

## ACUTE EFFECTS OF A SINGLE SESSION OF HOT YOGA ON CALORIC EXPENDITURE, RANGE OF MOTION, AND METABOLISM

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### ABSTRACT

Performing yoga in a heated environment is an increasingly popular exercise option among the population and is purported increase range of motion (ROM), caloric expenditure, and aerobic fitness. Despite this, there exists a gap in the literature regarding hot yoga. **PURPOSE:** To compare an acute session of yoga performed in heated (HC) versus room temperature conditions (RT) with regards to changes in ROM, oxygen consumption, caloric expenditure, and biomarkers related to exercise stress and inflammation. **METHODS:** Sixteen experienced yoga practitioners (F=14, M=2; 41±14yr, 22.8±2.2 kg/m<sup>2</sup>) completed a 1-hour yoga exercise protocol using a standardized Bikram yoga sequence in both a HC (105°F, 40°C) and RT (74°F, 23.3°C). Measurements of ROM in the upper body (shoulder external & internal rotation, wrist flexion, elbow flexion, scaption, and forward flexion), lower body (hip flexion, hip internal & external rotation, hip abduction) and blood sample collection occurred before, immediately following, and 30-minutes following exercise respectively. ROM images were analyzed using standardized software based techniques utilized in orthopedic clinical settings. Blood samples were analyzed using a high sensitivity cytokine ELISA kit for interleukin 6,10 (IL-6, IL-10) and tumor-necrosis-factor alpha (TNF-α). Oxygen consumption, RER, and caloric expenditure were continuously monitored using an automated metabolic cart during yoga bouts. A mixed-model ANOVA repeated on time was used to detect differences between conditions (HC, RT) for ROM and serum cytokine changes. A paired t-test was used to compare metabolic measures recorded during exercise. Type I error for all analyses was set at α=0.05. **RESULTS:** Both conditions elicited similar acute increases in upper body ROM measures (p<0.05). For hip ROM, the HC elicited a significantly greater increase in hip abduction (RT Δ° = 2.3±1.3 | HC Δ° = 6.6±1.5; p<0.05). Mean VO<sub>2</sub> (ml·kg<sup>-1</sup>·min<sup>-1</sup>; RT: 8.6±0.2 | HC: 8.9±0.3), Peak VO<sub>2</sub> (ml·kg<sup>-1</sup>·min<sup>-1</sup>; RT: 14.5±0.4 | HC: 14.9±0.5), mean %VO<sub>2max</sub> (RT: 23.5%±1.3 | HC: 25.4%±2.1), and kcal expenditure (RT: 151.2±4.2 | HC: 156.0±6.6) did not differ between conditions. RER was observed to be different between the two conditions (RT: 0.95±0.02 | HC: 0.89±0.02; p<0.05). No post-exercise changes in serum TNF-α or IL-10 were observed. under either condition. Serum IL-6 was found to be significantly increased (15.5±8.0 fold) following HC only (p<0.05). **CONCLUSION:** These results indicate that under HC, performing a single session of yoga may elicit greater acute increases in some aspects of ROM but does not increase oxygen consumption or caloric expenditure compared to RT. However, HC may increase fat substrate utilization as indicated by a decreased RER during exercise and increase in IL-6 (metabolic myokine) at 30- minutes post exercise. Lastly, a standardized Bikram based session (HC or RT) was not found to reach a sufficient aerobic threshold for chronically improving aerobic capacity (~40-55% VO<sub>2max</sub>). Further research will be needed to examine if performing yoga under HC may contribute to greater chronic changes in ROM and body composition compared to RT as well as the dose-response relationship for eliciting these changes.