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Cardiovascular Correlates of Emotional State, Cognitive Workload and Time-on-Task Effect during a Realistic Flight Simulation

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Abstract: In aviation, emotion and cognitive workload can considerably increase the probability of human error. An accurate online physiological monitoring of pilot's mental state could prevent accidents. The heart rate (HR) and heart rate variability (HRV) of 21 private pilots were analysed during two realistic flight simulator scenarios. Emotion was manipulated by a social stressor and cognitive workload with the difficulty of a secondary task. Our results confirmed the sensitivity of the HR to cognitive demand and training effects, with increased HR when the task was more difficult and decreased HR with training (time-on-task). Training was also associated with an increased HRV, with increased values along the flight scenario time course. Finally, the social stressor seemed to provoke an emotional reaction that enhanced motivation and performance on the secondary task. However, this was not reflected by the cardiovascular activity.

Keywords: Cognitive Workload, Emotion, Flight Simulation, Heart Rate, Heart Rate Variability, Neuro-Ergonomics.