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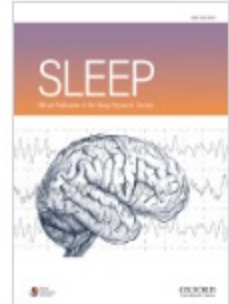
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Effects of zolpidem and zaleplon on cognitive performance after emergent morning awakenings at T_{max}: a randomized placebo-controlled trial

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Abstract

Study Objectives

Prescription sleep aids are frequently used in the general population and even more frequently in spaceflight. To evaluate the risk to operational safety, a ground-based, double-blind, placebo-controlled study on the emergent awakening effects of zolpidem and zaleplon was conducted.

Methods

N = 34 participants (age *M* = 42.1 ± 9.7; 25 males; 9 Astronauts, 7 Astronaut candidates, and 18 Flight Controllers) were investigated for three nights separated by *N* = 10 days. They were randomized to ingestion of one of the following at lights out: placebo, 10 mg zaleplon, and either 5 mg (*N* = 20) or 10 mg (*N* = 14) zolpidem. They were awakened abruptly by alarm at the expected *A_{K,max}* (1 hr after lights out for zaleplon; 1.5 hr for placebo/zolpidem). Participants were required to turn off the alarm and perform a cognitive test battery twice, separated by a 20–30 min reading break. They then returned to sleep and were awakened to perform the same cognitive tasks at an average of 6.7 hr after drug ingestion.

Results

Relative to placebo, the effects of 10 mg zaleplon and 5 mg zolpidem on cognitive performance were minor. In contrast, 10 mg zolpidem adversely affected cognitive throughput (*p* < 0.001), psychomotor vigilance (*p* < 0.001), working memory (*p* < 0.01), delayed word recall (*p* < 0.05), and subjective sleepiness (*p* < 0.01) at the first emergent awakening. At terminal awakening, neither cognitive performance nor subjective sleepiness was impaired after ingestion of zaleplon or zolpidem (5 mg and 10 mg) compared with placebo.

Conclusions

Presleep ingestion of sleep medications, especially 10 mg zolpidem, poses a risk for performance errors after emergent awakenings near the expected *A_{K,max}*.

Registration

Optimize Astronaut Sleep Medication Efficacy and Individual Effects (clinicaltrials.gov ID NCT03526575).

Keywords: zolpidem, hypnotics, spaceflight, performance, sleep inertia, awakening

Topic: astronauts, space flight, sleep, zaleplon, ingestion, zolpidem, cognitive ability, awakening

Issue Section: Cognitive, Affective and Behavioral Neuroscience of Sleep

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