Chapter 12:

Judgement: Drawing Conclusions from Evidence

Heuristics used in Making Judgements

- Judgements based on recalled information
  - Memory is not always accurate
- Induction – drawing conclusions on basis of small number of examples
  - E.g. All swans are white.
  - Conclusion not necessarily valid.
  - One negative instance can invalidate the conclusion.

Heuristics used in Making Judgements - 2

- Availability Heuristic
  - Consider relevant episodes that we can recall & judge frequency of that category of episodes on the basis of number of episodes recalled
- Representativeness Heuristic
  - Is a new acquaintance a liar?
  - How similar is this person you know who lies frequently
    - Assume that the liar is representative of the category & use resemblance to evaluate new acquaintance

Definitions

- Descriptive vs normative account of thinking
  - How we actually think vs. how we should think
- Can we be trained to think better?

Memory & Judgement

- Judgements based on recall of information
  - E.g. frequency judgments, evaluation of various products
- Memories can be selective, incomplete, distorted or unavailable
  - Influenced by frequency of events, recency, distinctiveness, emotionality etc.
- Therefore judgement can also be influenced by these factors

Quick Demo

- Are there more words beginning with R or more with R as the third letter?

Quick Demo - 2

- Take one minute to write down as many words as you can that begin with R.
- Now take one minute to write down as many words as you can that have R as the third letter.

Availability Heuristic

- Heuristics: reasonably efficient strategies that *usually* give acceptable solution
- Availability Heuristic - Make judgements on basis of most available (recallable) instances.
  - More words beginning with *r* or having *r* as third letter
- Mental lexicon – words organized according to beginning sounds; rhyming words associated.
  - → Easier to recall words beginning with *r* than words with *r* in third position
- Words with *r* in third position actually more frequent

Availability Heuristic - 2

- Do more people die of diabetes or homicides? Car accidents or stomach cancer?
  - People overestimate frequency of accidents & homicides because of press coverage, & underestimate death rates of common diseases because deaths don't receive press coverage.
- Information presented to you is biased
- Bizarre, unusual or distinctive events more recallable
- Physician overdiagnose rare diseases
  - more likely to remember cases of rare disease

Availability Heuristic - 3

- Who does the dishes more often, you or your roommate or spouse?
  - Self reference effect
  - Higher probability of remembering actions performed by oneself than those performed by others.

Availability Heuristic - 4

- Participants asked to recall examples of themselves being assertive
  - Some Ss asked to recall 6 examples; others asked to recall 12 examples
- Ss then rated themselves on assertiveness
- Ss giving 6 examples rated themselves as being more assertive than Ss asked to give 12 examples.
- More difficult to produce 12 examples than 6
- → Ss judging on basis of availability (ease of recall) of examples of assertive behaviour

Representativeness Heuristic

- Making judgement about category membership – e.g. is Mr. Y honest.
  - Mr. Y is used car salesman or teacher.
- Assume that all members of category are similar & any single member is *representative* of category.
  - Experience with small number of category members (e.g. several good teachers or one dishonest car salesman)
  - Many generalizations are accurate; e.g. engineers are good at math; architects have good spatial reasoning
    - Representiveness heuristic often accurate for homogeneous categories

Representativeness Heuristic
Reasoning from a Population

- Gambler's Fallacy
- Coin tossed 6 times & 6 heads appear.
- What is probability next toss gives a tail?
- Gambler thinks 7 heads in a row is unlikely; therefore next toss → tail
- Coin has no memory; trials are independent.
- Probability of head after 6 consecutive heads = .5 (if coin is honest)
- Probability of 7 heads in 7 tosses = (1/2)^7 = 1/128

Reasoning from a Population - 2

- On average, # heads in N tosses of coin will be N/2
- If N is large, proportion of heads will be close to .5
  - HHHHHHH is very unlikely & HHHHHHT is more likely
- If N is small, number of heads will frequently be zero or N
- P(5 heads in 5 tosses) = ?

Reasoning from a Population - 3

- If category is homogeneous, (sequences of Hs & Ts will all have 50-50 mix) then N-to-1 or N-t-0 sample unlikely
  - If N is small, than N-to-1 or N-to-0 is quite likely
  - If N is large, then N-to-1 or N-to-0 is unlikely

Representativeness Heuristic

Reasoning from a Single Case

- Assume homogeneity within a category
  - One exemplar from category is "typical"
  - Can generalize from category to a single exemplay and also from a single exemplar to entire category

Reasoning from a Single Case - 2

- Ss saw interview with prison guard who was either compassionate & believed in rehabilitating criminals, or who showed contempt for inmates & believed they couldn't be rehabilitated.
- Ss told that guard was typical or not typical
- 2 X 2 design
- Ss later questioned about their views of justice system

Reasoning from a Single Case - 2

- Ss who saw compassionate guard had more positive views about justice system than Ss who saw guard with negative views of inmates.
- Information about how typical the guards were was ignored.

→ Ss generalized to entire justice system on basis of one person even when told that the person was not a typical prison guard

Reasoning from a Single Case - 3

- "Man who" argument – generalization on basis of one observation
- Based on assumption that all members of the category (e.g. prison guards) are homogeneous
- Would you buy a Toyota? Why or why not?
- Suppose large survey of Toyota owners was done by reputable firm.
  - Would you trust the survey or one person's experience?

Reasoning from a Single Case - 4

- Manufacturers have high standards for quality control; aim for uniformity in their product.
  - → Reasoning from single instance is not unreasonable

Anchoring

- How many people in NL die of cancer every year?
- Make a ball park guess & then make adjustment.
- Give people a ball-park figure → influences their judgement
- Did Ghandi live past 140? Past 9?
  - Ask for Ghandi's age at death.
  - If given 140 → 67; if given 9 → 50

Charitable Donations

- Fund raiser suggested a donation of $500K
- If potential donor turned pale, he then added "over 5 years of course"
- If potential donor did not turn pale, he then added "for the first year".

Detecting Covariation

- Language learning involves detecting certain variables which covary; e.g. doer of action comes before recipient of action
- First lecture: how do you know whether you should continue with the course? What has predicted good prof or good course in the past?
- Identifying covariation (or predictors) is important for many judgements

Illusions of Covariation

- Rorschach Test: do certain responses indicate personality traits?
- Chapman & Chapman (1971) – fictional protocols from fictional people randomly paired & given to undergraduates
- No real relationships between Rorschach responses & personality traits
- College students asked which responses indicated homosexuality

Chapman & Chapman (1971)

- In 1971, homosexuality was considered a psychiatric disorder.
- Ss perceived relationship between responses pertaining to buttocks and homosexuality
- Clinical psychologists also perceived the same relationship even though statistical analysis of data indicates no relationship!
- Why?
  - Beliefs direct perception of the data

Illusory Covariation – Theory Driven or Data Driven?

- Jennings, Amabile & Ross (1982) - detection of covariation when Ss did or did not have expectations
  - Had to rate correlation from -100 to 100
- Theory-driven = expectations: children's honesty measured by false reports about athletic performance & cheating on a puzzle
- Data-driven – no expectations: Students ratings of stick pcitures of men carrying walking sticks. Length of walking stick & height of person varied

Jennings, Amabile & Ross (1982) - 2

- Actual strength of relationship between 2 variables was manipulated

Jennings, Amabile & Ross (1982) - 3

- Results
- Data-driven condition: strong correlation between actual correlation and Ss estimates
  - Estimates conservative, below actual correlations for low correlations
- Theory-based condition: weak correlation between actual and estimated correlations
  - Ss overestimated correlations
- Participants perform differently in presence of expectations – judgements inaccurate and too high

Causes of Illusory Correlation

- Biased data
  - Limited experience with situation + biased sample
    - E.g. one or two really poor teachers or dishonest car salesmen
  - Availability of recent, frequent (but not typical) or distinctive instances
    - Toyota vehicles – several reports of accelerators being stuck received a lot of media coverage, including a local case
    - Anecdote from a friend

Causes of Illusory Correlation - 2

- Confirmation Bias (see Chapt. 13) – people have a tendency to look for confirming evidence rather than disconfirming.
  - Notice, remember & recall confirming instances consistent with schemata (based on what we are told, initial experience)
  - Once belief is established, negative instances are discounted.
    - Owner of several Toyotas thought media reports were exaggerated, people involved were fraudsters, etc.

Base Rates

- Sample: 70% lawyers & 30% engineers
- Jack is a 45 years old, married with four children. He is generally conservative, careful & ambitious. He has little interest in politics & social issues, spends free time on hobbies which include home carpentry, sailing & mathematical puzzles.
- If he was selected randomly from the sample, what is probability is he more likely to be a lawyer or engineer?

Base Rates - 2

- In lawyer-engineer example, people likely to rely on stereotypes for lawyers & engineers.
  - Conclude he is an engineer.
  - Ignore base rate information
  - Rely on stereotype & representativeness heuristic.

Base Rates - 3

- My friend is a professor who likes poetry, is rather shy and of small stature. Do you think that my friend studies psychology or Chinese Studies?

Base Rates - 4

- Sample contains 10,000 Chinese scholars & 90% of Chinese scholars fit stereotype
  - .9 * 10,000 = 9000
- Sample contains 500,000 psychologists & 5% fit the stereotype.
  - .05 * 200,000 = 10,000
- Given that person selected at random fits the stereotype, what is probability person is professor of Chinese Studies?

Base Rates - 5

- Must consider both base rates (proportion of sample who are psychologists or professors of Chinese Studies) and diagnostic value of the stereotype (proportion of people in each category who fit the stereotype)

Base Rates - 6

- Kahneman & Tversky (1973)
  - If Ss given only base rates, judged likelihood of engineer or lawyer, Chinese Studies or Psych. prof accurately.
  - If given stereotype, Ss ignored base rates & judged solely on basis of stereotype.
  - If 70% lawyers & 30% engineers, Ss said hobby carpenter was likely to be an engineer.
  - Ss relying on representativeness heuristic
  - Why? Limited capacity memory?

Considering Sample Size

- Nisbett et al. (1983)
  - Ss imagine encountering a new bird, a "shreeble". Bird is blue.
  - How likely is it that all shreebles are blue?
  - Ss imagined seeing a new element "fluoridium" that burned with a blue flame.
  - How likely is all fluoridium burns with a blue flame?
  - Ss imagine encountering member of "lost tribe" who was obese.
  - How likely are all members of tribe to be obese?

Considering Sample Size

- Ss thought it likely that all fluoridium burns with a blue flame, less likely that all shreebles were blue, and even less likely that all members of lost tribe were obese.
- Ss use background knowledge of the variability of members of various categories (chemical elements, animals, human beings)
- If there is high variability among members of category, then large samples are needed

Dual Process Models

- Two different ways of thinking:
  - System 1: Heuristics – fast, effortless, automatic, fallible
    - Intuitive, associative
  - System 2 – slow, effortful, require attention & deliberate intention
    - Reasoning, rule-driven
- Tend to use System 1; System 2 used only in "special" circumstances

Dual Process Models - 2

- System 2 requires training, needs focused attention
- System 1 more likely if person under time pressure, distracted, not fully alert
  - System 1 is semi-automatic, needs to be overruled
  - → Requires central executive
  - Predict that people with large WM would be more likely to use System 2. Prediction confirmed.

Effect of Data Format

- Base rate problems (involve conditional probability)
  - More likely to be solved correctly if numbers given as frequencies rather than proportions or probabilities. Why?
  - Frequencies more concrete; probabilities are abstract
  - Working memory overload
    - What proportion of the Chinese scholars fit the stereotype vs. What proportion of those who fit the stereotype are Chinese scholars?

How Data are Interpreted

- If something in the problem situation reminds S of statistics, then System 2 thinking is more likely.
  - Ss more likely to consider sample size if data in problem selected randomly
- If data is seen as statistical (e.g. sports data), System 2 reasoning more likely
- If data is not seen as statistical (e.g. interview seen as sample of person's behaviour) statistical reasoning less likely

Multiple Sources of Information

- Flouridium example – we know that chemical elements are generally "pure" and all samples are very similar
- "Lost tribe" example – we know that large individual differences exist in human beings
- Students understand exams & passing rates
  - More likely to reason statistically
  - See problem on Chemistry grades.

Why You Need to Study Statistics

- Training improves likelihood of System 2 thinking.
- Fong, Krantz & Nisbett (1986)
- Interviewed students in a stats course about sports. Telephone interviews conducted in the first or last week of the course.
- Question about why many star rookies don't do as well in later years. (First year provides small sample of athlete's performance. Performance may be much better or much worse than long term average.)
- For first-week interviews 16% of Ss interviewed had some understanding; for last-week interviews, 37% had understanding of the idea of a small sample.