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Why is it hard to imagine what is false?

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The mental model theory gives an account of how people envisage the situations in which assertions are true (see, e.g., Johnson-Laird, 1983; Johnson-Laird & Byrne, 1991). It postulates that there is no direct way to envisage the situations in which the assertion is false. You must first imagine what is true in order to infer the case, or cases, in which the assertion is false. We carried out three experiments in order to test this hypothesis. In all the experiments, the participants listed both the situations in which assertions would be true and the situations in which they would be false (in counterbalanced orders). Experiments 1 and 2 differed only in the complexity of the assertions. The results yielded three kinds of converging evidence that corroborated our hypothesis. First, the latencies of responses in experiments 1 and 2 showed an interaction between the two sorts of task (listing what is true, and listing what is false) and the order in which participants carried them out. As expected, they were faster to list the false cases after they had listed the true cases than to list the false cases before they had listed the true cases. Second, the participants made a systematic error that bore out our prediction. They would construct the false cases merely by negating each of the true cases. For example, given an assertion of the form:

A or B, or both

they would list the following correct cases in which the assertion would be true:

A
B
A B

This responses also shows a bias towards truth, because the participants fail to make explicit those propositions in the premise that would be false in the first two cases, e.g. in the first case A is true, but B is false. After they had made this response, the participants often listed the following cases in which the assertion would be false:

not-A
not-B
not-A not-B

The correct answer, of course, is that the assertion is false in only one case:

not-A not-B

Third, the participants in Experiment 3 were asked to 'think aloud' as they carried out the task, and their protocols reflect the same strategy and show how firmly entrenched it is in their ways of thinking. They consider the true cases in order to derive the false cases from them. Truth appears to be highly salient; falsity appears to be less salient. The different between them makes sense in daily life; but, it can lead to error on occasion.

References

- Johnson-Laird, P. N. (1983). *Mental Models*. Cambridge: Cambridge University Press; Cambridge, MA: Harvard University Press.
Johnson-Laird, P. N., and Byrne, R. M. J. (1991). *Deduction*. Hillsdale, NJ: Lawrence Erlbaum Associates.