# Review of: "A Case for Nature in Long-Haul Space Exploration"

Jürgen Bereiter-Hahn[1]

1 Johann Wolfgang Goethe Universität Frankfurt am Main

Potential competing interests: No potential competing interests to declare.

Certainly extended missions in space are strongly challenging physical health, cognition and social behaviour within the crew[1]. Therefore countermeasures have to be developed, comparable to training machines applied to maintain physical strength during prolonged exposure to microgravity. For the cognitive and mental aspects of stresses exposure of crew to “natural environments” is proposed. What “natural environment” means remains open, but in fact is not very significant because the exposure is supposed to remain virtual rather than real and therefore the regimes can be very flexible. The idea for including sensory affections reducing stress during extended space missions is absolutely convincing and important. Mimicking natural environment, however, would be only one possibility within a system of countermeasures which should be considered. E.g. exposure to classical music also proved to be very effective in stress reduction, and the physiological situation as well may substantially reduce stress and stress sensitivity [2] as was envisaged within ESA´s hibernation strategy for deep space missions [3]. Reduction of metabolic activities by torpor, the physiological state during hibernation, could solve most of the stress problems and reduce material requirements (pay load). However, all activities of crew would be suspended during their time in torpor.

(1) Choukér A (ed.): Stress challenges and immunity in space. From Mechanisms to monitoring and preventive strategies. 2nd ed. Springer Nature Switzerland (2020).

(2)Cerri, M. et al. Hibernation for space travel: Impact on radioprotection. Life sciences in space research 11, 1-9, doi:10.1016/j.lssr.2016.09.001 (2016).

(3) Choukér A, Ngo-Anh TJ, Biesbroek R, Heldmaier G, Heppener M, Bereiter-Hahn J: European space agency's hibernation (torpor) strategy for deep space missions: Linking biology to engineering. Neuroscience and biobehavioral reviews 131, 618-626, doi:10.1016/j.neubiorev.2021.09.054 (2021).