THE CLINICAL AND ETHICAL IMPLICATIONS OF COGNITIVE BIASES

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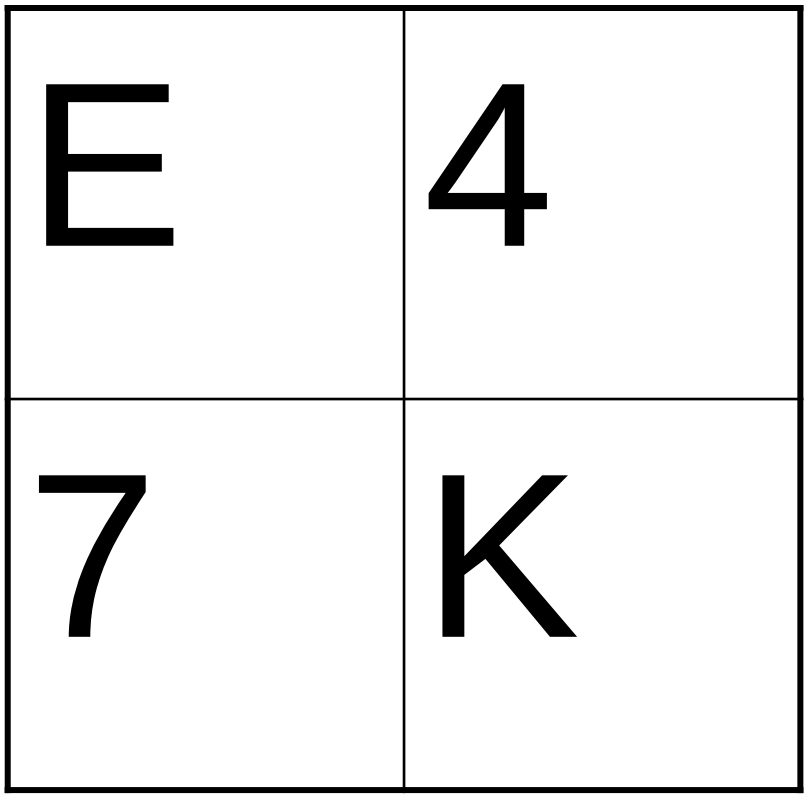
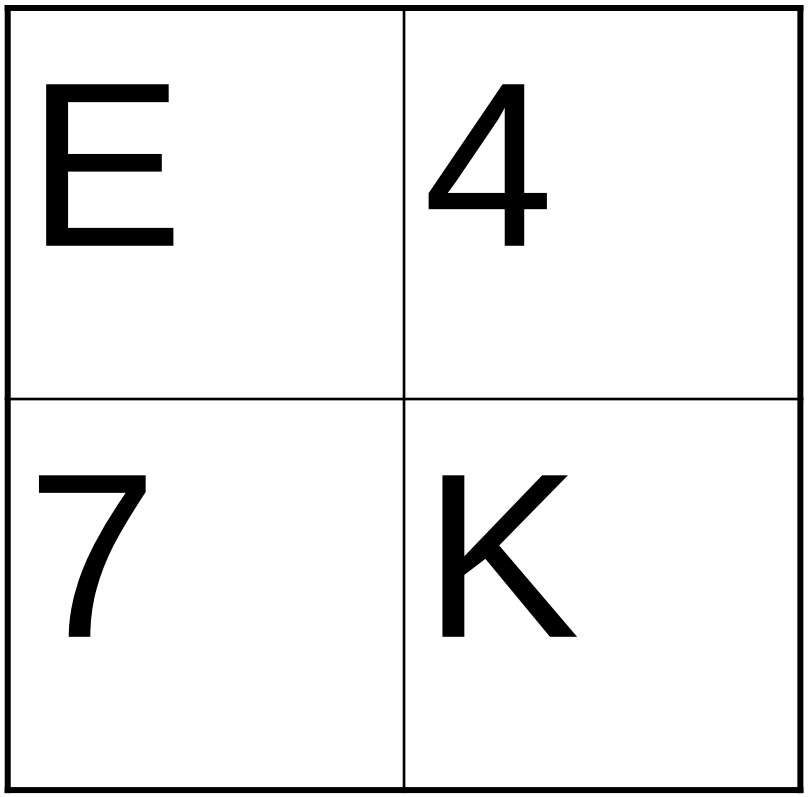
Some games

Wason selection task

- choose two cards to turn over in order to test the following hypothesis:
- If the card has a vowel on one side, it must have an even number on the other side



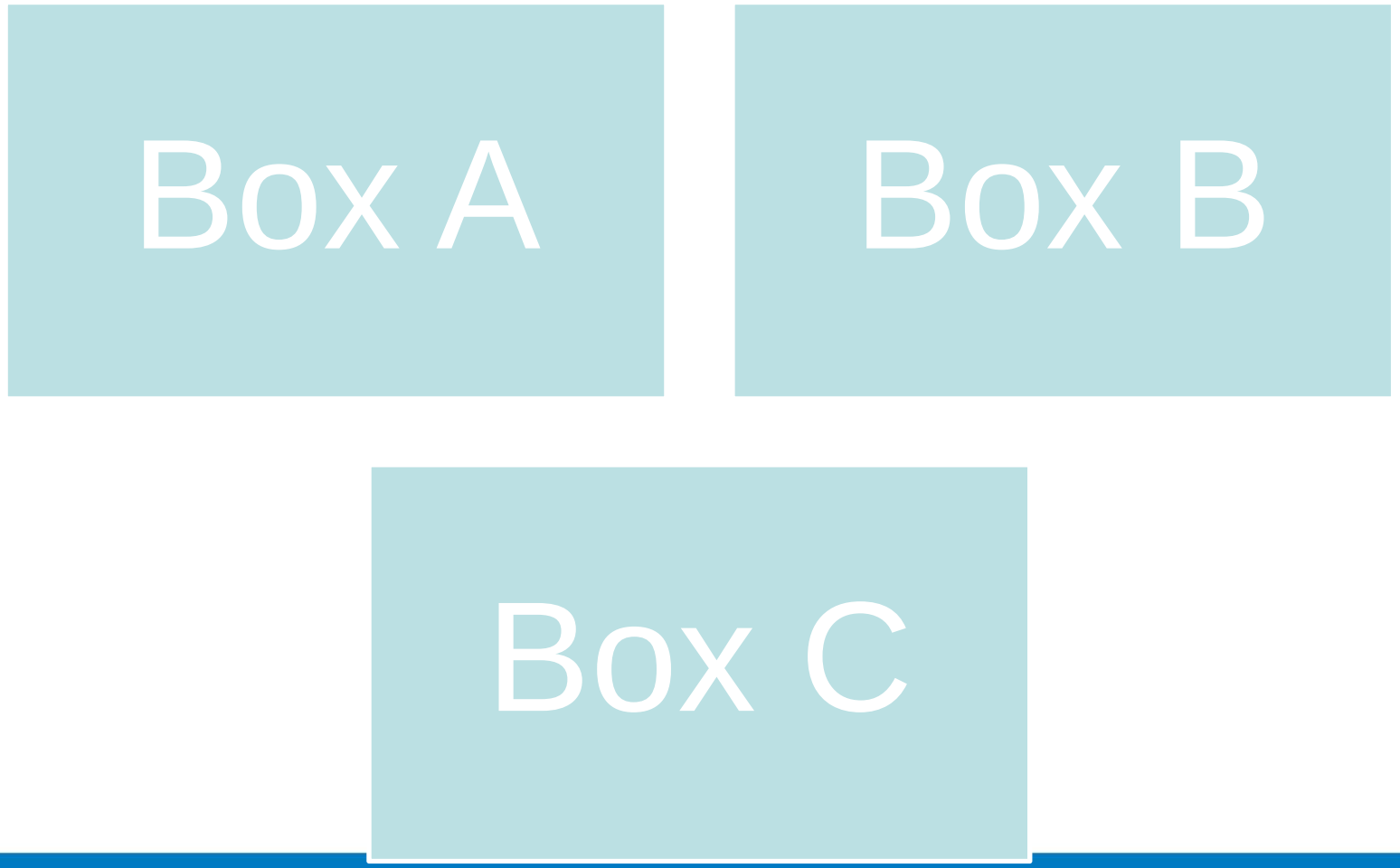
- Most subjects make the error of choosing E & 4
- Traditionally subjects fail to select the cards E & 7 that can both correctly confirm and falsify the hypothesis



The Monty Hall Problem

Monty asks you to choose between three boxes. One box contains a valuable prize, the other two boxes do not.

The Monty Hall Problem



The Monty Hall Problem

After you choose Box A, Monty reveals Box C as empty, and then asks you if you would like to switch your choice. Of the remaining two Box A and Box B, do you switch your choice?

Do you switch from A to B?

Box A

Box B

Should you switch from A to B?

Box A

Box B

Yes, you should you switch from A to B

Box A	Box B
33%	50%

last one

A bat and a ball cost $1.10 in total. The bat costs 1 dollar more than the ball. How much does the ball cost?

Reasoning and Rationality

- Sub-field of epistemology
- Looks for normative guidance in acquiring/establishing claims to knowledge or systems of inquiry.
- Foundation for pure and applied science.

rational persuasion

rational persuasion

- Deduction
- Induction
- Abduction (IBE)

deductive reasoning

A good deductive argument is such that if the premises of the argument are true, the conclusion must be true, and hence the argument is valid.

P1 Socrates is a person

P2 All persons are mortal

C Socrates is mortal

deductive reasoning

Wason card example redux:

The Weson selection task is solves using two laws of deductive reasoning:

modus ponens:	*modus tollens:*
if p then q	If p the q
p	not q
therefore q	Therefore not p

deductive reasoning

The Wason selection task is solves using two laws of deductive reasoning:

modus ponens:	*modus tollens:*
if p then q	*if p the q*
p	*not q*
therefore q	*therefore not p*

deductive reasoning

The most common failure of the Wason selection task is to chose a set of cards that both confirm and falsify the rule. This bias is called ‘confirming the consequent’.

if p then q

q

therefore p

In natural language: If I go out in the rain, I will get wet. I am wet, therefore I must have gone out in the rain.

inductive reasoning

A good inductive argument will predict the character of a population based on a smaller sample of that same population.

Whereas a good deductive argument will be valid and true, a good inductive argument will be strong (as compared to weak) based on sample size and any form of bias that does not truly represent the larger sample.

abductive reasoning

Abduction or ‘inference to the best explanation’ seeks to explain a set of circumstances often through positing the existence of an unobserved entity.

Uses and misuses of abduction:

- Gregor Mendel and his peas
- William Paley hidden watchmaker
- Medical diagnosis

abductive reasoning

two paradigm shifts

two paradigm shifts

- PRACTICE SHIFT from experiential-based to evidence-based practice.
- ETHICAL SHIFT from paternalism to respect for patient autonomy.

two paradigm shifts

These two shifts coincide in an interesting fashion in that both place a strong emphasis on statistical and probabilistic evidence, in EBM as the criteria for decision-making and in law and ethics as the ‘gold standard’ for fulfilling the condition of disclosure in patient consent.

what are cognitive biases?

A **cognitive bias** is a pattern of deviation in judgment, whereby inferences about other people and situations may be drawn in an illogical fashion.

Wikipedia

what are cognitive biases?

A heuristic is a ‘reasoning shortcut’ or ‘rule of thumb’, either acquired or inherent that may also results in predictable, systematic errors in judgement.

what are cognitive biases?

Daniel Kahneman & Amos Tversky

Tversky, Amos; Kahneman, Daniel (1974), "Judgments Under Uncertainty: Heuristics and Biases", *Science* **185** (4157): 1124–1131

conjunction fallacy

"Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with the issue of discrimination and social justice, and also participated in antinuclear demonstrations.

Which of the following is more probable:

1. Linda is a bank teller (T)
2. Linda is a bank teller and is active in the feminist movement (T and B)"

The `Conjunction Fallacy' Revisited: How Intelligent Inferences Look Like Reasoning Errors. *Journal of Behavioural Decision Making, 12, 275-305.*

framing effect

Framing effect is an example of cognitive bias in which people react differently to a particular choice depending on whether it is presented as a loss or as a gain. People tend to avoid risk when a positive frame is presented but seek risks when a negative frame is presented.

*see list

http://en.wikipedia.org/wiki/List_of_cognitive_biases

framing effect

Problem 2

Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer.

framing effect

Decision (i) Choose between:

A. a sure gain of $240 [84%]

B. 25% chance to gain $1000 and 75% chance to gain nothing [16%]

Decision (ii) Choose between:

C. a sure loss of $750 [13%]

D. 75% chance to lose $1000 and 25% chance to lose nothing [87%]

framing effect

Problem 1 (Survival frame)

Surgery: Of 100 people having surgery 90 live through the postoperative period, 68 are alive at the end of the first year and 34 are alive at the end of five years.

Radiation Therapy: Of 100 people having radiation therapy all live through the treatment, 77 are alive at the end of one year and 22 are alive at the end of five years.

framing effect

Problem 1 (Mortality frame -- Lung Cancer)

Surgery: Of 100 people having surgery 10 die during surgery or the post-operative period, 32 die by the end of the first year and 66 die by the end of five years.

Radiation Therapy: Of 100 people having radiation therapy, none die during treatment, 23 die by the end of one year and 78 die by the end of five years.

Rational Choice and the Framing of Decisions
Amos Tversky; Daniel Kahneman *The Journal of Business, Vol. 59, No. 4, Part 2: The Behavioral Foundations of Economic*Theory. (Oct., 1986), pp. S251-S278.

framing effect

The inconsequential difference in formulation produced a marked effect. The overall percentage of respondents who favored radiation therapy rose from 18% in the survival frame (N = 247) to 44% in the mortality frame (N = 336). The advantage of radiation therapy over surgery evidently looms larger when stated as a reduction of the risk of immediate death from 10% to 0% rather than as an increase from 90% to 100% in the rate of survival. The framing effect was not smaller for experienced physicians or for statistically sophisticated business students than for a group of clinic patients.

anchoring

Question 1.

Was Gandhi older or younger than 9 when he died?

How old was Gandhi when he died?

anchoring

Question 1.

Was Gandhi older or younger than 9 when he died?

How old was Gandhi when he died?

Question 2.

Was Gandhi older or younger than 140 when he died?

How old was Gandhi when he died?

anchoring

Average answers:

Question 1. 50 yrs.

Question 2. 67 yrs.

anchoring

Grocery (Wanisky, Kent, Hoch)

A grocery store wants to sell a large shipment of tomato soup quickly.

Scenario 1: Sign is displayed “ Limit 12 per customer”

Scenario 2: No sign.

anchoring

Grocery (Wanisky, Kent, Hoch)

Results:

No sign: 50% of customers bought 1-2 cans.

With sign: a majority of customers bought 4-10 cans, no customer bought only 1.

anchoring

He was sprawled on the floor of his apartment surrounded by empty beer and wine bottles when E.M.S. broke down the door. He was 63, but his elderly mother still kept tabs on him. When he hadn't answered the phone for three days, she'd called 911. He was an alcoholic, she told E.M.S., with many admissions to the hospital for "alcohol withdrawal," but was otherwise healthy.

http://well.blogs.nytimes.com/2012/07/19/falling-into-the-diagnostic-trap/?_r=0

availability

The **availability heuristic** is a mental shortcut that occurs when people make judgments about the probability of events by how easy it is to think of examples. The availability heuristic operates on the notion that if something can be recalled, it must be important. The availability of consequences associated with an action is positively related to perceptions of the magnitude of the consequences of that action. In other words, the easier it is to recall the consequences of something, the greater we perceive these consequences to be.

zero risk bias

Zero-risk bias is a tendency to prefer the complete elimination of a risk even when alternative options produce a greater reduction in risk (overall). This effect on decision making has been observed in surveys presenting hypothetical scenarios and certain real world policies (e.g. war against terrorism as opposed to reducing the risk of traffic accidents or gun violence) have been interpreted as being influenced by it.

status quo bias

Status quo bias is a cognitive bias; a preference for the current state of affairs. The current baseline (or status quo) is taken as a reference point, and any change from that baseline is perceived as a loss.

Behavior in regards to retirement plans, health, and ethical choices show evidence of the status quo bias.

selection bias

Selection bias is a statistical bias in which there is an error in choosing the individuals or groups to take part in a scientific study.

confirmation bias

Confirmation bias is a tendency of people to favor information that confirms their beliefs or hypotheses. People display this bias when they gather or remember information selectively, or when they interpret it in a biased way. The effect is stronger for emotionally charged issues and for deeply entrenched beliefs. They also tend to interpret ambiguous evidence as supporting their existing position.

Google MD!

gambler’s fallacy

The **gambler's fallacy** is the mistaken belief that if something happens more frequently than normal during some period, then it will happen less frequently in the future (presumably as a means of *balancing* nature).

just-world hypothesis

The **just-world hypothesis** or **just-world fallacy** is the cognitive bias (or assumption) that a person's actions always bring morally fair and fitting consequences to that person, so that all noble actions are eventually rewarded and all evil actions are eventually punished.

Table C.1
Factors Important in Risk Perception and Evaluation

Factor	Conditions Associated with Increased Public Concern	Conditions Associated with Decreased Public Concern
Catastrophic Potential	Fatalities and Injuries Grouped in Time and Space	Fatalities and Injuries Scattered and Random
Familiarity	Unfamiliar	Familiar
Understanding	Mechanisms or Process Not Understood	Mechanisms or Process Understood
Uncertainty	Risks Scientifically Unknown or Uncertain	Risks Known to Science
Controllability (Personal)	Uncontrollable	Controllable
Voluntariness of Exposure	Involuntary	Voluntary
Effects on Children	Children Specifically at Risk	Children Not Specifically at Risk
Effects Manifestation	Delayed Effects	Immediate Effects
Effects on Future Generations	Risk to Future Generations	No Risk to Future Generations
Victim Identity	Identifiable Victims	Statistical Victims
Dread	Effects Dreaded	Effects Not Dreaded
Trust in Institutions	Lack of Trust in Responsible Institutions	Trust in Responsible Institutions
Media Attention	Much Media Attention	Little Media Attention
Accident History	Major and Sometimes Minor Accidents	No Major or Minor Accidents
Equity	Inequitable Distribution of Risks and Benefits	Equitable Distribution of Risks and Benefits
Benefits	Unclear Benefits	Clear Benefits
Reversibility	Effects Irreversible	Effects Reversible

Thanks!

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