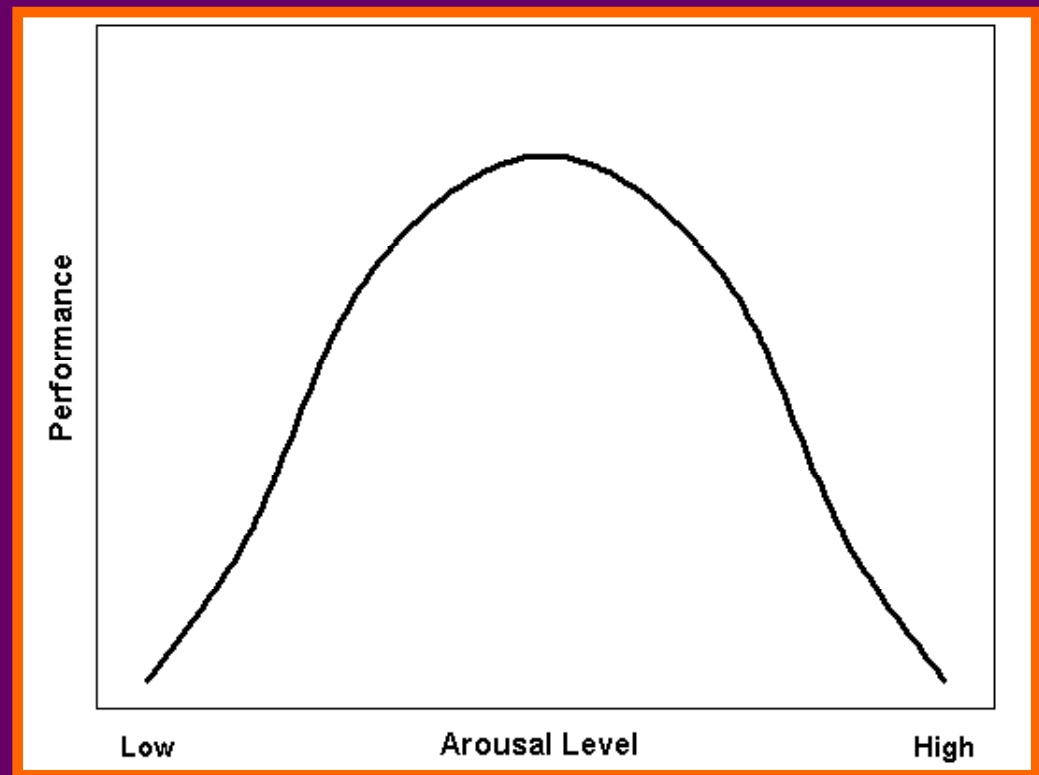


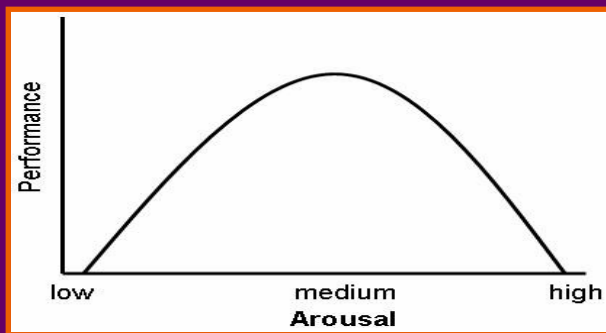
Physiological Arousal and Mental Arithmetic Performance: A Complex Relationship

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

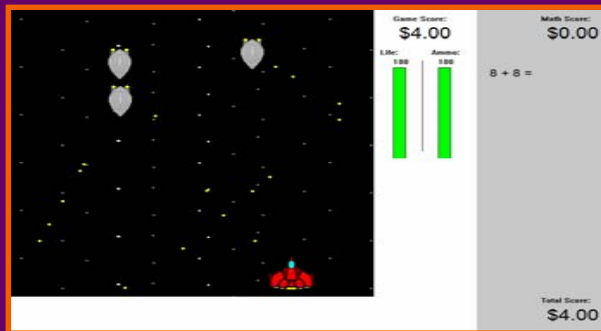
Clemson University
October 2006



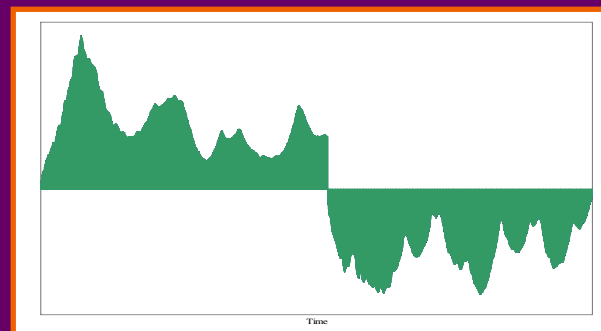
This talk presents an experimental analysis of the arousal-performance relationship



Arousal-Performance and Augmented Cognition



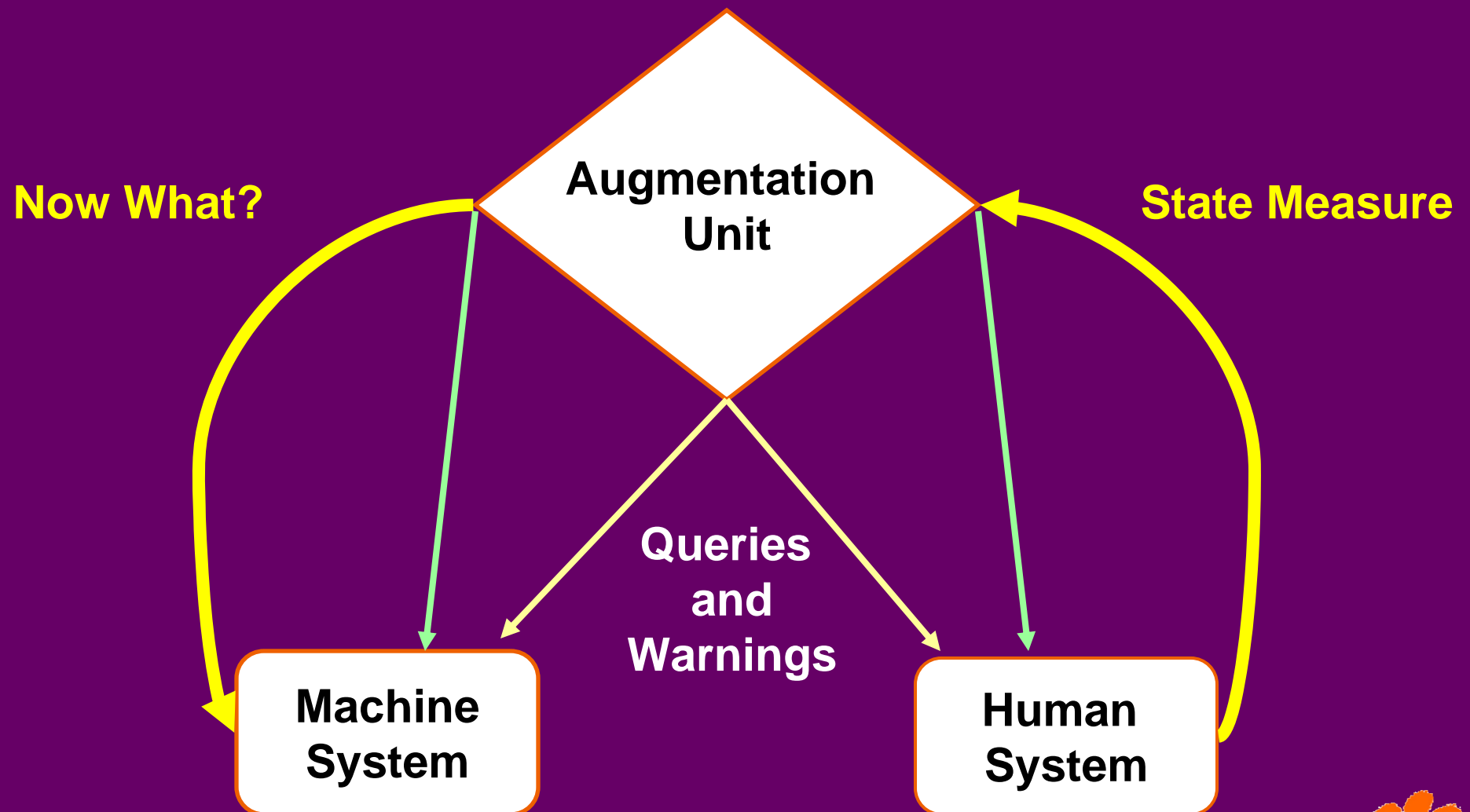
Experimental Design



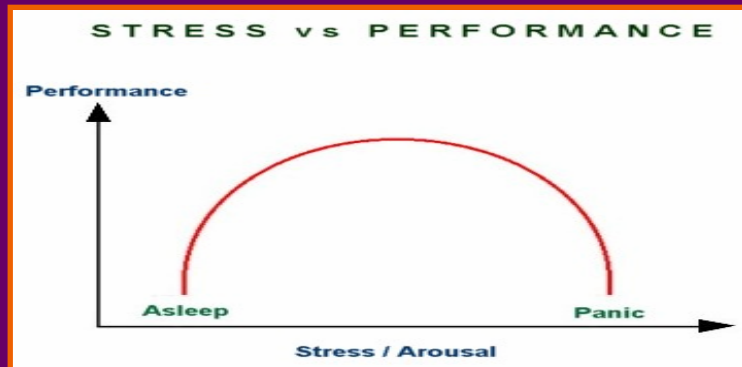
Study Results



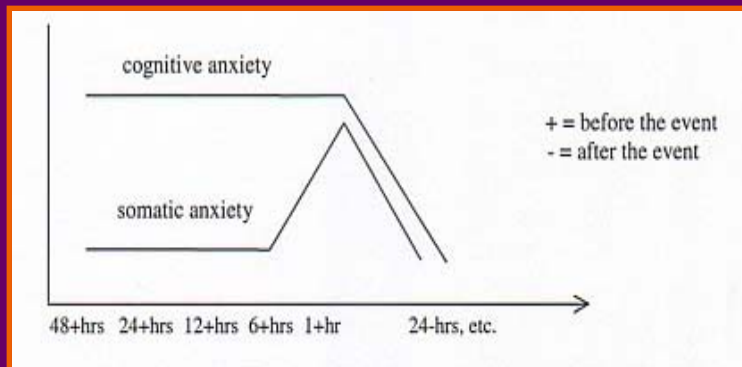
The goal of AugCog is to improve performance through task mitigation



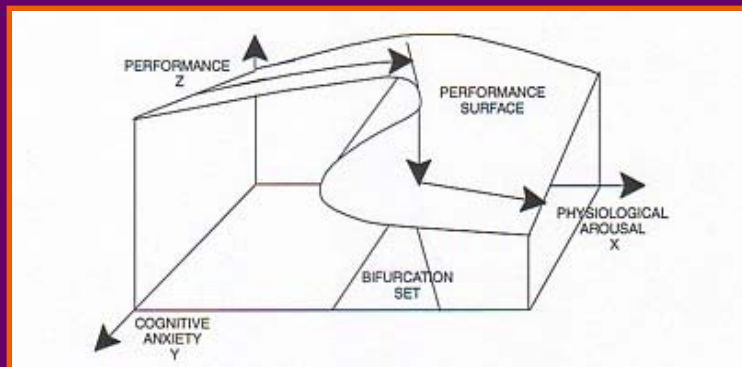
The arousal-performance relationship has been the topic of much debate



The Inverted-U
(Yerkes & Dodson, 1908)



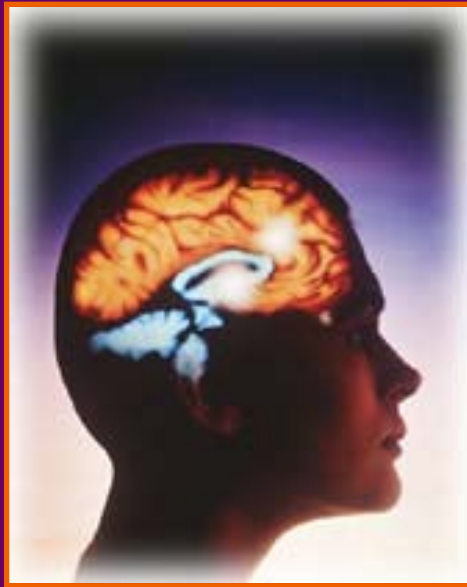
Catastrophe Model
(Hardy & Fazey, 1987)



Multidimensional Theory of Anxiety
(Martens et al., 1990)

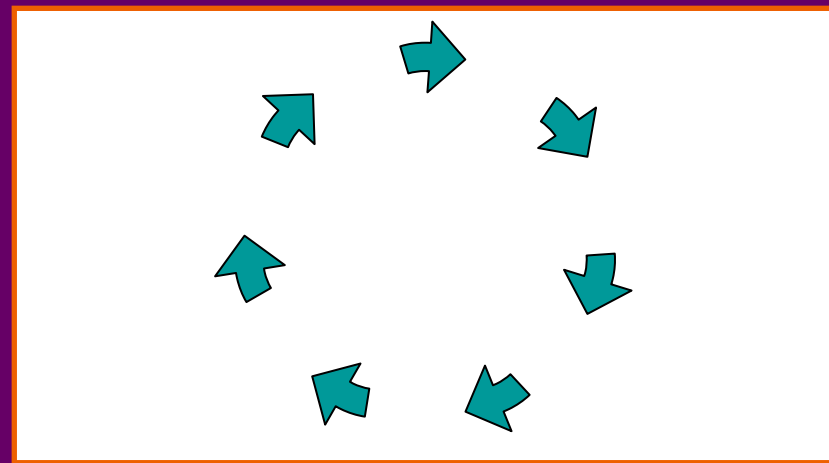


Our goal was to examine arousal and performance during mental arithmetic



Cognitive Task

**Continuous Data
Recording**



Participants engaged in a dual-task paradigm throughout the study

Primary Task

Secondary Task

Game Score: \$4.00

Math Score: \$0.00

Life: 100

Ammo: 100

8 + 8 =

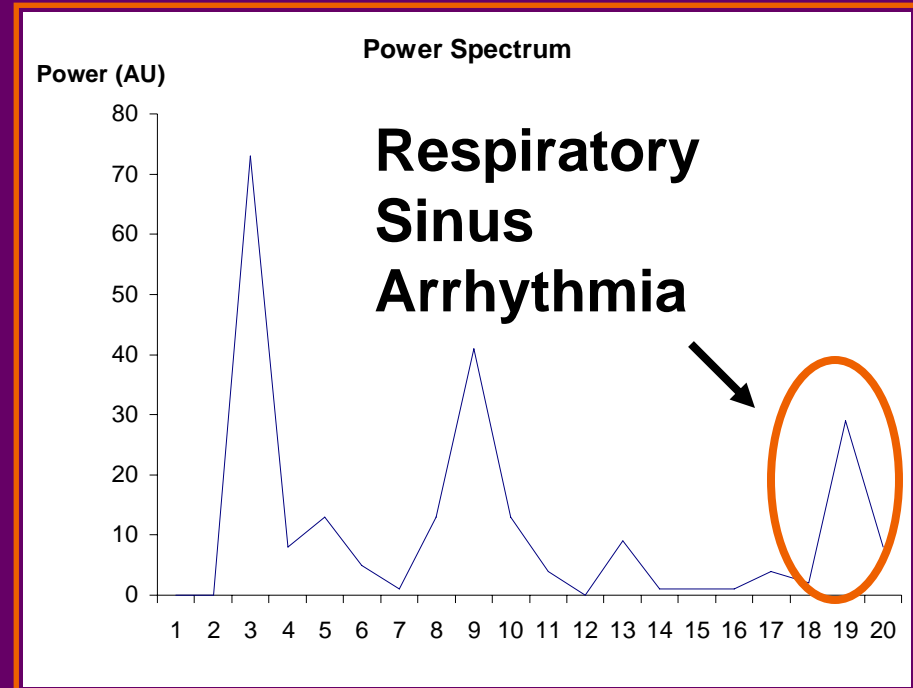
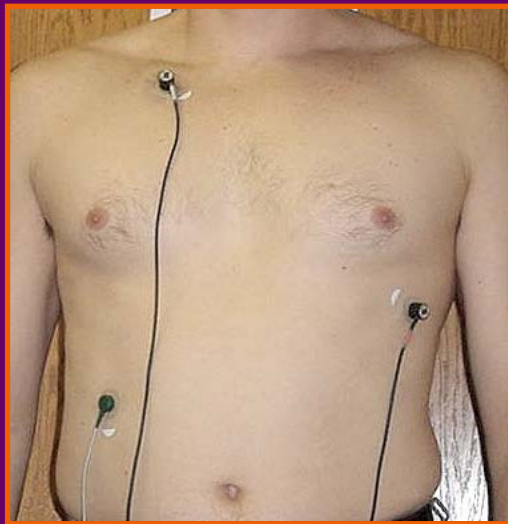
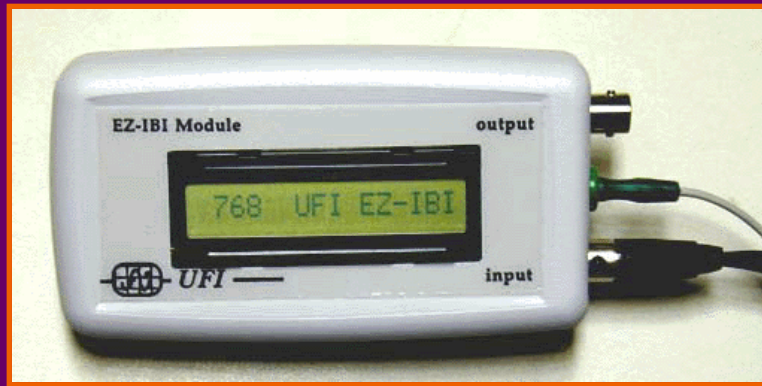
Total Score: \$4.00

Alternated between shooting and surveillance modes

Stayed the same



Inter-beat intervals (IBIs) were recorded continuously and arousal was derived



↑ RSA

↓ Arousal



Performance scores on the math task were recorded continuously

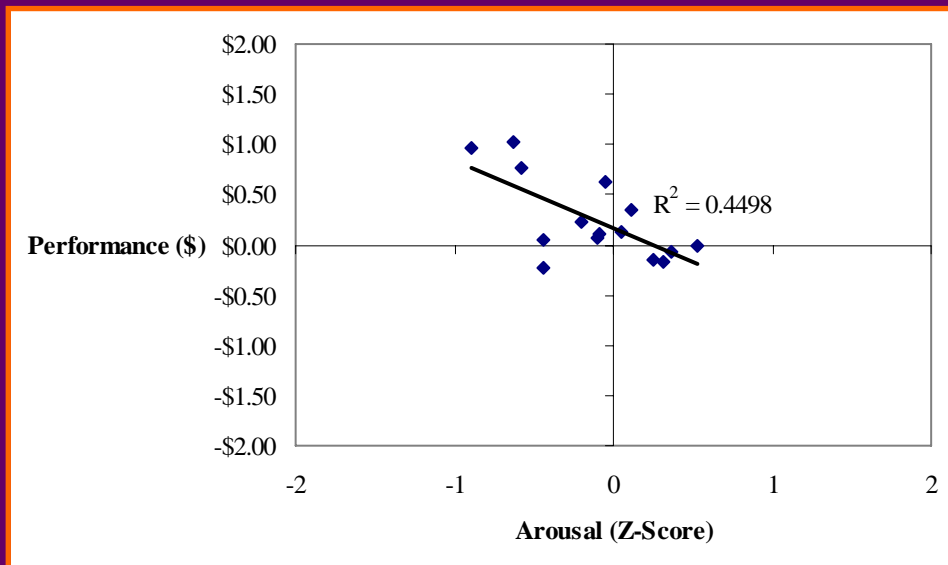
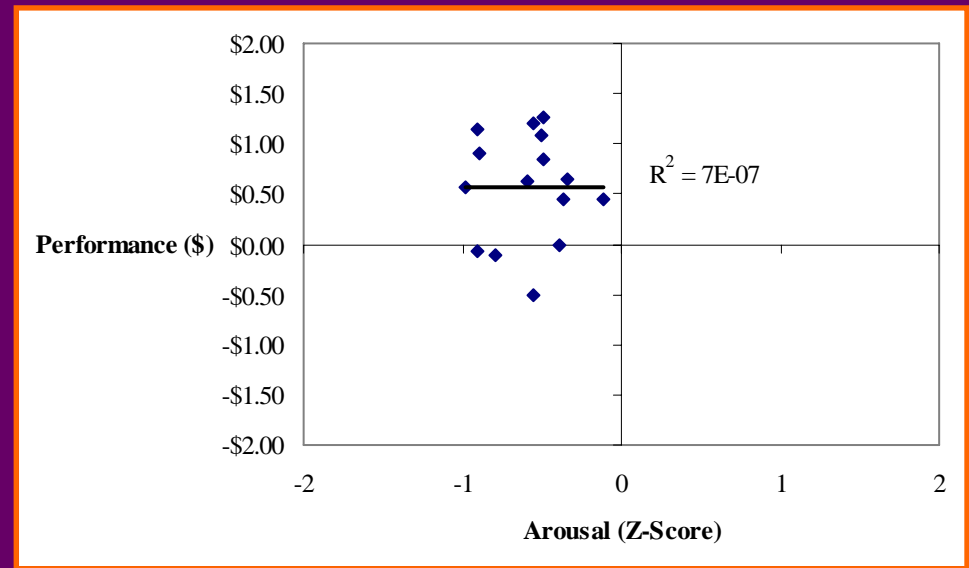


Performance per Interval = End Score – Beginning Score



No arousal-performance relationship or a negative linear relationship were most common

No relationship
(N= 25)

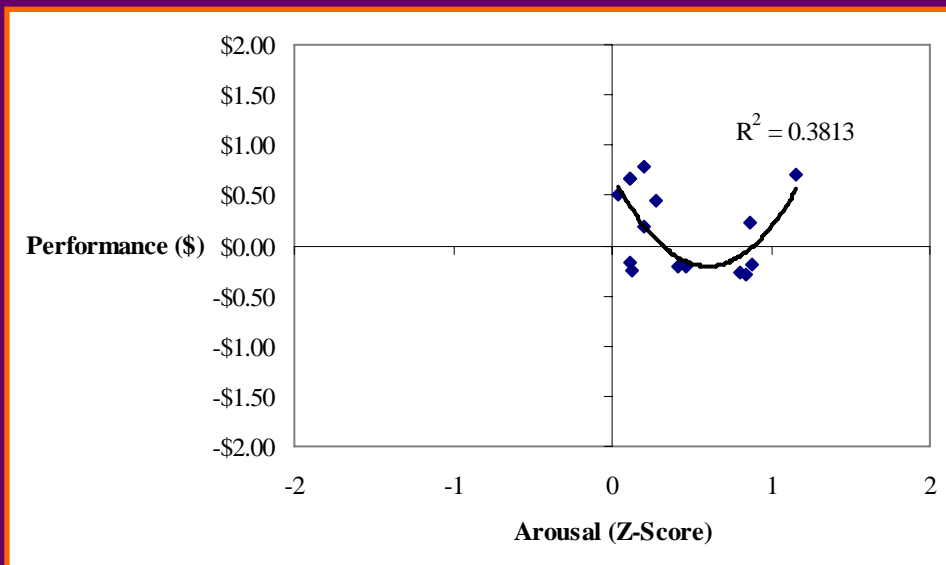
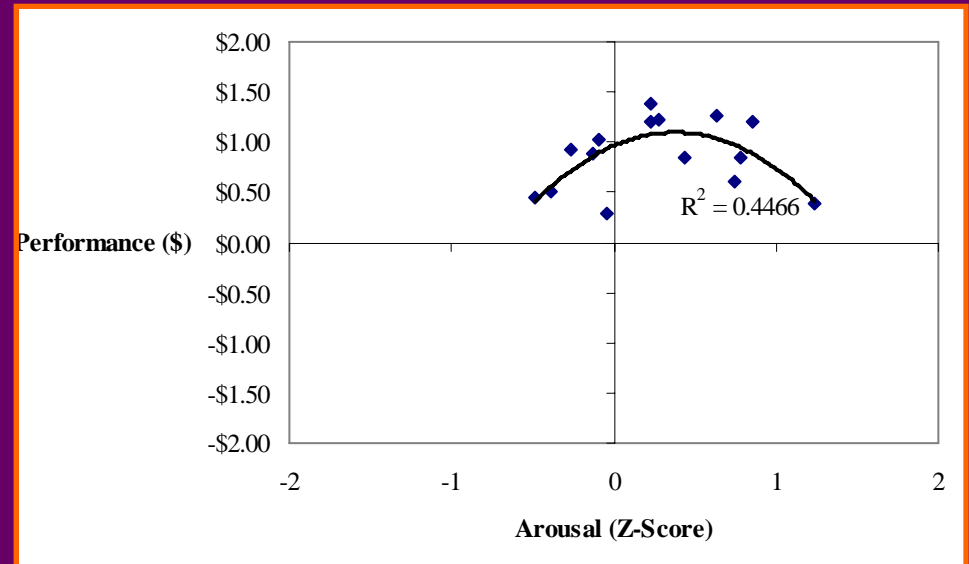


Negative Linear Relationship
(N = 14)



A small minority of participants exhibited a curvilinear relationship

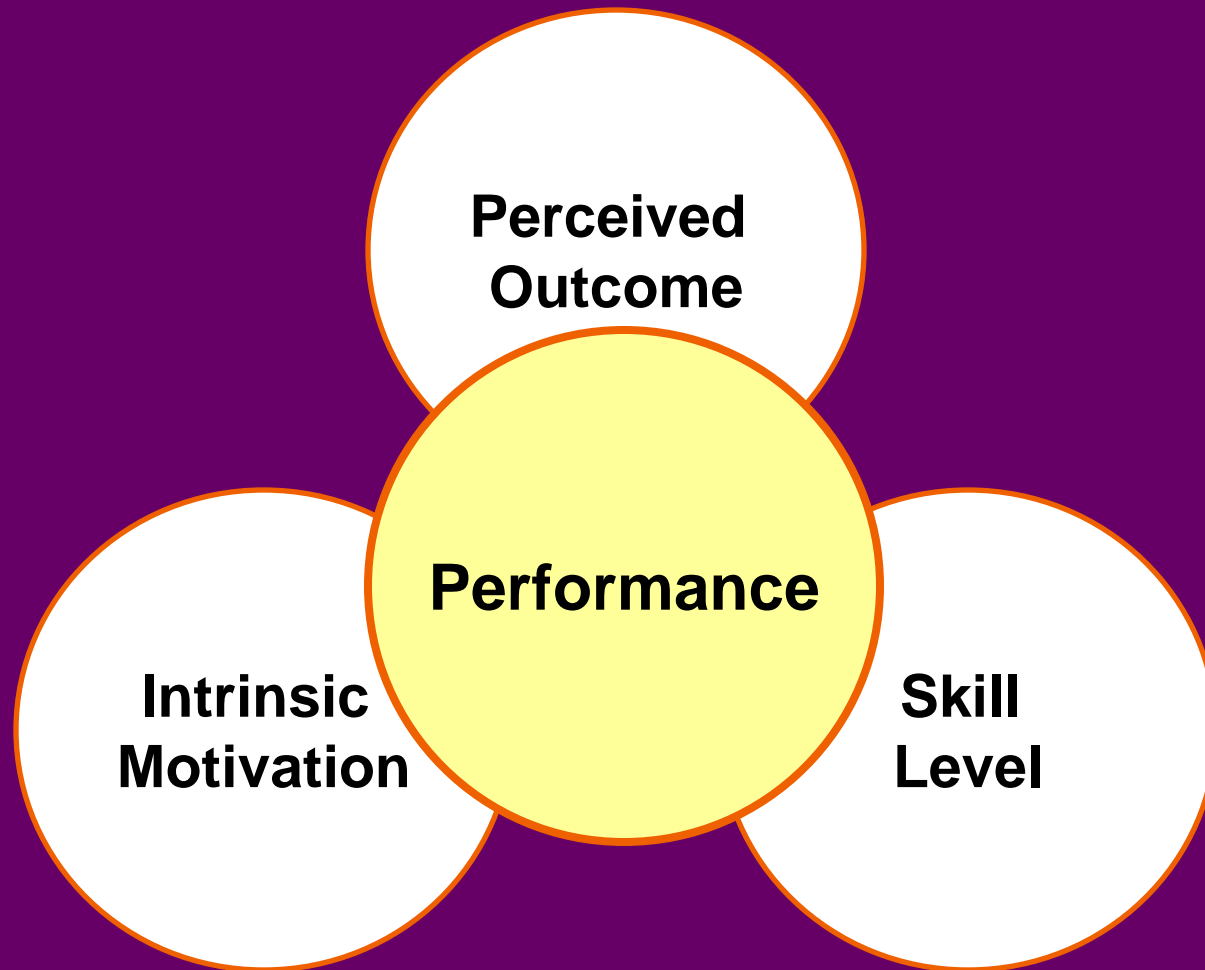
Inverse-U Relationship (N = 2)



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



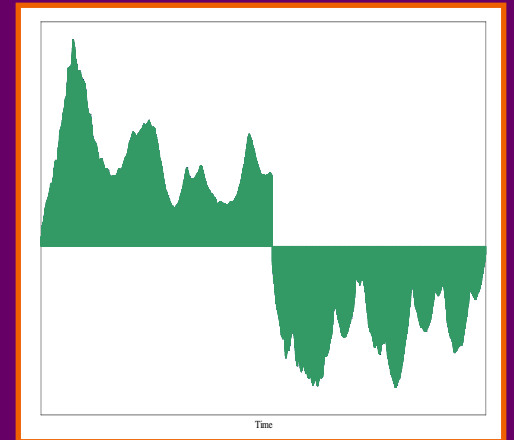
Have vast individual differences

Need tailored mitigations



Need multiple state measures

State shifts instead of thresholds



Questions?

