Heart Rate Variability as a Biomarker for Working Memory Performance and Fatigue Perception

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PURPOSE

- Targeting the emergency response work setting
- Working memory (WM) test
- Performance measurements and fatigue subjective reports
- Aiming to provide a fieldable and unobtrusive measurement of fatigue for emergency responders using heart rate variability (HR/V)

BACKGROUND

- Relationship of higher HR/V with lower stress\(^1\) and better adaptation to environmental stimuli\(^2\)
- Significant association between fatigue and sympathetic activation marked by the increase in LF and LF/HF ratio\(^3\)

METHODS

- Data from the sham group of our tDCS study\(^4\)
- Thirty healthy adults (Female = 15)
- Sixty-minute visuospatial 2-back working memory (WM) test
- Twelve 5-minute blocks
- Analysis:
  - Baseline HR/V: Median split followed by paired sample t-test
  - HR/V during the test: Spearman’s rank correlation coefficient

RESULTS

- High baseline heart rate variability (HR/V) was related to overall better performance and less fatigue; but increasing HR/V was related to increasing concurrent fatigue during the test.

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REFERENCES


![Figure 1. Experiment workflow: baseline HR/V collected while participants filled out background questionnaires.](image1)

![Figure 2. Two-back task schematic indicating matching event.](image2)

![Figure 3. Higher baseline RMSSD, LF Power and LF/HF Ratio were associated with overall higher WM performance.](image3)

![Figure 4. Higher baseline LF Power and LF/HF Ratio were associated with overall lower fatigue perception.](image4)

![Figure 5. Higher RMSSD and LF Power during the WM test was associated with concurrent higher fatigue perception.](image5)