

COMPARISON OF COGNITIVE PERFORMANCE AFTER AN ACUTE BOUT OF MODERATE INTENSITY BACKWARD AND FORWARD EXERCISE

GROBLER, L., TERBLANCHE, E.

UNIVERSITY OF STELLENBOSCH

INTRODUCTION: Literature suggests that acute bouts of cardiovascular exercise positively affects executive cognitive function (Chang et al., 2015), however, previous research is limited to forward modes of exercise. For most individuals, backward locomotion is a novel task, requiring greater inputs from the prefrontal cortex and skeletal muscles. However, little is known about the influence of backwards locomotion on executive function. Thus, the aim of this study was to compare the effect of an acute bout of forward (FW) and backward (BW) exercise on executive function.

METHODS: 17 trained participants (age: 19-24 years) volunteered for this cross-over design study. All participants were inexperienced in BW running. Participants performed three familiarisation sessions, where after 20 minute acute bouts of FW and BW running on a motorised treadmill was completed at a moderate intensity (65% of heart rate reserve) (Chang et al., 2015) and on separate days. 20-30 minutes post-exercise, participants completed a modified computer-based Stroop test. The reaction times of the simple (ST) and complex tasks (CT) of the Stroop were analysed. Interference scores (IS) were calculated by subtracting the reaction time of the simple from the complex tasks (Coetsee et al., 2017). T-tests and Cohen's d effect sizes were used to test for statistical significance.

RESULTS: There were no statistically significant differences in the cognitive performance of the participants for the ST (FW: 20.83 ± 2.85ms; BW: 20.83 ± 2.63ms), the CT (FW: 28.57 ± 5.89ms; BW: 26.70 ± 4.18ms), or the IS (FW: 7.74 ± 4.07ms; BW: 5.87 ± 2.85ms) of the Stroop task ($p > 0.05$). Cohen's d effect sizes for the three outcomes were 0.00 (ST), 0.37 (CT) and 0.53 (IS), indicating no to small practically faster reaction times during BW running than FW running.

CONCLUSION: To the authors knowledge this is the first study attempting to determine the influence of BW in comparison to FW exercise on cognitive function. It was expected that the novelty of BW exercise would induce faster reaction times in the Stroop test, however, results show that there are likely only negligible differences in the reaction times of trained individuals after a bout of FW and BW exercise. This may be attributed to the intensity at which the exercise was completed, as previous literature has shown higher intensity exercise to be more effective in the facilitation of neuronal efficiency (Wohlwend et al., 2017).

References: Chang Y.K. et al. (2015) *Med Sci Sports Exerc* 47(1):159-165

Coetsee, C. & Terblanche, E. (2017) *Eur Rev Aging Phys Act* 14(1):13

Wohlwend, M. et al. (2017) *Front Psychol* 8:406

Oral presentations

OP-SH10 Exercise effects on cognitive functioning and emotional responses

INFLUENCE OF ACUTE HIGH-INTENSITY INTERVAL TRAINING BOUT ON COGNITIVE PERFORMANCE

CASOLO, A.1, ANTONIETTI, A.2, GAGGIOLI, A.2, TOMIO, N.2, CAZZOLA, C.2, BRUSEGHINI, P.2,3, GALVANI, C.2

1 UNIVERSITA DEGLI STUDI DI ROMA

INTRODUCTION: High-intensity interval training (HIIT) appears to be a time-efficient and safe exercise, promoting improvements in aerobic fitness and in some cardiometabolic risk factors in both healthy subjects or clinical patients¹. Acute bouts of exercise have an influence on cognitive function even if the exercise-cognition relation is complex, depending on the type, duration and intensity of exercise and the type of the cognitive task required². The aim of this study was to analyze the influence of an acute bout of low volume-high intensity interval training (LV-HIIT) on visual-spatial ability.

METHODS: Thirty-six healthy active young women (age: 22.0±1.4 yr; BMI: 21.4±1.9 kg/m²; V'O₂max: 40.5±3.8 mlO₂/kg/min) engaged in (1) a LV-HIIT session, consisting of 3 repeated 20s Wingate against a resistance of 5.0% body mass interspersed by 2 min of active recovery³ followed by a cognitive training (LV-HIIT, N=18) or (2) a control session, consisting of a same time period of listening to music (CON, N=18). The day before and immediately after each experimental session, cognitive performance was assessed by the Paper Folding & Cutting Test (PFC)⁴ and Mental Rotation Test (MS, MRT)^{5,6}.

RESULTS: A significant ($p < 0.0001$) decrease in mean power output and a significant ($p < 0.001$) rise in Borg Scale were found (mean power: Bout1 389±45 W, Bout2 373±52 W, Bout3 357±61 W; Borg Scale: Bout1 3±1 RPE, Bout2 4±2 RPE, Bout3 6±2 RPE), detecting an increased fatigue state in the LV-HIIT group. The time to complete the PFC test was significantly ($p < 0.05$) lower (pre: LV-HIIT 456±129 s, CON 429±129 s; post: LV-HIIT 240±89 s, CON 226±77 s) and the number of errors significantly ($p < 0.001$) decreased in the post test (pre: LV-HIIT 9±3 n, CON 9±3 n; post: LV-HIIT 13±2 n, CON 12±3 n) compared with pre test for both groups.

CONCLUSION: Our study demonstrated that a LV-HIIT session does not impair cognitive performance on visual-spatial ability in healthy active young women when mediated by cognitive training, confirming, in accordance with Alves⁷, that cycling could be associated with enhanced performance after exercise regardless exercise intensity.

REFERENCES:

1 Gibala MJ. (2012). *J Physiol*, 590(5):1077-84.

2 Lambourne K. (2010). *Brain Res*, 1341:12-24.

3 Gillen JB. (2014). *Med Sci Sports Exerc*, 46(5):S557.

4 Thorndike R. (1986) Chicago: Riverside.

5 Shepard RN. (1971). *Science*, 171(3972):701-3.

6 Vandenberg SG. (1978). *Percept Mot Skills*, 47(2):599-604.

7 Alves CR. (2014). *Percept Mot Skills*, 118(1):63-72.

CONTACT:

christel.galvani@unicatt.it