

# Creativity and Cognitive Performance of Space Crews: An isolation mixed-gender study



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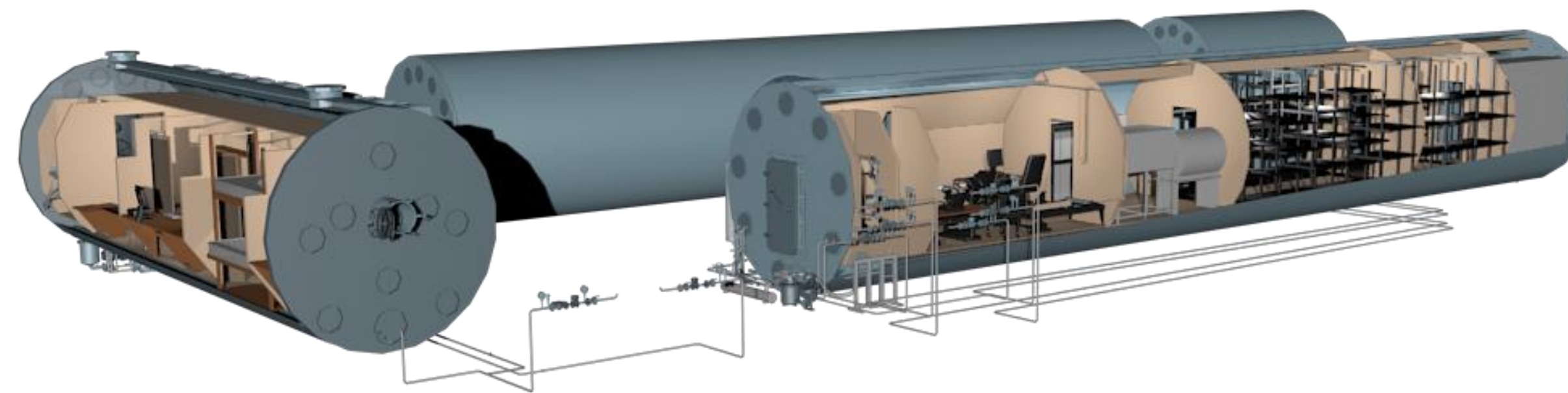
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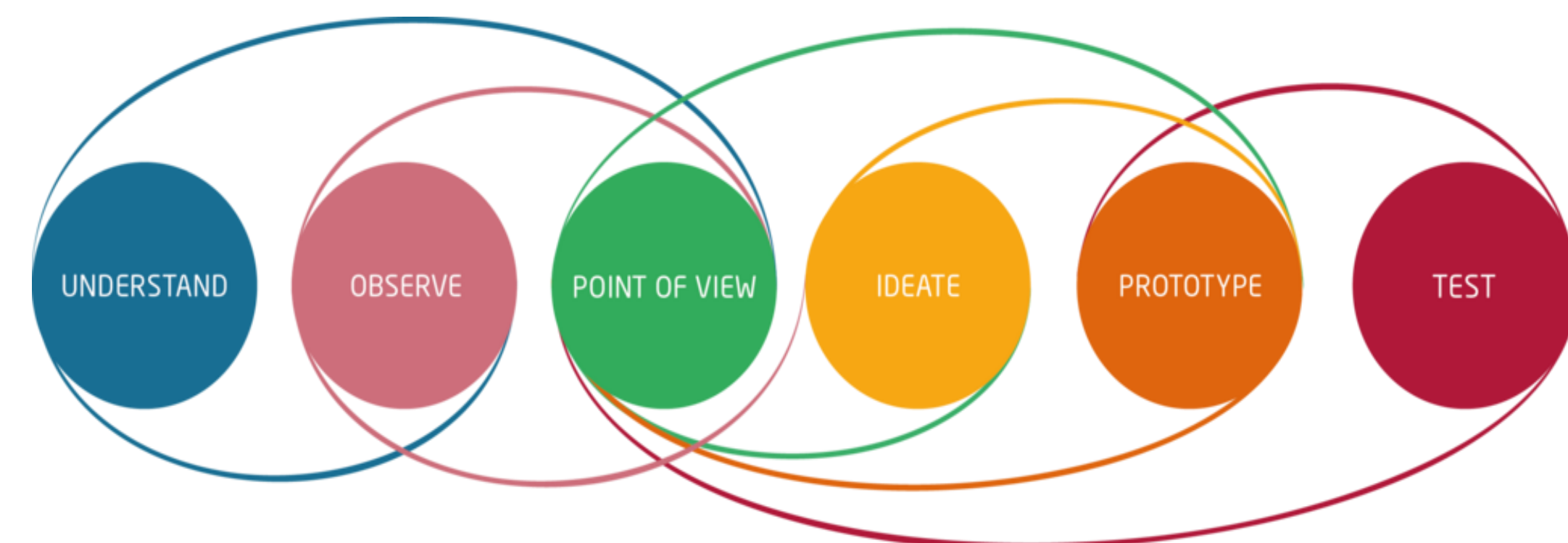
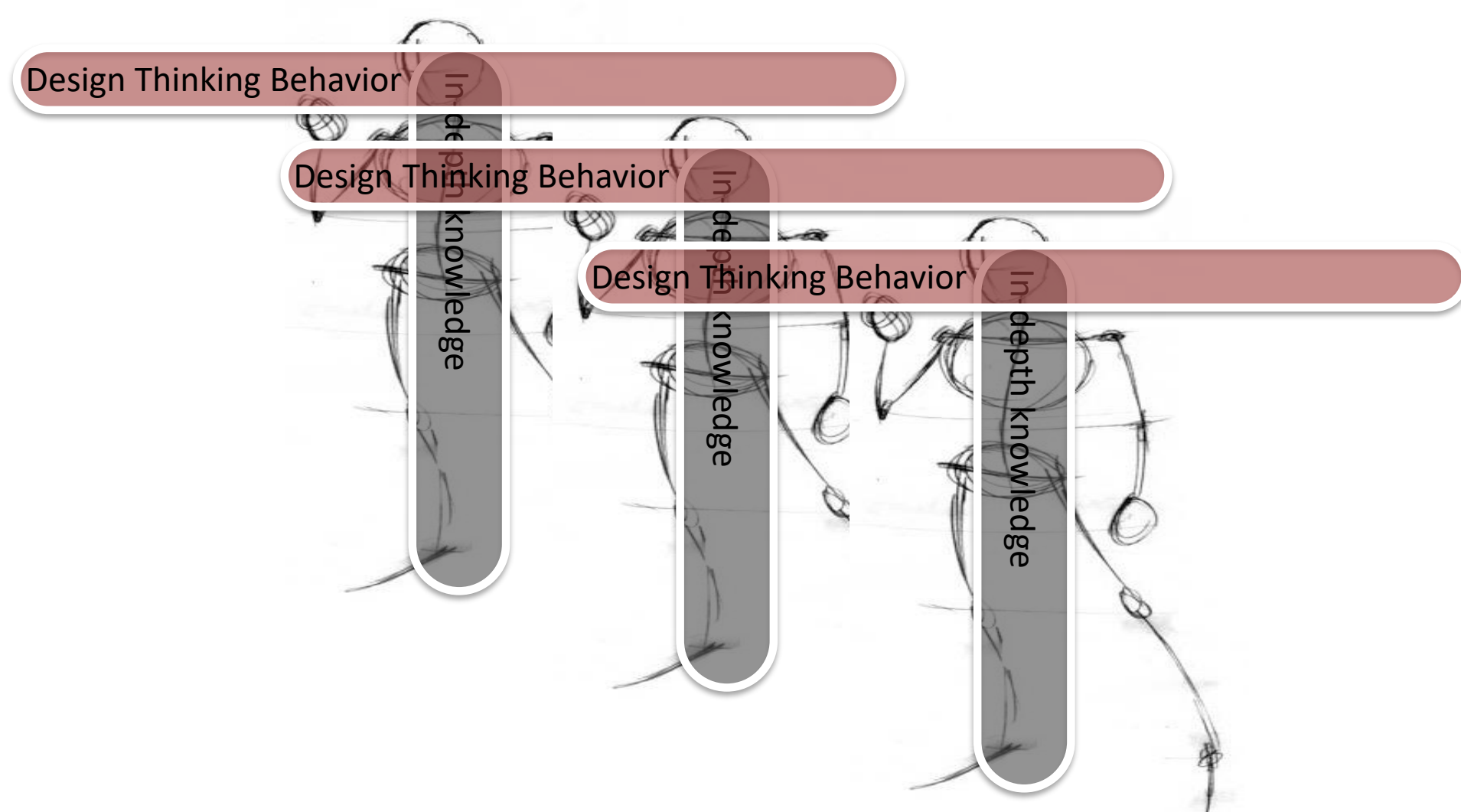
In the time of vivid interest across numerous private and public stakeholders and increasing investment in space exploration to reach areas far beyond the current limits, international cooperation is the key. And the deeper into space would humans go, the greater synergy would be required. Colonization of Moon, and later of Mars, challenges state-of-the-art technology and makes **international cooperation** obviously inevitable. The latter implies an imperative of **mixed-gender** and international space crews. Moreover, with the growing number of prolonged space travels and unknown psychological hurdles (Kanas, 2015; Vakoch, 2011), the role of crew teamwork, crew cohesion and creativity will be even more critical for the missions success than it is today (Smith, Sandal, 2018).

**PILLAR43** is an interdisciplinary and cross-institutional project to investigate into teamwork principles and prerequisites towards successful long-term internal space assignments. A test bed was **SIRIUS-19** (Scientific International Research In Unique terrestrial Station), human 4-month isolation experiment. SIRIUS-19 is part of an isolation experiments series (from 17 days in 2018 to a one-year isolation in 2021/2022) in an Earth-based analogue facility simulating short-term as well as prolonged space missions (e.g. Mars500 where an international crew of six men spent 520 days in an imitated Mars journey). The uniqueness of SIRIUS-19 is its mixed-gender crew (3 men and 3 women) which is the first-of-a-kind attempt among prolonged isolation studies. Such a crew composition is not only of scientific interest but also of a great importance in terms of real space missions and future Moon village arrangement. Besides, it should help **promote space science among women and advocate for more female assignments**. Thus, SIRIUS-19 crew consisted of one Russian cosmonaut (crew commander), two NASA specialists (test pilots) and three Russian women (doctor, engineer, and test pilot).



**Study overview:** There were two main research streamlines under the PILLAR43 umbrella: analysis of creativity patterns of the isolated crew (using Design Thinking) and tracking changes in the cognitive performance of the crew based on their group decision making (psycholinguistics).

**Design Thinking**, developed at Stanford University, is a method of innovation creation where empathy and thinking-out-of-the-box foster non-trivial solutions to complex problems (Leifer et al., 2011).



**Psycholinguistics** is an interdisciplinary cognitive field of science which aims to explain the nature and functioning of human language (e.g. Dietrich et al., 2017; Pinker, 2014). In the frame of the current experiment, it is aimed at understanding what changes take place due to long-term stress factors in human cognition and, consequently, ability to communicate and collaborate.

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**INNOVATIVE METHOD IN IMPROVING COMMUNICATION ISSUES BY APPLYING INTERDISCIPLINARY APPROACH. PSYCHOLINGUISTIC PERSPECTIVE TO MITIGATE COMMUNICATION TROUBLES DURING CISLUNAR TRAVEL.** Valentina Anikushina<sup>1,5</sup>, Victor Taratukhin<sup>2,5</sup>, Christiane von Stutterheim<sup>3</sup>, Vadim Gushin<sup>4</sup> Heidelberg University, [anikushina@stud.uni-heidelberg.de](mailto:anikushina@stud.uni-heidelberg.de), <sup>2</sup>University of Muenster, [victor.taratukhin@ercis.uni-muenster.de](mailto:victor.taratukhin@ercis.uni-muenster.de), <sup>3</sup>Heidelberg University, [stutterheim@idf.uni-heidelberg.de](mailto:stutterheim@idf.uni-heidelberg.de), <sup>4</sup>Institute for Biomedical Problems, Russian Academy of Sciences, [vgushin57@imbp.ru](mailto:vgushin57@imbp.ru), <sup>5</sup>SAP Knowledge [valentina.anikushina@sap.com](mailto:valentina.anikushina@sap.com), [victor.taratukhin@sap.com](mailto:victor.taratukhin@sap.com)

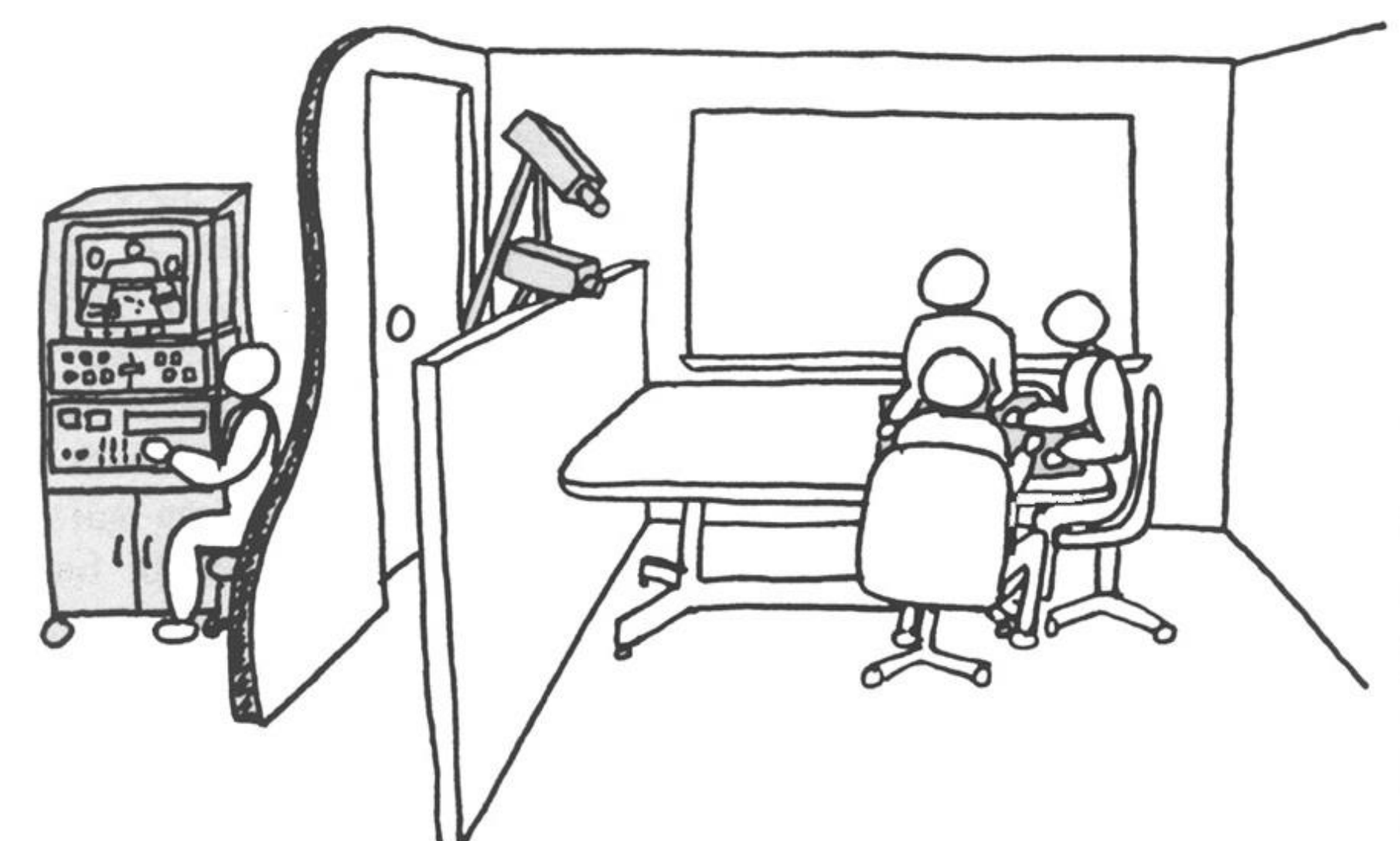
**Introduction:** Communication during long-term space flights is a crucial factor for mission success, both regarding the in-group, onboard, communication and communication between the crew and the MCC. The present study aims to explain verbal communica-

sequently, psychological apprehension of stress in life in general (primarily conducted by the Institute for Biomedical Problems (Moscow), i.e. [2]).

**Study interest:** The interest of the present study is based on the linguistic behavior of the female and



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**PILLAR43** project should, on the one hand, support and enrich existing research on human factors in extreme environments by suggesting original approaches to increase creativity performance and, on the other, provide some new insights into dynamics of cognitive behavior on individual and group levels.

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