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DEALING WITH EXTREME CONDITION AT HIGH ALTITUDE AND IN SPACE

Abstract

Hypoxia as a result of reduced oxygen levels and air pressure at high altitudes about 2400m above sea level has proven to pose an extremely challenging and sometimes fatal condition for humans, especially when lacking acclimatization. In hypoxic and hypobaric shuttle environment for extravehicular activity (EVA), which is likely to happen in imminent beyond low Earth orbit missions, astronauts could develop symptoms very similar to Acute Mountain Sickness (AMS) and therefore put missions and their own lives at high risk. AMS is one of the most common high-altitude illnesses manifesting itself in the form of a combination of symptoms including headache, loss of appetite, nausea, fatigue/weakness, sensorimotor dysfunction (dizziness) as well as insomnia. To this point a paper-based self-assessment of a subject exposed to high altitude using the Lake Louise Score (LLS) has been the only standardized mean for diagnosing AMS and assessing its severity. The aim of this study is to evaluate the feasibility of developing a light-weight integrated telemedicine device assessing and preventing the development of AMS or similar illness by analyzing the relevant weighted physiological and environment parameters. In the case of space missions, the device would communicate recommendations directly to flight surgeon as medical decision aid, and directly to the expedition leader/mountaineer himself in the case of high-altitude activities. Based on extremely valuable data obtained in a study conducted by the German Aerospace Center (DLR) in which two mountaineers spent three weeks in a hypobaric chamber simulating oxygen levels as low as 8%, crucial parameters and early warning factors for prevention of AMS will be identified according to the observed physiological changes of the two mountaineers. One of the mountaineers actually developed AMS during the study. Additionally, the possibility of recording physiological parameters of subjects during high-altitude group expedition using telemedicine devices will be investigated. Having a way of detecting critical physiological changes in hypoxic and hypobaric at an early stage constitutes a great application and example of how space research can directly benefit terrestrial problems, as AMS is still a very common unaddressed illness among mountaineers.