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IMPACT OF NEUROTECHNOLOGY ON SPACE MEDICINE

Abstract

The research and development of long duration interplanetary space missions brings with it the need to increase our understanding of the structural, morphological, molecular and functional alterations that the Central Nervous System (CNS) undergoes after prolonged exposure to ionizing radiation and microgravity.

Consequently, the efforts of the scientific community have focused on the characterization of certain effects that are extremely detrimental to the physiology of the human brain, mainly affecting the somatosensory and visual cortex, cerebral connectivity and blood flow, and the proper execution of motor actions in astronauts.

Thus, one of the most promising alternatives for monitoring health and improving the productivity and performance of crew members, is the implementation of neurotechnological tools that allow establishing a control and communication channel between the neural activity of users and a certain device.

A clear example of this can be seen in the brain-computer interfaces (BCIs) aimed at space exploration, which are developed with the purpose of recording and detecting those brain signals referring to the user's motor intentions, and which will later be translated into commands that a device or machine can execute; thus representing a promising approach that could contribute both to the generation of reports associated with the mental and cognitive state of astronauts, and to the control of multiple tasks performed solely by neural activity.

For this reason, this paper aims to provide an exhaustive and in-depth review of the studies that have been produced to identify the results that could originate from the application of brain-computer interfaces in space exploration and medicine, as well as a detailed description of their non-invasive brain mapping techniques that have significant potential for use in space missions.