BRAIN AND COGNITION WEEK 10- reasoning and decision making

Multiple forms of thinking:

- Reasoning research= do humans follow laws of logic? Inductive and deductive reasoning
- Decision making= do they think using laws of probability
- Problem solving research= research into reasoning/decision making, ptps come up with the solutions themselves
- Creativity research= how are novel products and ideas created?
- Analogy making= to what extent can knowledge acquired in a domain be transferred in a different domain?

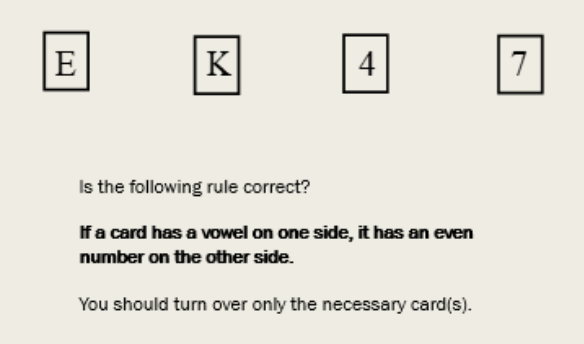
The approaches differ in tasks studied and the theoretical assumptions made… BUT they all study the same question: thinking! They key conclusions are also the same:

- Long-term memory knowledge is essential to thinking
- Limits in attention and short-term memory make even simple problems hard to solve
- Whether attention is directed to the key aspects of the problem predicts whether people will find a good solution

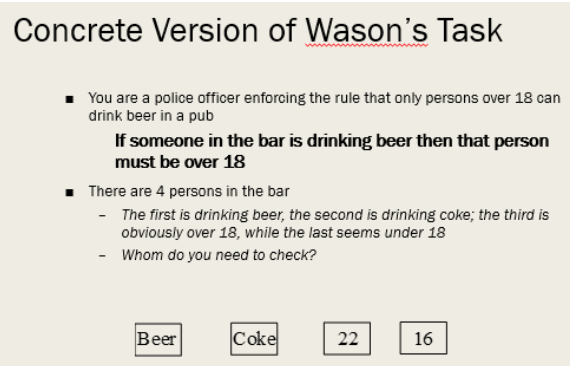
REASONING

WASON (1968) selection task- illustrates the '**confirmation bias'** – a human tendency to confirm views help rather than falsify the, this is a very common bias in human thinking.

Most people choose card E and 4- but we must falsify the rule by choosing card 7.



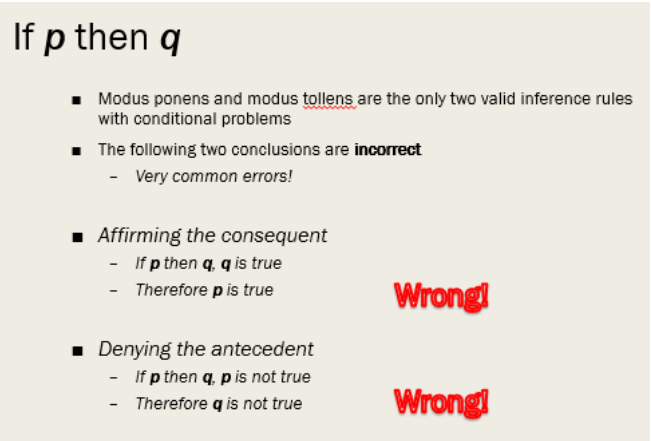
Concrete version of this= GRIGGS & COX (1982)



Should check person drinking beer and the person looking under 18! Around 3 out of 4 ptps get this correct- in the abstract task though, about 1 in 10 get it right.

Conditional problems- the selection task belongs to a broader category of problems called conditional problems… these problems use two rules of logic: modus ponens and modus tollens

- **Modus ponens**. If p then q, p is true, therefore q is true- an intuitive rule
  e.g. if psych is a science, then the moon is blue, psych is a science therefore the moon is blue.
- **Modus tollens**. If p then q, q is not true therefore p is not true. If not q then not p – a less intuitive rule but central to falsification. E.g. if Atkinson and Shiffrin's theory is correct, then blocking rehearsal stops LTM encoding. Blocking rehearsal does not stop LTM encoding therefore Atkinson and Shiffrin's theory is not correct



Modus ponens and tollens are the only two valid inference rules with conditional problems.

Scientific reasoning- POPPER 1968- falsification is the only valid way to test the validity of theories. No matter how many instances of positive evidence have been collected, a negative instance is always possible.

- HUME's 1739 *Problem of Induction*- it isn't possible to prove a scientific theory- future empirical data may refute the theory (e.g. all swans I have seen are white, so are all swans are white???) then we discover black swans!

Falsification as scientific strategy- POPPER

- In order to establish a causal link between 2 occurrences, finding a relation between them is necessary but not sufficient
- For any conclusion about causality, it is necessary to conduct a falsification experiment
- In principle, a single experiment is sufficient. In practice, things are more complicated (e.g. errors in measurement)

JOHN STUART MILL 1843- if we want to conclude that X causes Y, we need the rules of…

Rule of agreement: if X is followed by Y, then X is sufficient for Y, and could also be the cause of Y.

Rule of difference: if Y does not occur when X does not occur, then X is necessary for Y to occur.

Pragmatic reasoning schemas- CHENG&HOLYOAK 1985- people use universal logical rules. However, there is a clear difference between concrete and abstract versions of Wason's task. People use pragmatic reasoning schemas based on experience!!

Mental models- JOHNSON-LAIRD 1981- we try to decide the meaning of every statement by forming internal representations- mental models… these are used to infer conclusions

- E.g. John is taller than Paul, Paul is taller than Dave- so John is also taller than Dave

EVALUATION of mental model theory-

☺- accounts for difference or difficulty or different types of syllogisms

☺- highlights the role of working memory

☹- little direct evidence that people build the proposed mental models

☹- little support for the hypothesis that people try to find counter-examples

In general, reasoning tasks are very artificial – plausibility of conclusions irrelevant

LORD ET AL'S 1979 Experiment on Death Penalty- The Danger of the Confirmation Bias ***

2 groups (based on attitude scale) – pro-death-penalty and ant-death-penalty. They read 2 studies with 2 independent variables (Design of study and outcome of study). The flaws of the designs are highlighted and attitude scale given again at the end of the experiment.