



Effect of base layer materials on physiological and perceptual responses to exercise in personal protective equipment

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ABSTRACT

Ten men (non-firefighters) completed a 110 min walking/recovery protocol (three 20-min exercise bouts, with recovery periods of 10, 20, and 20 min following successive bouts) in a thermoneutral laboratory while wearing firefighting personal protective equipment over one of four base layers: cotton, mod-acrylic, wool, and phase change material. There were no significant differences in changes in heart rate, core temperature, rating of perceived exertion, thermal discomfort, and thermal strain among base layers. Sticking to skin, coolness/hotness, and clothing humidity sensation were more favorable ($p < 0.05$) for wool compared with cotton; no significant differences were identified for the other 7 clothing sensations assessed. Separate materials performance testing of the individual base layers and firefighting ensembles (base layer + turnout gear) indicated differences in thermal protective performance and total heat loss among the base layers and among ensembles; however, differences in heat dissipation did not correspond with physiological responses during exercise or recovery.

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