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MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Sciences onboard the International Space Station and Beyond (6)

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IRIS (IMAGE REVERSAL IN SPACE) - THE EFFECTS OF MICROGRAVITY ON PERCEPTION OF DEPTH-REVERSIBLE FIGURES

Abstract

This experiment investigated whether the perception of depth-reversible figures is altered when the observer is in microgravity. A set of ten bi-stable ambiguous figures was presented to one ISS crew member both in 1g and 0g during orbital flight. The figures included static images (such as the Necker cube), kinetic depth displays (such as a moving plaid and a sphere cluster of moving dots appearing to rotate in one of two directions), and silhouette photographs. For each stimulus figure, the subject reported which of the two possible perceptual configurations he saw first and then continuously indicated when perceptual reversals occurred; each session lasting one minute.

The same first percept was reported both in 1g and in 0g. The time delay for the first reversal between the two possible image interpretations was longer and the number of reversals was fewer in during the first session in microgravity (FD44) as compared to normal gravity. The responses returned to the 1g baseline by FD116. For all figures examined, the probability of seeing a given perceptual configuration was essentially constant regardless of whether the subject was in 0g or 1g. It was also noted that there was a significant increase in the number of errors committed by the ISS crew member during the first session in 0g (FD44) over the pre-flight experiment. By FD116, the number of errors returned to the nominal pre-flight values as the subject perceptually and cognitively adapted to spaceflight. Results also show that figures of similar nature (static images, kinetic depth displays, silhouette photographs etc.) show similar trends in terms of first percept, time to first reversal, reversal rate, and probability of seeing a given perceptual configuration.

These findings confirm that an adaptation of cognitive processes takes place in microgravity during orbital flight. The decrease in the number of perceptual reversals indicates that, consistent with a multi-sensory approach to three-dimensional form perception, gravity has a clear effect on the interpretation of depth-based stimuli and this gravity-based component interferes with visual perception stability.