

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Astronauts: Those Who Make It Happen (5)

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PSYCHOBIOLOGY OF COGNITION AND CREATIVITY IN SPACE ENVIRONMENT

Abstract

Often neglected in the Space science research, Psychology studies are crucial in the future of Human Exploration: distance, isolation and confinement, sensory deprivation, hostile environment require solutions to psychologically support crews. Indeed, human brain has shown several limits under brief simulated microgravity conditions, consisting in reduced neural plasticity and inhibited pain responses (Messerotti et al., 2011; Spironelli Angrilli, 2011).

The authors propose an experiment to measure space effects on astronauts' mental state and performance, made of as a series of tasks and measurements.

Subjects will be administered different tasks representing independent variables: creative-artistic tasks, mental arithmetic and sustained attention tests:

- a creative-artistic task (designed by one of the authors, L. Buzzoni) based on painted and transparent films that can be overlapped to create multiple polychrome effects; creativity and colors are used as stimuli and psychological compensation; this task was already considered by the Italian Space Agency as a candidate to fly on STS-120 mission, ALTEC supporting experiment design and training model manufacturing.

- a mental arithmetic test (DST) consisting of a fast subtraction of a two-digit number from a three-digit number;

- a sustained attention test, named d2;

Other test could be envisaged (e.g. use of Dream Questionnaire) to complete investigations.

Various measures can be foreseen:

- behavioural measures (paper and pencil evaluation of emotional valence, arousal, difficulty, stress level, anxiety);

- possible physiological measures (like EEG recordings, depending on on-board H/W availability, e.g. the EEG equipment only of ALTEA for 26-channel EEG recording);

- task performance: the DST and d2 tests provide number of correct responses and percentage of errors. This allows comparison of performances from ground and space conditions.

The experiment protocol is Ground-Space-Ground: sessions run before, during, and after mission, on the same astronauts: each session should range 60-90 min. This allows the comparison of psychobiological measures in space with the ground ones. The 6-months missions of the new Italian astronauts Luca Parmitano and Samantha Cristoforetti, possibly enlarged to other 2-4 subjects, would allow multiple repetitions on-board, with statistics benefit.

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