IMPLICATIONS OF PASSENGER ANXIETY AND MOTION SICKNESS FOR COMMERCIAL SUBORBITAL SPACEFLIGHT

James M. Vanderploeg, MD, MPH
Rebecca S. Blue, MD, MPH
Tarah L. Castleberry, DO, MPH

ICASM 2018     Bangkok, Thailand
Acknowledgements

• Co-investigators
  • Tarah Castleberry, DO, MPH
  • Rebecca Blue, MD, MPH
  • Johnene Vardiman, MS
  • Frederick Bonato, PhD
  • Andrea Bubka, PhD
  • Kimberly Seaton, PhD
  • Charles Mathers, MD, MPH
  • Rahul Suresh, MD, MPH

• Facilities
  • NASTAR Center (Environmental Techtonics Corp.)

No disclosures to declare
Introduction

- Concern about anxiety during a flight causing disruption or putting the mission, vehicle, or crew at risk
- Concern about motion sickness adversely impacting mission enjoyment for individual and fellow passengers
- Study designed to evaluate layperson responses to centrifuge-simulated spaceflight

Goals:

- identify predictive indicators for anxiety in commercial spaceflight participants
- develop methods to prevent mission-impacting events.
Methods

- 148 subjects (70% men, 30% women)
- Varied training lengths and exposures
  - 2-7 centrifuge runs over 0.5 to 2 days
  - Culminating in 2 simulated suborbital spaceflights
- Two cohorts received dedicated anxiety-mitigation training
- All cohorts completed pre- and post-spins questionnaires
- Test monitors observed subjects for signs of anxiety and motion sickness during their experience
Pre-spin Questionnaires

- All subjects were administered a series of personality, motion sickness, and anxiety questionnaires before participation.
  - Multiple Affect Adjective Checklist-Revised (MAACL-R)
  - Motion Sickness Susceptibility Questionnaire Short-form (MSSQ)
  - Zuckerman-Kuhlman Personality Questionnaire (ZKPQ)
  - International Personality Item Pool (short version) for Neuroticism, Extraversion, and Openness (IPIP-NEO)
  - State-Trait Anxiety Inventory (STAI)
- All 5 tests were administered prior to participation but no answer was considered exclusionary.
- The STAI was repeated the morning of the subjects’ final (or only) day of centrifuge exposures.
Results Overview

- Total of 148 subjects participated in centrifuge trials
- Test monitors identified 29 subjects as concerning for anxiety
- Overall, 10 subjects opted out of one or more run or limited their G-exposure
- Training length was not associated with subjects withdrawing from participation
- Motion sickness was significantly associated with non-completion of the centrifuge runs
Motion Sickness Susceptibility

• Pre-participation MSSQ scores were significantly higher in subjects identified as concerning compared to those that demonstrated no evidence of anxiety.

• MSSQ average percent likelihood of motion sickness:
  • concerning: 33.1 ±29.0%
  • not concerning: 19.5 ±19.3%, df 146, P=0.02
Methods of Feedback

- Various means were used to obtain feedback from subjects:
  - Oral feedback in group setting
  - Oral feedback in one-on-one setting
  - Written feedback after completion of all spins
- Private, written format was the most likely method in which test subjects reported anxiety-related symptoms.
Discussion

• Unknown whether the correlation between motion sickness and anxiety will hold true in commercial spaceflight

• Close observation and intervention during training for an upcoming space flight will be critical to lessening the risks from inflight anxiety

• Written, private reporting may be the most reliable means of identifying issues during training and before a space flight

• Enabling SFPs to develop a strong trust relationship with training and medical personnel will likely improve the ability to identify participants at risk before anxiety or motion sickness become detrimental to the flight experience
References


Questions