

Tversky & Kahneman (1974)

Judgment under Uncertainty: Heuristics and Biases

Main Summary:

- Because making judgments about probabilities of outcomes can be a complex process, people often use heuristics to make quick, simple, judgments.
- Heuristics are often useful but they can lead to severe, systematic errors.

Representativeness:

- Probabilities are often evaluated by how much one thing (A) is representative of, or resembles, another (B).
- Can lead to errors because:
 - It is insensitive to prior probability of outcomes (base rates are important in making accurate judgments of probability)
 - It is insensitive to sample size (larger samples will stray from the mean less of the time, but this is often ignored)
 - Of misconceptions of chance (people expect chance events to be represented globally AND locally, and they expect deviations in one direction induce deviations in the other (e.g. roulette))
 - It is insensitive to predictability (people rely on favorable descriptions rather than relevant information.)
 - Of the illusion of validity (people pick outcomes that most represent input)
 - Misconception of regression (people do not expect regression toward the mean)

Availability:

- When frequencies are determined by ease to which they are brought to mind
- Can lead to biases due to:
 - The retrievability of instances (frequency is often determined by familiarity and salience because they come to mind easier)
 - Effectiveness of a search set (easier to search for words that start with an 'R' than that have the third letter 'R', so the first is judged as more frequent)
 - Imaginability (ease of constructing instances does not reflect frequency)
 - Illusory correlation (overestimating frequency of co-occurrence of associates)

Adjustment and Anchoring:

- People estimate based on initial values, which bias estimates
- Anchoring is strong in cases of incomplete computation (Insufficient adjustment)
- Conjunctive events are often overestimated and disjunctive ones are underestimated

Discussion:

- Even the 'statistically sophisticated' commit many of these fallacies
 - Raises the question, what are individual differences in heuristic use: to what extent does knowledge about heuristics make us less likely to commit errors? In daily life are we just as bad as the students in these studies even though we're aware?
- Many believe coherence is the only valid criterion for probability judgment
- How economical are these heuristics? Are they worth trying to inhibit?

Gigerenzer & Brighton (2009)

Homo Heuristicus: Why Biased Minds Make Better Inferences

Introduction:

- Heuristics aren't as bad as they have been made out to be. In fact, less information and computation can lead to better accuracy

Less-is-More effects:

- Less-is-more: More information/computation can *decrease* accuracy (overfit)
- Take-the-best: order cues in order of validity and make a decision as soon as the first cue is found that discriminates between objects - more accurate than MR and tallying

Ecological Rationality:

- Good fit does not mean good predictability and low bias may not be functional
- Bias-variance dilemma – to get low prediction error, models must accommodate different patterns, but diversity in patterns increase variance
- Take the best is better than greedy take-the-best no matter if cues correlate or not
- The more noisy/sparse observations are, the better simple heuristics will perform

Computational Models of Heuristics:

- They argue that labels distort meanings (the gambler's fallacy and hot-hand fallacy are opposite but are often both explained in terms of representativeness)
- Labels should be replaced by models

'Unpacking the Adaptive Toolbox':

- Memory is perhaps the most important selection principle. If people know a lot about the situation they rely on knowledge-based heuristics, followed by more simple recognition heuristics. If they know nothing they resort to social imitation
- Feedback and ecological rationality are other important selection principles
- Once a heuristic is recognized as possible to be performed, it is also evaluated before being implemented

Methodology and Empirical Evidence:

- To test heuristics, make sure tests are competitive, at the individual level, and are adaptively selected.
- Comparative tests are important because we need to find which model fits best rather than which one fits at all and flaws in design will hurt all models tested

Discussion:

- 3 extreme human mind designs:
 - Perfect memory does not help when abstracting or summarizing
 - Infinitely flexible system of abstraction ensures zero bias but requires intense processing
 - Quick inferences from few observations relies on estimation but works when inferences need to be made quickly and when the future is more unpredictable (this design is the only non-extreme design though)