

Can volunteer rural fire-fighters accurately self-monitor their cognitive performance?

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Aims

This study examines the effect of sleep deprivation and fatigue on volunteer fire-fighters cognitive performance during a 3-day fire-ground tour simulation and whether they are able to accurately monitor their own performance.

Introduction

During multiple day campaigns, volunteer fire-fighters are faced with life threatening situations and a workload with both physiological and psychological components. Fire-fighters must constantly monitor their own levels of fatigue and performance abilities to manage safety risks¹. If a mismatch arises between perceived performance and actual performance, safety may be compromised. If individuals or crews do not detect and respond to a decline in performance, the risks to health and safety cannot be managed.

In general, people are relatively accurate at judging their neurobehavioral and cognitive performance, even under conditions of sleep restriction or fatigue². Accuracy however, appears to be context specific, and no study has examined subjective accuracy during exposure to working conditions similar to those faced by rural fire-fighters.

Methods

Procedure

We developed an innovative, laboratory-based simulation of a 3-day fire-ground tour that required participants to live on site. During the daytime, measures of cognitive function (PVT) and subjective ratings of performance were collected after 14 separate 50min bouts of physical work designed to mimic fireground tasks. Participants were assigned either the 'control' (18-20 C day & night temperature, 8 hours sleep opportunity) or 'awake' condition (18-20 C day & night temperature, 4 hours sleep opportunity). Participants (N=35) represented various agencies across Australia.

Neurobehavioural performance

The Psychomotor Vigilance Task (PVT) provides a measure of reaction time. The 5min task, administered using a hand-held device, is a well developed measure that is extremely sensitive to effects of sleep deprivation and fatigue³.

Subjective Ratings

Subjective assessments of performance were measured using Visual Analogue Scales. Subjective responses were collected before and after each test battery. Questions included "how well do you think you will perform" and "how well do you think you performed" respectively². Fatigue was measured using the Samn-Perelli seven point Fatigue scale⁴.

<http://tinyurl.com/awakesmokyhot>

Findings

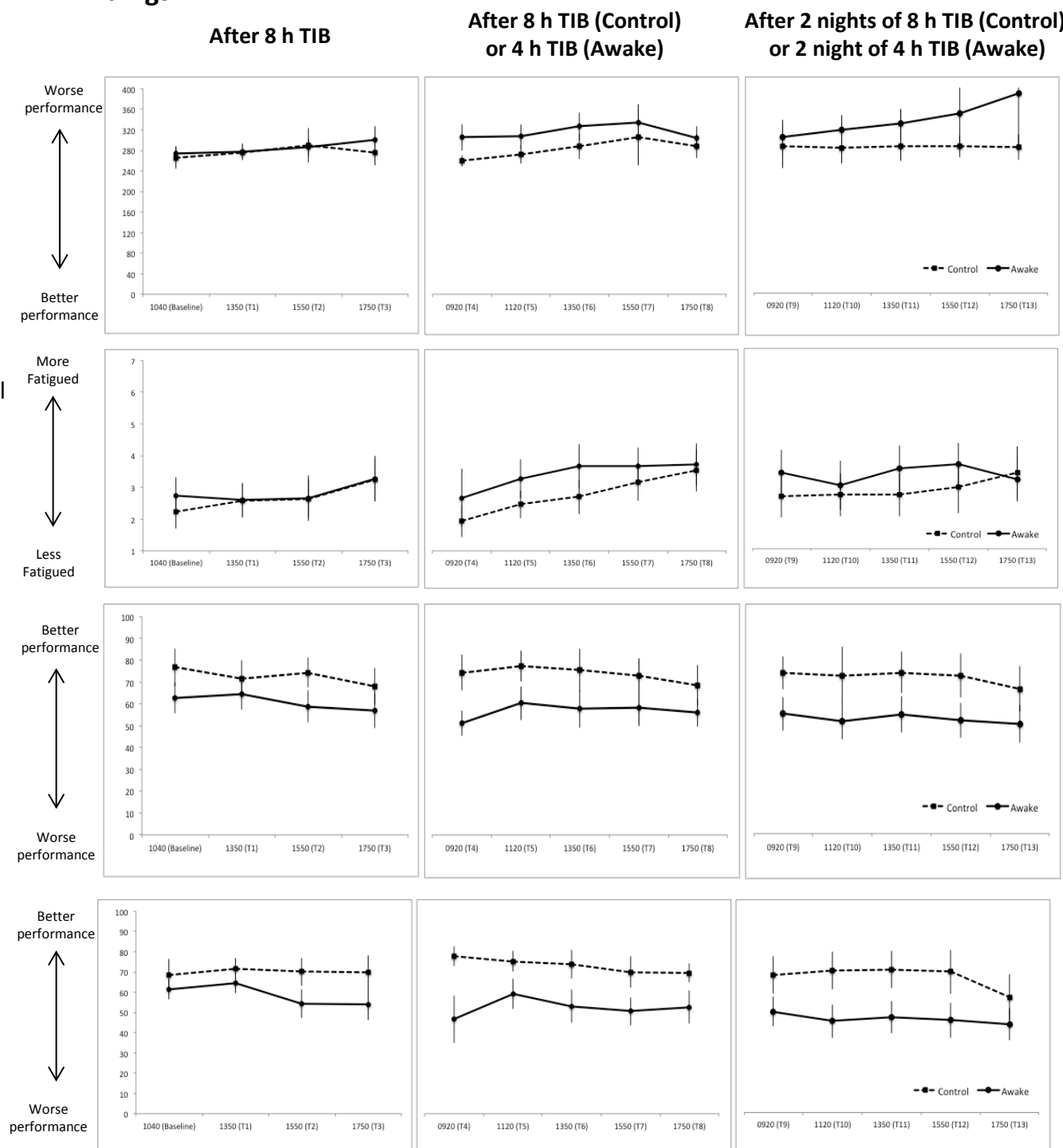


Figure 1: Average PVT reaction time score (milliseconds), subjective fatigue (1=low-7=high), and pre and post performance ratings (0-100) across each session over the three days of testing for both the control (N=19) and awake condition (N=16); **NOTE: TIB, Time in Bed .**

Simulated physical firefighting work with 8 hours sleep opportunity did not appear to have any impact on cognitive performance across the day or across successive days. Restricting sleep however, appeared to impair cognitive performance - particularly after two nights of little sleep. Self ratings of fatigue tended to increase across a simulated work day.

Firefighters in the awake condition judged their performance (both before and after the cognitive battery) as lower than the controls. Self-assessment of performance in the restricted sleep condition did not tend to mirror actual changes in performance.

Although subjective judgments can be an effective, efficient, and cost effective tool in providing feedback in regard to safety in continuing work, as fatigue increases, the reliability of self assessment of fatigue and performance may be compromised.

References

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