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Author: Ms. Donya Naz Divsalar
Simon Fraser University, Canada, ddivsala@sfu.ca

Mr. Farshid Sadeghian
Simon Fraser University, Canada, farshid_sadeghian@sfu.ca
Mr. Malcom Tremblay
Simon Fraser University, Canada, mtrembla@sfu.ca
Dr. Andrew Blaber
Simon Fraser University, Canada, ablaber@sfu.ca

INVESTIGATING THE EFFECTS OF PAIRED HEEL-RAISE AND SQUAT EXERCISE FOLLOWING CENTRIFUGATION ON CEREBROVASCULAR FLOW, USING A SHORT ARM HUMAN CENTRIFUGE (SAHC)

Abstract

Post- flight studies have widely shown that exposure to microgravity causes temporary and permanent physiological damage to the human body. These include, but are not limited to, decreased orthostatic tolerance, impaired cardiovascular regulation, vision impairments, and weakening of cerebral blood flow regulation. Ground-based studies have examined the effectiveness of centrifugal forces in creating Artificial Gravity (AG) as a spaceflight deconditioning countermeasure for many years. The most recent research has suggested that a combination of exercise along with centrifugation might act as a feasible method for keeping astronauts physiologically healthy during long-term missions. Our study aims to investigate the effect of paired heel-raises and squatting combined with centrifugation on muscle-pump baroreflex activity. To test our hypothesis, 10 male and 10 female participants will undergo cardio-postural assessment during a supine-to-stand test after a 45-minute period of centrifugation, using a previously established model of a SAHC. After the centrifugation period and following the stand test, participants are asked to perform regular squat exercise, while instructed to specifically raising their heels when lowering their bodies. To ensure the correctness of the exercise, subject movements will be monitored through infrared cameras placed on three locations along the exercise environment. Cerebral blood flow will be assessed before, during and after centrifugation using transcranial Doppler ultrasound. The expected result following this protocol is an increase in muscle-pump baroreflex activity. If indeed an increase in baroreflex activity is observed, a shift in individualized AG training will be recommended. This small change in exercise regimen may result in significant cardiovascular advantages that can be applicable and useful for future missions through incorporating this simple exercise on board of commercial spacecrafts and Lunar bases to ensure the health of astronauts.