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MINDFUL MISSION: NAVIGATING MENTAL HEALTH IN SPACE WITH WEARABLE TECH OR BEYOND THE STARS: HARNESSING WEARABLE TECH TO SAFEGUARD ASTRONAUT MENTAL HEALTH

Abstract

The mental health of NASA crew members is a critical issue for understanding the successful execution of long-duration missions, particularly in relation to the development of psychiatric illnesses. With the expansion of the space program and the increasing human presence in space, several risk factors regarding mental health are more likely to emerge, which may have significant operational outcomes. Artificial intelligence (AI) has proven successful in healthcare in recent years by augmenting expert clinical decision-making or enhancing medical knowledge. Deploying AI tools in the context of a space mission could similarly improve crew self-reliance and enhance their psychological well-being. Recently, there have been rapid developments in AI technology and wearable technology for healthcare and clinical use, offering numerous advantages for individualizing diagnoses and treating psychiatric disorders, including anxiety and depression. Wearable technology includes biometric data tracking in different iterations that users can wear in multiple forms, including devices such as smartwatches, smart glasses, and smart bracelets, external sensors such as electrocardiogram electrodes, implantable sensors such as dermal smart patches, and electronic textiles such as smart clothes. Wearable devices are designed to provide a constant stream of healthcare data for disease diagnosis and treatment. This is achieved by continuously recording physiological parameters such as temperature, blood pressure, blood oxygen, respiratory rate, physical movement, and the electrical activity of the heart, brain, and skin. Real-time monitoring of symptoms of anxiety and depression can be assessed through many such parameters collected by wearable devices. For instance, Spaceflight Associated Neuro-Ocular Syndrome (SANS) is a relatively new condition with limited data on its causes, mechanisms, and long-term effects. The small proportion of astronauts who suffer from SANS makes it challenging to comprehend this condition altogether. However, with the development of wearable technologies, it can continuously monitor astronaut health during spaceflight and provide real-time data on changes in visual and neural health, including the onset of SANS. Therefore, this study aims to evaluate the effectiveness and benefits of wearable AI used for anxiety and depression and demonstrate how it can benefit crew members in improving astronauts' performance, well-being, and mental health, ultimately enhancing mission success. The integration of wearable AI with space missions may provide new insights into preventing mental health disorders and maintaining crew well-being.