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Cognitive changes induced by microgravity during parabolic flights

Saturday, September 13, 2025 4:30 PM (20 minutes)

Clarifying the cognitive effects of microgravity is essential for ensuring optimal human performance during future long-duration space and interplanetary missions. Given the limited opportunities for spaceflights, the high cost, and the long-time intervals between launches, terrestrial analogs such as parabolic flight (PF) offer a valuable alternative for controlled experiments.
During four ESA PF campaigns, we investigated the impact of microgravity on two cognitive functions: (1) visuospatial attention (Study 1, using the Posner spatial cueing task) and (2) motor awareness (Study 2; see Salatino et al., 2023 for task details). Participants performed cognitive tasks at 1g before flight (PRE), at 0g (0G) and 1g (1G) during flight, and again at 1g after flight (POST). Stress/arousal levels were monitored through physiological markers.
In Study 1, microgravity enhanced stimulus-driven attentional capture ($p < 0.001$) and impaired voluntary attention control ($p = 0.006$). In Study 2, motor awareness was significantly reduced under microgravity conditions ($p < 0.001$). Notably, these cognitive changes were not attributable to changes in physiological arousal.
These findings highlight the effectiveness of PF as a reliable analog for studying the cognitive impacts of microgravity. The results have significant implications for designing countermeasures to support astronaut performance during space missions and offer promising applications for Earth-based rehabilitation of vestibular and sensorimotor dysfunction.

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The Psychology of Space Exploration and Extreme Environments

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No

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