Physiological Arousal and Mental Arithmetic Performance: A Complex Relationship

Stephanie R. Fishel
Eric R. Muth
Adam W. Hoover

Clemson University
October 2006
This talk presents an experimental analysis of the arousal-performance relationship

Arousal-Performance and Augmented Cognition

Experimental Design

Study Results
The goal of AugCog is to improve performance through task mitigation.
The arousal-performance relationship has been the topic of much debate

The Inverted-U
(Yerkes & Dodson, 1908)

Catastrophe Model
(Hardy & Fazey, 1987)

Multidimensional Theory of Anxiety
(Martens et al., 1990)
Our goal was to examine arousal and performance during mental arithmetic.
Participants engaged in a dual-task paradigm throughout the study

Primary Task: Alternated between shooting and surveillance modes

Secondary Task: Stayed the same

Game Score: $4.00

Math Score: $0.00

8 + 8 =
Inter-beat intervals (IBIs) were recorded continuously and arousal was derived.
Performance scores on the math task were recorded continuously.

Data stream split into 2 minute intervals.

Performance per Interval = End Score – Beginning Score
No arousal-performance relationship or a negative linear relationship were most common.

No relationship (N= 25)

Negative Linear Relationship (N = 14)
A small minority of participants exhibited a curvilinear relationship.

**Inverse-U Relationship (N = 2)**

**U-Shaped Relationship (N = 3)**
Other variables besides arousal play a seemingly large role in performance.
In summary, the relationship between arousal and performance is complex

- Have vast individual differences
- Need tailored mitigations
- Need multiple state measures
- State shifts instead of thresholds

Questions?