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Author: Dr. Luke Hughes
Northumbria University, United Kingdom, luke4.hughes@northumbria.ac.uk

# OPTIMISATION OF INFLIGHT AND POST-SPACEFLIGHT EXERCISE COUNTERMEASURES USING BLOOD FLOW RESTRICTION EXERCISE TO MITIGATE MICROGRAVITY-INDUCED PHYSIOLOGICAL DECONDITIONING

**Abstract**

During spaceflight missions, astronauts work in an extreme environment with several hazards to physical health and performance. Exposure to microgravity results in remarkable deconditioning of several physiological systems, leading to impaired physical condition and human performance, posing a major risk to overall mission success and crew safety. Physical exercise is the cornerstone of strategies to mitigate physical deconditioning during spaceflight. Decades of research have enabled development of more optimal exercise strategies and equipment onboard the International Space Station. However, the effects of microgravity cannot be completely ameliorated with current exercise countermeasures. Moreover, future spaceflight missions deeper into space require a new generation of spacecraft, which will place yet more constraints on the use of exercise by limiting the amount, size and weight of exercise equipment and the time available for exercise. Space agencies are exploring ways to optimise exercise countermeasures for spaceflight, specifically exercise strategies that are more efficient, require less equipment and are less time-consuming. Blood flow restriction exercise is a low intensity exercise strategy that requires minimal equipment and can elicit positive training benefits across multiple physiological systems. Using a tourniquet cuff to restrict blood flow in the exercising limb during exercise, it elicits several positive training adaptations in the physiological systems affected by microgravity, as evidenced in ground based analogous research. This method of exercise training has potential as a strategy to optimise exercise countermeasures during spaceflight and reconditioning in terrestrial and partial gravity environments. It has been recognisded by NASA and ESA as a promising strategy to optimise exercise countermeasures during spaceflight and improve human healthcare on Earth. This form of exercise training requires minimal equipment and is low-intensity, which compliments the anticipated operational, technical and logistical constraints of future spaceflight missions beyond low earth orbit.