Ten-year study highlights sleep deficiency and sleep medication use in astronauts

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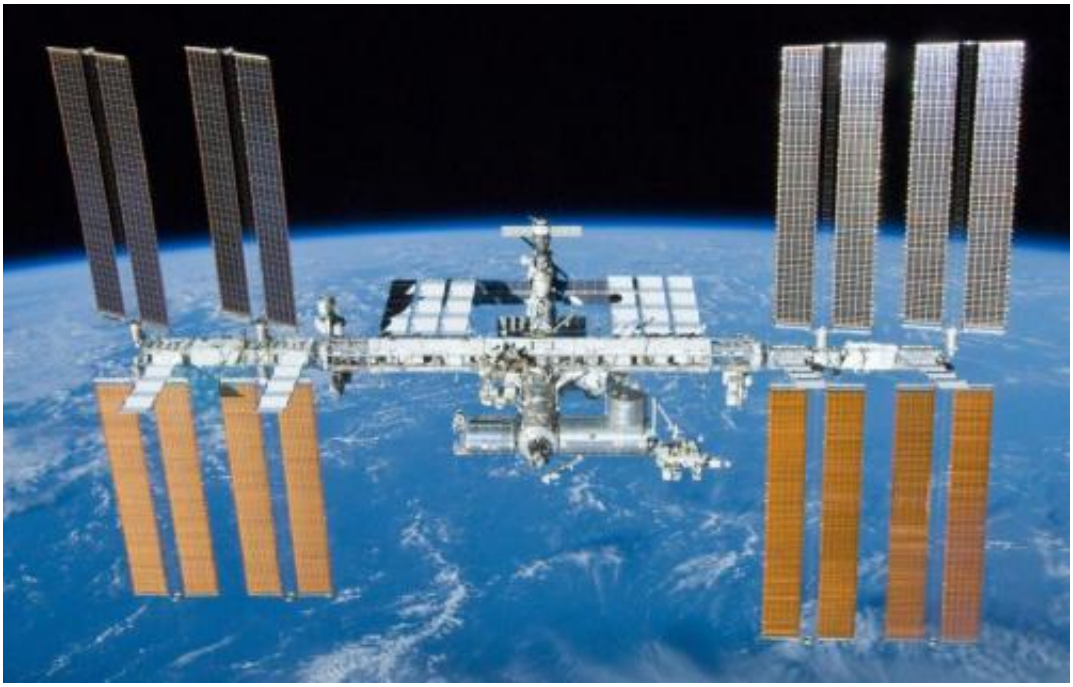

The International Space Station is featured in this image photographed by an STS-132 crew member on board the Space Shuttle Atlantis after the station and shuttle began their post-undocking relative separation. Credit: NASA/Crew of STS-132

In an extensive study of sleep monitoring and sleeping pill use in astronauts, researchers from Brigham and Women's Hospital (BWH) Division of Sleep and Circadian Disorders, Harvard Medical School, and the University of Colorado found that astronauts suffer considerable

sleep deficiency in the weeks leading up to and during space flight. The research also highlights widespread use of sleeping medication use among astronauts.

The study, published in *The Lancet Neurology* on August 8, 2014, recorded more than 4,000 nights of sleep on Earth, and more than 4,200 nights in space using data from 64 astronauts on 80 Shuttle missions and 21 astronauts aboard International Space Station (ISS) missions. The 10-year study is the largest study of sleep during space flight ever conducted. The study concludes that more effective countermeasures to promote sleep during space flight are needed in order to optimize human performance.

"Sleep deficiency is pervasive among crew members," stated Laura K. Barger, PhD, associate physiologist in the BWH Division of Sleep and Circadian Disorders, and lead study author. "It's clear that more effective measures are needed to promote adequate sleep in crew members, both during training and space flight, as sleep deficiency has been associated with performance decrements in numerous laboratory and field-based studies."

Despite NASA scheduling 8.5 hours of sleep per night for crew members in space flight, the average (mean) duration of sleep during space flight was just under six (5.96) hours on shuttle missions, and just over six hours (6.09) on ISS missions. Twelve percent of sleep episodes on shuttle missions and 24 percent on ISS missions lasted seven hours or more, as compared to 42 percent and 50 percent, respectively, in a post-flight data collection interval when most astronauts slept at home.

Moreover, the results suggest that astronauts' build-up of sleep deficiency began long before launch, as they averaged less than 6.5 hours sleep per night during the training interval occurring approximately three months prior to space flight.

The research also highlights widespread use of sleeping medications such as zolpidem and zaleplon during space flight. Three-quarters of ISS crew members reported taking sleep medication at some point during their time on the space station, and more than three-quarters (78 percent) of shuttle-mission crew members used medication on more than half (52 percent) of nights in space.

"The ability for a crew member to optimally perform if awakened from sleep by an emergency alarm may be jeopardized by the use of sleep-promoting pharmaceuticals," said Barger. "Routine use of such medications by crew members operating spacecraft are of particular concern, given the U. S. Federal Drug Administration (FDA) warning that patients using sleeping pills should be cautioned against engaging in hazardous occupations requiring complete mental alertness or motor coordination, including potential impairment of performance of such activities that may occur the day following ingestion of sedative/hypnotics. This consideration is especially important because all crew members on a given mission may be under the influence of a sleep promoting medication at the same time."

Charles Czeisler, PhD, MD, FRCP, chief, BWH Division of Sleep and Circadian Disorders, and senior study author, adds: "Future exploration spaceflight missions to the moon, Mars or beyond will require development of more effective countermeasures to promote sleep during spaceflight in order to optimize human performance. These measures may include scheduling modifications, strategically timed exposure to specific wavelengths of light, and behavioral strategies to ensure adequate sleep, which is essential for maintaining health, performance and safety."

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Provided by Brigham and Women's Hospital