Case Study

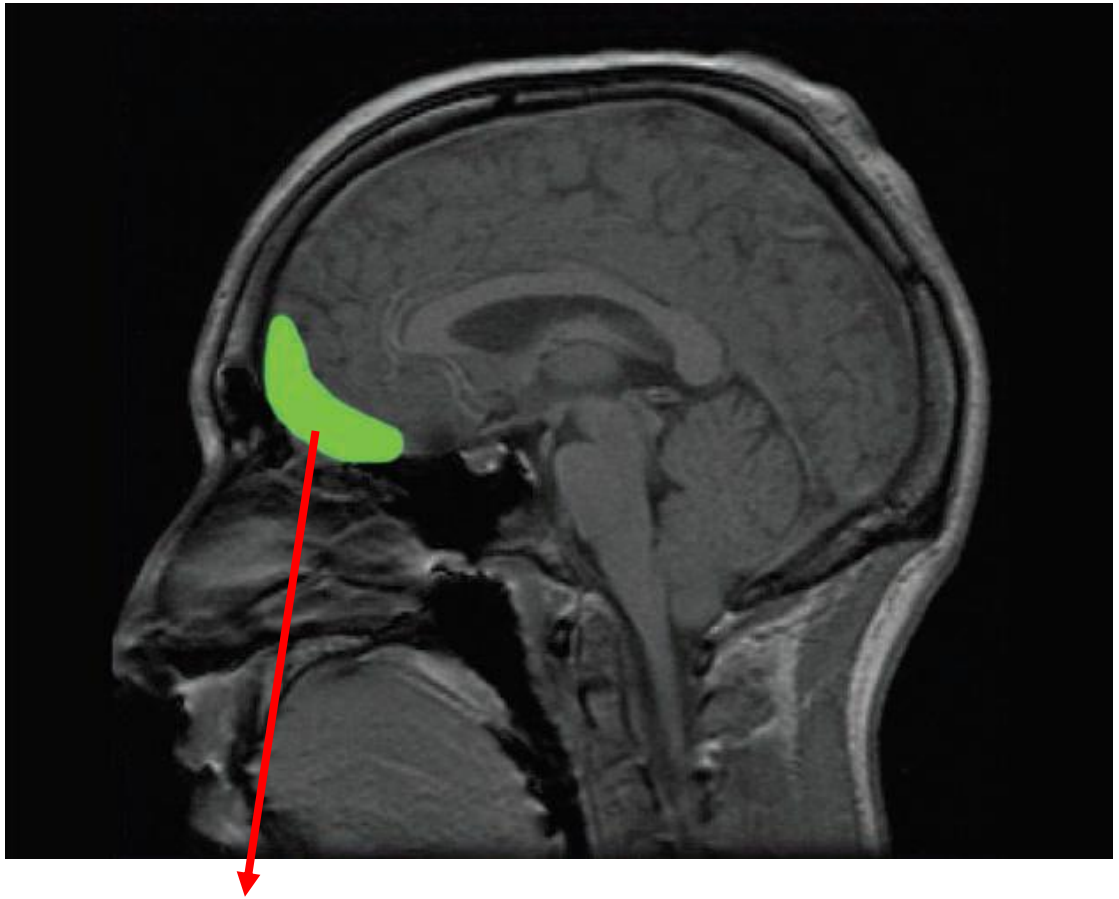
Patient Elliot:

- Had a brain surgery to remove a tumour.

- Perfect IQ.

- But He'd spend an entire afternoon deciding whether to classify a set of records by "place" or by "date." He needed so much time to choose where he'd eat lunch that he was likely to miss lunchtime.

What is the underlying functionality that seems to be affected?



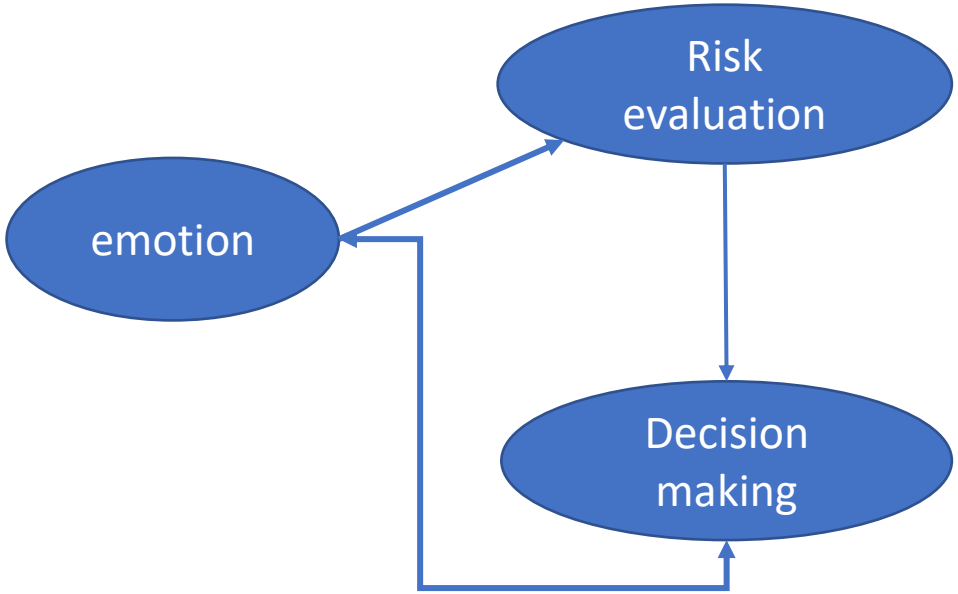
orbitofrontal cortex

- Behavior 2: Elliot showed no bodily response at all if shown pictures depicting tragedy or aggression; he didn't react to sexual images, or gruesome pictures of wounds, or any other image that for most people cause a powerful emotional response

In scheduling an appointment, he needed 30 minutes, staring at his calendar, to decide which of two days would be better for him

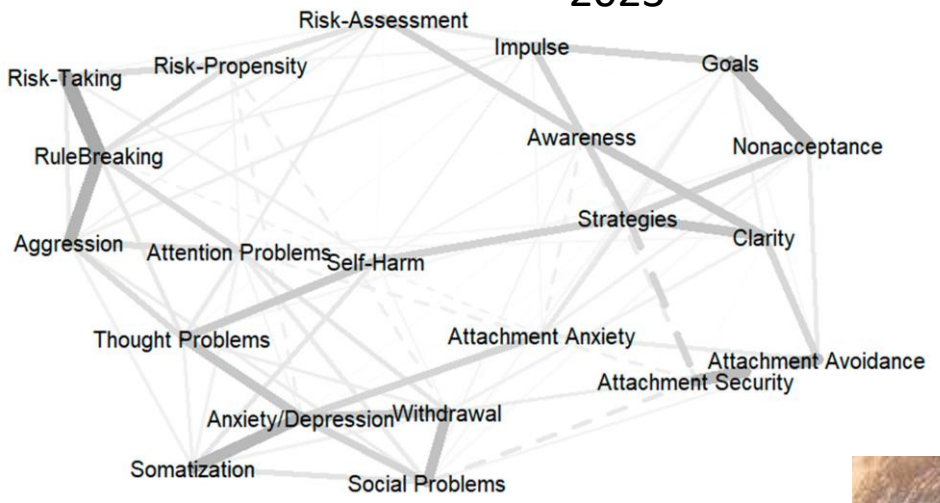
What is missing or deficit?

- Why did Elliot’s lack of emotion lead to paralysis in his decision making?

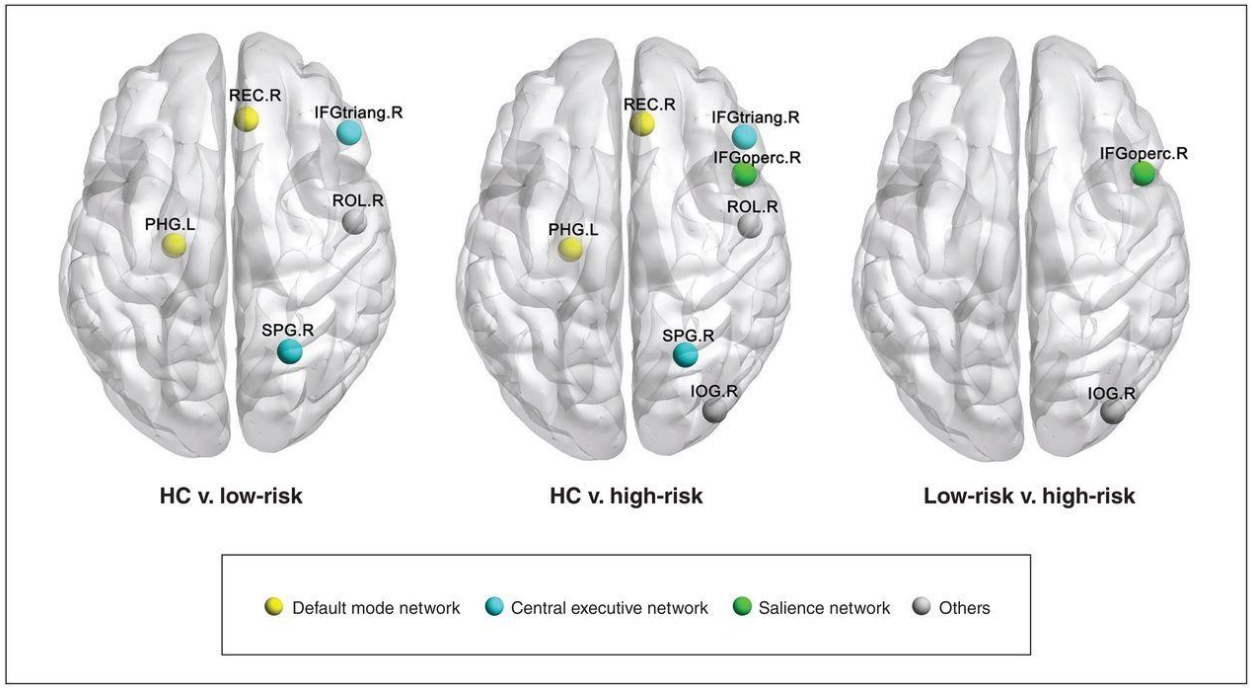


Risk-taking –driven by emotional circuit?

L Cerniglia et al., 2023



Sample study – from structural brain analysis



Brain regions exhibiting nodal centrality differences among high-risk youth with attention-deficit/hyperactivity disorder (ADHD), low-risk youth with ADHD and healthy controls (HC).

The authors included 149 youth with a mean age of 14.1 (standard deviation [SD] 2.5) years (36% female), of whom 49 were healthy controls, 50 were low-risk youth with ADHD and 50 were high-risk youth with ADHD

Zhu et al.(2023). Brain network structural connectome abnormalities among youth with attention-deficit/hyperactivity disorder at varying risk for bipolar I disorder: a cross-sectional graph-based magnetic resonance imaging study. *Journal of Psychiatry and Neuroscience*, *48*(4), E315-E324.

Judgement and Reasoning

Judgements

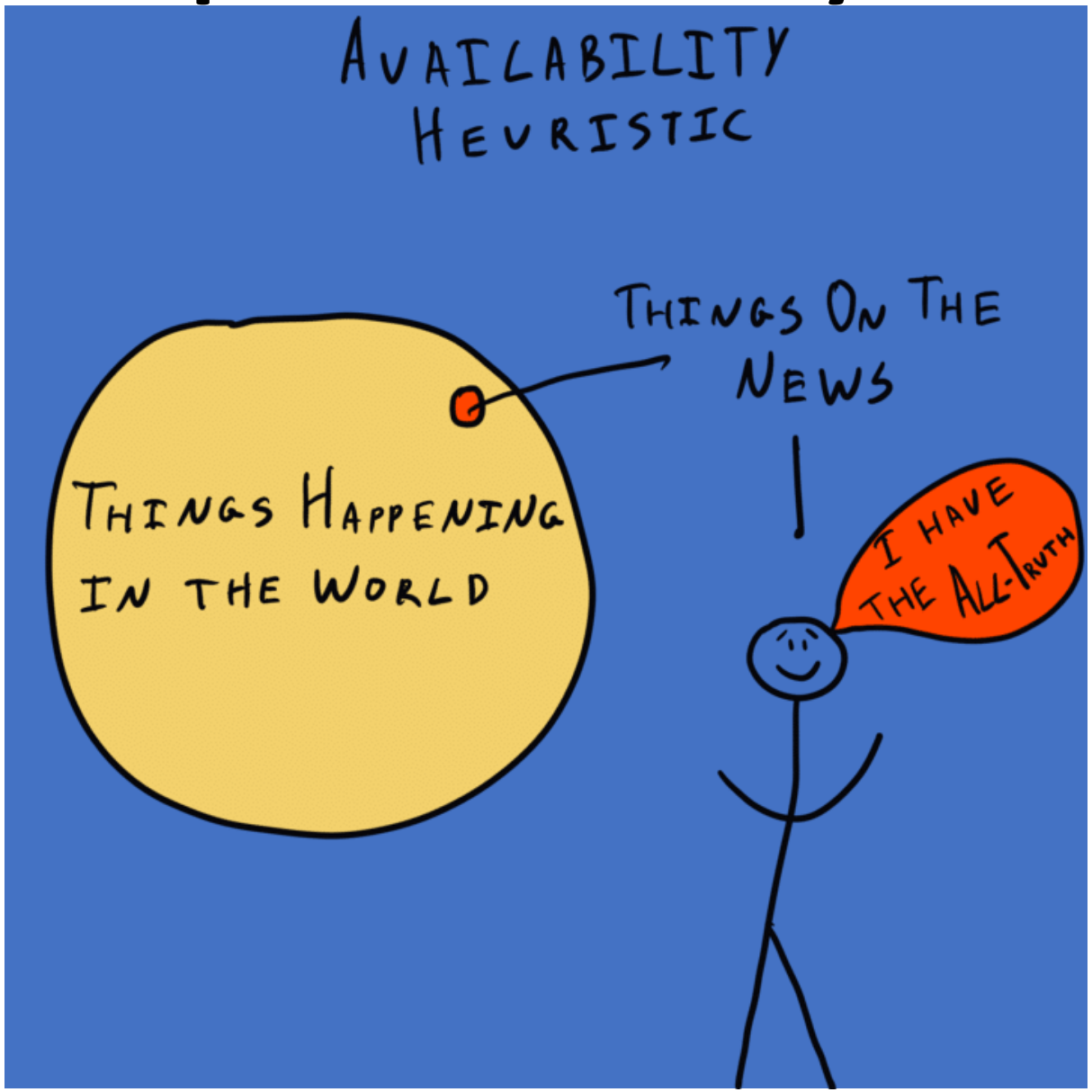
- “It might seem odd to suggest that people could make different perceptual decisions even if perception is unchanged. This is possible, however, if people are implicitly or explicitly encouraged to make different decisions about ambiguous information”

Confidence as a diagnostic tool for perceptual aftereffects
•Regan M. Gallagher,
•Thomas Suddendorf &
•Derek H. Arnold
Scientific Reports **volume 9**, Article number: 7124 (2019)

How do we make judgements?

- **Frequency estimate** — an assessment of how often various events have occurred in the past.
- If frequency info is missing, rely on attribute substitution – that is, deduce it to be a rare event.
- Additionally, mostly rare events are emotional and hence it has higher precedence for memory recall.
- This process of relying on *availability* as a substitute for *frequency* — is a form of attribute substitution known as the **availability heuristic** (Tversky & Kahneman, 1973).
- In most cases, we rely on *resemblance or similarity* instead of *probability* – *which is known as* **representativeness heuristic**.

Example: Availability heuristic



representativeness heuristic??.

ATTRIBUTE SUBSTITUTION – reduces cognitive load

TABLE 12.1 DIFFERENT TYPES OF ATTRIBUTE SUBSTITUTION

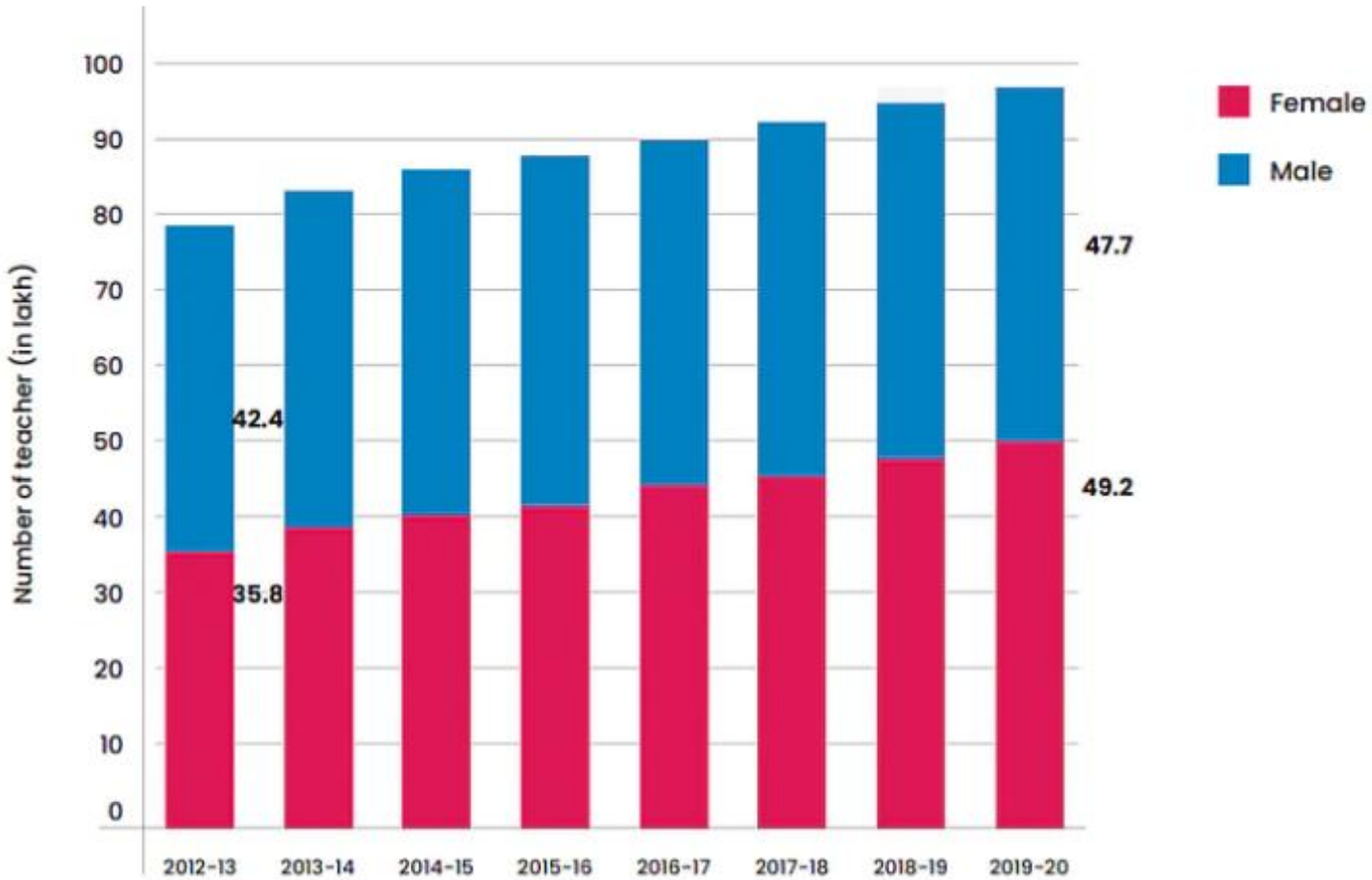
You want to judge . . .	Instead you rely on . . .	This usually works because . . .	But this strategy can lead to error because . . .
Frequency of occurrence in the world	Availability in memory: How easily can you think of cases?	Events that are frequent in the world are likely to be more available in memory.	Many factors *other than* frequency in the world can influence availability from memory!
Probability of an event being in a category or having certain properties	Resemblance between that event and other events in the category	Many categories are homogeneous enough so that the category members do resemble one another.	Many categories are not homogeneous!

Heuristic is an efficient strategy that **<u>usually</u>** leads to the right answer.
Heuristics allow errors; that's the price you pay in order to gain the efficiency.

Frequency leading to availability

- “Are there more words in the dictionary beginning with the letter *R* (‘rose,’ ‘rock,’ ‘rabbit’) or more words with an *R* in the third position (‘tarp,’ ‘bare,’ ‘throw’)?”
- Most people insist that there are more words beginning with *R* (Tversky & Kahneman, 1973, 1974), but the reverse is true — by a margin of at least 2-to-1.

- Q: are there more male or female school teachers in India – if so, what is the approximate ratio?



Number of teachers (in lakh) by gender, all India 2012-13 to 2019-20 (Source: Unified District

ODDS OF WINNING INDIAN LOTTERIES

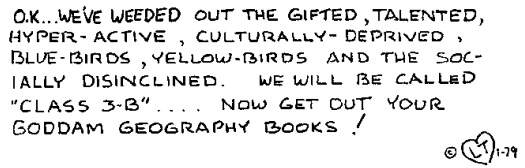
DAY OF DRAW	LOTTERY	JACKPOT ODDS	ANY PRIZE ODDS	COST PER TICKET	COST PER BOOK OF TICKETS	FIRST PRIZE
Sunday	Pournami	1 in 9,000,000	1 in 119	₹40	₹750	₹7,000,000
Monday	WIN WIN	1 in 9,000,000	1 in 119	₹40	₹750	₹6,500,000
Tuesday	Sthree Sakthi	1 in 9,000,000	1 in 119	₹40	₹750	₹7,000,000
Wednesday	Akshaya	1 in 9,000,000	1 in 119	₹40	₹750	₹6,000,000
Thursday	Karunya Plus	1 in 9,000,000	1 in 119	₹40	₹750	₹7,000,000
Friday	Nirmal	1 in 9,000,000	1 in 119	₹40	₹750	₹6,000,000
Saturday	Karunya	1 in 9,000,000	1 in 119	₹50	₹1250	₹10,000,000 (1 crore)

Kerala man who bought lottery ticket on way to bank for loan wins Rs 12 crore prize

Why do we have errors in judgement?

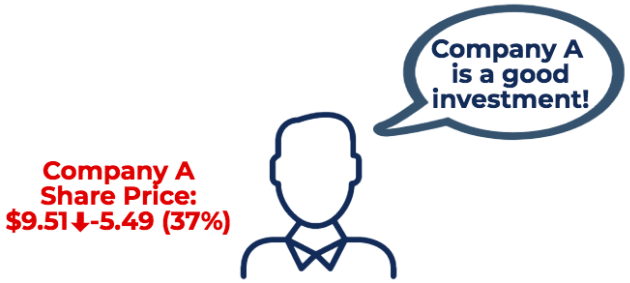
- Homogeneity
- Relying on Heuristics (coin toss: H H H H H H ?)
- Cultural differences (Masuda and Nisbett (2001))
- Detecting Covariation – errors in cause & effect estimations. And importantly Illusions of covariation.

American and Japanese students



What leads to these illusions & assessment of covariation ?

- **confirmation bias** — a tendency to be more alert to evidence that *confirms* your beliefs rather than to evidence that might *challenge* them (Nisbett & Ross, 1980; Tweney, Doherty, & Mynatt, 1981).
- **base-rate information -** information about how frequently something occurs in general.
- For example, people are more alert to a base rate phrased as “12 out of every 1,000 cases” than they are to the same information cast as a percentage (1.2%) or a probability (.012). (See Gigerenzer & Hoffrage, 1995; also Brase, 2008; Cosmides & Tooby, 1996.)
- **Role of Chance -** one instance shaping the outcome of an entire event.
- **Education:**
- **Belief perseverance**



Could it be, then, that human judgment is fundamentally flawed?

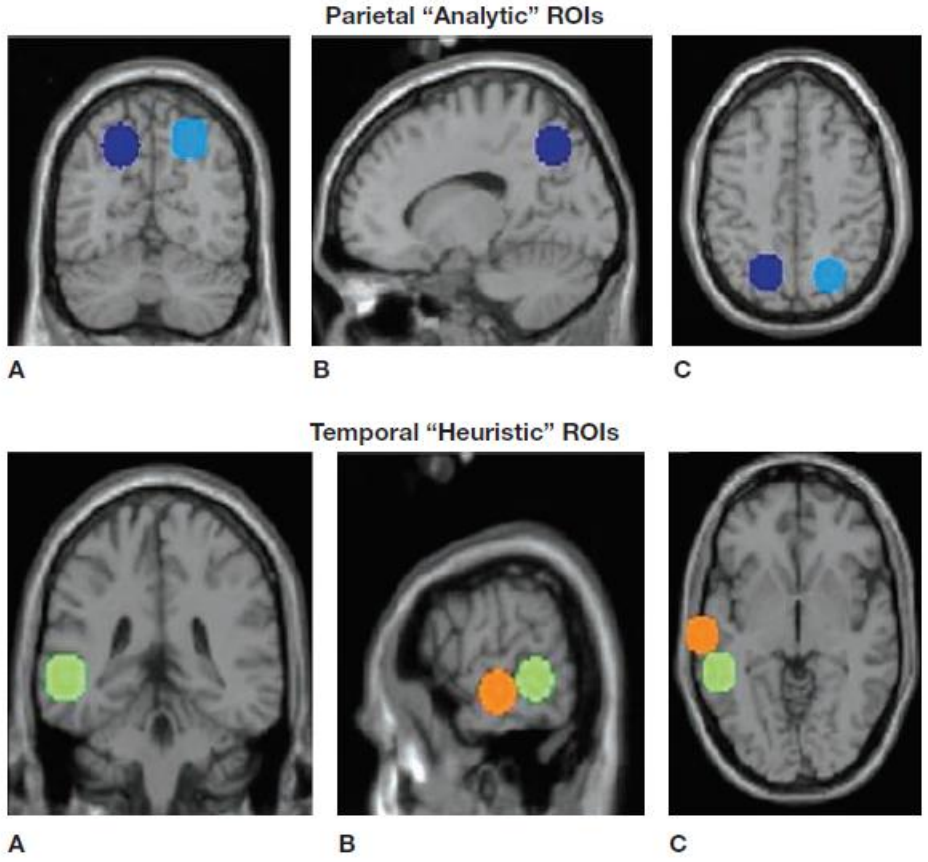
Confirmation bias takes many forms:

- First, when people are assessing a belief or a hypothesis, they're more likely to seek evidence that might confirm the belief than evidence that might disconfirm it.
- Second, when disconfirming evidence is made available to them, people often fail to use it in adjusting their beliefs.
- Third, when people encounter confirming evidence, they take it at face value; when they encounter disconfirming evidence, they reinterpret the evidence to diminish its impact.
- Fourth, people often show better memory for confirming evidence than for disconfirming evidence, and, if they do recall the latter, they remember it in a distorted form that robs the evidence of its force.
- Finally, people often fail to consider alternative hypotheses that might explain the available data just as well as their current hypothesis does.

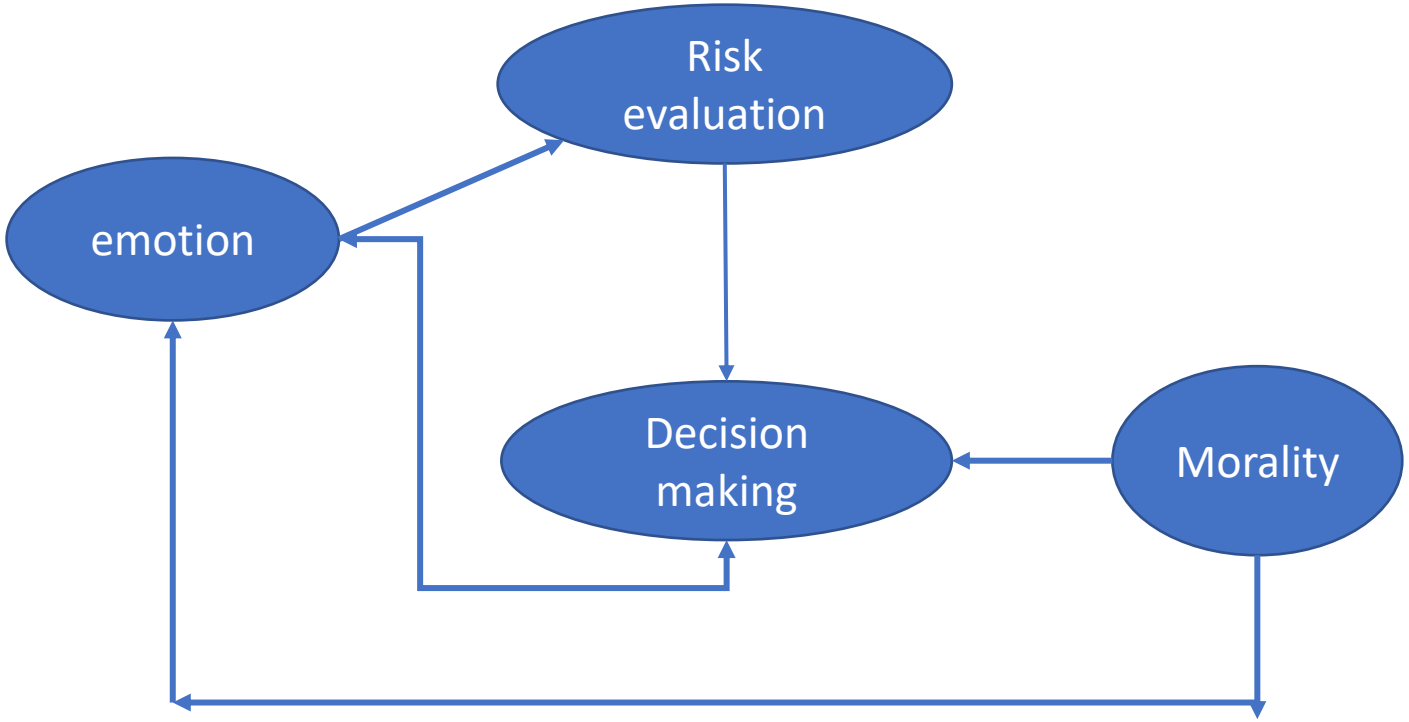
Answer? – types of thinking.

- **dual-process model: Type 1** as the label for the fast, easy sort of thinking and
- **Type 2** as the label for the slower, more effortful thinking

FIGURE 12.2 DUAL-PROCESS MODELS AND THE BRAIN



Many theorists propose that there are (at least) two distinct modes of thinking. Here, the colored patches highlight "regions of interest" (ROIs) when participants were relying on Type 2 ("Analytic") thinking and when they were relying on Type 1 ("Heuristic") thinking.


Risk evaluation
emotion
Decision making
Morality