



Dehydration in Staff Performing Helicopter Retrieval Work

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Introduction

- > Current evidence suggests dehydration $\geq 2\%$ can produce significant impairment of physical and/or cognitive function^{1, 2, 3}
 - Memory
 - Hand-eye coordination
 - Fatigue
 - Alertness
 - 6-7% reduction in physical work capacity⁴

Introduction

- > Studied in a number of settings
 - Athletic – soccer, cycling, long distance running
 - Military
 - Occupational – industrial mine workers⁵, fire fighters⁶, construction workers⁴

- > Only published study in helicopter crews involved wearing of immersion suits⁷
 - Simulated environment – summer flying in Canada
 - 1.6% dehydration



Study Aims

- > Staff undertaking helicopter retrieval work in North Queensland were at risk of becoming dehydrated
 - Measure the incidence of potentially clinically significant dehydration
- > Degree of dehydration would be greater
 - during the wet season
 - missions of longer duration



Study Aims

- > Did NOT aim to determine the effects of dehydration on staff – potentially much harder to assess



Methods

Subjects

- > Prospective observational field study
- > Convenience voluntary sample of staff
 - Aircrew, paramedics, doctors
- > **Staff asked not to alter normal fluid consumption routine**



Methods

Procedures

- > 2 data collection periods
 - April-June 2008 (dry season)
 - Dec 2008-Jan 2009 (wet season)
- > Daylight missions (0600-1800hrs)
- > Pre and post mission weights
- > Aircraft cabin temperature recorded
- > Environmental data obtained from Australian Bureau of Meteorology for Townsville airport



Methods

Clothing

- > Standard items for flight

Statistical analysis

- > Normally distributed continuous variables - student's t-test
- > Comparison of proportions – Chi squared test or Fisher's exact test
- > Correlations between continuous variables – Pearson's method

Ethics

- > Approval considered



Results

STAFF

- > 4 females, 18 males = 22 staff
- > Mean age 40yrs (28yrs-61yrs)
- > Living in Nth Qld 11yrs (1mth-47yrs)
- > Average 4 data sets from each person



Results

MISSIONS

> Number

- 100 (59 dry, 41 wet) performed
- Data collected from 45%
- 92 data sets from possible 500

> Types

- 6 Primary retrieval missions
- 34 Interhospital transfers (76%)
- 5 Search and Rescue



Results

> Environment – wet vs dry

- Mean max temp (31.6°C v's 27.7°C, $p < 0.001$)
- Mean max cabin temp (32.2°C v's 27.9°C, $p < 0.0001$)
- Mean humidity 9am (72% v's 63%, $p < 0.001$)

> Duration

- Mean 202 minutes (95% CI 179 - 225)



Results

> Included vs excluded missions

- Proportion of included missions higher in wet than dry season (26/41, 63.4% vs 19/59, 32.2%, $p=0.02$)
- No statistically significant differences in
 - Duration of mission
 - Type of mission
 - Number of missions per day
 - Environmental data

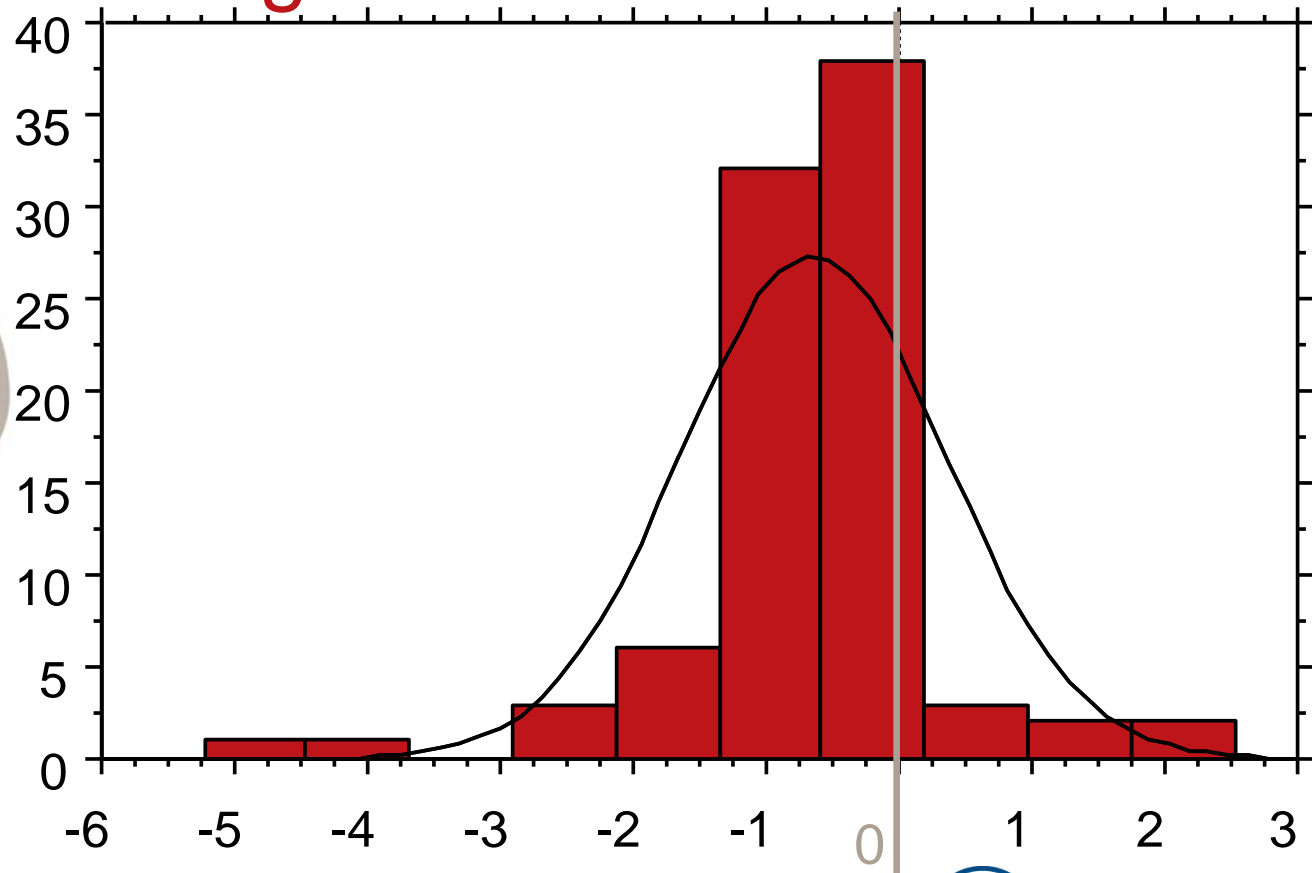


Results

PRIMARY OUTCOME VARIABLE

- > Mean weight loss 0.53kg = 0.66% of total body weight (95% CI 0.64-0.68)

Distribution of percentage weight change



Subject
s

% weight
change

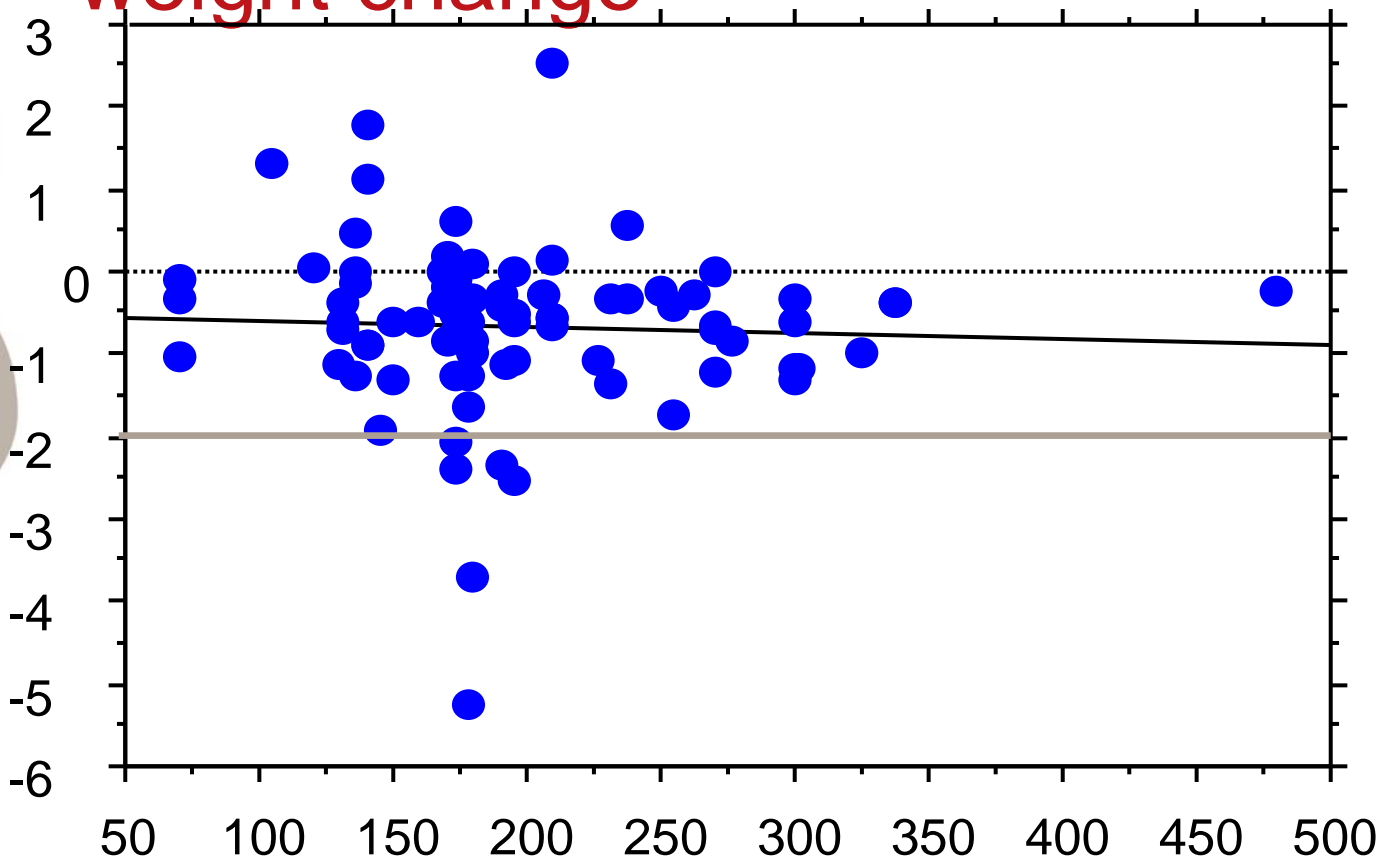


Results

- > No significant difference in % weight change between dry and wet seasons – 0.60% (95% CI 0.29-0.91) vs 0.70% (95% CI 0.44-0.98), $p=0.59$

Mission duration and percentage weight change

% weight change



Mission duration mins





Results

- > >2% dehydration in 6/92 (6.5%, 95% CI 2.4-13.7) cases
 - 5/22 subjects
 - No difference between seasons ($p=0.44$)
 - No correlation with mission duration ($p=0.68$)



Discussion

- > Mean degree of dehydration was not high enough to be detrimental to performance
- > 6.5% of cases did become dehydrated to >2%
 - Staff are at potential risk



Discussion

- > Anticipated that environmental and flight specific variables may contribute to dehydration
 - Not sufficiently powered to detect a difference in each variable
 - Behavioral factors may influence hydration status



Discussion

- > Days on which data collected representative of normal working conditions
- > Adaptation to heat assumed to have occurred



Limitations

- > Field study – unable to control for all variables
- > Study may have influenced fluid intake
- > Staff with inter-current illness not excluded
- > 18% of data from 1 subject
- > 18% of potential data collected

Limitations

> Assessment of environmental conditions

• In aircraft





Future directions

- > To determine individual and/or behavioural factors leading to significant dehydration
- > A larger study, controlling for fluid intake and assessing hydration status prior to initial weigh in
- > Use of Thermal Work Limit to assess environmental work risks



Conclusion

- > Staff involved in helicopter retrieval missions in North Queensland become dehydrated by approximately 0.66% (95% CI 0.64-0.68) of their total body weight
- > Incidence of potentially clinically significant dehydration was 6.5% (95% CI 2.4-13.7)
- > No environmental or flight specific variables identified to predispose to dehydration



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References

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Thank you

