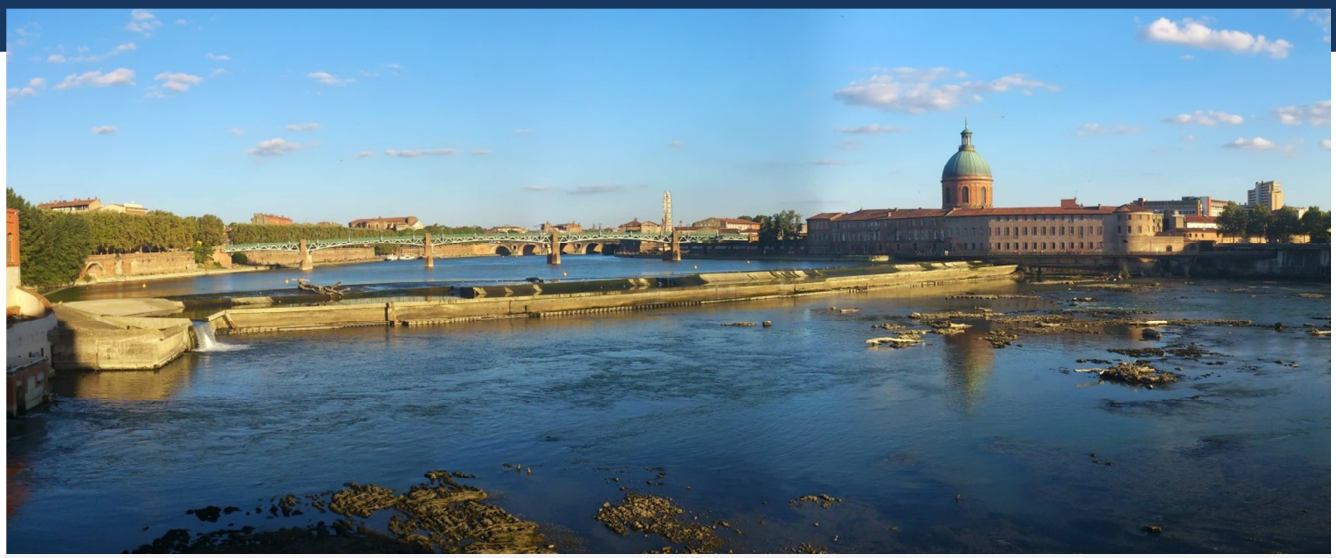

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Influence of Anxiety and Mental Workload on Flight performance in a Flight Simulator

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Content

Introduction

The variation of cognitive workload (CW) can considerably impact the probability of human error due to distraction, mind-wandering or cognitive resources overload 1. Besides, a high level of anxiety can provoke dangerous situations when pilots are not able to take control ensuring total precision and safety. The objective of this work is to assess whether state-anxiety, generated by a social stressor, affects flight performance when the CW varies.

Methodology

Nineteen participants (22.7 ± 3.8 years) were included in our analysis. All of them were in possession of the Private Pilot License, having at least a flying experience of 50 flight hours (141.3 ± 139.5 hours). The experiment took place in an AL-50 simulator and consisted in a dual-task scenario which required the simultaneous accomplishment of a pre-established flight plan and a secondary task. A previous training consisting in a similar dual task scenario was carried out.

The established flight scenario lasted approximately 35 minutes, including a 24-minutes cruise phase. A strict timing for the flight instructions was specified. Speed (measured in knots), heading (degrees) and altitude (m) parameters were collected during the simulations (sampling rate of 1Hz). To evaluate the performance, any deviation greater than ± 5 units from the requested flight parameter was counted as an error.

The secondary task consisted of pressing a 7 inches touch-screen as quickly as possible after hearing some numbers integrated among Air Traffic Control instructions unrelated to the flight plan, only to get a more realistic setting. The task was presented during the cruise and subdivided in two inter-subject counterbalanced phases of 12 minutes: Low Cognitive Workload (LCW), where participant was instructed to press the screen if the heard numbers meet a simple attribute (magnitude or parity); High Cognitive Workload (HCW) where the attribute depended on the color of the numbers displayed on the screen.

The participant was filmed and involved in a competition with the other participants similarly to [2] in order to enhance the state-anxiety. Cognitive and somatic anxiety levels and self-confidence were measured by means of the CSAI-2R questionnaire [3]. An ANOVA was performed: 2 levels of CW: LCW and HCW and one between-subject factor: anxiety (2 groups according to a cluster analysis from CSAI-2R scores).

Results

Concerning the altitude, a main effect of anxiety was significant ($p=.025$, $\eta p^2=0.262$), showing a better accuracy for group scoring lower in anxiety. No effect of CW and no interaction were significant. Regarding the heading, a main effect of CW was found ($p=.048$, $\eta p^2= 0.211$) and an interaction CW-anxiety was obtained ($p=.045$, $\eta p^2=0.214$), showing worse accuracy for more anxious group only under HCW. No significant results were found for speed.

Conclusion

The subjective feeling of cognitive and somatic anxiety, when pilots are supervised or involved in a competition, influences in a different way distinct manoeuvers. They have a negative effect to keep altitude and impact also heading, but the latter only when cognitive workload increases.

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