COE CST Seventh Annual Technical Meeting

Task 308: Assessment of Screening and Training Requirements for SFPs regarding Anxiety during Repeated Exposures to Sustained High Acceleration

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Agenda

- Team Members
- Task Description
- Schedule
- Goals
- Results
- Conclusions and Future Work

Team Members

- Principal Investigator: James Vanderploeg, MD, MPH
- Co-Investigators: Rebecca Blue, MD, MPH; Charles Mathers, MD, MPH; Tarah Castleberry, DO, MPH; Johnene Vardiman, MS
- Collaborators: Frederick Bonato, PhD; Andrea Bubka, PhD; Kim Seaton, PhD
- Students: Rahul Suresh, MD

Organizations

- University of Texas Medical Branch
- NASTAR Training Center
- Saint Peter's University

Task Description

- SFP anxiety or panic attack may present a significant problem for the commercial spaceflight industry
  - Industry depends upon layperson participation
  - Requires a perception that flights are safe and enjoyable

- SFPs likely to have expectations: training and risk mitigation
  - Efforts towards meeting expectations or educating the public: beneficial effects for the industry?

- SFPs may have difficulty performing tasks in stressful scenarios
  - May not fully understand how their own actions affect the risk profile of spaceflight activities

Preliminary Studies

- Multiple studies designed to provide understanding of layperson physiological response to hypergravity/acceleration (2012-2017)
  - 2012: 77 Subjects
  - 2014: 86 Subjects
  - 2016-7: 157 Subjects

Schedule

- 2014: Tolerance of Centrifuge-Simulated Suborbital Spaceflight by Medical Condition
- 2014: Subject Anxiety and Psychological Considerations for Centrifuge-Simulated Suborbital Spaceflight
- 2016: Screening and Mitigation of Layperson Anxiety in Aerospace Environments
- 2017: Effects of Training on Anxiety and Task Performance in Simulated Suborbital Spaceflight

Goals

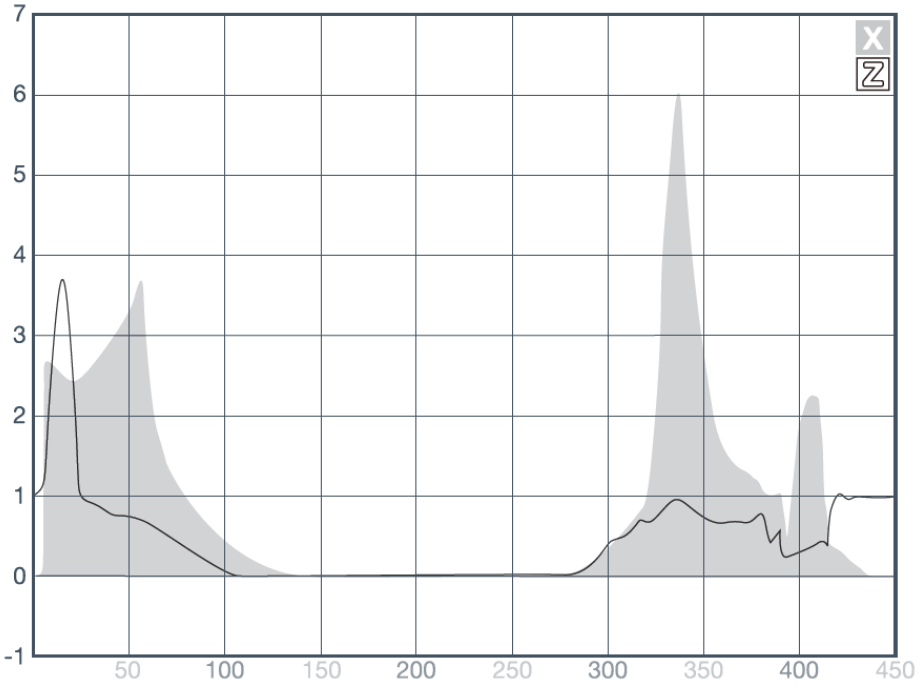
- Understand how minimally trained laypersons perform during simulated emergency scenarios in centrifuge-simulated suborbital spaceflight

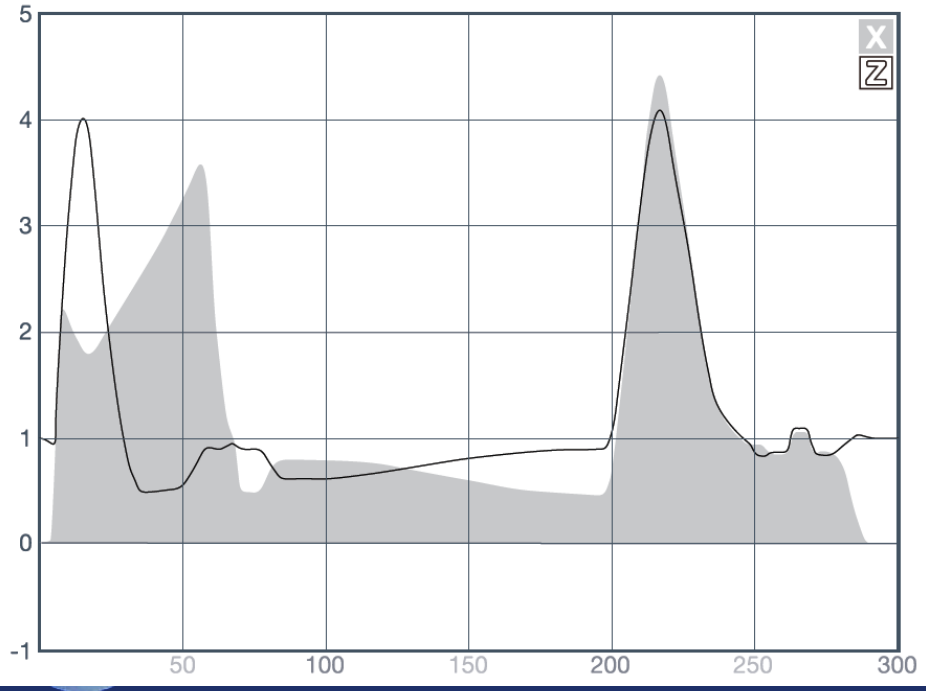
- Identify preconceptions of risk, training requirements, emergency preparedness, and the safety of the commercial spaceflight industry

- Identify opportunities for public outreach or SFP education to address risk and better enable the informed consent process

Centrifuge Profiles

- Centrifuge profiles:
  - Single-directional acceleration
    - $+G_z$ (head-to-toe)
    - $+G_x$ (chest-to-back)
  - Combined profiles
    - Designed to simulate flight
  - Simulated Emergency Scenario





Results

In brief:

- Most subjects felt training sufficient
  - Positives:
    - Clear explanations
    - Trainer experience / first-hand knowledge
    - Practice sessions / hands-on training
- 80% believe training should be required

- Emergency task performance:
  - Significant discrepancy between performance and perception
  - Common errors:
    - “Wait to start” commands
    - Task details
    - Harness application
  - 86%: address at more detail, practice before flight / simulation

Results

PUBLICATIONS

- Suresh R, Blue RS, Mathers CH, Castleberry TL, Vanderploeg JM. Dysrhythmias in Laypersons during Centrifuge-Simulated Suborbital Spaceflight. *Aerosp Med Hum Perform* 2017; 88(11)1-8.
- Suresh R, Blue RS, Mathers CH, Castleberry TL, Vanderploeg JM. Sustained Accelerated Idioventricular Rhythm in a Centrifuge-Simulated Suborbital Spaceflight. *Aerosp Med Hum Perform* 2017; 88(8): 1-5.
- Blue RS, Bonato F, Seaton K, Bubka A, Vardiman JL, Mathers CH, et al. The Effects of Training on Anxiety and Task Performance in Simulated Suborbital Spaceflight. *Aerosp Med Hum Perform* 2017; 88(7): 641-650.

PRESENTATIONS

- Aerospace Medical Association Annual Scientific Meeting, Denver, CO, May 2017 – 6 panel presentations
- Aerospace Medical Association Annual Scientific Meeting, Dallas, TX, May 2018 - anticipated

Conclusions and Future Work

- Numerous further publications planned
  - The Role of Public Opinion in the Viability of the Commercial Human Spaceflight Industry
  - Insight and Task Performance in Simulated Suborbital Spaceflight: Implications for Informed Consent
  - Training Effects on Motion Sickness During Simulated Commercial Spaceflight
  - Aggregate Findings of Layperson Tolerance in Centrifuge-Simulated Suborbital Spaceflight
- Follow on Studies
  - Facial Recognition of Anxiety for Early Intervention?

TASK 308. ASSESSMENT OF SCREENING AND TRAINING REQUIREMENTS FOR SFPs REGARDING ANXIETY DURING REPEATED EXPOSURES TO SUSTAINED HIGH ACCELERATION

utmb Health
Aerospace Medicine

PROJECT AT-A-GLANCE

- University: The University of Texas Medical Branch
- Principal Investigator: James Vanderploeg, MD, MPH
- Co-Investigators: Rebecca Blue, MD, MPH; Tarah Castleberry, DO, MPH; Charles Mathers, MD, MPH, Johnene Vardiman, MS
- Residents: Rahul Suresh, MD

RELEVANCE TO COMMERCIAL SPACE INDUSTRY

- The viability of the commercial spaceflight industry will be dependent upon layperson participation, which requires a perception that flights are safe and enjoyable.
- Spaceflight participants are likely to have expectations regarding training and risk mitigation; efforts towards meeting expectations or educating the public may have beneficial effects for the industry.
- Spaceflight participants may have difficulty performing tasks in stressful scenarios, but may not fully understand how their own actions affect the risk profile of spaceflight activities

STATEMENT OF WORK

- Understand how minimally trained laypersons perform during simulated emergency in centrifuge-simulated suborbital spaceflight
- Identify preconceptions of risk, training requirements, and commercial spaceflight safety

STATUS

- Project data collection completed
- 157 subjects recruited, centrifuge trials completed June 2016
- Data analysis completed 2017

FUTURE WORK

- Presentation and publication of significant findings – publication anticipated 2018, presentation expected at Aerospace Medical Association Annual Scientific Meeting 2018
- Publication anticipated 2018, *Aerospace Medicine and Human Performance*