TACSM Abstract

Skin Temperature and High Dew Point in Hot Environments Affects Self-Paced Exercise

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ABSTRACT

Dew point (*d*p) is the absolute measure of water vapor and directly affects comfort whereas 5-10°C feels dry; 10-15°C feels comfortable and 20-24°C feels uncomfortable. **PURPOSE:** This project tested the hypothesis that exercise in hot ambient conditions with a high *d*p (>20°C) would affect the selection of self-paced exercise compared to neutral dry conditions (<0°C *d*p). **METHODS:** Six healthy active (7 day activity: 9826±3900 steps/day; VO_2max: 52±10 mL/kg/min) subjects (4M/2F, 25±9y, 171±6cm, 69±7kg) completed a 30 min baseline rest then 60 min of exercise intensity they chose that represents their perceived exertion of 12 (between light and somewhat hard) on a 20-point rating of perceived exertion scale while blinded to the ergometer watts in a hot dry (42.3±0.3°C; 10.4±0.4%R*h*; 4.8±0.7°C *d*p) condition that progressively increased (6°C *d*p increase every 10 minutes) to a high *d*p (42.5±0.0°C; 62.2±5.3%R*h*; 33.9±1.5°C *d*p) and control neutral dry (22.9±1.0°C; 11.5±1.9%R*h*; -8±2.5°C *d*p) condition in random order separated by at least 7 days. Heart rate (HR), intestinal (Tin) and mean skin temperature (Tsk), forearm skin blood flow (Skbf) and local sweat rate (Sr), exercise intensity (watts), and thermal comfort scale were measured every 10 minutes. A 2-way repeated measures analysis of variance was used to examine interaction and main effects for condition x time and linear regression analysis examined the change (%Δ) in initial exercise intensity with %Δ of resting HR, Tin, Tsk, Sr, and Skbf. **RESULTS:** Resting HR (18±17%Δbpm), Tsk (14±14%Δ°C), Skbf (615±182%ΔPU), Sr (368±118%Δmg·min·cm^2) increased in hot compared to neutral condition (P≤0.03) while Tin was maintained (P=0.45). During exercise in hot low to high *d*p, HR, Tin, Tsk, and Sr increased further from 30-60 min compared to the neutral low *d*p condition (Time x Condition interaction, P≤0.04) whereas Tsk was elevated from 0-60 min in the hot condition (main effect condition, P<0.004). The initial self-selected pace of exercise was 20±16% lower in the dry hot condition (P<0.01) and further decreased (Time x Condition interaction, P≤0.006) by 37±26%at 60 min compared to the neutral dry condition. Only resting Tsk was strongly correlated (r=-.76, P<0.04) with initial self-selection of exercise intensity that accounted for 58% of the variability (r2, P<0.08). **CONCLUSION:** Initial elevated skin temperature is strongly associated with the selection of self-paced exercise while during exercise elevated dew point further reduce the selection of exercise intensity.