

Priming Causal Conditionals

Caren A. Frosch (froschc@tcd.ie)

Ruth M.J. Byrne (rmbyrne@tcd.ie)

School of Psychology and Institute of Neuroscience,
Trinity College Dublin, University of Dublin, Dublin 2, Ireland

Introduction

We describe two experiments designed to examine the mental representations that people construct of causal relations. We examined the possibilities people think about when they understand different sorts of causes by measuring the length of time it took them to read conjunctions after priming them with causal conditionals. The results support the idea that people think about different possibilities to understand different sorts of causes.

Experiments

We examined three sorts of causes. Strong causes, such as ‘cutting his finger causes it to bleed’ (p causes q) are consistent with two true possibilities, p and q, not-p and not-q (Johnson-Laird & Byrne, 2002). Weak causes such as ‘rain causes a person to get wet’ are consistent also with a third possibility, not-p and q. Enabling conditions, such as ‘exercise causes weight loss’ are consistent with a different third possibility, p and not-q. We relied on a priming paradigm to examine reading times for a conjunction (such as ‘p and q’) after it was primed by a conditional (if p then q) compared to a baseline that contained no conditional (Santamaria, Espino, & Byrne, 2005).

Method

In Experiment 1 we examined reading times for conjunctions primed by conditionals which contained enabling relations. In Experiment 2 we examined conjunctions primed by conditionals which contained strong and weak causes. We tested 22 (Experiment 1) and 29 (Experiment 2) participants. The participants read short stories presented on a computer screen, e.g.:

‘Martin was telling Laura about his medicine bottle.

He told her that the lid had to be squeezed for it to open.

He also said

If the lid was twisted then the bottle opened.

When Martin showed Laura the bottle, she saw that

The lid was twisted and the bottle opened.

Laura went to get a drink.’

They pressed the space bar to see each sentence and their latencies were recorded. Participants in Experiment 1 were assigned to two conditions: enabling and baseline. In the enabling condition, the third sentence was a conditional containing an enabler; the baseline condition received instead a sentence describing the color or location of the conditional’s antecedent. Participants in Experiment 2 were assigned to three conditions: strong cause, weak cause, and baseline. The key measure was the length of time participants took to read the four sorts of conjunction.

Results and Discussion

Experiment 1 shows participants read the conjunctions p and q, and p and not-q more quickly when primed by an enabling conditional compared to the baseline, $t(21) > 2.8$, $p < .01$, as Table 1 shows. Experiment 2 shows participants read the conjunctions p and q, not-p and q, p and not-q more quickly when they were primed by a weak cause compared to the baseline, $t(28) > 2.1$, $p < .05$. They read the conjunctions p and q, not-p and not-q, and p and not-q more quickly when primed by a strong cause, $t(28) > 2.5$, $p < .02$.

Table 1: The mean reading times (in milliseconds) for the different conditions of the two experiments (reliable differences asterisked)

| Conjunction | p & q | not-p& not-q | not-p & q | p& not-q |
|---------------------|-------|--------------|-----------|----------|
| <i>Experiment 1</i> | | | | |
| Baseline | 2610 | 2962 | 3206 | 2960 |
| Enabler | 2145 | 2735 | 2874 | 2556 |
| Difference | 465* | 227 | 332 | 404* |
| <i>Experiment 2</i> | | | | |
| Baseline | 2607 | 3288 | 3405 | 2966 |
| Weak | 2229 | 2895 | 2697 | 2416 |
| Strong | 2099 | 2740 | 2953 | 2443 |
| Difference (weak) | 378* | 393 | 708* | 550* |
| Difference (strong) | 508* | 548* | 452 | 523* |

The two experiments show that people keep in mind different possibilities when they understand different sorts of causes, as we expected. Enablers primed two true possibilities, p and q, and p and not-q; strong causes primed two true possibilities, p and q, and not-p and not-q; and weak causes primed two true possibilities, p and q, and not-p and q. Strong and weak causes also primed the possibility p and not-q compared to the baseline and further examination of false possibilities may be fruitful.

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References

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