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Positive psychological effects of space missions

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Abstract

Being in space is a powerful experience that can have an enduring, positive impact on the psychological well-being of astronauts and cosmonauts. We sought to examine the frequency, intensity and distribution of such salutogenic experiences among persons who have flown in space, using a questionnaire we developed based on the scientific literature and first person accounts. All participants reported positive effects of being in space, but the degree of change varied widely, and some experiences were particularly common. Three of our five predicted attitude–behavior relationships were supported by the data. Response patterns did not vary according to demographics or time in space. Cluster analysis yielded two groups of participants. One group was generally more reactive and also placed a higher priority on perceptions of space than did the other group. We conclude that positive experiences are common among space travelers and seem to cluster into meaningful patterns that may be consequential for Mars missions. We consider the possible selection, training, and monitoring issues raised by our findings.

1. Introduction

The experience of being in space is a powerful one that is likely to have an enduring, positive impact on the psychological well-being of astronauts and cosmonauts. Very little research has been done in this area to date.

In a previous survey, a group of 54 astronauts and cosmonauts who had flown in space rated the excitement of space flight as one of the strongest factors enhancing communication between crewmembers and mission control support personnel on the Earth [1].

Only one scientific study that we are aware of has focused in detail on the positive effects of spaceflight, and this was a recent analysis of the published memoirs of four pioneering American astronauts [2]. It found that achievement was a core value orientation for all of them, but it tended to drop during spaceflight, while other enjoyment-related values rose. After the flight, the pre-launch balance of values was typically restored. The one individual for

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whom this pattern was most pronounced reportedly had the most difficult post-flight adjustment period. More information is needed about the patterning of such experiences and the implications of these patterns for adjustment and mental health.

Our study sought to contribute to this newly emerging area of research. Based on anecdotal reports from astronauts and cosmonauts, as well as the scientific literature on the salutogenic (health-promoting) effects of stressful experiences, we developed a questionnaire measuring the positive effects of the space experience. Previously [3], we presented the psychometric properties of our questionnaire, item-level and subscale-level descriptive statistics, and the modal responses from an initial subject sample. Here we will review the main findings pertinent to the whole sample and then focus in more detail on the search for patterns in responses across subgroups of respondents.

2. Methods

2.1. Participants

The sample included 39 anonymous respondents recruited from the Association of Space Explorers (ASE) and the NASA Astronaut Office. Every respondent had flown in space at least once. As we described in more detail elsewhere [3], the ASE participants were recruited via email, and the NASA participants were recruited by mail, with the distribution being carried out by these organizations rather than our study team, to help preserve anonymity.

2.2. Instrument

Participants completed the 36-item Positive Effects of Being in Space (PEBS) questionnaire, which has been described in detail elsewhere [3]. The PEBS is based on the 21-item post-traumatic growth inventory (PTGI) developed by Tedeschi and Calhoun [4] and included additional items more specifically relating to experiences from space. The PEBS has the following subscales: New Possibilities, Appreciation of Life, Personal Strength, Relating to Others, Spiritual Change, Perceptions of Earth, Perceptions of Space, and Changes in Daily Life. Each of the 36 items was rated on a Likert scale ranging from 0, “I did not experience this change as a result of my being in space” to 5, “I experienced this change to a very great degree as a result of my being in space”. There were two additional qualitative items. One asked respondents to list any other change not already addressed and rate it on the same scale. Another asked respondents to select and describe their most powerful positive experience.

3. Results

All participants reported positive effects of being in space, and the most widely reported changes involved Perceptions of Earth ($F = 24.2$, $p < .001$, $df = 7$). For example, 97% of the final sample said that they “gained a stronger appreciation of the Earth’s beauty”. By contrast, Spiritual Change was the least common, with each type of change reported by 33% of the sample.

Changes regarding attitudes were equally common as changes regarding behaviors, and 3 of our 5 a priori hypotheses about specific attitude–behavior changes were upheld. Respondents who changed regarding (1) treasuring the Earth or (2) appreciating its fragility or (3) beauty were more likely to report increasing their involvement in environmental causes ($r = .58$, $r = .66$, $r = .38$, $p < .05$). However, those who became more aware of the unity of humankind were not significantly more likely to report a stronger (4) involvement in politics or (5) relationship with their family.

Next, we tested whether responses varied across types of respondents. Contrary to our expectations, none of the levels of reported changes varied by gender, age group, number of missions, type of mission (short or long duration), or total number of days in space. This include the full scale, subscale, and item scores.

Next we used a more data-driven approach to search for groups of subjects with different response profiles. A cluster analysis calculated the standardized Euclidian distances between persons in multidimensional space, using 13 dimensions corresponding to the responses on the space-specific items. The branching pattern showed two clusters of respondents (plus one outlier, which was removed). Cluster 1 contained 23 subjects, and Cluster 2 contained 15 subjects.