

Executive Function Performance and Prefrontal Activation When Cycling on an Active Workstation in Young Adults

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Objectives

The purpose of the study was to examine the effects of self-paced cycling on an active workstation on executive function and prefrontal cortex activation in young adults.

Methods

In a cross-over study design, 35 young adults (mean age = 21.4 ± 2.6 years, 45.7% females) were randomly assigned to the following two task conditions separated by 48 hours: performing cognitive tests while sitting (SIT) and performing cognitive tests while cycling on an active workstation (ACTIVE).. Executive function was assessed by a task-switching paradigm and Stroop Color and Word Test (SCWT). Prefrontal activation was monitored using a 38-channel fNIRS system (NIRx Medical Technologies LLC, USA).

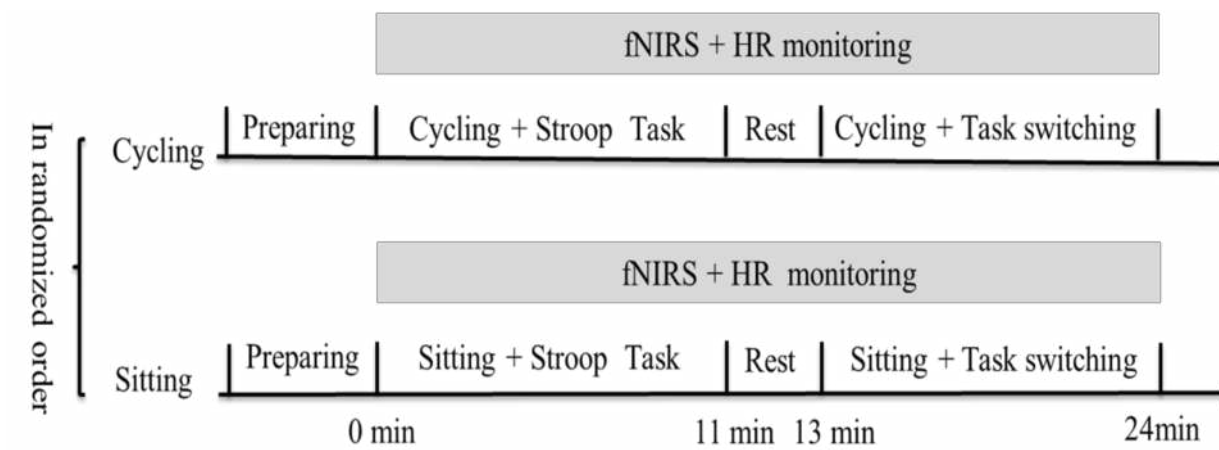


Figure 1. Chart of experimental design and protocol.

Results

The behavioral results showed that there were no significant differences on Stroop interference effects ($P = 0.66$) between sitting and cycling conditions. Likely, no differences on the global switch costs ($P = 0.90$) and local switch costs ($P = 0.67$) were observed between sitting and cycling conditions.



Figure 2. Data collection

For the fNIRS results, the oxy-Hb in response to Stroop interference in Channel 5, 10 and 12 was decreased during the cycling condition (all $P_s < 0.05$, FDR-corrected). Conversely, the oxy-Hb associated with global switch costs in Channel 3, 29, and 31 was increased during the cycling condition (all $P_s < 0.05$, FDR-corrected).

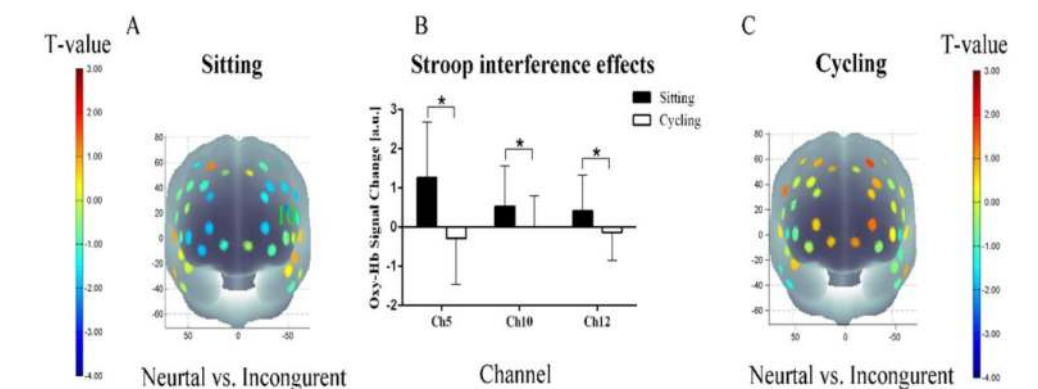


Figure 3. fNIRS results of Stroop task

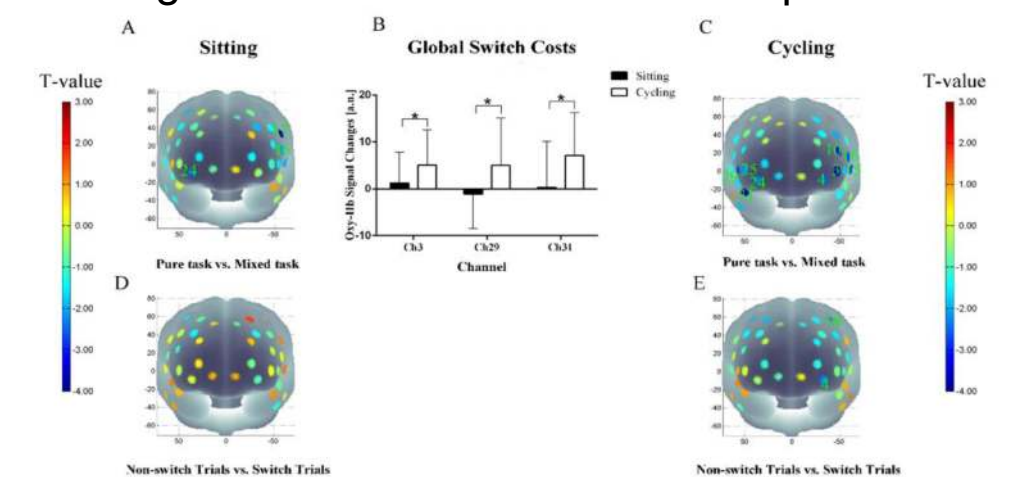


Figure 4. fNIRS results of task switch

Conclusion

The findings indicated that behavioral performances on executive functions were not affected by cycling at an active workstation, while cognitive resources were reallocated during cycling at an active workstation.

