

Voluntary Exercise Enhances Learning And Consolidation But Not The Retrieval Of Cued Conditioned Fear In Mice. WA Falls*, CM MacAulay, JH Fox, SE Hammack, JT Green. Psychology, University of Vermont, Burlington, VT, USA

Exercise is associated with improved cognitive function in humans as well as improved learning across a range of learning tasks in rodents, including Pavlovian conditioned fear. We have shown, for example, that two weeks of voluntary exercise prior to tone and foot-shock pairings improves cued Pavlovian fear conditioning. However, in this experiment, as in most, exercise was initiated prior to conditioning and was continued through to testing for conditioned fear. Thus it was difficult to determine whether voluntary exercise improved the learning, consolidation or retrieval of Pavlovian conditioned fear. In an effort to isolate which of these processes were modulated by voluntary exercise, we ran experiments in which two weeks of voluntary exercise was restricted to time periods that would most likely affect either learning, consolidation or retrieval of conditioned fear. In each experiment, separate groups of exercising or sedentary mice were given 5 tone and foot-shock conditioning trials. Access to a running wheel was introduced either during the two weeks prior to fear conditioning, the 2 weeks immediately after fear conditioning (consolidation period) or 2 weeks after fear conditioning. In all groups conditioned fear was assessed immediately after the two week exercise period using the fear-potentiated startle procedure. Compared to sedentary mice, mice that exercised either prior to fear conditioning or immediately after fear conditioning showed enhanced conditioned fear. Fear conditioning was not enhanced in mice that began exercising 2 weeks after fear conditioning. Taken together these results suggest that exercise improves the learning and consolidation of fear memory but does not improve the retrieval or performance of conditioned fear. Studies have examined the time dependent effects of exercise on physiological changes in learning-related circuits in the brain. Studies are underway to examine in more detail the relationship between these physiological changes and the effects of exercise on learning and consolidation of fear memory.