Cognitive function during strenuous exercise in a hot environment

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Purpose: Exercise in a hot environment potentially has detrimental effects on brain function. The purpose of this study was to examine the effects of strenuous exercise on cognitive function in hot and thermoneutral environments. We also tested if neck cooling has beneficial effects on cognitive function during exercise in a hot environment.

Method: Participants performed a cognitive task at rest and during exercise in the Control (thermoneutral), Hot, and Hot+Cooling conditions. In all conditions, participants cycled for 10 minutes while keeping their heart rate at 160 beats/min. Cooling was applied to the neck by a wet towel and fanning.

Results and Discussion: The accuracy of the cognitive task decreased during strenuous exercise as compared with that at rest. However, the impaired accuracy was not different among exercise conditions. Weight reductions were less than 0.5% in all conditions, and no differences were observed between exercise conditions. The neck cooling had no effect on cognitive function. The present findings suggest that strenuous exercise impairs cognitive function, and that a hot environment may not augment the detrimental effects of exercise on cognitive function provided that exercise intensity is relatively equal and obvious dehydration is not found.

Changes in movement-related cortical potential preceding voluntary muscle relaxation

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Purpose: Activities of our daily life is a series of voluntary movement, and the muscle relaxation as well as muscle contraction has an important role in the execution of complex movement. The purpose of this study was to identify Changes in movement-related cortical potential preceding voluntary muscle relaxation in handgrip task.

Methods: Nine healthy right-handed volunteers participated in this study. EEG activity was recorded with Ag/AgCl electrodes at Fz, FCz, CZ, Pz, C3 and C4. The subject maintained 30%MVC for at least 5 sec before relaxation movement. then, Subjects performed voluntary muscle relaxation from 30%MVC to 0%MVC, 10%MVC and 20%MVC. To obtain the MRCP, the EEG was averaged during the period from 2000 ms before to 500 ms after the EMG onset.

Results and Discussion: The MRCP onset in the handgrip task from 30%MVC to 20%MVC and 10% MVC occurred earlier than that in the handgrip task from 30%MVC to 0%MVC. This result suggest that the neural preparation is difference between voluntary muscle relaxation and precisely controlled force relaxation.

Keywords: movement-related cortical potential (MRCP), voluntary muscle relaxation, maximum voluntary contraction (MVC)