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RESTORING HEALTHY HEART DYNAMICS THROUGH ATTENTION REGULATION: A NEW APPROACH TO CARDIAC ADAPTABILITY

Abstract

Although great progress has been made to counteract the physiological effects of space flight for safe return to Earth, more effective techniques are constantly tested and adopted. Space physiology issues are complex and involve interactions between many systems. For example the cardiovascular system is not only affected through changes in heart and blood vessel mechanisms but also by microgravity effects on other systems such as respiratory and skeletal muscle. Back on Earth, cardiovascular diseases are the number one cause of death, the majority of which are considered preventable (WHO).

Attention Regulation, a process very much akin to meditation, has shown promise in terms of promoting cardiac health in the short- and long-term, more specifically in significant increases of heart rate variability (HRV) indices which are related to reduced CVD risk. No study has yet been performed on the speed of onset of the benefits, nor of how long these benefits last between individual sessions. These data are key to the incorporation of attention regulation into the training practices of astronauts and treatment options of at-risk populations.

In this study, 18 healthy subjects were trained weekly in Attention Regulation for a period of 10 weeks. During each session, cardiovascular parameters such as electrocardiograph, impedance cardiograph, seismocardiograph, photoplethysmograph and breath rate were continuously recorded. The subjects first listened to a 30-min (baseline) radio documentary and then in subsequent weeks an 8-min documentary followed by a 20-min meditation and a 20-min documentary. Subjects were instructed to focus on respiration during the meditation sessions. HRV was assessed through time-domain as well as frequency-domain markers. Stroke volume was estimated from the seismocardiogram in conjunction with photoplethysmorgraphy and incorporated into an inclusive model of heart mechanics.

Preliminary analysis showed that augmented HRV could be measured as early as the second week of practice and that these persisted 20-minute post-meditation. These prefatory results strengthen the hypothesis that attention regulation may be suitable for astronaut training as well as clinical settings.

In conclusion, we have shown that beneficial results can be obtained after two training sessions taking place over two weeks, and that the effects of heightened HRV do not drop suddenly when the session is over. Further projects will include larger-scale studies, and the development of a robust and adaptable template for introducing the techniques in various cultural and professional settings. Opportunities to test the validity of the techniques during space mission are being sought.