

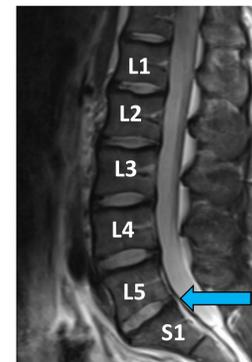
Early, low-intensity controlled exercise helps reduce Low Back Pain symptoms.

Movement is Medicine for the Spine: What Simulated Spaceflight Can Teach Us About Treating Low Back Pain on Earth.

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Introduction

- Low back Pain is widespread in the working and older age group, with around 40% of workplace-related ill health being linked to spinal health (HSE, 2018).
- Astronauts also have high incidences of spinal injury and ill health and are roughly four times more likely to experience intravertebral disc herniation compared to peers (Johnson *et al*, 2010).
- LBP and post-flight astronauts both experience spinal deconditioning and loss of deep spinal extensor muscles, especially at the L5/S1 level
- Spaceflight and simulated spaceflight can be used to study the aetiology of low back pain as an accelerated model of aging and sedentary lifestyle in which measurements can be taken before and after the onset of pain.
- Research question: Is FRED plus standard rehabilitation better than standard rehabilitation alone for low back pain after simulated spaceflight?



MRI of the spine, which shows the L5/S1 level, which is particularly susceptible to deconditioning in aging and spaceflight.

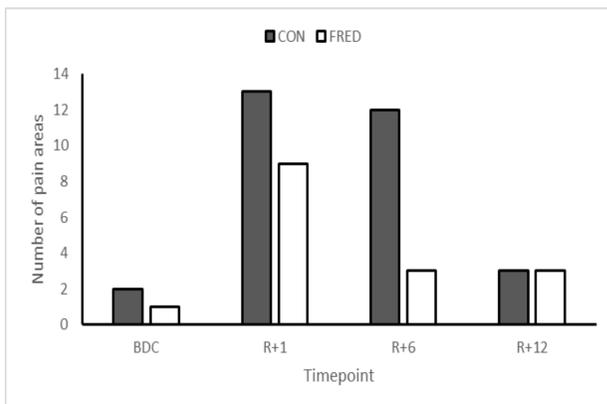
A participant using FRED. FRED is a modified elliptical trainer with the near-frictionless movement of the footplates. FRED offers a postural challenge in which the user is required to control the movement velocity and maintain a stable upright posture



Methods

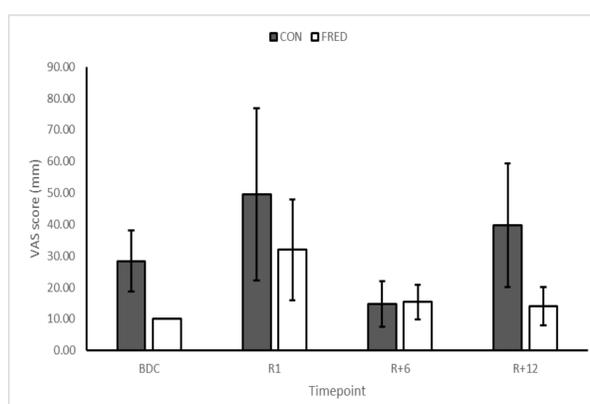
- 24 participants (8F/16M) undertook 60-days of head-down tilt bed rest as part of the Artificial Gravity Bed Rest (AGBRESA) Study in Cologne, Germany in 2019
- Written bespoke pain questionnaires were provided in German
- Answered on baseline data collection (BDC) day-12, BDC-1, weekly during HDT (HDT7, HDT14, etc.), every day during the first week of recovery (R+0 to R+6) and on the penultimate day of recovery (R+12).
- Participants were divided into a control group (CON) who undertook standard rehabilitation and an intervention group (FRED) who undertook standard rehabilitation plus daily FRED train for up to 30 minutes.

Number of Pain Reports



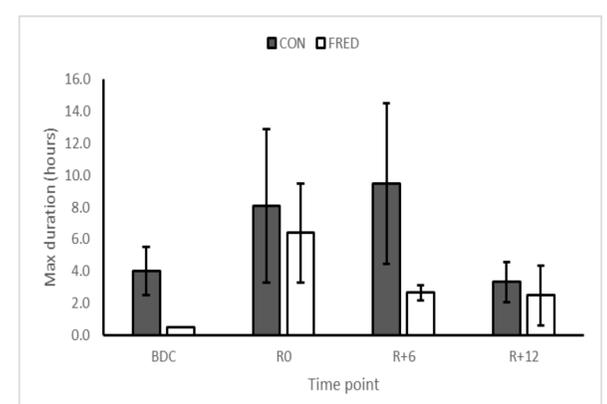
- By R+6 the FRED group showed a marked reduction in the number of pain reports compared to CON group (R+6: FRED=3, CON=12).
- By R+12 both groups had a low number of back pain reports

Visual Analogue Scale Score



- No Significant Difference between groups at any time point, but there is a clinically meaningful reduction in the FRED group at R+1, which remained low to R+12
- At R+1 FRED group had a lower pain intensity score after 1 session FRED=28.2±12.2mm, CON group (44.6±22.1mm)
- At R+6 both groups had comparable scores
- At R+12 the FRED group reported less pain intensity than the CON group

Maximum Symptom Duration



- By R+6 the FRED group experienced pain for less time compared to the CON group (FRED= 2.7±0.5hr and CON= 9.5±5hr)
- The lower duration of pain was maintained at R+12 in the FRED group and had dropped in the CON group

Conclusions

- Thirteen sessions of up to 30 minutes of FRED exercise in addition to standard reconditioning seems to have a beneficial effect during the early (R+1 to R+6) reconditioning phase.
- There was little no additional benefit of adding FRED exercise to the standard reconditioning program between R+6 and R+12
- Low-intensity early exercise had a clinically meaningful reduction in pain in the early phase of re-ambulation after 60-days of simulated spaceflight, which can be used as an accelerated model of aging and sedentary lifestyle.

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