

MEETING ABSTRACT

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Inside the 'Hurt Locker': the combined effects of explosive ordnance disposal and chemical protective clothing on physiological tolerance time in extreme environments

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From 15th International Conference on Environmental Ergonomics (ICEE XV)
Portsmouth, UK. 28 June - 3 July 2015

Introduction

Explosive ordnance disposal (EOD) technicians are often required to wear specialised clothing combinations that not only protect against the risk of explosion but also potential chemical contamination. This heavy (>35 kg) and encapsulating ensemble is likely to increase physiological strain by increasing metabolic heat production and impairing heat dissipation [1,2]. This study investigated the physiological tolerance times of two different chemical protective undergarments (2.9 kg v's 4.2 kg), commonly worn with EOD personal protective clothing, in a range of simulated environmental extremes and work intensities.

Methods

Seven males performed eighteen trials wearing two ensembles. The trials involved walking on a treadmill at 2.5, 4 and 5.5 km.h⁻¹ at each of the following environmental conditions, 21 °C, 30 °C and 37 °C wet bulb globe temperature (WBGT). The trials were ceased if the participants' gastrointestinal temperature reached 39 °C, if heart rate exceeded 90 % of maximum, if walking time reached 60 minutes or due to volitional fatigue.

Results

Physiological tolerance times ranged from 8 to 60 min and the duration (Figure 1, mean difference: 2.78 min,

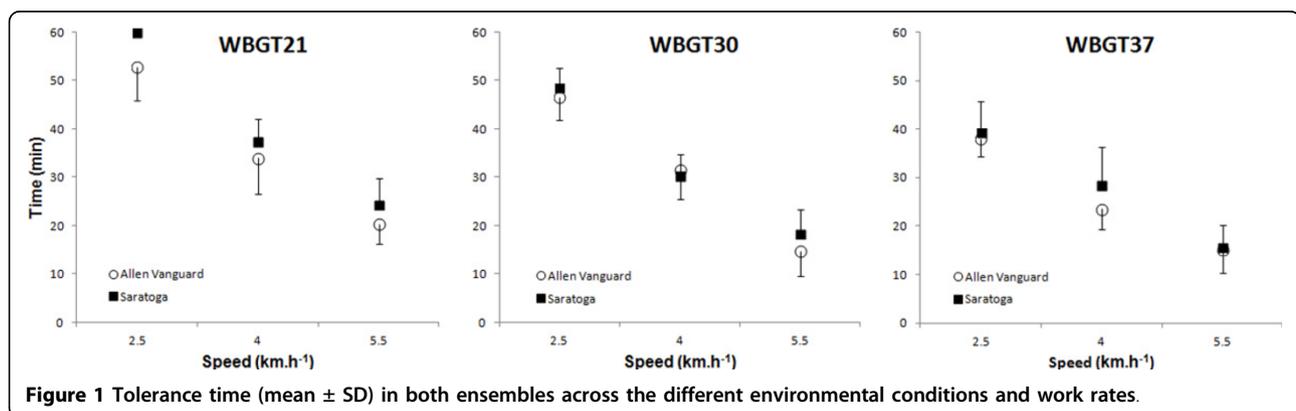


Figure 1 Tolerance time (mean ± SD) in both ensembles across the different environmental conditions and work rates.

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$P > 0.05$) were similar in both ensembles. A significant effect for environment ($21 > 30 > 37^{\circ}\text{C}$ WBGT, $P < 0.05$) and work intensity ($2.5 > 4 > 5.5 \text{ km}\cdot\text{h}^{-1}$, $P < 0.05$) was observed in tolerance time. The majority of trials across both ensembles (101/126; 80.1%) were terminated due to participants achieving a heart rate equivalent to greater than 90% of their maximum.

Discussion and conclusion

This is the first study to systematically compare the physiological tolerance times of two air-permeable, charcoal-impregnated chemical protective undergarments while worn in combination with EOD personal protective clothing. Physiological tolerance times wearing these two ensembles were similar and predominantly limited by cardiovascular strain.

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Published: 14 September 2015

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doi:10.1186/2046-7648-4-S1-A79

Cite this article as: Costello *et al.*: Inside the 'Hurt Locker': the combined effects of explosive ordnance disposal and chemical protective clothing on physiological tolerance time in extreme environments. *Extreme Physiology & Medicine* 2015 **4**(Suppl 1):A79.

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