

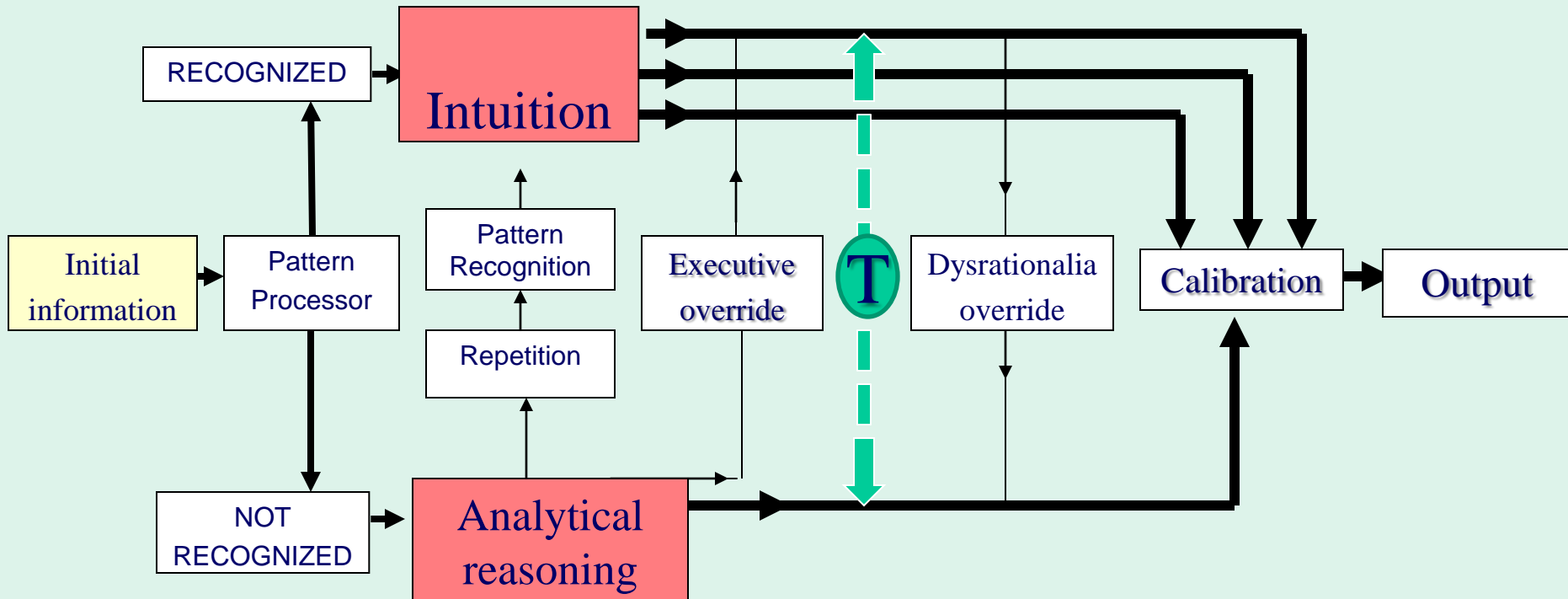
Thinking

(and the factors that influence it)

Pat Croskerry MD PhD

Scottish Intensive Care Society

St Andrews, *January 2011*



Dual Process Model

Medical Decision Making

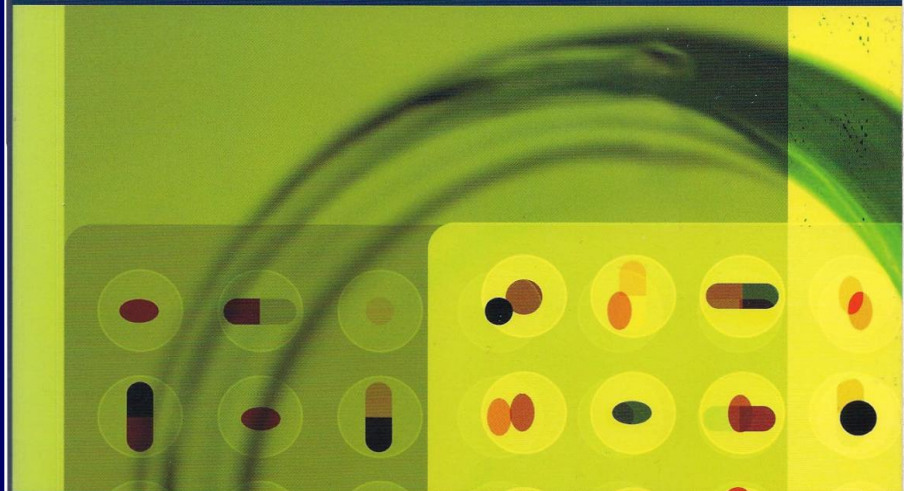
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graph TD; A[Medical Decision Making] --> B[Intuitive]; A --> C[Analytical]
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Intuitive

Analytical

Orthodox
Medical
Decision
Making
(Analytical)

Rational Medical DECISION MAKING



A CASE-BASED APPROACH

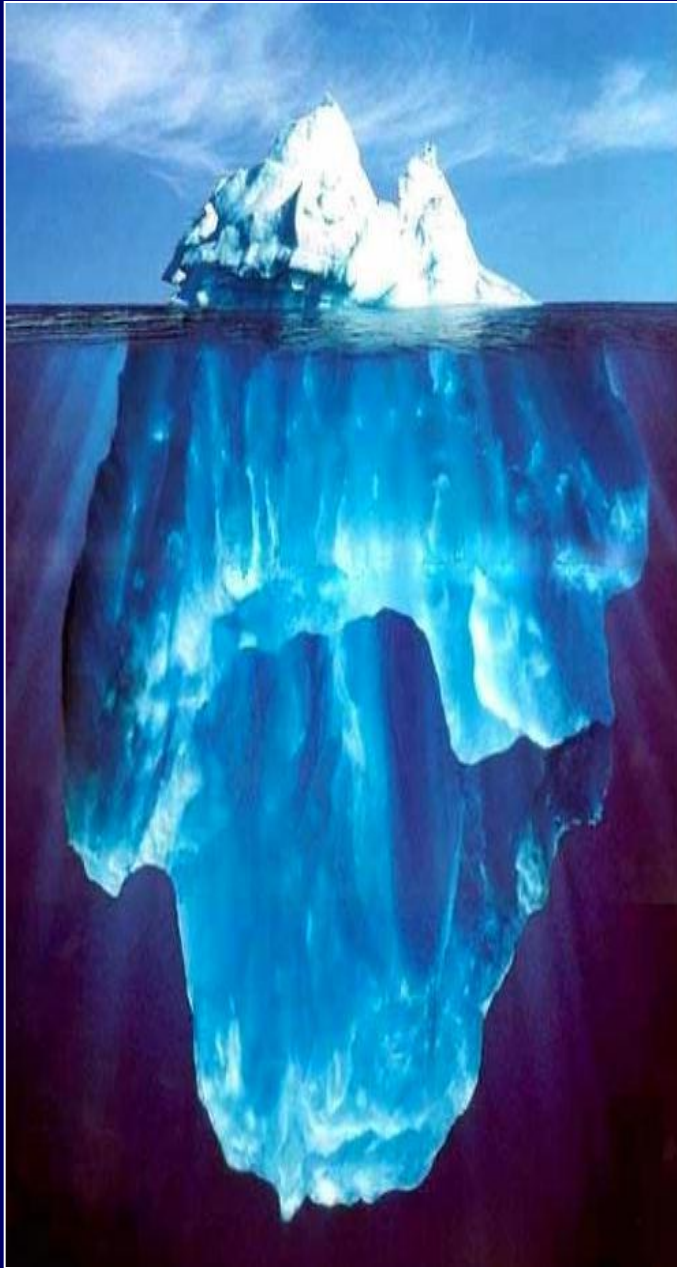
Goutham Rao

Mc
Graw
Hill

LANGE

Rational Medical Decision-Making

- Knowledge base
- Differential diagnosis
- Best evidence
- Reviews, meta-analysis
- Biostatistics
- Publication bias, citation bias
- Test selection and interpretation
- Bayesian reasoning
- Hypothetico-deductive reasoning



- ‘Cognitive thought is the tip of an enormous iceberg. It is the rule of thumb among cognitive scientists that unconscious thought is 95% of all thought –
- this 95% below the surface of conscious awareness shapes and structures all conscious thought’

Lakoff and

Johnson, 1999



Rational blind-spots

- Framing
- Context
- Ambient conditions
- Individual factors

Individual Factors

- Knowledge
- Intellect
- Personality
- Critical thinking ability
- Decision making style
- Gender
- Ageing
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- Fatigue, sleep deprivation, sleep debt
- Cognitive load tolerance
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- Deference to authority

Intelligence

- Measurement of intelligence?
- IQ most widely used barometer of intellect and cognitive functioning
- IQ is strongest single predictor of job performance and success
- IQ tests highly correlated with each other
- Population average is 100
- Average for doctors approximately 120
- Wide range: 10th percentile 106 – 90th percentile 130
- The higher the cognitive ability, the more likely System 1 will be overridden by System 2

Intellectual capacity

- Speed at processing information
- Capacity to learn new information
- Ability to understand complex ideas
- Flexibility to adapt to changing conditions
- Ability to reason
- Tendency to suppress intuitive thinking and avoid error
- Increased performance in analytical reasoning

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Personality

- Factors into 5 major variables

Neuroticism

Extraversion

Openness to experience

Agreeableness

Conscientiousness

- 50% of variance genetic
- Different disciplines have different profiles

Surgeons



Tough-Minded

Decisive

Aloof

Enterprising

Resilient

Anesthetists



Vigilant

Shy

Withdrawn

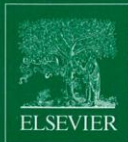
Inhibited

Cold

Analytical-Intuitive Testing

- Gender
- Age
- Personality
- Intellect
- Compliance with guidelines

Overconfidence



Supplement to

THE AMERICAN JOURNAL of MEDICINE®

May 2008
Volume 121 (5A)

The Green Journal

Diagnostic Error: Is Overconfidence the Problem?

GUEST EDITORS

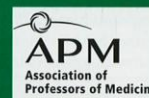
Mark L. Graber, MD, FACP
Chief, Medical Service
Veterans Affairs Medical Center
Northport, New York
Professor and Associate Chair
Department of Medicine
SUNY Stony Brook
Stony Brook, New York

Eta S. Berner, EdD, FACMI, FHIMSS
Professor, Health Informatics
Department of Health Services Administration
School of Health Professions
University of Alabama at Birmingham
Birmingham, Alabama

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‘We argue that physicians in general underappreciate the likelihood that their diagnoses are wrong and that this tendency to overconfidence is related to both intrinsic and systemically reinforced factors’

Berner and Graber, AJM 2008

Not only are they wrong but physicians are
“walking... in a fog of misplaced optimism”
with regard to their confidence

Lowry, CMAJ, 1995

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“... the intellectually disciplined process of actively and skilfully conceptualizing, applying, synthesizing or evaluating information gathered from, or generated by observation, experience, reflection, reasoning, or communication as a guide to **belief or action**”.

Scriven and Paul, 2009

Features of a critical thinker

- Knowing and understanding dual process theory
- Awareness of evolutionary influences on decision making
- Recognizing distracting stimuli, propaganda, bias, irrelevance
- Identifying, analyzing, and challenging assumptions in arguments
- Awareness and understanding of cognitive fallacies and poor reasoning
- Awareness of impact of major cognitive and affective biases on thinking
- Recognizing deception, deliberate or otherwise
- Capacity for assessing credibility of information
- Understanding the need for monitoring of own thought processes
- Understanding of the importance of monitoring of own affective state
- Awareness of critical impact of fatigue/sleep deprivation on decision making
- Capacity to imagine and explore alternatives (lateral thinking)
- Capacity for systematically and effectively working through problems
- Awareness of importance of the context under which decisions are made
- Understanding the dynamics and properties of individual vs. group decision making
- Capacity for anticipating the consequences of decisions

Medical school at Salerno

- Began in 10th century
- Flourished in 10-13th centuries
- Best in world: Salerno known as ‘town of Hippocrates’
- Insistence upon proper training to practice medicine



Preliminary training (premed): Logic, rhetoric, grammar, metaphysics, physics, cosmology, biology, psychology, mathematics, astronomy, and music

(Barts started in 1123, and University of Aberdeen medical school in 1495)

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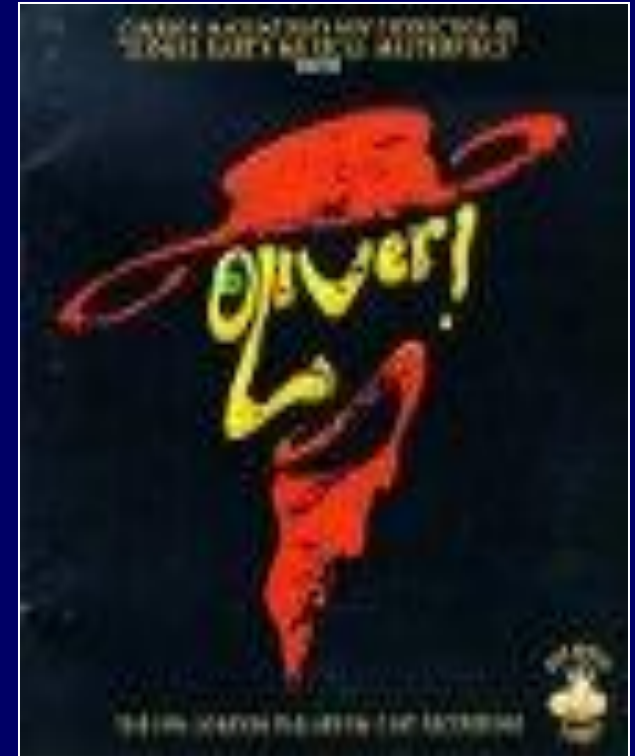
Decision making style

(intrinsic individual characteristics)

- Clinical inertia
- Thematic vagabonding
- Goal fixation
- Failure to engage feedforward control
- Faulty control action
- Encysting (paralysis by analysis)
- System 1 vs System 2 disposition
- Risk aversion and conservatism
- Indolence

Fagin in the musical 'Oliver'

Reviewing the situation



I think I'd better think it out again'

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Does gender impact decision making?

- Men violate safety rules more often
- Men take more risks than women
- Male physicians make different decisions than female physicians
- Female physicians have more apprehension, less self-assurance, and worried more than their male counterparts
- Females are more System 1 than males



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Ageing

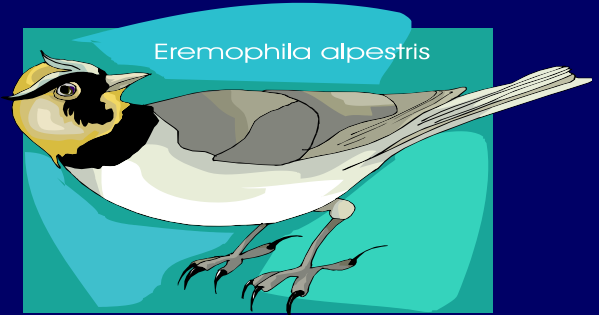
- Decline in memory
- Decline in cognitive performance
- Decline in psychomotor skills
- Usually OK until 6th decade
- More vulnerability to primacy effects
- Decreasing tendency to follow standards of care
- Decrease in analytical reasoning
- Increasing reliance on intuitive reasoning
- Increased tendency to risk aversion
- Increased conservatism
- Decreased tolerance for circadian disruption

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Diurnal Types

Morning Active (Larks)



Intermediate

Evening Active (Owls)



Chronotypes

(M-types or E-types)

- People tend to be one or the other
- Women are more M-type than men
- We get more M-type as we get older

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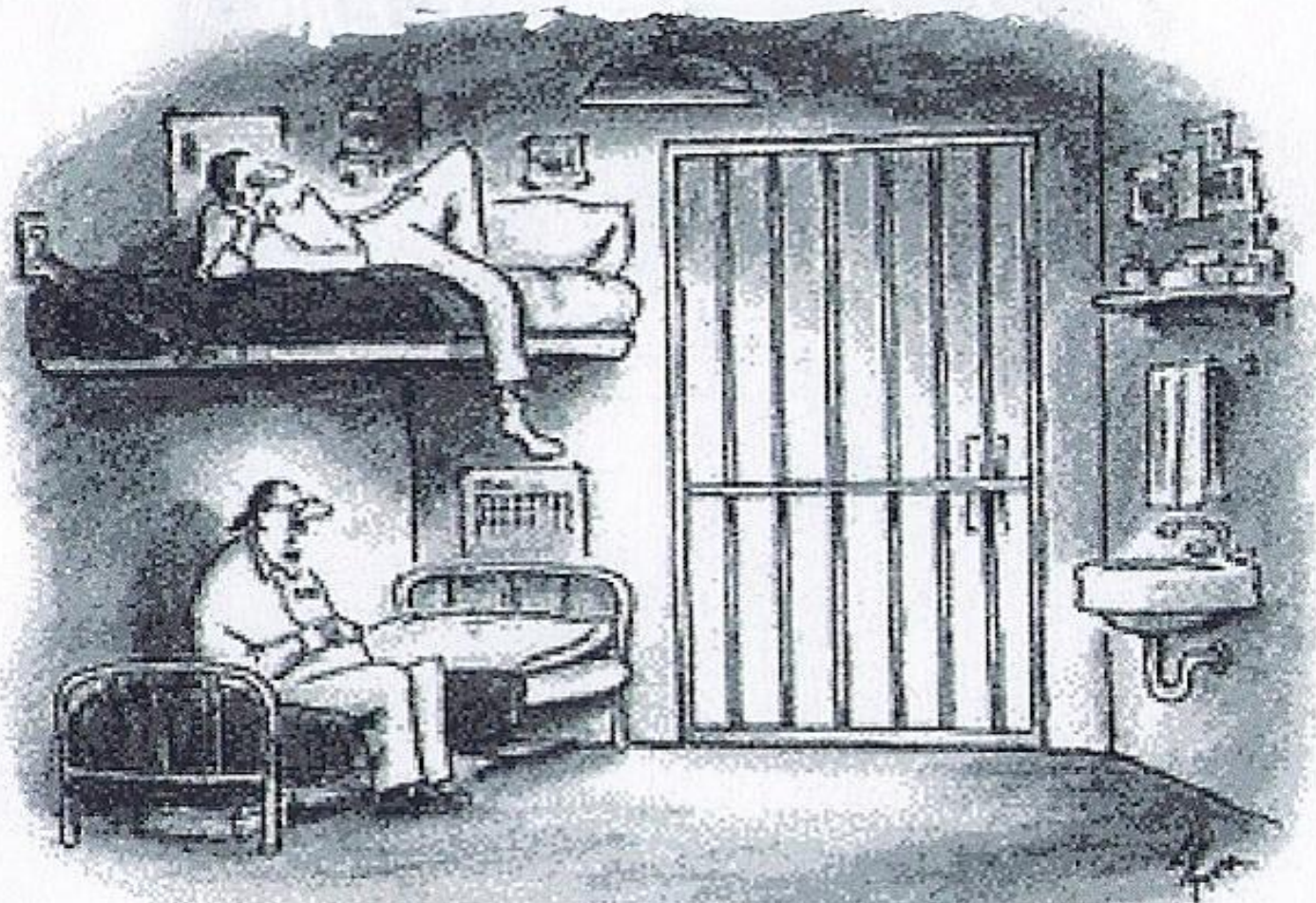


If you have peace of mind, when you meet with problems and difficulties they won't disturb your inner peace. You'll be able to employ your human intelligence more effectively. But, if your mental state is disturbed, full of emotion, it is very difficult to cope with problems, because the mind that is full of emotion is biased, unable to see reality. So whatever you do will be unrealistic and naturally fail.

23 November 2010



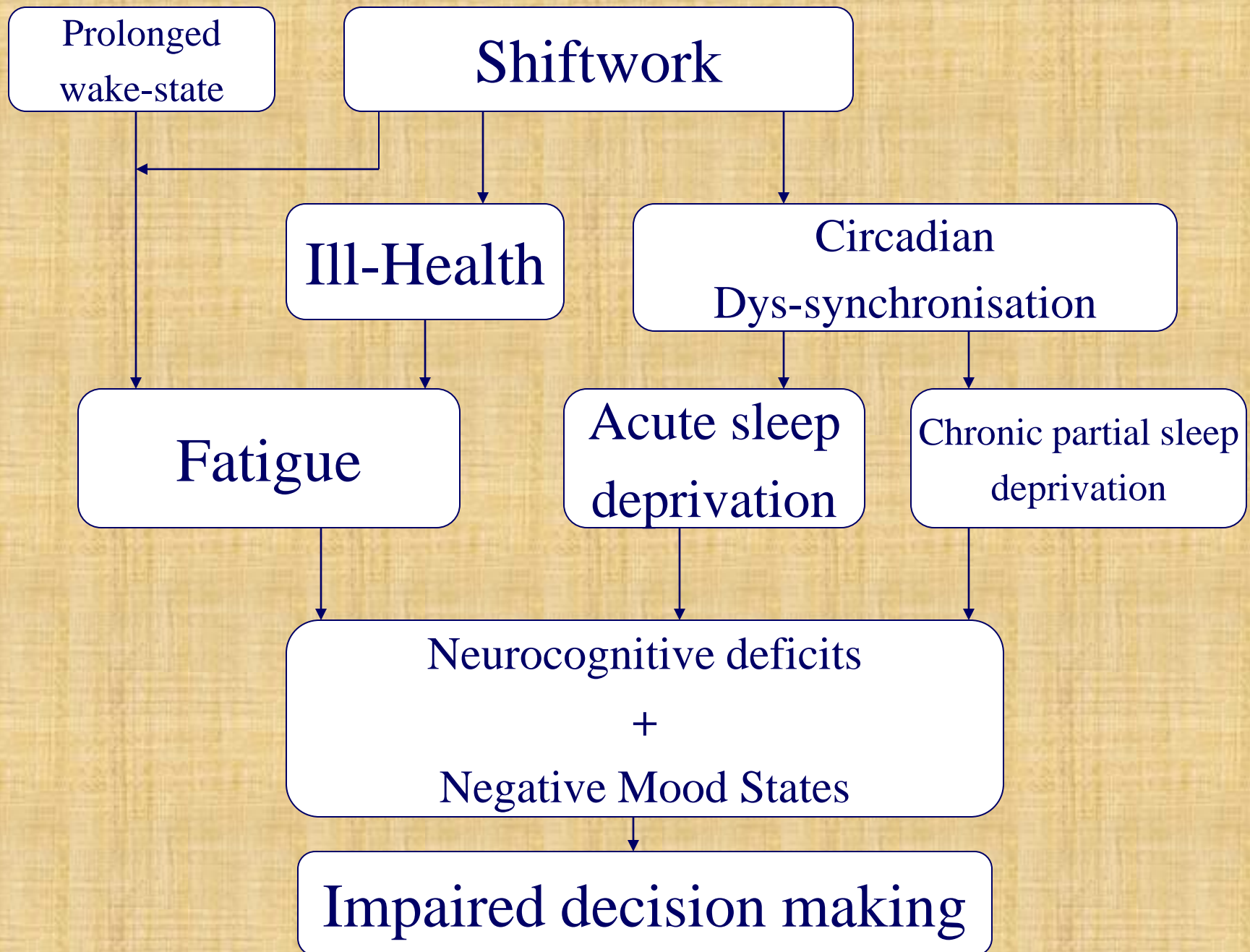
Research on workplace incivility (for example, emotional abuse or rudeness in the workplace) shows that if someone is rude to you at work or if you witness rudeness you are more likely to make mistakes



“If the jury had been sequestered in a nicer hotel this would probably never have happened”

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‘...there is no evidence to suggest that any amount of training, motivation or professionalism is able to overcome the performance deficits associated with fatigue, sleep loss, and the sleepiness associated with circadian variations in alertness’

Institute of Medicine, 2004

Circadian Low Point

...the level of performance of someone who has been up all night equates to a blood alcohol level of 0.1%. In effect, by 0400 hrs, the performance of nurses and physicians, up since the previous day, is equivalent to being legally intoxicated.

Dawson and Reid, *Nature* 1987

Clinical Symptoms of Sleep Deprivation

- Longer reaction time
- Lapses in attention or concentration
- Lost information
- Errors of omission
- Poor short term memory
- Poor mood (increased fatigue, confusion, stress, irritability)
- Reduced motivation
- Distractibility
- Sleepiness
- Poor psychomotor performance

About 20% of people are unable
to tolerate night shiftwork

LaDou, J *The Western Journal of Medicine* 1982

In the latter part of a night shift
cognitive decline is estimated at
25-30%

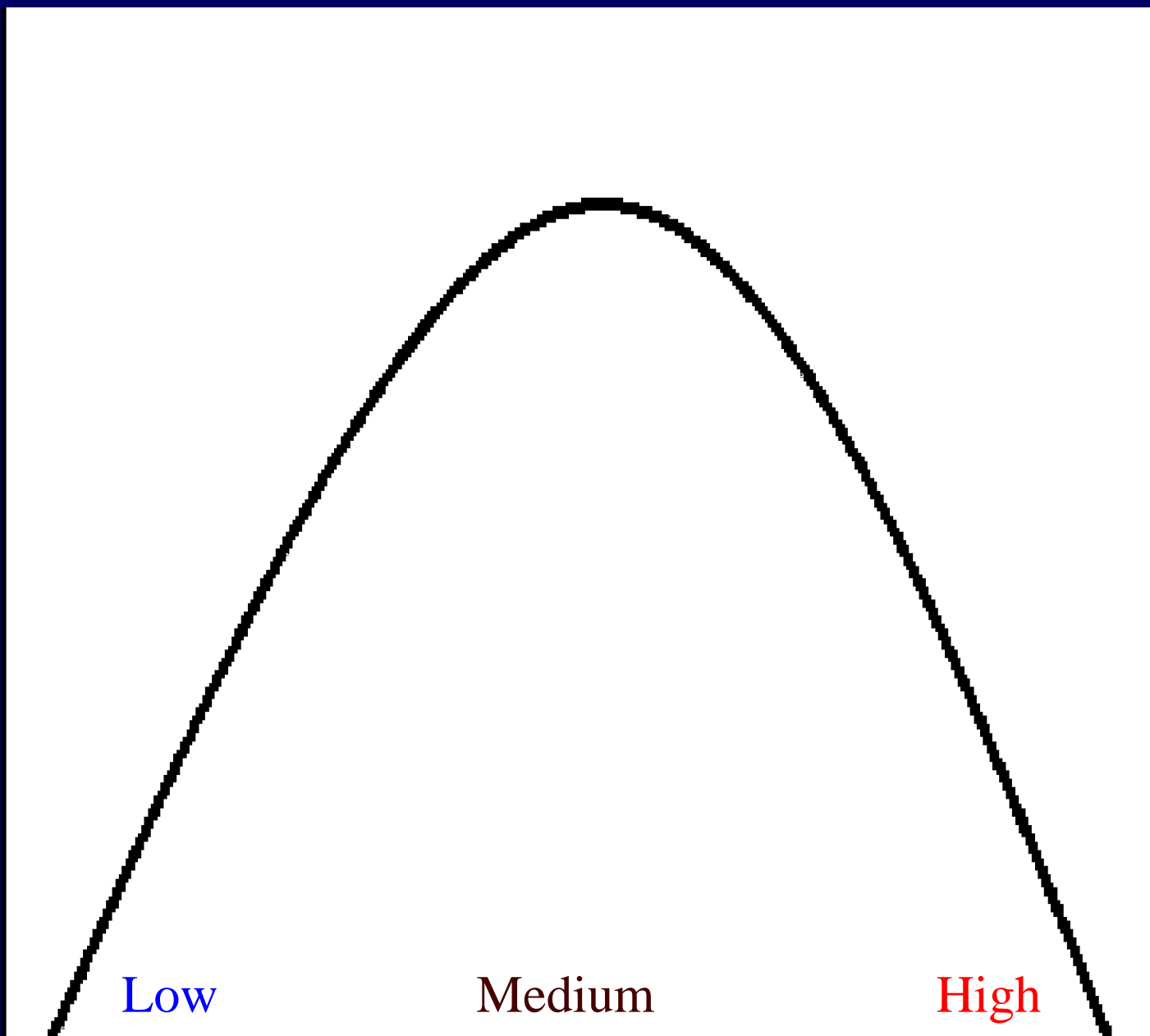
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Cognitive Load

- Increases with number of decisions required
- Increases with complexity of decisions required
- Associated with raised level of anxiety
- Associated with increased interruptions and distractions
- Leads to more defaults to intuitive mode
- Associated with increased heuristic use and bias
- Associated with proportionate increase in error rate

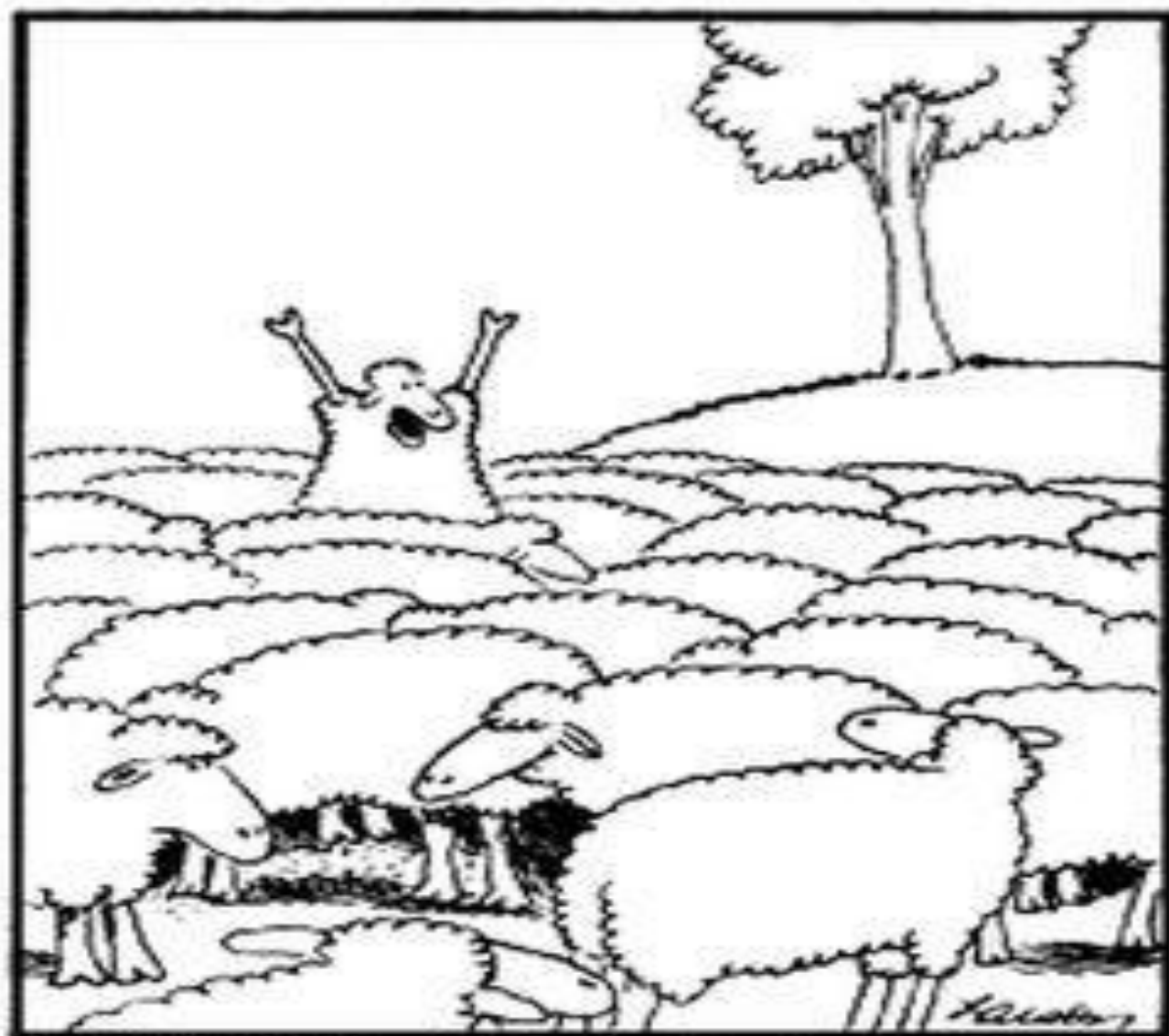
↑
Performance



Arousal level →

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"Wait! Wait! Listen to me! ... We don't have to be just sheep!"

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Susceptibility to authority
gradient