TACSM Abstract

The Effect of Heat Acclimatization and Heat Acclimation on Endurance Trained Athlete Substrate Utilization

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ABSTRACT

Heat acclimatization (HAz) and Heat Acclimation (HA) are important strategies to induce thermoregulatory adaptations to mitigate negative impact of heat stress. However, despite improving endurance performance, few studies explore their impact on substrate utilization. **PURPOSE**: To investigate the effect of HAz and HA on endurance athlete substrate utilization during submaximal exercise in the heat. **METHODS**: Fourteen endurance-trained male athletes (mean ± SD; age, 33 ± 9 years; body mass, 70.9 ± 10.1 kg; height, 177.7 ± 6.4 cm; VO_{2max}, 59.3 ± 7.4 ml ·kg^{-1} ·min^{-1}; % body fat, 8.5% ± 3.9%) participated in this study. Participants performed 60 mins bouts of submaximal exercise (58.9 ± 2.2% v$VO_{2max)}$ in the heat (ambient temperature [T_{amb}], 35.5 ± 0.2°C; %relative humidity [%RH], 46.4% ± 1.3%; wet bulb globe temperature [WBGT], 29.3 ± 0.3°C; wind speed 4.0 ± 0.1 km ·h^{-1}). Prior to heat exposure (baseline), following HAz (post-HAz), and post-HA. During 60 min exercise, oxygen consumption (VO_2) and respiratory exchange ratio (RER) were measured at the beginning (5-10 min), middle (30-35 min), and ending stages (55-60 min) of the protocol. Following the baseline, participants underwent self-directed summer training (HAz). Following post-HAz trials, participants underwent 5 days of HA sessions, which involved exercising to induce hyperthermia (38.50°C-39.75°C) for 60 minutes in the heat (T_{amb}, 39.1 ± 0.5°C; %RH, 51.8% ± 2.6%; WBGT, 33.4 ± 0.8°C) over an eight-day stretch. **RESULTS**: RER was significantly higher post-HAz (mean ± standard error; 0.85 ± 0.01) compared to baseline (0.81 ± 0.01, $p<0.001$) independent of exercise stages. Post-HA RER (0.83 ± 0.01) did not prove to be significantly different from baseline (p=0.187) or post-HAz (p=0.143). Additionally, RER starting exercise (0.84 ± 0.01) was higher than the middle (0.83 ± 0.01, p=0.048) and the end (0.82 ± 0.01, p=0.016), independent of intervention. RER in the middle was also higher than in the end (p=0.026) There was no significant VO_2 difference between baseline (38.9 ± 1.2 ml ·kg^{-1} ·min^{-1}), post-HAz (37.5 ± 1.3 ml ·kg^{-1} ·min^{-1}, p= 0.062), or post-HA (38.5 ± 1.3 ml ·kg^{-1} ·min^{-1}, p=0.668). **CONCLUSION**: Self-directed HAz may impact athlete substrate utilization when performing submaximal exercise in a heated environment. Additionally, RER decreases as time of submaximal exercise in the heat increases. Other factors such as, athlete fitness level and exercise intensity, should also be considered when drawing conclusions regarding RER.