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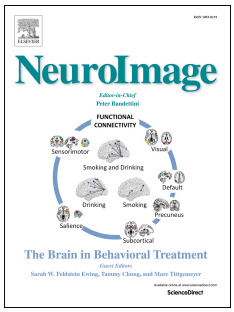

Physical exercise increases overall brain oscillatory activity but does not influence inhibitory control in young adults

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Physical exercise increases overall brain oscillatory activity but does not influence inhibitory control in young adults

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Abstract

Extant evidence suggests that acute exercise triggers a tonic power increase in the alpha frequency band at frontal locations, which has been linked to benefits in cognitive function. However, recent literature has questioned such a selective effect on a particular frequency band, indicating a rather overall power increase across the entire frequency spectrum. Moreover, the nature of task-evoked oscillatory brain activity associated to inhibitory control after exercising, and the duration of the exercise effect, are not yet clear. Here, we investigate for the first time steady state oscillatory brain activity during and following an acute bout of aerobic exercise at two different exercise intensities (moderate-to-high and light), by means of a data-driven cluster-based approach to describe the spatio-temporal distribution of exercise-induced effects on brain function without prior assumptions on any frequency range or site of interest. We also assess the transient oscillatory brain activity elicited by stimulus presentation, as well as behavioural performance, in two inhibitory control (flanker) tasks, one performed after a short delay following the physical exercise and another completed after a rest period of 15' post-exercise to explore the time course of exercise-induced changes on brain function and cognitive performance. The results show that oscillatory brain activity increases during exercise compared to the resting state, and that this increase is higher during the moderate-to-high intensity exercise with respect to the light intensity exercise. In addition, our results show that the global pattern of increased oscillatory brain activity is not specific to any concrete surface localization in slow frequencies, while in faster frequencies this effect is located in parieto-occipital sites. Notably, the exercise-induced increase in oscillatory brain activity disappears immediately after the end of the exercise bout. Neither transient (event-related) oscillatory activity, nor behavioural performance during the flanker tasks following exercise showed significant between-intensity differences. The present findings help elucidate the effect of physical exercise on oscillatory brain activity and challenge previous research suggesting improved inhibitory control following moderate-to-high acute exercise.

Key words: brain rhythms, EEG, information processing, executive control, sport