spent in the interaction zone in EX-G were decreased and increased with repeated experimental sessions. These results showed that long-term voluntary exercise can promote helping behavior. Furthermore, EX-G showed significantly higher activation of OXT neurons in the PVN during the helping situation compared to no-EX-G in the HELP condition and EX-G in the EMPTY condition. In addition, we found that the facilitating effect of helping behavior obtained in EX-G was inhibited by OXT antagonist (icv). These results suggest that long-term exercise promotes empathy-like behavior toward unfamiliar conspecifics through the activation of OXT neurons.