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# APPLICATIONS OF ELECTRICAL STIMULATION AND ELECTROTACTILE FEEDBACK IN HUMAN SPACEFLIGHT

**Abstract**

Electrical stimulation is widely used in a clinical context for muscle activation, pain reduction, electrotactile feedback systems and neurophysiological tests. The presented work deals with possible applications of electrical stimulation in human space flight. In the early years of human space flight, tests with electrical stimulation were performed to countermeasure muscle loss caused by weightlessness, but this idea was not developed further. Improved knowledge and possibilities in the use of electrical stimulation open up new opportunities for its usage in future space flight activities. In this work the potential of electrical stimulation in space related activities is presented. Electrotactile feedback systems can be used in several approaches as an augmented reality platform to improve feedback in astronautical activities performed on the International Space Station, extra-vehicular activities or planetary operations. Electrotactile systems have the potential to enhance body functions such as orientation and environmental awareness. The stimulation of muscle fibres can be used to reduce muscle loss in long time duration space missions. Muscles that can not be trained with the facilities provided on board of a space ship can be stimulated with electrical stimulation to assure that crucial muscle groups are ready for operation when landing on the surface of another planet to perform the required tasks. This work explains the basic principles of electrical stimulation and also considers tactile stimulation, based on outcomes of a research project at Bournemouth University in joined collaboration with the National Health Service (NHS) in the UK. Different scenarios of possible applications are presented to show the potential of electrical stimulation in human space flight.