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Arthur Saniotis
University of Adelaide

Gabriel G. De la Torre
Universidad de Cádiz

Maciej Henneberg
University of Adelaide

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Mindfulness Meditation and Spaceflight: A Potential Adjunct Therapy for Astronauts

Arthur Saniotis[1,2,5*], Gabriel G. De la Torre[3], Francesco Maria Galassi[1,4], Maciej Henneberg[1,5], Kazhaleh Mohammadi[6]

[1]Biological and Comparative Anatomy Research Unit, School of Biomedicine, The University of Adelaide, Adelaide, Australia
[2]Bachelor of Doctor Assistance Department, DDT College of Medicine, Gaborone, Botswana
[3]Neuropsychology and Experimental Psychology Lab, University of Cadiz, Cadiz, Spain
[4]Department of Anthropology, Faculty of Biology and Environmental Protection, University of Lodz, Lodz, Poland
[5]Institute of Evolutionary Medicine, University of Zurich, Zurich, Switzerland
[6] Department of Anesthesia Technologies, College of Health Technology, Cihan University-Erbil, Erbil, Kurdistan Region, Iraq.

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Studies on space medicine indicate that stress can affect astronaut behaviours and their ability to perform their multiple tasks (Kanas and Manzey 2008; De La Torre et al. 2012). Astronauts face various stressors due to micro-gravity, living in small and enclosed confines, isolation, mix of arduous workload and boredom, disconnection from the natural world, unpredictable events, etc. Glucocorticoid secretion has a central role in inflammation and immunosuppression. Furthermore, supra-physical amounts of glucocorticoids hinder innate immunity (de Kloet 2004).

Mid to long term duration space missions expose astronauts to possible chronic stress with consequential GC dysregulation. While studies show that dendritic recovery is possible in the hippocampal and pre-frontal cortex, this is only achievable when chronic stress is reduced. Consequently, astronauts have an increased risk for disproportionate stress. Even with psychological support astronauts encounter many psychological stressors during mid to long duration space missions.

To address this issue, we recommend that the practice of mindfulness meditation be incorporated to offset psychological stressors during space flight and post flight adjustment. Mindfulness meditation is a Buddhist derived technique and has for centuries been employed in Asian countries. The objective of mindfulness meditation is on focussing on being attentive to one's cognitive and affective states in the present moment. Through regular practice of mindfulness meditation, a participant may learn to disengage from repetitive thoughts, thereby, reducing negative states and enhancing "cognitive flexibility" (Shapero et al., 2018). Over the last two decades mindfulness-based interventions have been integrated in western psychotherapeutic regimes.

Regular practice of mindfulness meditation has been shown to reduce stress response, increased cerebral blood flow, enhanced analgesia, and improved attentional performance and immune function (Chiessa and Serretti 2009; Zeidan et al., 2010).

It has been argued that the effectiveness of mindfulness meditation could be due to its capacity for instigating changes in brain morphology (Newberg et al., 2010). Previous meditation research indicates an increase in neuroplasticity of white matter in individuals engaged in short term meditation (4 weeks) (Tang et al., 2012); second, short term meditation (5 days) improved stress control and attention in the target group (Tang et al., 2007).

A seminal study by Vernikos et al (2012) discussed the benefits of yoga for astronauts. Unfortunately, this study failed to explain what kinds of yogic practices were feasible to be conducted by space crew members within the space-ship environment.

We justify the use of mindfulness meditation, since breathing is a natural act and that by focussing in the present moment inner sensations may be alleviated for a fraction of time, thus, promoting a relaxation state.

We recommend that mindfulness meditation during spaceflight should incorporate deep and slow breathing in either an upright seated position or supine position, eyes closed with attention focussed on the lower abdomen. Due to noise generated by the space ship environment ear muffs can be worn. Deep and slow breathing could be performed between 5-10 minutes, once every eight hours. The short duration and relative ease mindfulness meditation incorporating deep and slow breathing makes it ideal for the monotonous and demanding environment of spaceflight. Mindfulness meditation provides a suitable therapeutic method for stress control and maintaining and improving neurological integrity. The convenience and reported benefits of short-term mindfulness meditation can be employed to complement space medicine to benefit astronaut health. Furthermore, we recommend that astronauts commence mindfulness meditation several months pre-space flight in order to optimise its neuro-behavioural benefits.

Concluding Points

- Mindfulness meditation is an inexpensive therapeutic method which does not rely on being constantly monitored by health professionals.
- Mindfulness meditation may be used during pre-flight preparation, as well as, during and post space flight. The slow breathing practice of mindfulness meditation may assist astronauts during post-flight recovery as it has been shown that slow breathing practices are associated with increased cerebral blood flow, orthostatic tolerance, and reduction in hypertension.
- Mindfulness meditation can be used to complement space medicine.
- Psychophysiological research using EEG could be very helpful and informative for explaining phenomena described asan overview effect or other meditation induced mental states that several astronauts have reported while living in space.

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