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Improving the Psychological Status of Astronauts in Space and its Application to Humans on Earth

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Abstract

Due to the various benefits of space technology and the proposed human settlement on the celestial bodies in the future. Therefore, there would be long-term future human deep-space mission of non-astronaut tourists or scientific payload specialists; but there are major risks in these proposed long-term manned missions. The risk factors include gravity transition, distance from the earth, space radiation, isolation or confinement, and hostile or closed environment. Most of these factors will have effects on the behaviour and emotion of space travellers which may lead to mental health challenges. The overview of these risk factors are given in relation to the development of mental health challenge for an astronaut in space; and the specific measures to improve astronauts psychological status in space is discussed; while the salient points are recommended as quite useful for human on earth, especially those in the confined or isolated environment.

Keywords: Gravity transition, Distance, Radiation, Isolation, Psychology, Astronaut, Earth.

Introduction

A distinctive characteristic of the Earth from the outer-space is gravity. Gravity is always present on Earth. The space region starts from an altitude of about 100km (62 miles) above the sea level. This is conventionally used as we are on the Earth and not in the Earth.

By 2050 the United Nations predicts numerous challenges, among which are increased human population; growing pressures on environment, sanitation, climate change; shortage in global food supplies; and intense energy demand. It is also predicted that in five billion years, the Sun enters its red giant phase and begins to eat up the planets one after the other. Therefore, exploring the space may result on some benefits in almost every facet of life such as improving health care, education, weather forecasting, disaster management, communication, and land and water resources management. Aside all these benefits, although the Moon is nearer, Mars is predicted to be able to sustain life for human settlement in the deep space. Preliminary work towards this started 1950s; a planned human mission is typically in 10 to 30 years in the future, but robotic exploration has started; and a trip to the Mars will take about 3 years (Laurie, 2020). As a result of the long-duration space flight, it is proposed that mental health changes may develop on astronauts as a result of some specific risk factors that are unavoidable in the deep space human missions. Therefore, measures to make better the psychological health of astronauts are outlined, which can also be employed for humans on earth undergoing similar or related psychological challenges.

Major Risks in a Proposed Long-Term Manned Mission

The major risks in a proposed long-term manned mission are:

Gravity Transition

Space traveller experience the gravity's field transition. Gravitational pull varies and differs from one celestial body to the other. On the way to Mars, there would be gravity variation by transition from one gravity type to the other, such as from the Earth gravity (9. 807m/s2), to microgravity (μg), and to the gravity of Mars (3.711 m/s2) (reduced gravity). This may or may not affect the psychology of astronauts.

Distance from the Earth

It will take a space traveller about 3 years before getting to Mars. This can grossly have effect on astronaut psychology.

Space Radiation

Radiation in the space environments represents one of the most significant risks for the human health in the long-term space missions. There are three primary sources of ionizing radiation of concern in the interplanetary missions: trapped belt radiation, Galactic Cosmic Rays (GCR) and the Solar Particle Events (SPE). The long duration space travel, for example, to Mars, represents a significant challenge because of the high doses of radiation, there is still need to research more about the mechanism to protect, against the three primary sources of radiation (Oluwafemi et al., 2018a; 2018b). Solution to space radiation on celestial body however is wearing spacesuit and burying the habitat (Mars One, 2015). Radiation affects the central nervous system which could therefore affect the brain structure and function and can lead to mental health challenge.

Isolation or Confinement

Psychology as the science of behavior and mind; and mental health as functioning at a satisfactory level of emotional (mood and thinking) and behavioral adjustment; the various aspects that could contribute to the overall changes in mental health of astronauts are: interpersonal stressors, effects of long-term microgravity and radiation, extreme isolation and loneliness, limited social contacts and novelty, Earth-out-of-view phenomenon challenge, lack of support from Earth due to communication delays, family problems at home, increased home sickness, sufficient sleep and food type deprivation.

Hostile or Closed Environment

As a result of the space environment being hostile because of microgravity effects on the physiology of astronauts, it can lead to mental health challenge. The space environment can have effects on the food of astronaut, and astronauts can therefore be denied the particular food type enjoyed by them; this can also lead to psychological challenge. The spaceship and the proposed crew habitat in celestial bodies are closed environment as Environmental Control and Life Support System (ECLSS) is active.

The major characteristics of the space environment are: microgravity and radiation. Microgravity is a state of weightlessness. The most serious consequences of weightlessness, however are: the weakening of physiological systems such as the cardiovascular system; affecting the musculoskeletal system; leading to bone "disuse" symptoms that include the loss of calcium, nitrogen, and phosphorus and decreased bone size and volume (Berry and Catterson, 1967). There are long-term and short-term effects of microgravity. The above listed microgravity effects on the body are under the short-term in the space laboratories. However, only recently has study being looking into the long-term health effects of spaceflight. Furthermore, these studies have only been undertaken in low Earth orbit, leaving many unknowns with respect to deep space flight.

Due to microgravity astronauts experience fatigue, irritability, lack of appetite, headaches, emotional-instability, sleep-disturbance, depression and anxiety. Microgravity specifically causes changed sensory input that confuses brain, causing occasional disorientation (NASA, 2017a).

Improvement of the Psychological Status of Astronauts

The following are therefore on how to improvement the psychological status of astronauts. All these are results that can also be applied at specific situations to humans facing psychological challenges here on our planet.

Interventions to Minimize Risk Factors in the Space Environment

A number of solutions are being explored to help protect astronauts from space environment effects. Required daily exercise to keep muscles and bones from deteriorating; wearing spacesuit; taking along sufficient medicine; simulation of Earth's gravity on spacecraft (NASA, 2017b); and the use of system of straps and buckles to help maintain an upright position is not underestimated. Also, plants should be grown inflight to aid aeration. So, potential astronauts should not be afraid.

Having a successful space exploration mission is very important, but much more vital are the lives of the travelers. A key contributor to this is the food they eat. For short-term space manned missions, astronauts food could be taken along with them from Earth, but for manned missions to the Moon or Mars which are the current research stations for long-term, the crew has to find how to feed themselves such as plants cultivation or any other means for their sustenance. Eating antioxidant-rich foods and foods that contains good amount of calcium, nitrogen and phosphorus (Lousada et al., 2015) are good interventions. Good food and nutrition for astronauts help to keep their psychology and physiology functioning well.

Some Solutions to Increase the Psychological Status of astronauts in Space

The use of psychoactive medications and crew-care packages. Some solutions in place needing better use are that: the psychological measure for the selection process should be improved; personality-test should be done and also completed by the mission control staff at the ground-station; and comprehensive training plans should be structured to assess the efficacy of stress-management. More and better research should be carried-out on the: biological and psychological factors which mediate adaptation and psychological resilience to the space environment; influence of microgravity on the profile of psychoactive medications; and effectiveness of verbal content analysis and other telemedicine-based techniques in identifying stress and in developing mental-health challenges.

Recommendations to Improve the Psychological Status of Astronauts in Space

For home sicknesses, other than a return to Earth, there seems to be no instant cure, but an easier workload, coupled with frequent opportunities for private communication with families and friends back home, are important morale boosters. It's also useful to write e-mails home to family and friends (Oluwafemi et al., 2021). The Earth-out-of-view phenomenon can be dealt with by having a telescope on board with which the crewmembers could clearly see Earth and its features (Lousada et al., 2017).

Three-dimensional (3D) graphic zooming interface whereby an astronaut can enter 'modules' of treatment, self-assessment, training and other resources; Virtual Space Station (VSS) research prototype that includes treatment for interpersonal conflict stress and anxiety.

"Positive psychology" is a relatively new form of study for psychologists. It focuses on pleasant emotions and thoughts; constructive attitudes about the future; individual traits that are conducive to societal and personal well-being (Gable and Haidt, 2005). Positive psychology makes researchers to have a different approach of normally held beliefs concerning the harmful effects of working and living in space, such as extreme anxiety or denials. Therefore, positive psychology should be embraced.

Conclusion

Astronauts are encouraged to embrace positive psychology. More so, this article is not solely applicable for astronauts in space, therefore, the salient points are also valuable for man on Earth, particularly those in the restrained or secluded location, making it very useful; as mental well-being is cogent.

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