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IMPACT OF A FLAME RESISTANT SYNTHETIC MATERIAL BASE LAYER ON HEAT STRESS FACTORS

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Protective clothing worn by wildland firefighters (WLFF) may increase physiological strain and heat stress factors due to increased insulation and decreased ventilation. PURPOSE: To examine the effects of a flame resistant synthetic material base layer on heat stress factors. METHODS: Ten recreationally active males (25 ± 6.1 yrs, 80.9 ± 8.4 kg, 11.1 ± 5.3% fat, 4.4 ± 0.6 L·min^{-1} VO_2 max) completed two trials of intermittent (50 min walking, 10 min sitting) treadmill walking (2.5mph, 4% grade) over 3 hours in a climate chamber (35^{0}C, 30% RH). Participants wore standard WLFF Nomex green pants, yellow shirt with either a 100% cotton base layer (C) or a flame resistant synthetic material base layer (S), while carrying a 35lb pack, hard hat, and gloves. Exercise was followed by a 30 minute rest period without pack, hard hat, gloves, or Nomex yellow shirt. Core (T_c) and skin (T_{sk}) temperature were measured continuously throughout the trial. Skin blood flow (SBF) and skin temperature (DT_{sk}) was recorded via laser doppler for two minutes prior to walking, five minutes during each break, and three, five minute periods during the 30 minutes following exercise. Physiological strain index (PSI) was calculated. Water was scripted at 8 ml/kg/hr. Repeated measures ANOVAs were performed using SPSS 22.0. RESULTS: Significant main effects for time were found on T_c ($p \leq 0.001$) and T_{sk} ($p=0.003$). No significant trialXtime interactions were found in T_c ($p=0.077$) and T_{sk} ($p=0.086$). SBF showed significant main effects for time ($p=0.001$) and a trialXtime interaction ($p=0.001$). Significant main effects for time were found on DT_{sk}($p=0.001$). Comparisons for SBF and DT_{sk}were made between peaks, nadirs, and the three post-exercise periods for C and S. Significant main effects for time were found on SBF peaks ($p=0.001$), nadirs ($p=0.028$), and posts ($p=0.001$). Significant main effects for time were found on DT_{sk} peaks ($p=0.019$) and posts ($p=0.001$). No significant trialXtime interactions were found between C and S. Significant main effects for time and trial were found on PSI ($p \leq 0.001$ and $p=0.04$, respectively). CONCLUSION: These data indicate that a flame resistant synthetic base layer may elevate SBF and possibly jeopardize indices of heat stress.