



Idaho National Laboratory

LESSON 3

The Nature of Human Error

Study Guide

Topic: The Nature of Human Error

Purpose: An understanding of human error is essential to HRA. There are a variety of human errors that can occur and a large number of factors or conditions that tend to elicit or help prevent errors.

Objectives: At the end of the lesson, students will be able to:

- Describe the basics of human cognition
- Define human error in a systems context
- Describe several methods for classifying error
- List conditions that affect human performance

Resources: Reason, Chapters 3 and 4; Gertman and Blackman, Chapter 1

What is Human Error?

- *Unwanted actions or inactions that arise from problems in sequencing, timing, knowledge, interfaces, and/or procedures that result in deviations from expected standards or norms that places people, equipment, and systems at risk.*

or

- *A failure on the part of the human to perform a prescribed act (or performance of a prohibited act) within specified limits of accuracy, sequence or time, which could result in damage to equipment, or property, or disruption of schedules operations.*

or

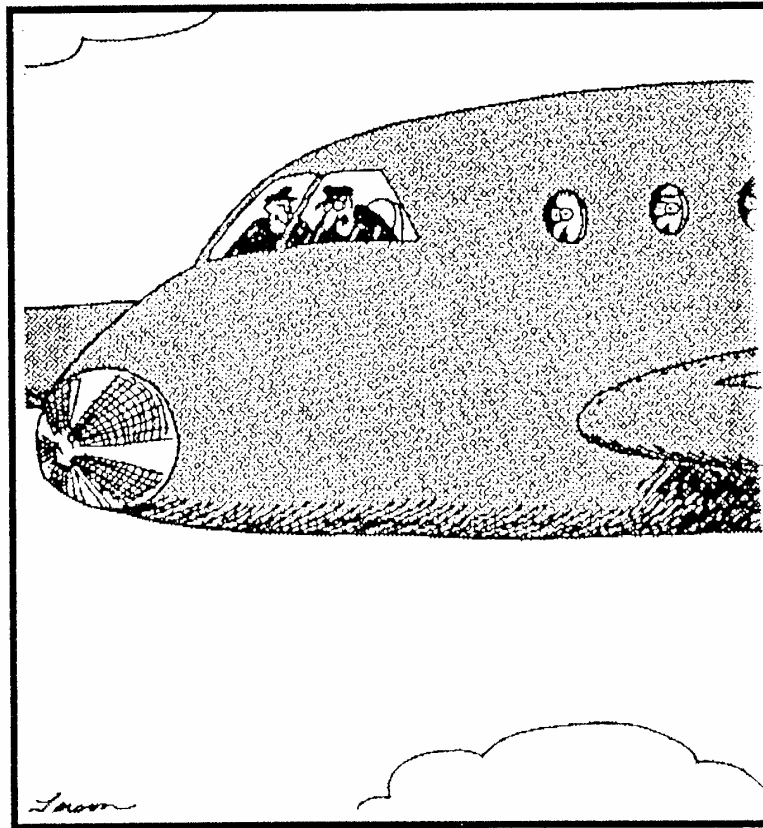
- *An out of tolerance action, or deviation from the norm, where the limits of acceptable performance are defined by the system.*

or

- *Unplanned or unintentional; intentional or circumvention.*

What do we mean by human error?





“The fuel light’s on, Frank! We’re all going to die!...We’re all going to die!..Wait, wait...Oh, my mistake - that’s the intercom light.”

#2 Classroom Exercise:

**Finished Files are the Result of
Years of Scientific Study Combined
With the Experience of Many Years.**



PARIS
IN THE
THE SPRING

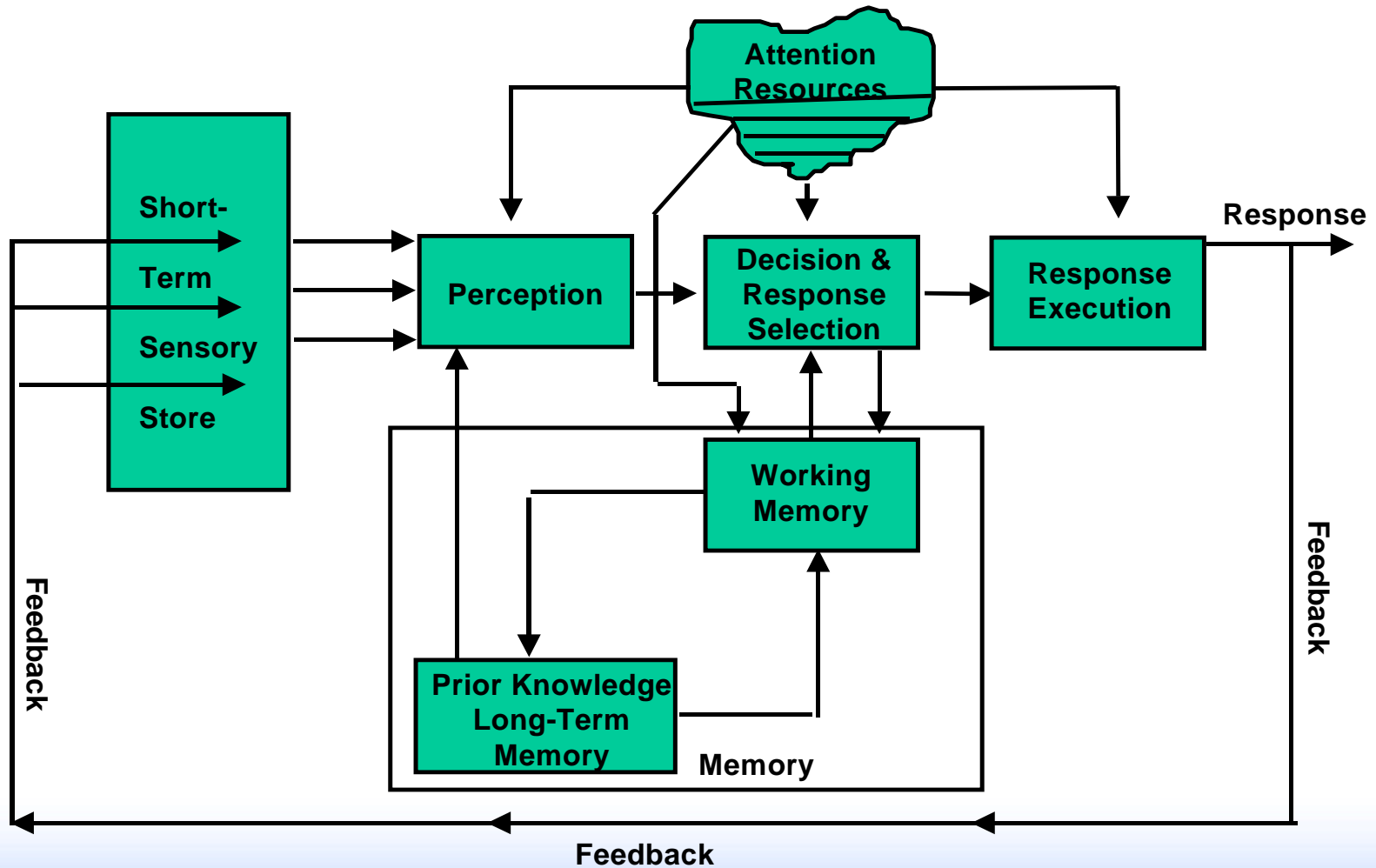
ONCE
IN A
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BIRD
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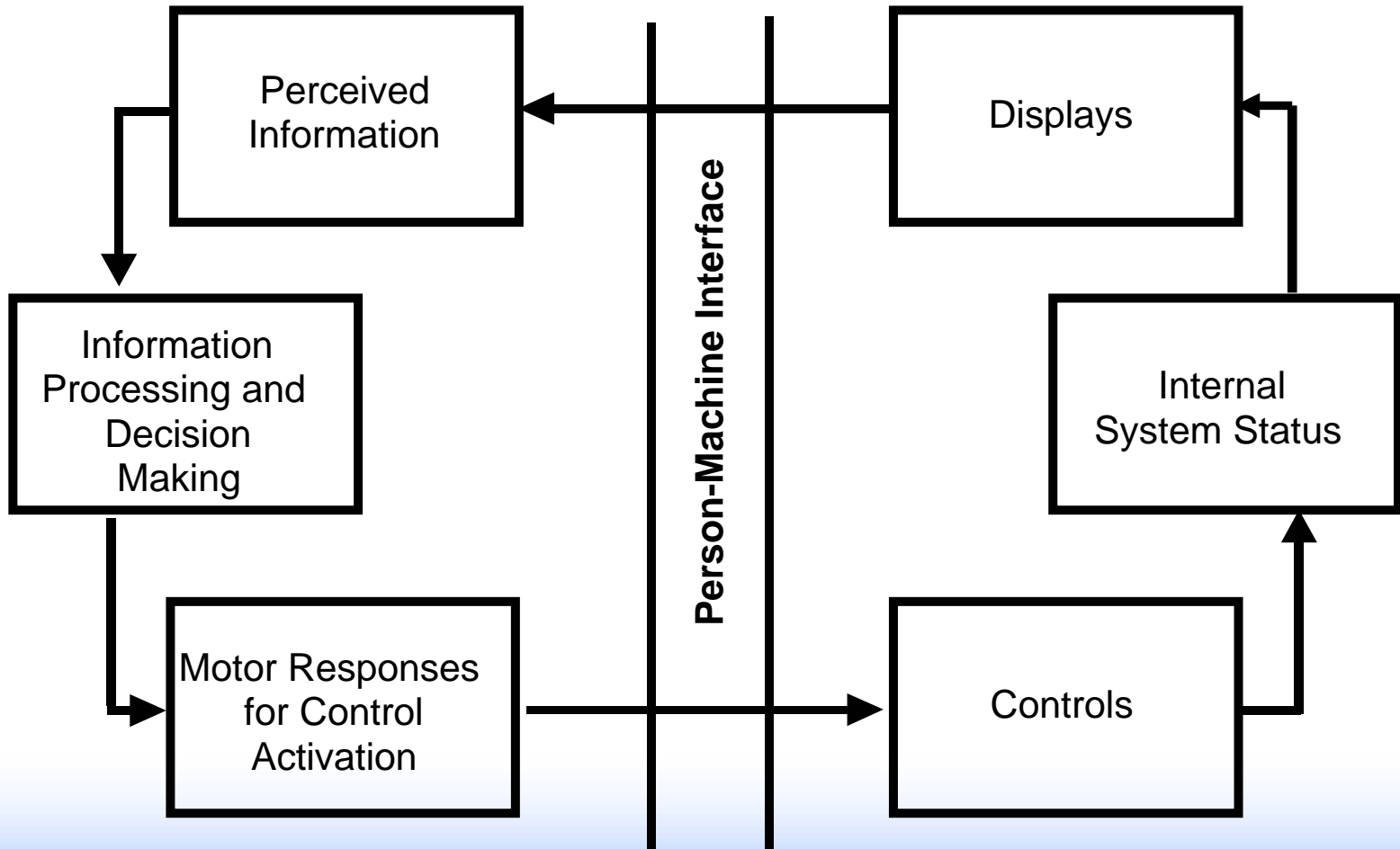
Conceptualizing error

- ***Humans are natural “error emitters”***
 - ***On average we make around 5-6 errors every hour***
 - ***Under stress and fatigue that rate can increase dramatically***
- ***Most errors are inconsequential or mitigated***
 - ***No consequences or impact from many mistakes made***
 - ***Where there may consequences, many times defenses and recovery mechanisms prevent serious accidents***
- ***A good way to understand human error is within the context of human cognition***
 - ***Information processing model***
 - ***Knowledge-based, rule-based, and skill-based based error rates***

Human Information Processing



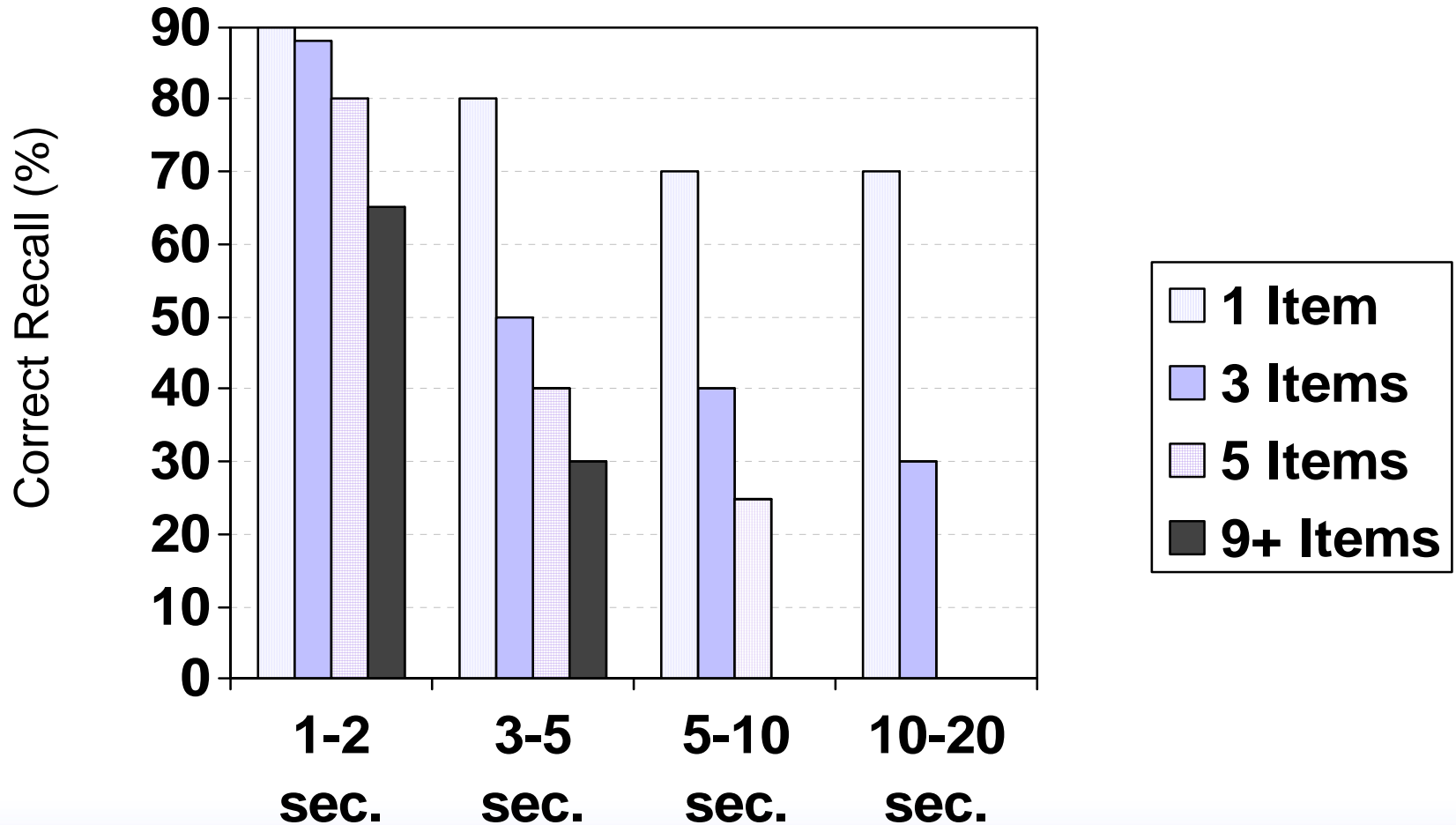
Cognition Can Be Integrated on a Systems Level



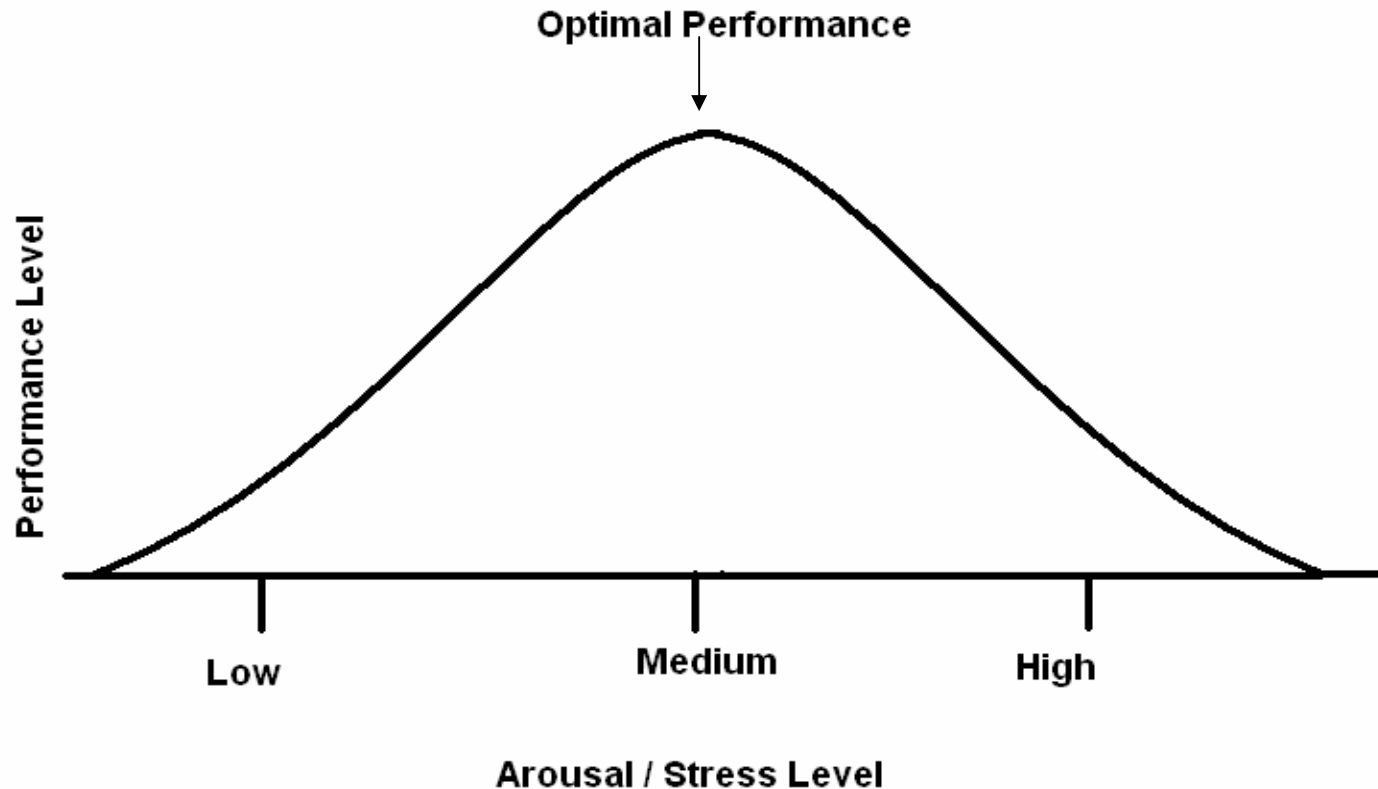
Human Performance Characteristics

- *The relationships between conditions such as stress, fatigue, memory requirements and noise on human performance are well documented*
- *Likewise: Experience, training, fatigue, interface design can have dramatic impact on performance*
- *As can: Emotional “overrides,” attitudes, expectations, and organizational values*

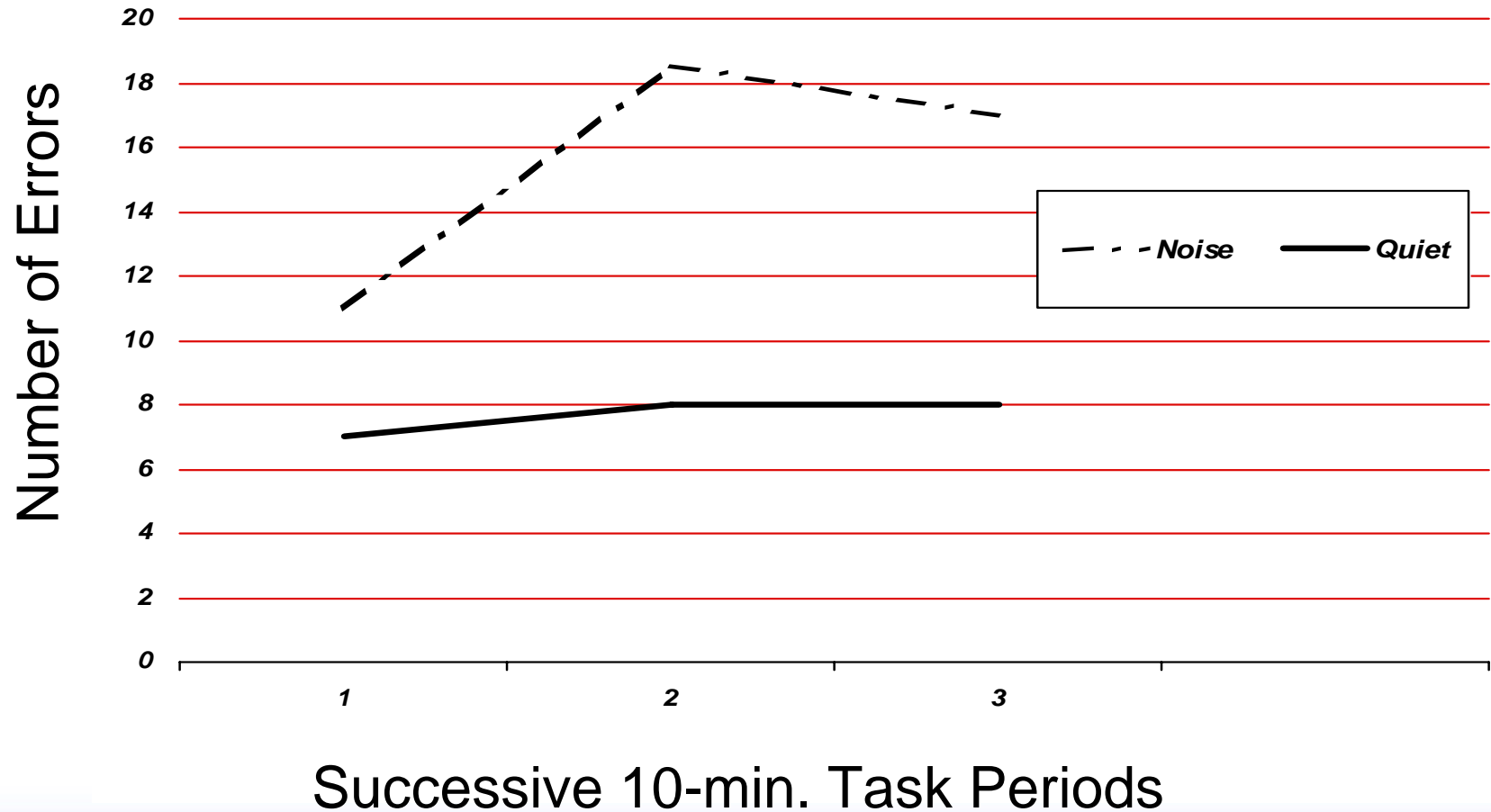
Retention Interval vs. Items in Memory



Human Performance Compared to Level of Arousal (Stress)



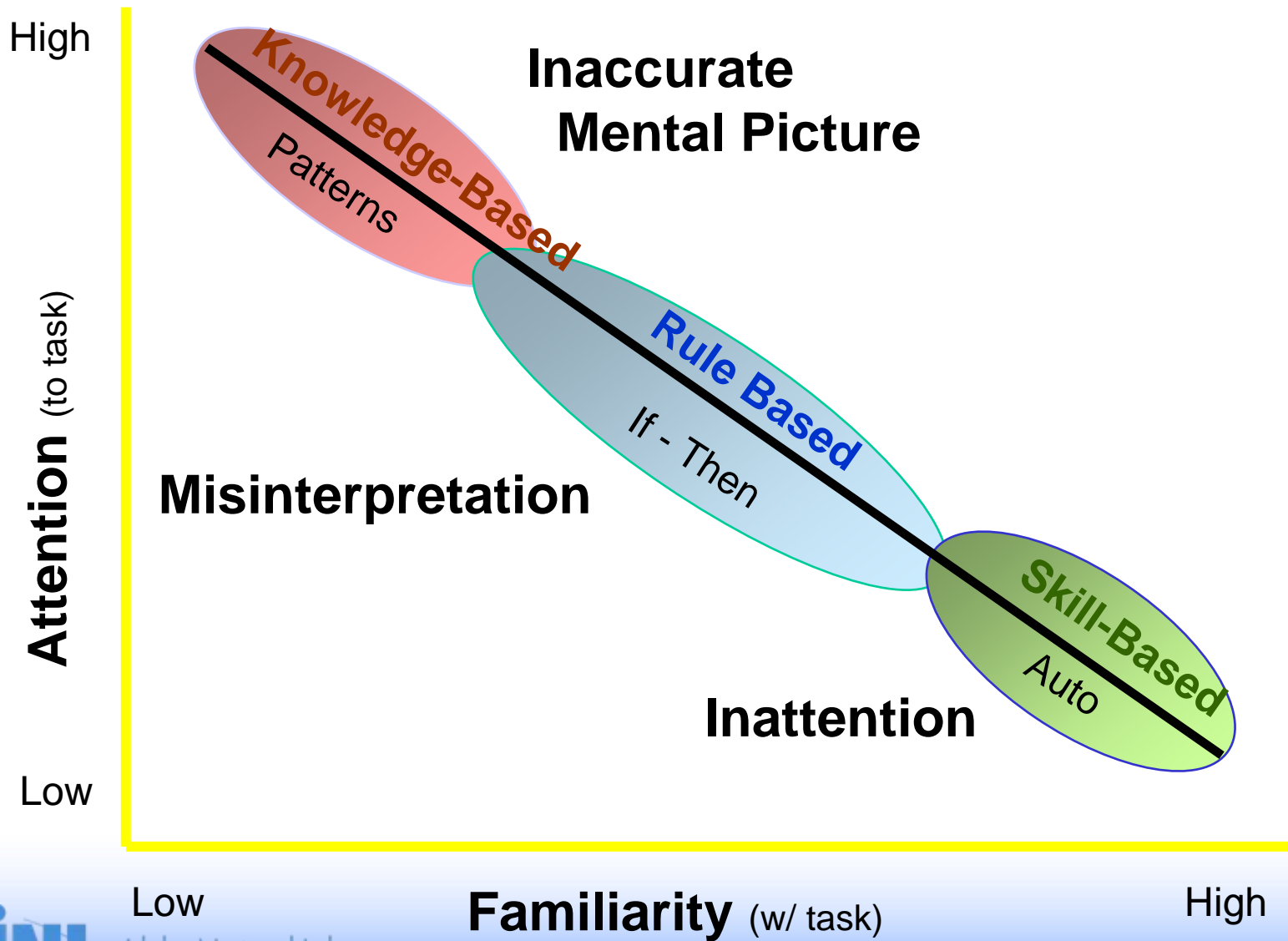
Effect of Continuous Noise on Performance



Context

- ***Context is the simultaneous occurrence of:***
 - ***Task***
 - ***Sequence***
 - ***Environment (equipment status, temperature, lighting, complicating conditions)***
 - ***Psychological factors (cognition, perception)***
- ***Understanding context can aid in the prediction of human behavior***

Performance Modes



Source: James Reason, *Managing the Risks of Organizational Accidents*, 1998.

Psychological Context

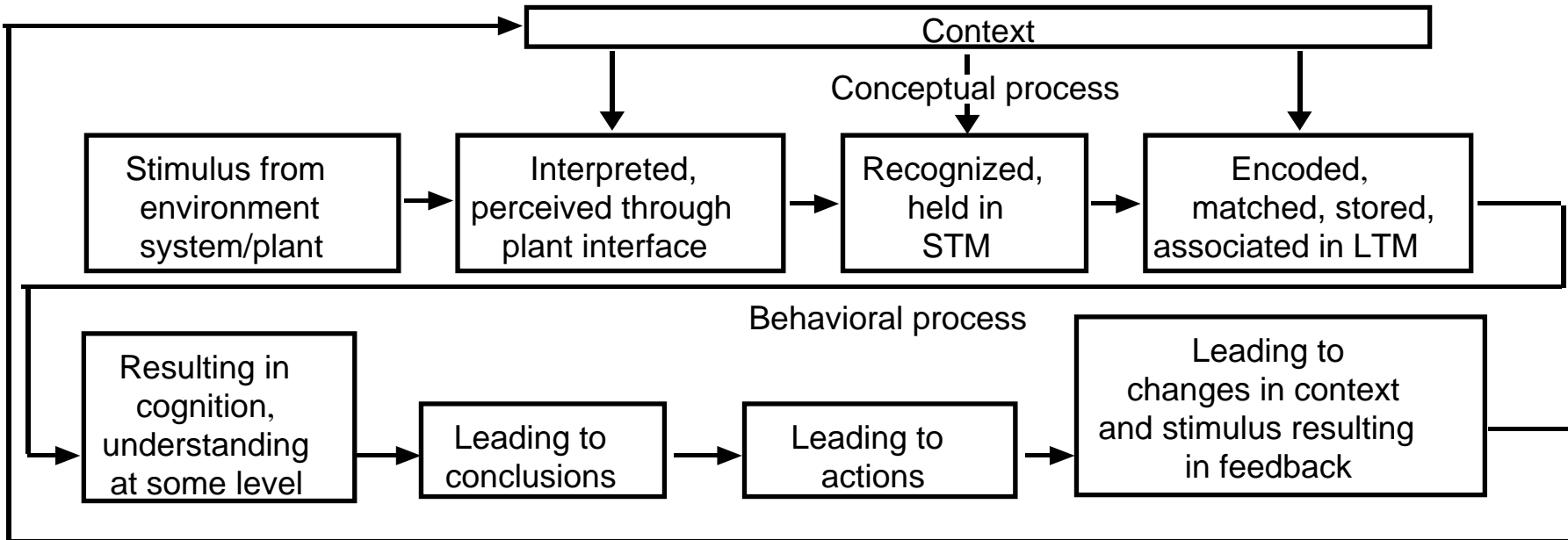
Is created by individuals based upon

- *their prior knowledge*
- *their expectations*
- *their present circumstances*
- *their goals*
- *the reward/punishment structure*

Context Elements

Past experience
Decision making, strategies, heuristics
Present (current) environment
Goal structure (future)

Context



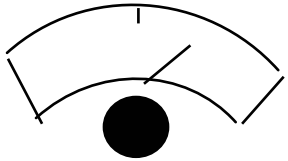
#4 Exercise: What contextual factors do you think may have been involved? List and Discuss.



Culture

Culture and cognitive expectancy can be powerful influences on performance

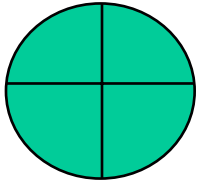
#5 In Class Exercise: Population Stereotypes



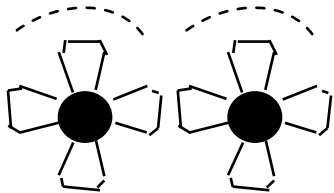
Knob

1. To move the arrow-indicator to the center of the display, how would you turn the knob?

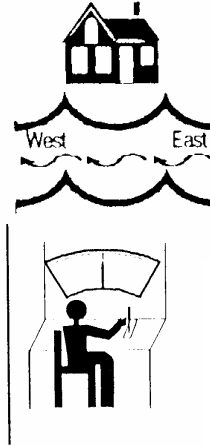
_____ clockwise
_____ counterclockwise



2. In what order would you label the 4 quadrants of a circle. Write in the letters A, B, C, D, assigning one letter to each Quadrant.



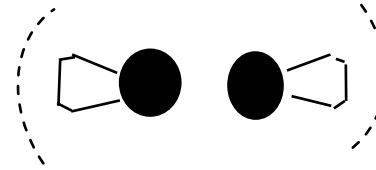
3. Here are 2 knobs on a bathroom sink, looking down at them. Put an arrow on each dotted line, to show how you would use them to turn the water on.



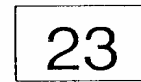
4. Here is a river flowing from east to west. Is the house on the _____ left bank?
_____ right bank?

5. To move the arrow indicator to the right of the display, how would you move the lever?

_____ Push
_____ Pull



6. Here are two knobs on a bathroom sink, looking down on them. Put an arrow on each dotted line, to show how you would operate them to turn water on.



7. To increase the number in the displayed window, how would you turn the knob?

_____ clockwise
_____ counterclockwise

Lesson Summary

Key Points:

Human error is closely tied to the mechanisms of human cognition

There are a number of methods for classifying error

Context and other conditions affect human performance