

ABSTRACT TITLE: The Effect Of Stress As Measured By Heart Rate Variability On Trauma Team Members in Weightlessness, Difficult Oceanic Conditions, and Mass Casualty.

Background: Human performance is often adversely affected by situational stressors in unusual environments. This includes mass casualty events, space exploration and difficult sea states. Currently, most methods of evaluating human performance is mostly subjective and potentially unreliable. For this reason our research group (Rocky Vista University, U of Calgary, the Canadian Space Agency, and Naval Surface Warfare) has developed a change our technique measuring stress with salivary hormones and added the evaluation of heart rate variability(HRV) to evaluate the physiologic stress of surgeons, team members and students performing in multiple training environments.

Objective: Identify the training stress parameters that will identify objectively the value of where stress is placed in simulated training.

Design/Methods: HRV was utilized in 3 different experiments to identify stress components while performing in 3 different environments. All performing in massive trauma scenarios

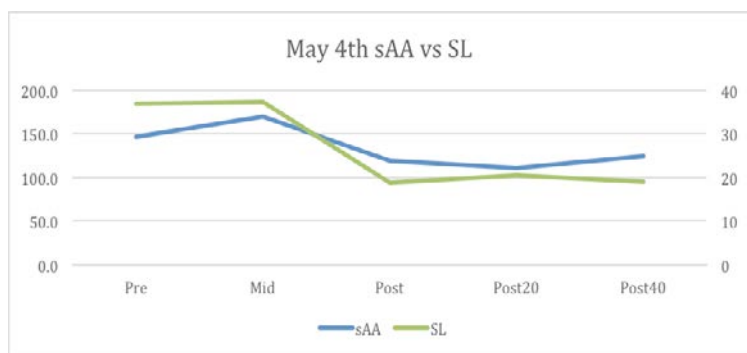
1. Surgeons at 1G versus Surgeons in parabolic weightlessness with the Canadian Space Agency.
2. Surgeons versus surgical scrubs technicians performing Surgery at Sea states 3 and 4.
3. Utilizing HRV to identify stress habituation and improvement of skills in second year medical students.

All environments included total immersion into the situation. Real weightlessness, real sea state motion, and living in a deployed unfriendly environment. Three different technologies were used. These will be described in the paper. The Advanced Brain monitoring system with HRV was used on sea state The Equivax EQ02 in weightlessness and the First beat with OVERSKUUD technology on the mass casualty.

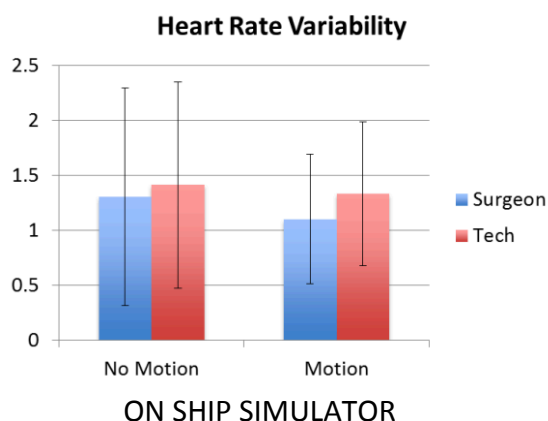
Results: As expected in weightlessness there was increased stress in weightlessness. This was greater in the 2 senior surgeons. Surprisingly There was no difference in the surgeons from zero sea state to sea state 4. However, The surgical technologist did show stressful physiologic response. Those involved in the multiple increasing mass casualty scenarios showed significant decline in physiologic response as the increasingly difficult week progressed. Showing significant habituation and increase skill.

Conclusion: The understanding of heart rate variability will lead to the ability to plan training and courses directed at the appropriate training level of personnel at all levels. We are now starting to objectively identify the true objective measurement of training regardless of skill level or age. This will help us to develop age and skill related courses in the future

Impact:



HRV VS HABITUATION



ON SHIP SIMULATOR

Variable	Ground Based	0g Based
Task Completion Time (sec)	192.4 (SD:28.6)	180.2 (SD:49.0)
Blood Loss (mL)	408.2 (SD:102.3)	307.6 (SD:178.1)
IBI (msec)	756.7	704.1
SDNN (msec)	193.2	189.1
pNN50 (%)	21.9 (SD:5.5)	20.3 (SD:3.5)

ZERO G VS 1 G