PARSING OUT THE INFLUENCE OF PRACTICE AND TESTING FATIGUE ON COGNITIVE PERFORMANCE

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Background

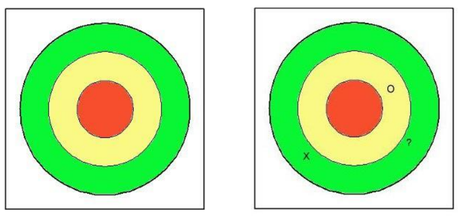
- Repeated testing, or practice, on cognitive tasks increases performance via learning
- However, repeated testing and extended time on task may also cause performance declines known as testing or mental fatigue [1]
- Mood and cognitive performance are further linked [2]
- Because operational tasks involve sustained performance, understanding performance limitations over time, while accounting for mood, is warranted

Hypotheses

- Cognitive performance would be affected by repeated testing and extended time on various cognitive tasks
- Mood would further influence testing fatigue

Methods

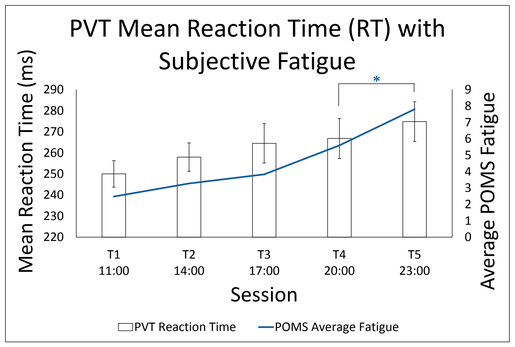
- N = 25 military personnel
- 13 hours testing on Rapid Decision Making and Psychomotor Vigilance Task
  - 5 test sessions, 3 hours apart starting at 11:00
  - Mood profile completed at each test session's completion
- The Rapid Decision Making (RDM) – examines the ability to analyze complex relationships while being able to change strategies depending on the given stimulus
- The Psychomotor Vigilance Task (PVT) – reaction time during sustained attention
  - Considered the gold standard in sleepiness fatigue testing
- The Profile of Mood States (POMS) [3] – Fatigue-Inertia scale used to measure subjective fatigue

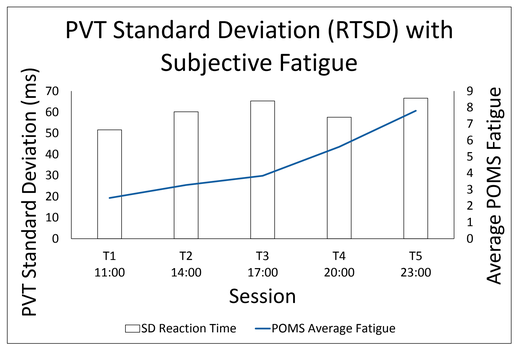


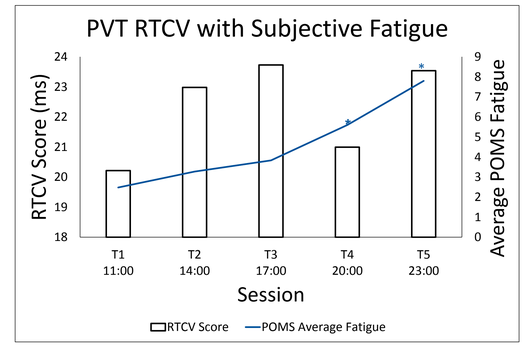
? = Minimal threat
O = Medium threat
X = Critical threat

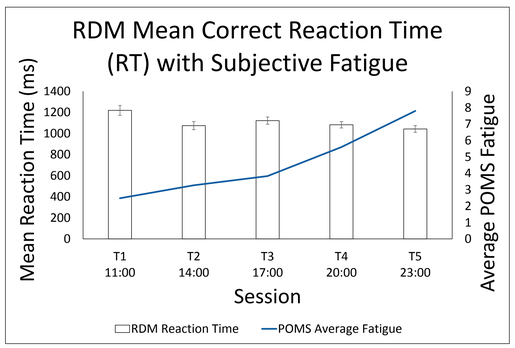
Rapid Decision Making

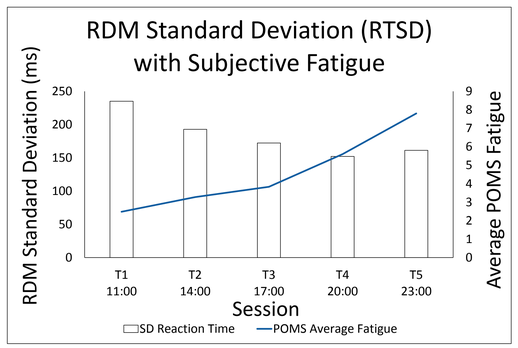
The PVT

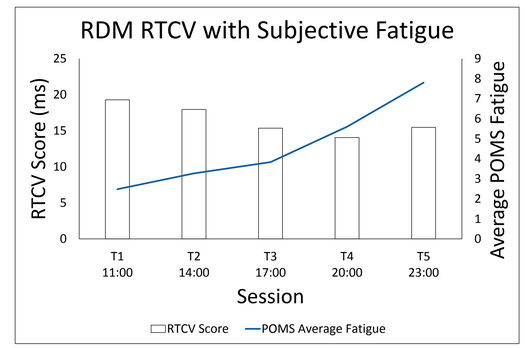












Analyses and Results

Statistical Analyses

- All calculated for both PVT and RDM
  - *Mean Reaction Time (RT)*
    - Measure of task performance and learning
    - Faster RTs indicates greater learning
  - *Response Time Standard Deviation (RTSD)*
    - Measures testing fatigue via absolute response speed variability
    - Greater variability indicates greater testing fatigue
  - *Reaction Time Coefficient of Variation (RTCV)*
    - Measures testing fatigue via relative response speed variability
    - Greater variability indicates greater testing fatigue

Results

- Subjective fatigue correlated with testing fatigue (RTCV) as measured by the PVT, but not as measured by the Rapid Decision Making
- Testing fatigue not evident for any task
- PVT reaction time exhibits a significant difference between T4 and T5, $t(24) = -3.17$, $p = .002$

Conclusions

- The lack of testing fatigue may indicate testing fatigue resiliency in short latency tasks spread across multiple testing sessions
  - Potentially allows for mental task separation
- Repeated task switching may lessen cognitive demand
  - Tasks completed utilizing this concept are less likely to exhibit confounded performance by time on task
- A significant PVT RT performance decrease was evident despite lack of testing fatigue or subjective fatigue indication
- Results should be utilized for optimization of sustained operational missions

References

1. Steinborn, M. B., Flehmig, H. C., Westhoff, K., & Langner, R. (2009). Differential effects of prolonged work on performance measures in self-paced speed tests. *Advances in Cognitive Psychology, 5*, 105-113.
2. Hockey, G. R. J., John Maule, A., Clough, P. J., & Bdzola, L. (2000). Effects of negative mood states on risk in everyday decision making. *Cognition & Emotion, 14*(6), 823-855.
3. .McNair, D. M., Lorr, M., & Droppleman, L. F. (1981). *Profile of mood states*: EdITS manual. San Diego, CA: Educational and Industrial Testing Service.