Predicting Aviation Performance in Rotor-Wing Students

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INTRODUCTION

PURPOSE

- To predict student performance in aviation courses using assessments of situational awareness, selective attention, and inhibitory function.
- Currently, a shortage of pilots in the U.S. has negatively impacted the market leading to major disruptions in airline traffic and curtailment of public aviation support missions.
- By identifying predictors of success in aviation courses, hypothesized to translate to the field, this pilot shortage may be alleviated through efforts directed at the training, recruitment, and retention of aviation students.

BACKGROUND

The aviation industry is currently facing a critical shortage of commercial fixed and rotor-wing pilots. This shortage has amplified the need for effective recruitment, training, and certification processes for aspiring pilots. As the demand for pilots grows, understanding the key competencies required for the role becomes crucial.

The U.S. Department of Labor has identified several Knowledge, Skills, and Abilities (KSAs) that are crucial for commercial pilots. Among these KSAs, research supports the particular importance of situation awareness, selective attention, and inhibitory function. These cognitive abilities play a critical role in ensuring pilots can effectively navigate and respond to the dynamic and often unpredictable environment of flight.

Research provides valuable insights into the importance of these KSAs.

- Pilots who excel in situation awareness training are more likely to perform well in fixed-wing airline operations (Banbury at el., 2007) underscoring the importance of situation awareness as a predictor of pilot performance.
- The flanker task, a cognitive assessment tool, has been employed across various professions to measure selective attention and inhibitory function. Results suggest that individuals who perform well are better equipped to manage distractions and prioritize tasks (Wylie, et al 2018).

RESEARCH QUESTION

While the significance of situational awareness, selective attention, and inhibitory function has been explored in the context of fixed-wing aviation, their predictive ability for rotor-wing aviation student performance remains unstudied. This presents an opportunity for further investigation, especially given the unique challenges and demands of rotor-wing flight.

Research Question: Are assessments on situational awareness, selective attention, and inhibitory function predictive of student success in rotor-wing aviation courses?

- **H1:** Positive relationships will exist between KSAs and student course performance
    - **H1a:** A relationship will exist between situational awareness and course performance.
    - **H1b:** A relationship will exist between selective attention and course performance.
    - **H1c:** A relationship will exist between inhibitory function and course performance.
- **H2:** Student KSAs will predict rotor-wing simulator performance.
- **H3**: Student course performance will predict after graduation employment.

SAMPLE TASKS

FASA Questionnaire Sample Items

Attention Management	For non-critical tasks, I frequently perform two or more tasks together rather than perform one task at a time.
Information Management	I weighed up all the evidence before making a decision.
Cognitive Efficiency	When I was calm/under-loaded I focused on potential threats
Automaticity	I was so used to doing certain tasks that I found it difficult to adapt to changing circumstances
Interpersonal Dynamics	I could tell what the other crewmember was thinking from their body language alone

Flanker Task Example: Participants are instructed to press the F keyboard button if the center arrow is pointing left and the J keyboard button when the center arrow is pointing right.

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METHODS

PARTICIPANTS

- Participants will be rotor-wing aviation students enrolled in instrumentality courses at Austin Peay State University.
- Approximately 15 aviation student participants across Lab I and Lab II instrumentality courses during the 23-24 academic year.

MEASURES

- **Factors Affecting Situation Awareness (FASA)** A modified version of the FASA assessment will be used to gauge situational awareness.
    - The FASA is a 24-item measure where participants indicate their level of agreement with statements related to their situational awareness using a 5-point Likert scale.

- **Flanker Task**
    - Participants will complete a modified Flanker task, which measures their ability to avoid the interference of distractors.
    - The degree of interference is determined by comparing changes in an individual's reaction time (RT) between congruent and incongruent trials. The lesser increase in RT when comparing the RT on incongruent versus congruent trials suggests a greater resistance to the impact of distraction.

PROCEDURES

- Participants will complete an informed consent shared through Qualtrics followed by a demographics survey.
- The modified FASA assessment will be administered using Qualtrics.
- After the FASA assessment, participants will engage in the Flanker task, indicating their responses using keyboard inputs across practice and assessment trails lasting approximately 15 minutes.
- Total time to participant is approximately 30 minutes.

FUTURE RESEARCH

Though 3 primary KSAs were identified, future research may expand and explore a broader range of KSAs. Specifically, those KSAs focusing on a singular Instrument flight operations course and those predicting success beyond lab courses.

CONTRIBUTIONS

Through the investigation of critical KSAs related to the commercial pilot profession, this study seeks to assess cognitive abilities in rotor-wing aviation students that may predict student retention, course successful, and later successful employment. By matching these skills with what's taught in flight school, researchers can assess the predictive ability of KSAs on training success, simulator performance, and actual flight assessments.

Furthermore, our exploration into the modified versions of the FASA assessment and the Flanker task in this context has the potential of adapting traditional Cognitive and I/O assessments to cater to industry-specific needs.

Through this, we aim to enhance the predictive modeling capabilities of I/O psychology, showcasing how cognitive and behavioral metrics can be harnessed to forecast success in specialized training environments such as aviation.

CONTACT INFORMATION

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