Individualized Centrifugation Training for Improving Microgravity Induced Orthostatic Tolerance

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Orthostasis: "Standing up"

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Hemodynamic

⇓ Venous return
⇓ Blood pressure

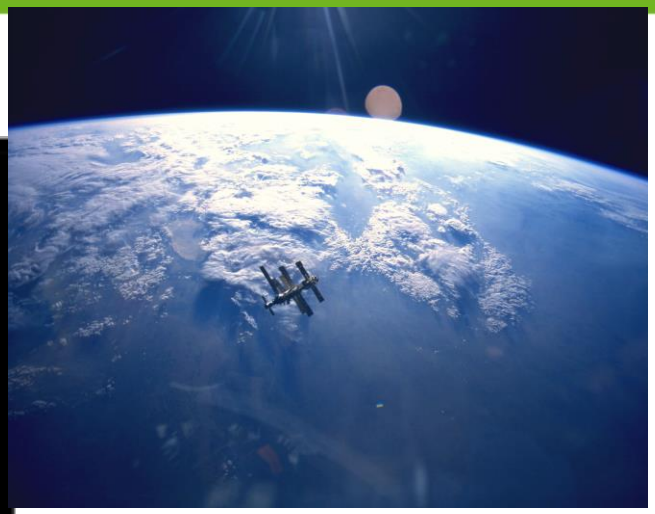
⇓⇓⇓
⇑ NERVOUS ACTIVITY

⇓⇓⇓
⇑Heart rate
⇑ Vascular resistance
⇑Blood pressure

Hormonal

- Stress hormones
- Other hormones

Orthostasis: PROBLEM?



Combining HUT + LBNP

Artificial Gravity (AG)

- Artificial Gravity (AG) improves orthostatic tolerance
  (Evans et al. 2004. *Aviat Space Environ Med* 75: 850-8)
  (Iwase et al. 2002 *Environmental Medicine* 64: 29 -33)

- AG maintains orthostatic tolerance in bed rested men
  (Stenger et al. 2012. *Eur J Appl Physiol* 112(2): 605-16)

- Effects across gender not clear
  (Fong et al. 2007. *Gravit Physiol* 14(1): P15-9)

- Effects of *individualized* AG training not known

Aims & Objectives

- Effects of **individualized** centrifugation on orthostatic tolerance

- Is artificial gravity training procol effective in both sexes?

Centrifugation during spaceflight may prevent orthostatic intolerance upon return to Earth

Hypothesis

45 min of AG increases orthostatic tolerance of men & women

Methodology

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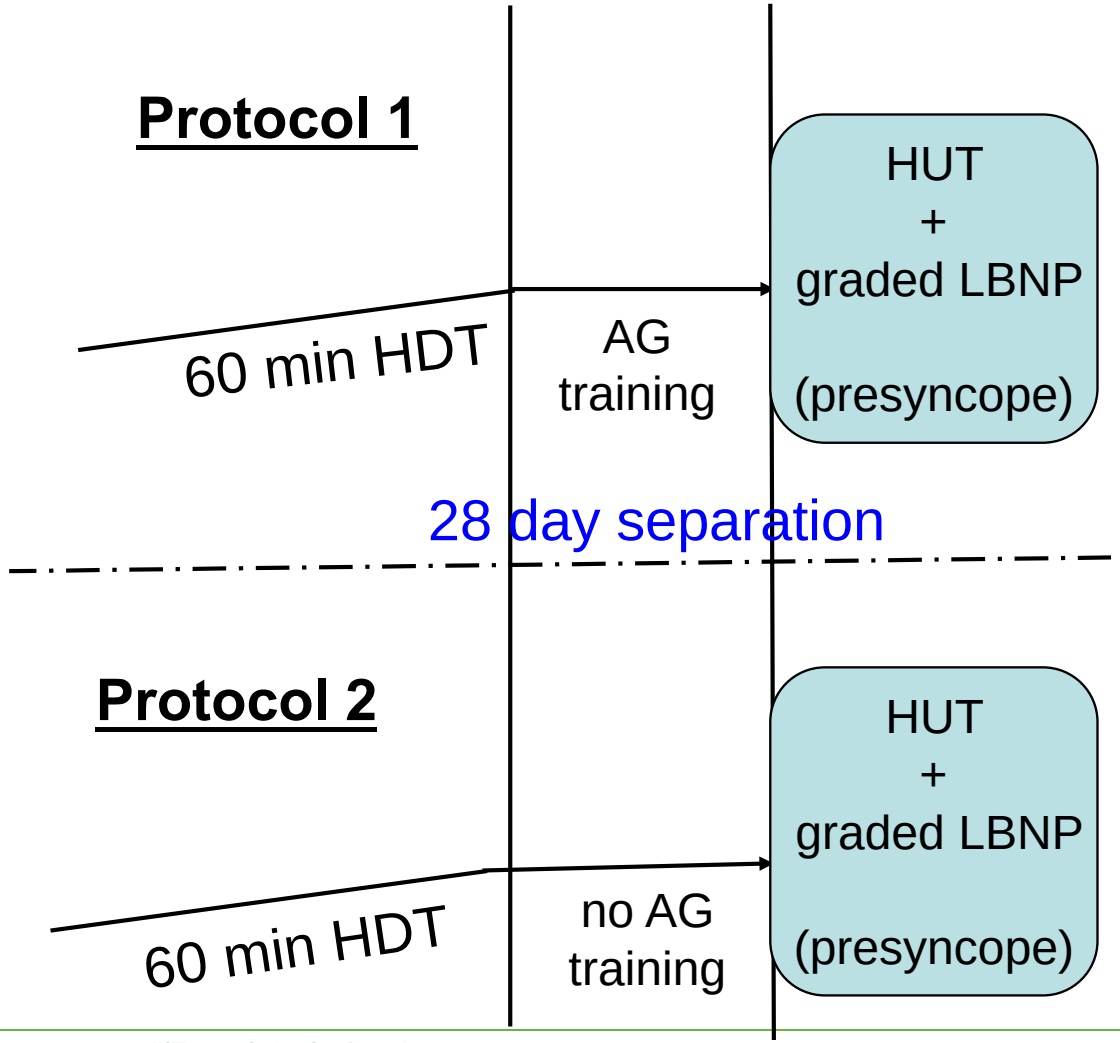
- 7 males and 5 females



Artificial Gravity Protocol

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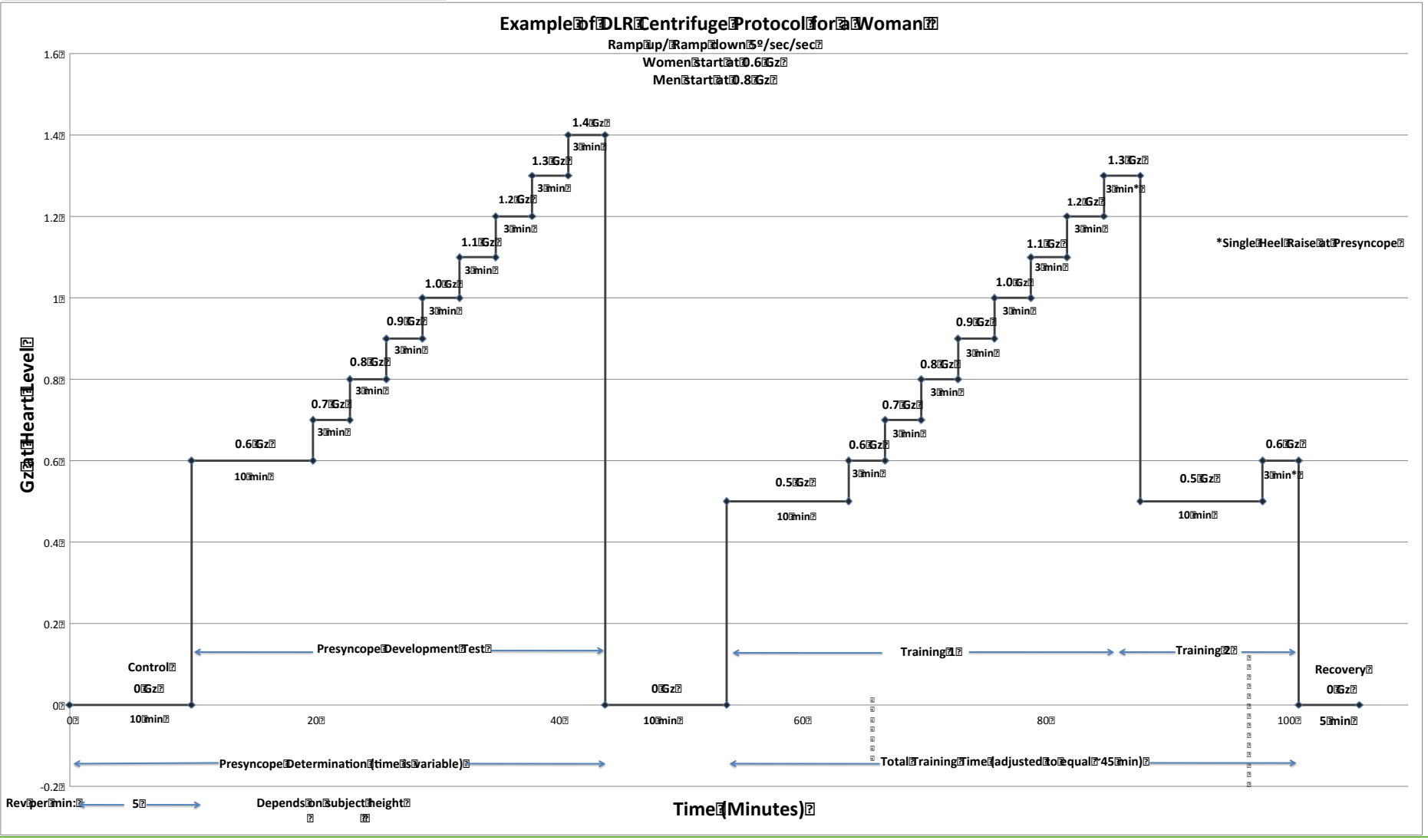
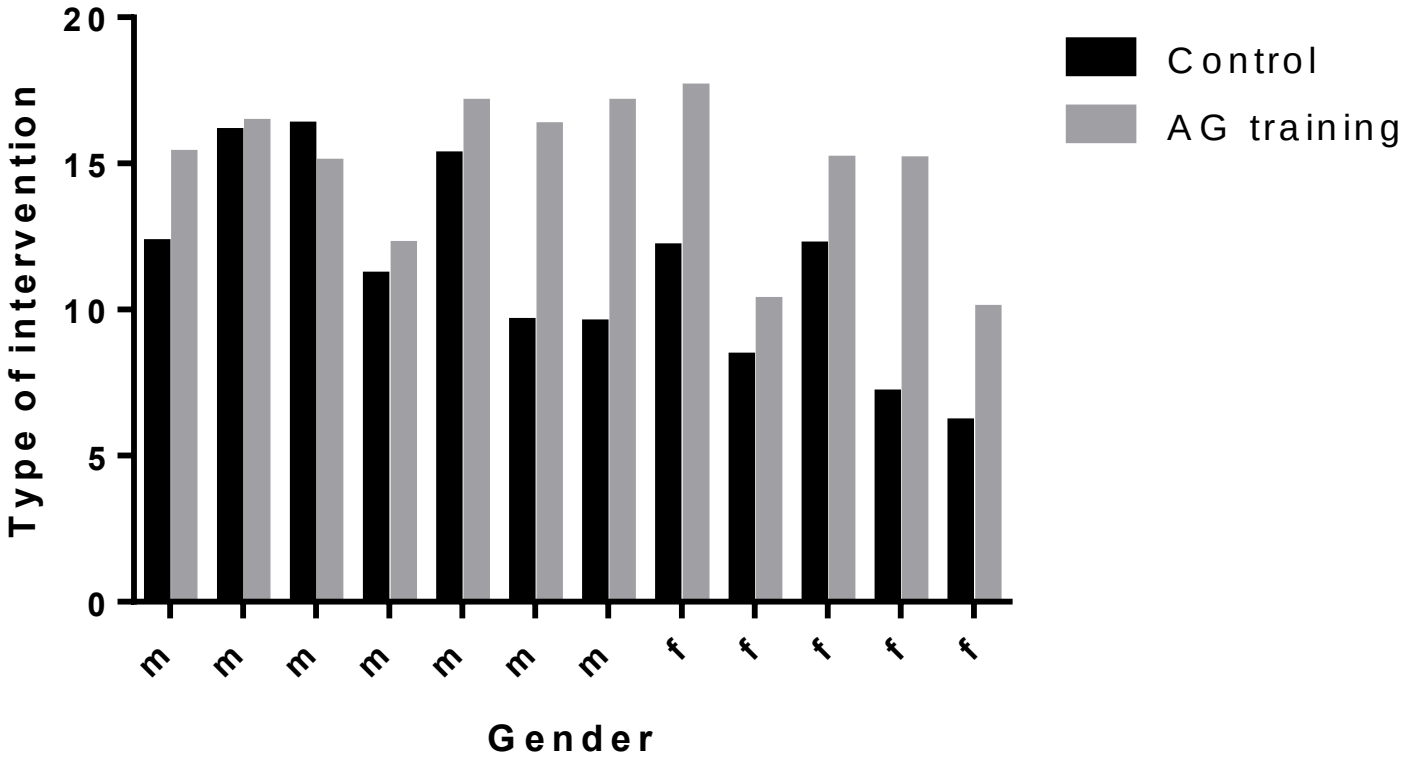


Results



AG improved orthostatic tolerance (11 min vs 14 min, $p < 0.0019$) and this improvement was seen in both sexes ($p < 0.0352$)

Conclusions

- Artificial Gravity improves orthostatic tolerance
- Orthostatic tolerance improved in males and females
- Individualized AG training program is important

Scientific Team

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