

Psychological research conception for :envihab - „Digital Friend“ and „Recreation Room“ – medical-psychological support during long-term space missions far from earth

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Living and working under extreme environmental conditions during long-term isolation and confinement (ICE) missions with high risks for health and life but with high relevance requires a very specific psychological understanding. The crew members of such kind of missions are not suffering patients or voluntary subjects in any experiment. Rigorous selection of the crew favors those who are tough, enduring, performance-oriented, and unaccustomed to “needing” the help of psychologists. They are highly motivated, best trained and educated heroes, spending the best of them to fulfill a real mission for the whole mankind. Under usual conditions they don't ask for psychological help, they are used to solve any problems themselves. And they should be that kind, they are selected for to be able to cope with the whole set of extreme mission conditions. However, experiences in long-term flights on space stations (e.g., MIR, ISS) have provided evidence that correlates mission length and psychological factors: the longer the space mission, the more the importance of psychological factors, the required knowledge about these factors, and their changes. Crew members may reach their personal limits, possibly first time in their life. They have a right of support and psychological research should develop means of psychological support as early as possible prior for example the first manned Mars-mission and all the more reason prior the first long-term living in a habitat on Moon or Mars. Developing and testing of psychological support tools for extra-terrestrial habitats should be the aim of psychological research in :envihab.

Two main domains of that research should be closely related to each other– first: means of monitoring, analyzing and informing the crew; second: possibilities for the crew for supporting prevention and intervention.

Monitoring methods used should be objective, non-obtrusive, non-disrupting, mission related, useful for crew itself (immediate expert-system based feedback) as well as that they should be neither tedious nor artificial nor abstract, so that they will not be avoided but accepted by the crew. A Mars-mission crew will not like to play role games or to be psychologically tested by questionnaires or abstract performance tests. New methods should not ask the crew members, or put them into artificial situations, they should measure their “real mission doing”, possibly including their “psychophysiological” reacting. There is a heightened need for new measurements and methods which are objective, reliable, computerized, continuously, or at least repeatedly, applicable in order to achieve – in a perfect setting - monitoring of nearly all behavior and performances during a mission. One approach could be “embedded testing” in real mission relevant tasks, e.g. training and running a docking maneuver, catching objects with a robot arm, controlling surface rovers for exploration, problem solving for resources distribution, life-condition maintenance. We will present prototype examples. The psychological effects of long-term isolation which have to be identified can include asthenia, exhaustion, motivation loss, passivity, feelings of isolation (loneliness), symptoms of depression, excitability, stimulus deprivation, and movement or activity deficits. Health maintenance depends much on physical training discipline and hygienic discipline. The sleep-wake cycle within a 24h day and night cycle as well as the work-rest schedule are disturbed. It is very informative to observe how these daily duties are permanently solved. If there are decreases or changes in

spare time use, such as skipping usual hobbies and so forth, this could be an early indication of mood change or motivation loss. In other words monitoring methods should also focus on the “little daily things”.

One of the most supporting psychological conditions for a successful long-term mission is a good functioning, compatible crew with a friendship atmosphere. When small teams have to work in highly autonomous conditions, where team members are fully dependent on each other in managing technology, carrying out tasks, and there are communication delays as well as daily (inter)personal and occupational hazards, successful adaptation and adherence to the primary jobs are difficult. The monitoring of group cohesion and group conflict should focus on the group dynamics, cultural life, events, group activities, sub-group separation. We will present one first method example and results from the Mars500 study. Changes occurring in the group roles and functions must be noted: The possibility to develop informal leadership can disturb or support group cohesion.

However, psychological monitoring is a sensitive case. It will work under enhanced autonomy only, if it provides primary support to the crew itself, and is only secondary meant for information for the ground. If earth has once selected a Mars-Crew, it has to believe in it and to support it on crew's demand. An intelligent knowledge management system should be developed, to serve the crew as a self-sustained psychological support system, which is available upon request to display crew condition parameters, to coach group processes and individual activity as well as to aid in tactical decision processes. In its initial stage the concept of this “Digital Friend” may encompass interconnected layers of knowledge reflecting different models of technical, situational, individual and group processes.

NSBRI has presented a “Virtual Space Station” as intervention tool providing self-testing and information. For prevention of individual psychological degradations support of strong group cohesion and the fight against stimulus deprivation has highest priority. A large Virtual Reality cave with equipment providing stimuli for possibly all senses could help. The concept of the “Recreation Room” is foreseen to focus in supporting the group cohesion by providing the possibilities experiencing refreshing stimulations together as whole group or in parts of the groups or even only in dyadic situations for intense personal talks. Cycling together and having a good talk in fresh sea air and watching, smelling and hearing the sea coast will help individually as well as the group feeling. It should be strongly avoided, that refreshing stimulus are provided only for individuals, pushing isolated humans much more into an perceived isolation, withdrawing social contacts.

As mentioned above there is a large need of new method development for this specific psychological situation. A simple transfer from clinical diagnostic or personnel selection is insufficient. The :envihab provides the possibility of a continuous development, improving and testing of such methods as was done until now during isolation studies or bedrest studies but also on board space stations MIR and ISS. For the validation of these new methods there exist a large set of methods as for example used in the FIT-study and others.