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STRESS, SLEEP CIRCADIAN RHYTHMS AND SALIVARY MELATONIN IN SPACE FLIGHT:
SIMULATED MARS ANALOGUE ENVIRONMENT

Abstract

Sleep disruption and reduced sleep duration have been documented during extreme conditions and spaceflight in both American astronauts and Russian cosmonauts, but the cause of the sleep disruptions remains unknown. So, this study was designed to evaluate the effect of extreme, multinational and isolated environments on the subjective and objective sleep disruption of crewmembers during a long-duration mission in a space analogue environment and the effect of stress. In this study, the 6 crew members lived (24 h) for 14 days during a short-term stay at the Mars Desert Research Station (MDRS) in Utah, USA. Sleep parameters were collected objectively using SenseWear Pro Armband™ (SWA) (Body Media, Pittsburgh, PA) salivary melatonin and by subjective means. The current stress test and salivary cortisol were measured. Data were analyzed using SPSS, version 11 (SPSS, Chicago, IL, USA). Total sleeping time, awaking number and sleep onset latency were decreased for first 7 days and further down there was a sudden increase and later it continued to increase till the end of mission ($P=0.467$), while CST score for pre and post sleep salivary cortisol and melatonin were increased for first 7 days and further down it decreased till the end of mission ($p=0.545$). Alertness on wake up was increased till the end of mission ($p=0.89$). There was good correlation with both objective or subjective sleep measures ($r=0.73$, $p=0.01$). This study proved that sleep stability and the sleep disruption leads to increased stress levels. These results suggest that SenseWear Pro Armband™ (SWA) is successfully employed for sleep decrements in astronauts during space missions. So, further study is required to evaluate the efficiency of Sense Wear and sleep salivary biomarker in detection of stress and sleep disturbance of astronauts in isolated environments in long duration missions.

Keywords: Stress, Sleep, BodyMedia's activity monitor, circadian rhythms, salivary melatonin, salivary cortisol, Mars