

Effects of Hot and Temperate Environments on Executive Function Tasks during Moderate and High Intensity Exercise.

Stephen Decker, Heidi Bachrich, Nikki Kellman, La Tori Flowers, Eric J. Jones, and Mark Faries

Human Performance Laboratory; Department of Kinesiology and Health Sciences; Stephen F. Austin State University; Nacogdoches, TX

Category: Masters

Advisor / Mentor: Jones, Eric (jonesej@sfasu.edu)

ABSTRACT

Cognitive function testing during changes in body core temperature has been widely studied in regards to human performance, often employing passive hyperthermia. More recently, executive function (EF) testing during exercise has been addressed to assess changes in performance with some level of active hyperthermia. The purpose of the present study was to employ both external thermal stress and active hyperthermia in order to assess changes in executive function (EF) tasks within varying environmental temperatures before, during, and after a maximal treadmill test. Nine apparently healthy college-aged males participated in two trials of a Bruce protocol treadmill test in hot (35°C) and temperate (21°C) environments. Treadmill tests were terminated upon subjects reaching ventilatory thresholds (VT). Subjects performed three EF tests to assess simple reaction time, attention/inhibition, and planning/problem solving abilities (Stroop-dot, Stroop-color, and Tower of London (TOL), respectively). Each test was given on three occasions during both trials; pre, mid, and post VT. Subjects' performances on time of completion and errors within both EF tests were assessed across varying environments. Paired samples t-test revealed no significant differences ($p=.05$) within time of completion or errors for either EF test across both environments, with the exception of TOL number of moves post VT ($p=.03$). While not statistically significant, further analysis revealed an improvement (-.86 sec.) in reaction time (Stroop-dot) from pre to mid protocol in hot trials, as compared to a worsening (+.50 sec.) during temperate. Pre to Post reaction times were attenuated during hot trials (-.13 sec improvement), as compared to temperate trials (+1.34 sec. decline). Attention/inhibition (Stroop-color time) from pre to mid exercise revealed attenuation of the worsening of performance within heat trials of +.64 sec. vs. +1.96 sec. during temperate. Planning/problem solving (TOL time) improved in both pre to mid (-12.62 sec. hot [$p=.44$], -21.65 sec. temperate [$p=.01$]) and pre to post exercise (-19.10 sec. hot [$p=.07$], -27.67 sec. temperate [$p=.01$]). Taken together, these support previous findings on the complexity of the exercise-EF relationships, while adding the potential of active hyperthermia to moderate these relationships. Future research

should continue to focus on external thermal stress and active hyperthermia in regards to effects on executive function tasks.

