

COGNITION IN ACTION

COGNITION IN CLINICAL SETTINGS



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SIGNAL DETECTION THEORY (SDT).

- WHAT IS SIGNAL DETECTION THEORY
- "Signal Detection Theory is a psychophysical model that explains how humans make decisions based on sensory information".
- "...is used when psychologists want to measure the way we make decisions under conditions of uncertainty, such as how we would perceive distances in foggy conditions" (Kelly and Hahn, 2019, p. 159).

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SDT EXAMPLES.

- Swets and Green (1978).
- The pilot is trying to detect the airport beacon on a foggy night.
 - Is that faint light the tower or not?
- The radiologist is inspecting an X-ray film.
 - Is that shadow a tumour or not?
- A witness to a robbery is looking at a lineup.
 - Is the third man from the end the culprit or not?
- The driver of a car is entering the on-ramp of a busy freeway.
 - Is there an opening in the traffic or not?
- In all such cases the problem arises because the information is not perfect and confusion among the potential alternatives can occur. (Swets & Green, 1978)

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INFLUENCES ON MEDICAL DIAGNOSIS DECISION MAKING

- Factors influencing medical diagnosis
 - Difference in SDT criterion between different countries
 - E.g., in US, probability of a signal given a "yes" response is 20-30%, whereas in England it is ~50%.
 - Can you think of any difference between the US & UK healthcare that may influence this?
 - What could the consequences of this be?

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KOSTOPOULOU ET AL (2019).

- Created 44 vignettes of patients for whom lung cancer could be considered (Hypothetical) and estimated their 1-year risk.
- 216 GPs from practices across England
 - Practices differed in the positive predictive value (PPV) of their urgent referrals (chance of referrals identifying cancer) and the sensitivity (chance of cancer patients being picked up via urgent referral from their practice)
- Results
- PPV increased, GPs ability to make a decision also increased, indicating lower inclination to refer.
- Female GPs were more inclined to refer than male GPs
- High referral PPV at the organizational level indicates GPs' inclination to avoid false positives.
- Experience plays a vital role.

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FRAMING

- What is Framing?
- "The framing effect, identified by Tversky and Kahneman, is one of the most striking cognitive biases, in which people react differently to a particular choice depending whether it is presented as a loss or as a gain." (Gong et al., 2013).
- Gong, J., Zhang, Y., Yang, Z., Huang, Y., Feng, J., & Zhang, W. (2013). The framing effect in medical decision-making: a review of the literature. *Psychology, health & medicine*, 18(6), 645-653.

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EFFECTS OF FRAMING

- Manner in which information is presented (framed) – positively or negatively – can influence decision-making process.
- Must consider not only internal cognitive processing factors, but also external influences that could make us **risk-seeking** or **risk-averse**
- Some decisions in clinical settings may seem obvious.
 - However, the framing of information may influence emotions, thereby altering how we reason about a decision at hand.
- Let's have a look at an example....

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FRAMING AND DECISION-MAKING IN CLINICAL SETTINGS

- The National Cancer Institute has two possible treatments for cancer, which could become standard treatments across the country.
- If treatment 1 is adopted, of every 1000 people who get cancer 400 will be saved.
- If treatment 2 is adopted, there is a 2/5 chance that 1000 of every 1000 will be saved and a 3/5 chance that no people of every 1000 will be saved.
- There are adequate resources to implement only one treatment programme.
- Which of the two would you favour for national implementation?
 - 1 or 2?

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FRAMING AND DECISION-MAKING IN CLINICAL SETTINGS

- The National Cancer Institute has two possible treatments for cancer, which could become standard treatments across the country.
- If treatment 1 is adopted, of every 1000 people who get cancer 600 will die.
- If treatment 2 is adopted, there is a 2/5 chance that no people of every 1000 will die and a 3/5 chance that 1000 of every 1000 will die.
- There are adequate resources to implement only one treatment program.
- Which of the two would you favour for national implementation?
 - 1 or 2?

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FRAMING AND DECISION- MAKING IN CLINICAL SETTINGS

- What were the rationales for your choices in each scenario?
- Can you tell which scenario was framed positively and which was framed negatively?
- Most students chose risk averse irrespective of framing.
- Fagley, N. S., & Miller, P. M. (1987). The effects of decision framing on choice of risky vs certain options. *Organizational Behavior and Human Decision Processes*, 39(2), 264-277.

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DOCTOR/PATIENT COMMUNICATION RELATED TO THE HOSPITAL.

- Not only the content but the way it is framed is a critical element for Doctor/Patient communication in the hospital.
- E.g. McNeil (1982).
 - Hypothetical Lung Cancer Treatment.
 - Students more likely to choose surgery outcome if told of the probability of survival rather than dying.

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SIMILARLY

- Marteau (1989)
 - Medical students and their advice on surgery
 - More likely to recommend surgery if the information on outcome was framed in terms of survival.
- Medical biases influences Communication.
 - Continual Smokers.
 - Bennett (2003) – Female Nurses and Pain Killers.

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MEDICAL DECISION MAKING

- Schwartz and Griffin (1986)
- Doctors show substantial disagreement over the interpretation of tests
 - X-Rays
 - ECG's
- Study asked pathologists to examine tissue sample on two occasions
 - Differed across 28% of judgements.

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BALDWIN (1945)

- 3 Panels of physicians
- 389 schoolboys were screened.
- Panel 1 – Saw all 389 screenings – They recommended 45% to have a tonsillectomy.
- Panel 2 saw remaining 215 boys – a further 46% should have the tonsillectomy
- Panel 3 saw remaining boys – a further 44% should have the tonsillectomy

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THOUGHT TASK.

- Such statistics about disagreements/errors in judgments are alarming.
- Why factors do you think influence disagreements/misdiagnosis or wrong treatment?

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TVERSKY AND KAHNEMAN (1981)

- As human information capacity is limited – under pressure errors can be made
- Do not do systemic strategies.
 - Rules of Thumb.....Bias and Error can be made
- Meehl (1954)
 - Compared accuracy of intuitive, heuristically driven judgments with those made up of a statistical formula.
 - Statistical relationship between predictors and disease
 - Statistical algorithm more accurate
 - Major changes in diagnosis

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BIASNESS IN JUDGEMENT

- Emotional involvement
 - Death of a Patient with symptoms
- Frequency the Doctor has encountered a particular pattern of clusters.
- Knowledge from colleagues
- Pay off of various diagnosis.
 - E.g. Appendicitis in Children especially

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WHAT ABOUT THE INFLUENCES OF MOOD.

- Isen et al (1991).
- Attempted to study the impact of Mood.
- Medical students – manipulated mood.
 - Some were told they had done well in the medical task.
- Then asked which patients was suffering from hypothetical lung cancer.
 - Positive affect group = less time to make a decision and less focused.
 - Emotional distress and medical errors (Houston and Alit, 1997).

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INFLUENCES ON DECISION MAKING

- The Simulation Heuristic
 - Judgment is based on the ease with which a plausible scenario can be constructed.
 - How easy is it to picture the event mentally.
 - Similar to availability
 - But ease of imagination instead of direct retrieval from memory

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INFLUENCES ON DECISION MAKING

The Undoing Problem :

Two different travellers are heading for the airport.

They have to catch different flights, which leave at the same time. They meet outside the hotel and decide to share a cab.

On the way they get caught in a traffic jam and get to the airport 30 minutes late.

They both expect to have missed their flight.

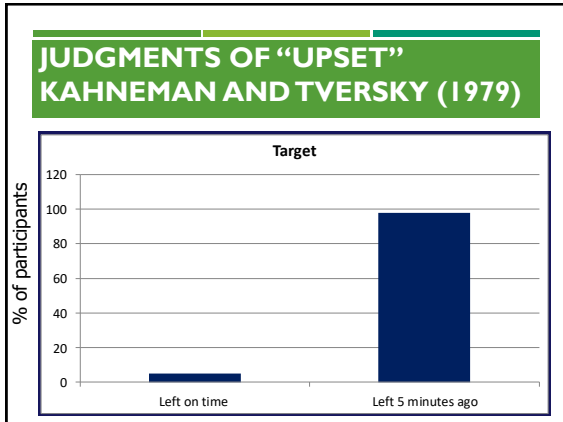
When they arrive at the departure gate, traveller A is told that his plane left on time and traveller B is told her plane was delayed, but left 5 minutes ago.

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INFLUENCES ON DECISION MAKING

- Who is more upset?
 - Person A or B?

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INFLUENCES ON DECISION MAKING

- The Simulation Heuristic
 - Judgment is based on ease of imagining plausible alternative scenarios
 - However there is no guarantee that imagined scenario might have occurred
 - Simulation can cause counterfactual emotions
 - Regret caused by comparison between current state and imagined alternative state

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INFLUENCES ON DECISION MAKING

- The Simulation Heuristic.
- Occurs in relation to regret or near misses.
- E.g. Buying a Lottery Ticket.
 - Someone bought a winning lottery ticket one hour after you bought your ticket, then you'd easily be able to visualize the potentiality that you had gotten stuck in traffic that day and turned up to buy the ticket an hour later.
- The probability of you ever turning up to buy the lottery ticket at the right time and place remains extremely low.
- It feels as if you were truly very close to winning the lottery as you can visualise it.

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INFLUENCES ON DECISION MAKING

- The United Nations Query:
- Please estimate the percentage of countries in the United Nations that are from the continent of Africa
 - Some people say 10%
 - What do you say?
- Some people say 65%
- What do you say?

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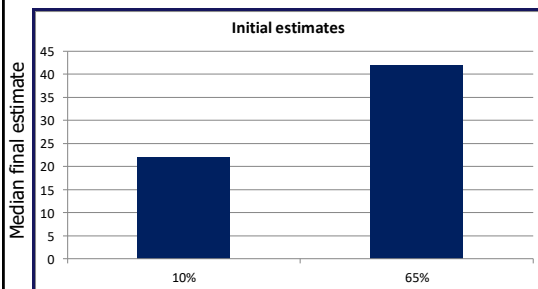
THE ANCHORING AND (INSUFFICIENT) ADJUSTMENT HEURISTIC

When we make estimates we are
influenced by the initial value state

- Tversky and Kahneman (1974)
- see also Epley and Gilovich (2006)

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AFRICAN COUNTRIES IN UN KAHNEMAN AND TVERSKY (1974)



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ANCHORING AND ADJUSTMENT HEURISTIC

- Final estimates overwhelmingly influenced by initial estimates
 - Estimates begin with initial values
 - Initial value serves as anchor
 - Common sales technique
- Estimates can even be influenced by meaningless or unrelated figures
 - Anchor to the figure alone

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ANCHORING – SOME EXAMPLES.

- Pricing
- REAL LIFE EXAMPLE: £9.99
- Setting a price at 9.99 creates the 'anchor' at 9 instead of 10, making the product appear cheaper.
- A 2020 study raises the concern that doctors may fall prone to the anchoring bias when diagnosing patients with COVID-19 and, therefore, may fail to properly diagnose future issues that arise with these patients (Yousaf et al., 2020)

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ADJUSTMENTS

- The adjustment Heuristic happens when we modify the information after the anchor until a plausible estimate is reached
- **REAL LIFE EXAMPLE:** HAGGLING AT A CAR BOOT SALE – YOU START HIGH AND MEET WHERE INTENDED INITIALLY.
- Anchoring heuristic and adjustment heuristic are mental shortcuts often involved in intuitive and judgmental biases
- Anchoring heuristic happens when we base our decisions unduly on either previously acquired knowledge or the initial piece of information (Myers, 2022).
- Adjustment heuristic happens when we modify the information after the anchor until a plausible estimate is reached (Corporate Finance Institute, 2022).
- It is believed that anchoring is a subconscious or semiconscious phenomenon, whereas adjusting around the anchor is a very conscious choice (Corporate Finance Institute, 2022)

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ANCHORING AND ADJUSTMENT

- A phenomenon
 - Final estimates assimilated towards anchor
- A process
 - Adjusting from the initial value

Adjustment from self-generated anchor values insufficient as the process terminates when a plausible (or satisfactory) value is reached.

- Epley and Gilovich (2006)

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BOUNDED RATIONALITY

- Herb Simon (1960, 1978)
 - Humans exhibit 'bounded rationality'
 - We make rational decisions within the limits of human information processing
 - ◊ E.g. STM capacity, incomplete knowledge, uncertainty
 - Definition of situation likely incomplete
 - Impossible to generate all alternatives
 - Impossible to predict consequences of each alternative

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BOUNDED RATIONALITY

- Agyemang (2021) - The idea that the decisions we make are based on the information we have at the time.
- Bounded rationality assumes that we make decision based on three factors.
 - cognitive ability
 - time constraint
 - imperfect information.

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BOUNDED RATIONALITY

- Limits of human information processing.
 - Definition of situation likely incomplete
 - Impossible to generate all alternatives
 - Impossible to predict consequences of each alternative
- Everyday example:
 - when ordering at a restaurant, we will make suboptimal choice if we feel rushed by the waiter.
- Medical Example.
 - Covid 19 – Vaccination vs Anti Vax discussion.

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BOUNDED RATIONALITY

- How do we overcome these limits of human information processing?
- We don't completely, but rather we **satisfice**. In other words, we settle
- Often noted in Medical Settings (Stokes et al., 2017).
- Time limited Consultations
- Complex cases – limited guidelines.
- Not always a bad thing.

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BOUNDED RATIONALITY

Final decisions therefore often influenced by personal or political agenda

- Satisficing is often the result
 - ❖ Choice of sandwich?
 - ❖ Degree course or job?
 - ❖ Partner?
 - ❖ Diagnosing the correct clinical outcome?

Heuristics are part of this bounded rationality

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OTHER ISSUES LINKED TO MEDICAL DECISION MAKING.

- The "deviant patient" perspective.
- Balint's (1964) psychoanalytic approach – patients were masking their real problems.
- Doctor's job to find out what was wrong.

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THE AUTHORITARIAN DOCTOR PERSPECTIVE.

- Ways in which doctors use their authority.
- Byrne and Long (1979) – 6 logical phases to a consultation.
 - 1) The doctor establishes a relationship with the patient.
 - 2) The doctor attempts to discover or actually discovers the reasons for the patient's attendance.
 - 3) The doctor conducts a verbal or physical examination or both.
 - 4) The doctor and/or patient consider the condition.
 - 5) The doctor and patient agree and detail further treatment or investigation if necessary.
 - 6) The consultation is terminated (usually by the doctor).

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BYRNE AND LONG (1979).

- Noted that logical structure rarely appears in reality.
- Usually fell down at stage 2 and/or 4.
- They also studied a range of verbal behaviours doctors used when talking to patients.
 - Continuum.
 - Patient centred communication style.
 - Doctor-centred communication style.

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DOCTORS TRADITIONAL COMMUNICATIVE STYLE.

- Traditional (Doctor Centred style) heavily criticised.
- Patient centred approach recommended.
 - Increase patient adherence.
 - Increase patient satisfaction (Stewart, 1984).

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THE INTERACTIVE DYAD PERSPECTIVE.

- Doctor and Patient shaping the conversation.
- Coulter (1999) – Doctor knows best should have no place in health care.

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THE INTERACTIVE DYAD PERSPECTIVE.

- A focus on the "joint" communication can help us shed light on some reasons for communication failure.
- E.g. Misunderstandings when the Doctor takes comments at Face Value.
- Non Verbal Communication.

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PATIENT SATISFACTION.

- Berry et al (2003).
- Medical Instructions – 2 groups.
 - Personalised.
 - Non Personalised.
- Findings.
 - Personalised style = greater satisfaction.
 - Lower perceived side effects.
 - Lower ratings to risk to health.

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SALA ET AL (2002).

- Amount and Type of Humour.
- Relationship with Patient Satisfaction.
 - Light Humour.
 - To use humour when the patient is tense.
 - Positive function humour.

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PATIENT UNDERSTANDING.

- Boyle 1970 – Patient definition of different illnesses.
 - 85% arthritis.
 - 77% jaundice
 - 52% palpitations.
 - 80% bronchitis.

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- Boyle (1970) – Location of vital organs.
 - 42% correctly located the heart.
 - 20% located the stomach.
 - 49% located the liver.

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PATIENT UNDERSTANDING – ROTH (1979).

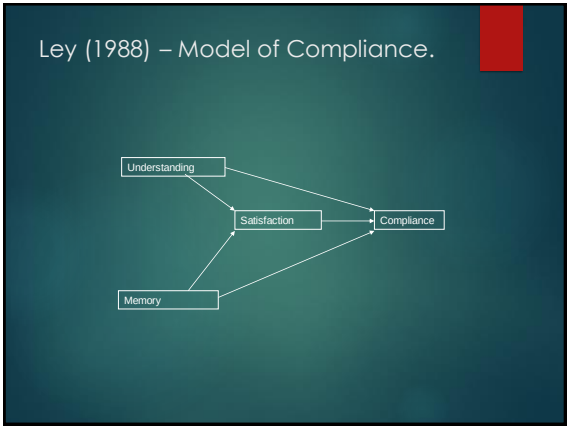
- Peptic Ulcers – What were they caused by?
 - Answers.....
 - Problems with teeth and gums.
 - Digestive Problems.
 - Excessive Stomach acid.

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PATIENT'S RECALL.

- ▶ Bain (1977).
 - ▶ 37% couldn't recall the name of the drug.
 - ▶ 23% couldn't recall the frequency.
 - ▶ 25% couldn't recall the duration.
- ▶ Crichton et al (1978).
 - ▶ 22% Forget the treatment regime recommended by the doctor.
- ▶ Ley (1989).
 - ▶ Anxiety, medical knowledge, intelligence, event importance
 - ▶ Age..... No!

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COGNITIVE BIASES

- Website discussing various types of cognitive biases
 - <https://yourbias.is/>

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DISCUSSION PAPER

- O'Sullivan, E. D., & Schofield, S. J. (2018). Cognitive bias in clinical medicine. *Journal of the Royal College of Physicians of Edinburgh*, 48(3), 225-232.
- Available on Google Scholar.

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