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IFSTTAR

Cognitive Workload and Personality Style in Pilots *Heart Rate Study*

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CONTEXT

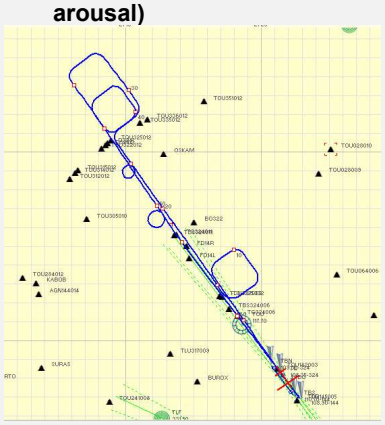
Pilots are commonly exposed to different sources of cognitive and emotional stressors and distractors

A physiological monitoring to assess cognitive workload (CW) variations is desirable to alert of risky states

Personality affects physiological responses (e.g. ECG) under high CW or stressful situations

MATERIAL AND METHOD

- 20 pilots (22.7 ± 3.7 years)
- Two **dual-tasks**: **flight plan + secondary task**
  - **1st**: pilot alone **(low emotional arousal)**
  - **2nd**: video camera and evaluation **(high emotional arousal)**



- The secondary task (2 x 12 min during the cruise) consisted of pressing as quick as possible a 7" touch-screen after hearing some isolated numbers integrated among Air Traffic Control instructions. Two levels of CW:
  - **Low Cognitive Workload** (**LCW**): to press the screen if the heard number meets a simple attribute (magnitude or parity)
  - **High Cognitive Workload** (**HCW**): the number attribute to meet depended on the color of the numbers displayed on the screen
- Analysis of variance (ANOVA): 2 (personality style) x 2 (CW) x 2 (emotional arousal levels)

OBJECTIVES

- **Analysis of Heart Rate (HR) linked to pilot distraction produced by a competing task to the flight**

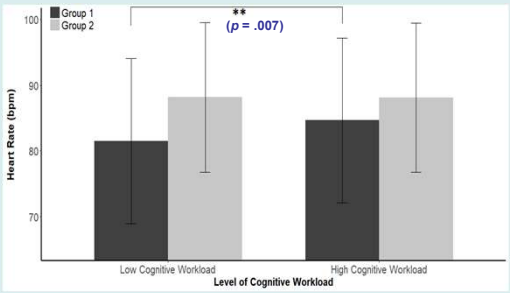
Personality Style defined by Neuroticism and Conscience (Big Five Inventory)

- **Verifying the influence of the pilot personality style on HR modulation due to high CW and high arousal**

RESULTS

- Globally, **HR increases under HCW** ($p = .046$)
- No effect of arousal and no interaction with CW were significant for the whole sample
- Two groups in terms of personality style were found: **Group 1** with higher neuroticism and lower conscientiousness than **Group 2**:
  ***K*-means clustering** gives the following centroids:

	Neuroticism (N)	Conscientiousness (C)
Group 1	2.20	3.39
Group 2	1.64	4.52



- No personality effect
- **Personality x CW interaction** $p = .01$, $\eta_p^2 = .31$
  HR increased for Group 1 under HCW, while remained stable for Group 2

CONCLUSIONS

- **Faster HR for HCW condition**
  - Higher level of vigilance (particularly for higher conscientiousness)
- **Low neuroticism and high conscientiousness:**
  - More physiological stability face to CW variations
  - Better adaptation to dual-task situations
  - Applications: Pilots selection and similar contexts like autonomous vehicles

References

- Blogut, A., 2015. Stressing factors in aviation. Scientific Research & Education in the Air Force – AFASES.
- Carretta et al. Consistency of the relations of cognitive ability and personality traits to pilot training performance. Int. J Aviat. Psychol, 2014, 24(4), pp. 247-264.
- Glicksohn, J., Naor-Ziv, R.: 'Personality profiling of pilots: traits and cognitive style.' Int. J. Personal. Psychol, 2016, 2(1), pp. 7-14.

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