The influence of short-term firefighting activity on information processing performance

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This study examined the following: effects of simulated firefighting (FF) activities under heat stress on sustained attention; whether incident rehabilitation (IR) influences performance; and relationships between performance, affect and personality. Firefighters performed ∼18 min of FF. Attention, physiological, perceptual and psychological assessments were made before and after FF, IR and recovery. IR had no effects. Self-rated Energy increased, Tiredness decreased and Anxiety increased immediately post-FF; all returned to baseline 120 min post. The immediate effect of FF was faster reaction time (RT) followed by slowing after recovery. Perceived Energy at baseline was associated (p-values < 0.05) with faster and Tiredness with slower post-FF RTs; Accuracy was unaffected. Conscientiousness was negatively associated with RT before and 120 min following FF. RTs were faster following FF, accuracy was unchanged. Higher baseline Energy/lower Tiredness were associated with faster, less variable RTs at baseline and post-FF. Those with higher Conscientiousness had faster RTs. Research should further investigate higher-level cognitive processing following, or ideally during, FF.

Practitioner Summary: This study examined the effects of simulated firefighting (FF) activities on sustained attention and affect. Energy and Anxiety increased, Tiredness decreased immediately post-FF. The immediate effect of FF was faster reaction time (RT) followed by slowing after recovery; accuracy was unaffected. Higher baseline Energy/lower Tiredness were associated with faster, less variable RTs.

Keywords: cognitive processing; reaction time; firefighting; anxiety; energy

Firefighters subject themselves to dangerous environmental conditions to protect human life and property. Adequate health and performance of this occupational group are vital and have significant effects on public health and well-being. Typical firefighting tasks (e.g. fire suppression, victim search and rescue, ventilation, overhaul) are both mentally and physically strenuous (Smith et al. 1996, 1997), and such work is routinely performed in hot and hostile environments while wearing heavy, constricting clothing (Eglin 2007). Physiological responses to many of these stressors have been examined (for reviews, see Barr, Gregson, and Reilly 2010; Soteriades et al. 2011); however, psychological responses to firefighting have been relatively understudied. Even fairly brief firefighting activities performed in the heat can result in significant physiological perturbations. These circumstances result in high heart rates (HRs), many times reaching near maximal levels (Barr, Gregson, and Reilly 2010; Smith, Manning, and Petruzzello 2001; Smith and Petruzzello 1998; Smith et al. 2001), and considerably increased core temperatures (Horn et al. 2011; Smith and Petruzzello 1998; Smith et al. 2001; Smith et al. 1997). The same 18-min series of firefighting tasks used in the current study elicited average pre- to post-firefighting increases in HR of 75 b·min⁻¹, resulting in 88% of age-predicted maximal HRs, and average increases in core temperature of 0.72°C (± 0.31°C; Smith et al. 2011).

It is important to determine the effects of the environment (i.e. hot, often hostile), physical exertion and personal protective equipment (PPE), alone and in combination, on cognitive functioning (e.g. decision-making, information processing), perceptual and psychological factors that could be important in determining risk for the firefighter. Little is known about the ability to make quick and accurate decisions in the unpredictable environment of the fireground (Barr, Gregson, and Reilly 2010; McLennan et al. 2007; Omodei, McLennan, and Reynolds 2005) as much of the research examining the effects of heat stress on cognitive performance has been conducted in laboratory settings (Hancock and Vasmatzidis 2003; Morley et al. 2012). In addition, examining the effectiveness of rehabilitation and cooling strategies is important for evaluating whether such strategies can either attenuate any decrements in cognitive functioning or speed the recovery process so that the firefighter might return to normal status more quickly.

Performing research in live burn facilities with simulated fireground activities allows for the ecologically valid investigation of firefighter responses, albeit while lacking some of the control that can be gained in a laboratory setting.

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