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

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CONTEXT

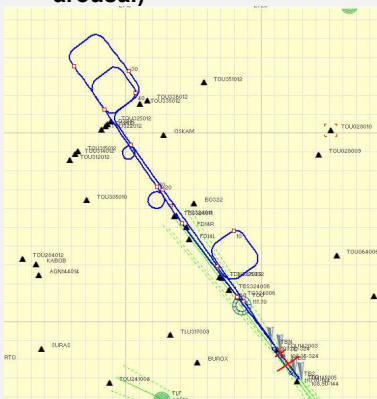
Pilots are commonly exposed to different sources of cognitive and emotional stressors and distractors

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

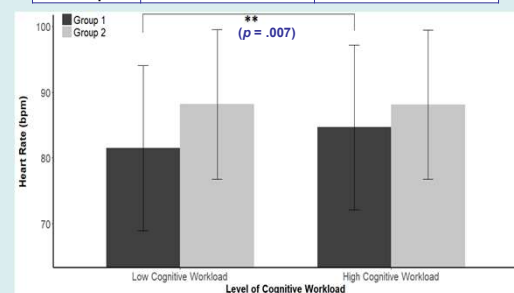
Personality Style defined by Neuroticism and Conscience (Big Five Inventory)

- 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

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