

Dehydration in Australian Bushfire Fighters Across Consecutive Shifts

Jenni Raines¹, Rod Snow¹, Chris Abbiss¹, David Nichols² & Brad Aisbett¹

¹ School of Exercise and Nutrition Sciences, Deakin University, VIC. ² Research and Development, Country Fire Authority, VIC.



Purpose

The purpose of this study was to describe the hydration levels of Department of Environment and Heritage (DEH) seasonal firefighters over successive days of experimental burn operations in Ngarkat, South Australia.

Methods

Twelve male firefighters (age 19-44 y, weight 56-110 kg, BMI 19-33 kg/m²) worked an average of 12 hours (range 9.5-14.5 hours) over consecutive shifts during experimental burns. (Temperature 16-39° C; relative humidity 12-64%; FFDI 3-49). Blood, urine, saliva samples and body weight were collected first thing in the morning, at the end-shift point and two hours after the end of the shift (recovery). A Step test was also performed in the morning and at the end-shift time point. All data is presented as means ± standard deviation.

Results

Figure 1. Heart Rate Recovery following the Step Test

Heart rate recovery was significantly slower (P=0.03) after the work shift compared to before the shift

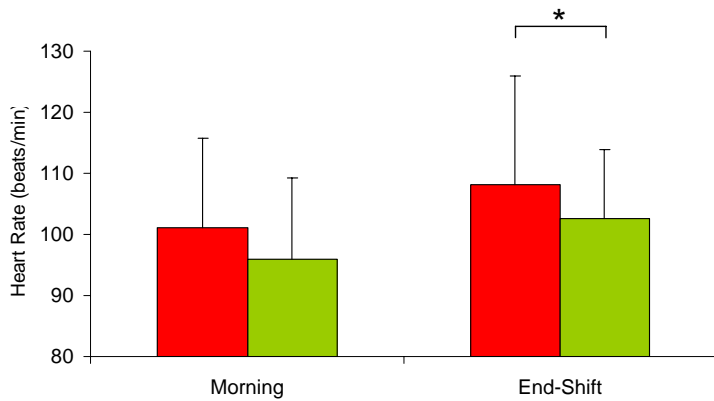


Figure 2. Average Body Weight Changes

Firefighters body weight fluctuated at the end-shift point. After 2 hours of recovery, firefighters had gained weight on both days.

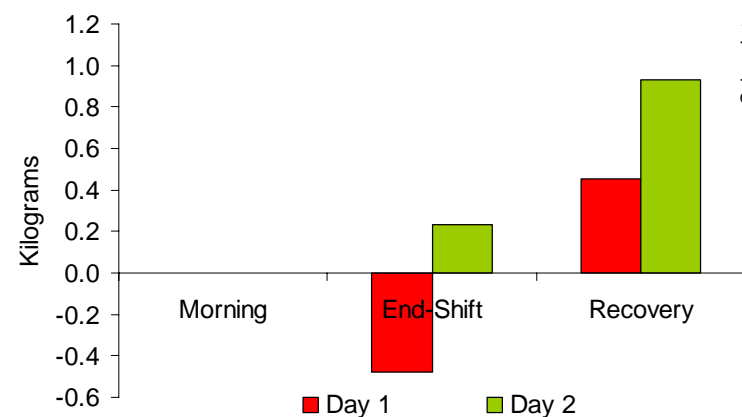


Figure 3. Urine Specific Gravity of Bushfire Fighters

Firefighters started their shifts seriously dehydrated and only marginally rehydrated after the second shift.

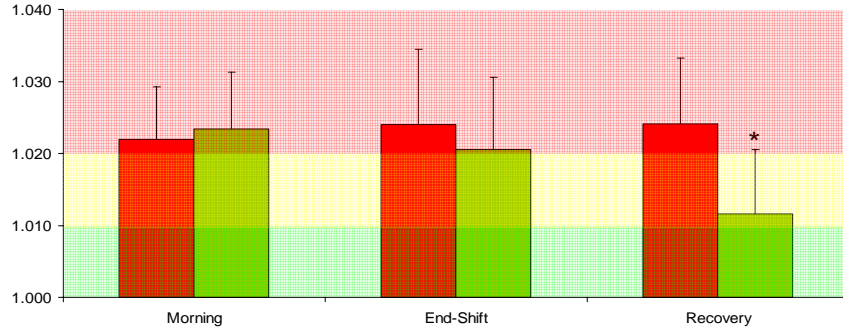


Figure 4. Urine Colour of Bushfire Fighters

There were no differences in urine colour indicating this measurement was unable to clearly determine the hydration status of firefighters.

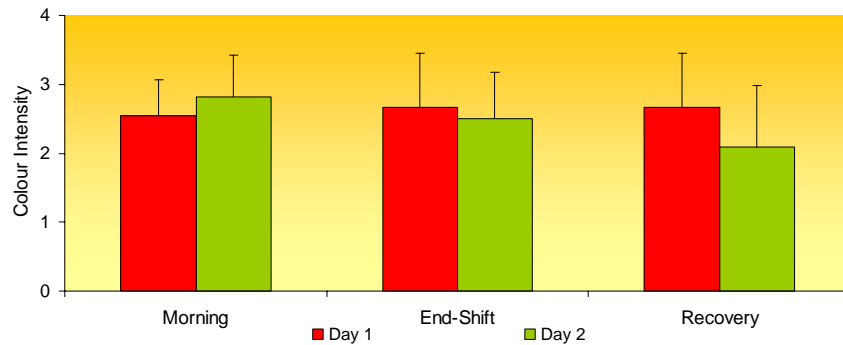
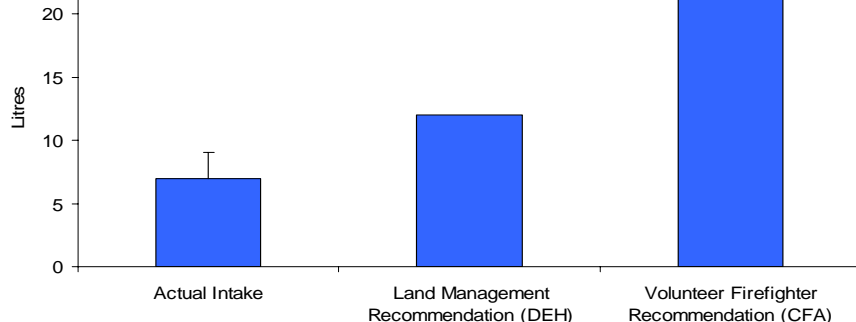


Figure 5. Actual Water Intakes versus Agency Recommendations for a 12- hour shift

Firefighters did not meet Agency recommended fluid intakes for a 12 hour shift



Practical Importance for Fire Agencies

Firefighters began work in an extremely dehydrated state and remained so throughout the two day work period. Dehydration may increase cardiovascular strain and fatigue especially during periods of greater stress such as emergency campaign fires. Scientifically valid and realistic fluid intake guidelines tested across multiple days of firefighting, are required to better manage firefighter fatigue.

The researcher would like to acknowledge the support of:

Deakin Uni – Andrew Howarth, Sandra Godfrey. LaTrobe Uni – Jim McLennan. DEH – Andy Koren, Brett Stephens, Peter Langstreth, Ian Tanner, Steve Kowalick, Ron Saers. CFA – Vince Bosua, Kate Johnson, Martyn Bona, Peter Tubbs, Rob Symonds.