IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IPB)

Author: Ms. Sucheshnadevi Patil
Humans In Space Inc. (HIS), United States

REMOTE HEALTH DATA ANALYSIS OF HAND AND WRIST MUSCULOSKELETAL INJURIES IN ASTRONAUTS DURING IN-FLIGHT AND POST-FLIGHT PERIODS WITH DIGITAL HEALTH SOFTWARE SOLUTION USING AIML ALGORITHM FOR PROGNOSIS

Abstract

Musculoskeletal (MKL) injuries are common in astronauts during extravehicular activity (EVA) and intra-vehicular activity (IVA). Extravehicular activities require planned scientific expeditions, assembling structures outside International Space Station (ISS), performing maintenance, and intervening to solve problems outside of the vehicle which cannot be robotically or remotely accomplished. During EVA, astronauts faced injuries such as finger swelling, muscle fatigue, onycholysis, hand fatigue, subungual redness, fingernail pain, hyperperfusion, infections, arthritis, dislocations, and compressive neuropathies. Effects of injury as pain and discomfort are for weeks disrupting their health and mental wellbeing. The spacesuit shoulder circumference and glove design along with the different categories of work performed on ISS during IVA and EVA may cause MKL injuries. Considering the nature of injury and solutions to detect and measure these injuries is significant. Hand injuries are common in both pre-flight training and in-flight extravehicular activity. Hand represented the most injured area of the body during EVA. The repetitive hand motion is a probable cause for discomfort and injuries. Large hand circumference is the dominant effect on the likelihood of onycholysis. The preliminary results suggest that forces on the finger and hand lead to changes in the blood flow at the tip of the fingers, and this phenomenon is measured using the non-invasive LDF sensor inside the astronauts' EMU glove design which is limited for medical prognosis. It is hard to maintain bone and muscle function, with consistent bone loss in space along with a lack of capability to maintain proprioception by the human body, susceptible causing MKL injury. The success of future Exploration missions is dependent on the ability to perform EVA tasks efficiently and safely in these challenging interplanetary environments. Lunar missions have plans for up to 30 times more EVA hours than during the Apollo era. Exploration missions to the moon and mars will present many new challenges about crew health, safety, and performance. Hence, we introduce our innovative advanced technological digital health software solution based on AIML algorithm which acts as injury measurement tool for prognosis. Medical technology for the prognosis of these MKL injuries after months of humans on moon mission is an innovative solution to further diagnose injuries and find solutions digitally for the first colony on the moon and mars. Moon exploration missions will have more initial EVA work, which is prone to musculoskeletal injuries to be analyzed for better recovery and human health for long-duration space missions.