

Sprints to Smarts: The Effect of High Intensity Interval Training on Various Executive Functions

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ABSTRACT

Exercise is known for a wide array of benefits. These range from increased health and longevity to improved physical fitness, and more recently, improvements in cognitive capacities. Interest has grown particularly with the effects of a single (acute) bout of exercise, and the potential transient benefits that may be obtained in various cognitive domains. These benefits are specifically in executive functioning (which is a subset of many higher level cognitive processes that include regulation of planning, working memory, response inhibition, cognitive flexibility, mental capabilities dealing with novelty) and management of goal directed behavior. Past research has primarily utilized aerobic exercise (60-70% of one's VO_{2max}) as the physical stimuli; however, there is a dearth of research on other exercise protocols. Currently there is only one study that has shown improvements of memory acquisition following acute sprinting. Thus, the aim of this investigation was to evaluate the acute effects of high intensity interval training (HIIT) compared with aerobic exercise on various aspects of executive functioning (EF); specifically attention/inhibition and planning/problem solving capacities. The Institutional Review Board approved all procedures described in this report and subjects gave written consent to participate. After completing a health history questionnaire, young adult male participants (N=20) completed five practice trials on a modified Stroop Task and Tower of London (TOL) task to ameliorate any potential learning effects associated with computer based cognitive testing. Following the EF testing participants completed a cardiorespiratory fitness test on cycle ergometers (Monark 894 E). Then, after a five minute rest, participants performed one maximal Wingate anaerobic power test for familiarization purposes. On following experimental days performance measures on a modified Stroop and Tower of London (TOL) tasks (completion speed, accuracy, and number of steps to solve) were assessed prior to five minutes, and thirty minutes post, a 15-min seated control, 14-min of HIIT, which consisted of four maximal Wingate anaerobic power tests-subdivided by four minutes of rest, and 30-min minutes of aerobic cycling at 60-70% of one's VO_{2max} . All experimental days were done consecutively and randomly assigned. Findings indicate faster completion times for HIIT. Aerobic conditions compared to the seated control for simpler tasks; however, revealed null findings were produced on other cognitive performance aspects. This data extends present understanding of acute exercise and executive functioning. Interpretation of these findings indicates little to no alteration in EF capacity following either type of acute exercise intervention within the tested cohort.