

Reasoning Task A

Imagine that each of the squares below represents a card. Suppose that you know from previous experience with these cards that every card has a letter on one side and a number of the other side.

You are then given this rule about these four cards:

“If a card has a vowel on one side, then it has an even number on the other side.”

Your task is to decide which of these cards you would need to turn over in order to find out whether the rule is true or false. Indicate only those card(s) you definitely need to turn over to determine this.

A

D

4

7

Reasoning Task B

Imagine that each of the squares below represents a card. Suppose that you know from previous experience with these cards that every card has a drink on one side and an age on the other side.

You are then given this rule about these four cards:

“If a person were drinking beer, then they must be over 18.”

Your task is to decide which of these cards you would need to turn over in order to find out whether the rule is true or false. Indicate only those card(s) you definitely need to turn over to determine this.

COKE

19

BEER

17

Reasoning in the Wason 4-Card Selection Task

This experiment is about human reasoning. Wason (1966) presented participants with four cards, showing one side only, as follows:

A	D	4	7
---	---	---	---

Participants were instructed that every card had a letter on one side and a number of the other side. They were then given the rule ‘If a card has a vowel on one side, then it has an even number of the other side.’ They were then asked which of the cards they needed to turn over in order to find out whether the rule was true or false. Most participants replied ‘A and 4’ or ‘only A’. The correct answer, however, is ‘A and 7’. (To convince yourself of this, imagine that you see an E on the back of the 7).

Two major results emerged:

1. Participants neglected to search for disconfirming evidence (they ignore the importance of finding an E on the back of the 7). This accords with Watson’s suggestion that people have a ‘confirmation bias’.
2. Participants sometimes chose an irrelevant card i.e. 4, perhaps because they simply chose cards that matched the propositions (the ‘matching bias’ proposed by Evans, 1972) or perhaps for some other reason, such as interpreting the rule as an example of ‘If and only if’.

Content Effects

The task has been investigated for various rules having the same logical form – a conditional – but different content. Logically, these rules take the form: If p then q , where p and q represent propositions. In this notation, the cards are represented as:

p	not- p	q	not- q
-----	----------	-----	----------

and the correct card choice is p and *not- q* .

Several studies have shown that performance on the task depends on the propositional content (e.g. Griggs and Cox, 1983; Johnson-Laird, Legrenzi & Legrenzi, 1972; Klaczynski, Gelfand & Reese, 1989; Wason & Shapiro, 1971). In a well known example, Griggs and Cox (1983) showed that most participants chose correctly when the rule was ‘If a person is drinking beer, then he or she must be 18 or over’. The cards were:

beer	coke	19	17
------	------	----	----

One explanation of the improved performance is that people can reason better when the rule is realistic or *concrete*, rather than *abstract* (Johnson-Laird, Legrenzi & Legrenzi, 1972). However, Cosmides (1989) argues that performance on the drinking-age problem is *not* improved because the rule is concrete nor even because it is familiar. She claims that we reason well about problems that reflect a 'social contract' situation. Can you think of any social contracts that are more important than others, that might reveal an effect on the Wason card sorting task?

Transfer Effects

Is performance better on an abstract version of the task following completion of a familiar, concrete version? Generally, researchers have failed to find improved performance, and most participants do not recognize the formal similarity of the problems (see, e.g., Johnson-Laird, Legrenzi & Legrenzi, 1972; Kaczynski, Gelfand & Reese, 1989).

The Present Experiment

The experiment in class uses a version of Wason's original abstract version of the 4-card selection task (Wason, 1966), together with a concrete version of the task from Griggs and Cox (1983). The correct responses on the abstract version are the same as in the concrete version, i.e. *p* and *not-q* (cards A and 7 in the abstract version; beer and 17 in the concrete version).

There were 2 groups of participants:

Abstract followed by concrete version

Concrete followed by abstract version

Participants were given 5 minutes to solve each problem,

There are two main questions of interest:

1. Is performance better on some versions of the Wason card sorting task than others the first time it is performed?

2. Is performance on the abstract task affected if it follows a concrete scenario?

Treatment of Results

There are a number of possible ways to score people's answers. However, we will simply classify answers to each problem as correct or incorrect. Answers are correct if participants select only the two cards logically necessary. Any other selection is incorrect.

1. Is performance better on some versions of the Wason card sorting task than others the first time it is performed?

This can be addressed by analysing only the first problem that people attempted. Did those people with the concrete problem do better than those with the abstract problem? You can analyse this with a 2x2 chi-square test (problem x correct/incorrect).

<i>First Problem</i>	Correct	Incorrect	Correct	Incorrect	Totals
Abstract					
Concrete					
Totals					

2. Is performance on the abstract task affected if it follows a concrete scenario?

This requires only the data from the abstract task, with separate correct/incorrect counts for when participants performed the abstract condition before the concrete condition, and when participants completed the abstract condition after the concrete condition. Did people do better on the abstract task if it followed the concrete problem? Again, use a 2x2 chi square test.

<i>Abstract Problem</i>	Correct	Incorrect	Correct	Incorrect	Totals
First (Before Concrete)					
Second (After Concrete)					
Totals					

References

- Cheng, P. & Holyoak, K. (1989). On the natural selection of reasoning theories. *Cognition*, 33, 285-313. [For a criticism of Cosmides' work]
- Cosmides, L. (1989). The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task. *Cognition*, 31, 187-276
- Cosmides, L. & Tooby, J. (1992). Cognitive adaptations for social exchange. In L. Barkow, L. Cosmides, & J. Tooby (Eds.), *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. Oxford: Oxford University Press.
- Evans, J. St. B. T. (1972). Interpretation and 'matching bias' in a reasoning task. *Quarterly Journal of Experimental Psychology*, 24, 193-199.
- Griggs, R.A. & Cox, J. R. (1982). The elusive thematic-materials effect in Wason's selection task. *British Journal of Psychology*, 73, 407-420.
- Griggs, R.A. & Cox, J. R. (1983). The effects of problem content and negation on Wason's selection task. *Quarterly Journal of Experimental Psychology*, 35A, 514-533.
- Johnson-Laird, P.N., Legrenzi, P. & Legrenzi, M.S. (1972). Reasoning and a sense of reality. *British Journal of Psychology*, 63, 395-400.
- Johnson-Laird, P.N. & Wason, P.C. (Eds.) (1977). *Thinking: Readings in cognitive science*. Cambridge: Cambridge University Press. [Especially Chapters 9 and 19.]
- Klaczynski, P.A., Gelfand, H. & Reese, H.W. (1989). Transfer of conditional reasoning: Effects of explanations and initial problem types. *Memory and Cognition*, 17, 208-220.
- Plotkin, H. (1994). *The Nature of Knowledge*. London: Penguin. [Selection containing a summary of Cosmides' argument is on reserve in the library].
- Wason, P.C. (1966). Reasoning. In B. Foss (Ed), *New Horizons in Psychology*, 1. Harmondsworth: Penguin.
- Wason, P.C. & Shapiro, D. (1971). Natural and contrived experience in a reasoning problem. *Quarterly Journal of Experimental Psychology*, 23, 63-71.