

## Gender Differences in Skin and Core Body Temperature during Exercise in a Hot, Humid Environment.

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### ABSTRACT

**Background.** It is universally accepted that men and women regulate heat differently during exercise in hot, humid environments. Despite this common knowledge, little empirical data is available to explain how gender differences effect core/skin temperature changes. Further, the data that is available includes only limited measurement sites and/or time points. **Methods.** The purpose of this study was to measure the heat regulatory patterns for both men and women during 60-min of exercise in a hot, humid environment. Twenty aerobically fit subjects (10 men; 10 women) completed an acclimation session followed by a 60-min exercise protocol in an environmental chamber set at  $39.9 \pm 1.1$  °C and  $46.4 \pm 4\%$  relative humidity. Each exercise protocol consisted of four intervals of an 8-min walk (mean  $\pm$ SD; men:  $4.0 \pm 0.3$ , women:  $3.0 \pm 0.2$  mph) and 7-min light jog (men:  $5.4 \pm 0.5$ , women:  $5.0 \pm 0.3$  mph). Subjects were confirmed to be euhydrated (urine specific gravity) prior to exercise and were encouraged to drink water to maintain hydration during exercise. Pre- and Post-exercise body weights did not differ, thus it appears hydration was maintained during exercise. Skin temperatures (iButton wireless loggers) were recorded every minute at seventeen sites (right and left: upper chest, mid-chest, abdomen, upper back, mid-back, lower back, upper arm, and lower arm, and back of the neck). In addition, core body temperature (rectal), rating of perceived exertion (RPE), and heart rate (wireless telemetry) were also recorded at the end of each interval of the protocol. Statistical analysis was carried out using a 2 (gender)  $\times$  60 (time) repeated measures ANOVA. Other variables were analyzed using a 2 (gender)  $\times$  8 (time) ANOVA with repeated measures on the 2<sup>nd</sup> factor. Any non-normally distributed data was log transformed. Significance was set at  $p < 0.05$  and location of effects will be determined using individual *t*-tests with a Bonferroni correction for multiple comparisons. **Results.** Analysis revealed significantly higher skin temperatures in four locations on men compared to women: right upper back ( $p=0.048$ ), right mid-back ( $p=0.001$ ), right lower back ( $p=0.001$ ), and left upper back ( $p < 0.001$ ). Additionally, these changes were seen despite no significant differences between genders in core body temperature, RPE, and heart rate. This latter finding supports the conclusion that a similar degree of exercise, heat stress was applied to both men and women. **Conclusions.** We found gender differences at four different skin temperature locations. These changes might suggest that men retain more metabolic heat in various locations on the back when exercising in a hot, humid environment compared to women. Further research is needed to understand how these changes may affect post-exercise recovery return to baseline skin and core temperature values.