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THE INFLUENCE OF CIRCADIAN RHYTHMS ON HUMAN PERFORMANCE IN SPACE

Abstract

The circadian rhythm is a cycle that takes place approximately every 24 hours; different physiological processes are repeated regularly in this timeframe. Some examples are the sleep-wake rhythm, hormones secretion, variation in body temperature and other parameters related to the circulatory system. Circadian rhythms depends on a biological clock, located in the suprachiasmatic nucleus of the hypothalamus, which allows the human body to maintain a synchronization with the natural day and night's cycle, 24 hours, for example through the sunlight, ambient temperature or social habits. The stability of these rhythms is inevitably altered if some of these external factors are no longer present, such as in the case of astronauts in orbit around the Earth, for instance those working in the International Space Station (ISS). Circadian rhythms and the wake-sleep cycle undergo a de-synchronization that has a direct effect on human's performance, for example in some experiments carried out on Earth in absence of sunlight (i.e. in caves) has been observed that the wake-sleep cycle tends to extend up to 36 hours, while the rhythm of variation of the body temperature becomes about 25 hours. The effects of the alteration of circadian rhythms during long-term spaceflight has not been identified yet because few studies have analysed this phenomenon until now. The behaviour of the human body in space has been studied from many points of view, and his deep understanding is essential in order to design missions that lead humans go beyond Low Earth Orbit (LEO), to the Moon, Mars and beyond. The knowledge of the effects that space has on human being allow to increase the possibility of success of a human's mission, trying to prevent the arise of physical and psychophysical problems. The aim of this paper is to analyse how the de-synchronization of circadian rhythms and the wake-sleep cycle influence the astronaut's performance in long-term spaceflight, taking a hard look at the data collected by space agency which has debated this argument so far.