

## Comparison of Heat Shock Protein Expression, Cognitive Performance, and Self-Reported Pain Following One Hour of Passive Heating or Walking in Older Adults: A Preliminary Analysis

CAYLA E. CLARK, NICOLE VARONE, JOSEPH MALLILLIN, ALYSSA FLORES, GEORGE A. KING FACSM, & B. RHETT RIGBY.

Exercise Physiology Laboratory; School of Health Promotion and Kinesiology; Texas Woman's University; Denton, TX

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Advisor / Mentor: Rigby, B. Rhett (brigby@twu.edu)

### ABSTRACT

Heat shock proteins (HSP) are major components of the cellular chaperone network responsible for regulating protein amyloid aggregation, and may have a neuroprotective effect against certain diseases. **PURPOSE:** This study aims to observe the level of HSP expression following one hour of aerobic exercise or whole-body passive heating in older adults. **METHODS:** Twenty older adults (age:  $68.5 \pm 4.23$  years, BMI:  $26.9 \pm 4.3$  kg/m<sup>2</sup>, 11 female) participated in a randomized controlled trial, repeated for time. Participants completed either one hour of moderate intensity walking on a treadmill (TM; 65-75% of age-predicted maximum heart rate), one hour of seated passive heating (HEAT) in a controlled environmental heat chamber (35-40°C, < 40% humidity), or one-hour of seated control (CON) in a neutral climate (21-24°C). Participants were randomly assigned to an intervention (CON: n=6, HEAT: n=7, TM: n=7). HSP expression was measured via blood samples with an enzyme-linked immunosorbent assay (ELISA) kit for HSP70 (Thermo Fisher Scientific Inc., Waltham, MA). Blood samples were collected immediately and 24 hours following each intervention. Cognitive performance was measured after each intervention using computerized software (Automated Neuropsychological Assessment Metrics, ANAM, Vista LifeSciences, Inc.), including tasks such as reaction time, cognitive flexibility, and response inhibition. Pain was assessed via a self-reported pain scale questionnaire (McGill Pain Questionnaire) immediately following each intervention. **RESULTS:** Detectable amounts of HSP70 were analyzed for 6 participants. There were no statistical differences for HSP70 concentration between groups immediately or 24 hours following each intervention ( $p > 0.05$ ). Reaction time improved following passive heating compared to control ( $p=0.027$ ), but did not change from baseline to immediately following each intervention (pre- vs. post-HEAT:  $1827.6 \pm 194.9$  vs  $1583.0 \pm 397.2$  ms; CON:  $2331.0 \pm 853.1$  vs  $2077.3 \pm 643.1$  ms; TM:  $1904.4 \pm 214.5$  vs  $1682.3 \pm 385.1$  ms;  $p=0.107$ ). Measures of cognitive flexibility were higher for the HEAT group ( $26.6 \pm 6.9$ ) compared to the TM group ( $23.6 \pm 5.0$ ,  $p=0.215$ ) or CON ( $19.9 \pm 6.6$ ,  $p=0.11$ ). Response inhibition was greater for HEAT compared to CON ( $35.2 \pm 8.6$  vs  $25.2 \pm 9.9$ ,  $p=0.004$ ), but TM did not differ between groups ( $p > 0.05$ ). Pain was perceived greater for TM and HEAT when compared to CON (TM:  $28 \pm 21$ ,  $p = 0.003$ ; HEAT:  $29 \pm 10$ ,  $p=0.004$ ; CON:  $10 \pm 12$ ) with no differences pre vs post ( $p > 0.05$ ). **CONCLUSION:** One bout of moderate intensity aerobic exercise or whole-body passive heating may not illicit changes in HSP70 expression or impair cognitive performance in older adults. There could be an anticipatory psychological affect resulting in different perceptions of pain for passive heating and exercise.