

# Belief Revision and Reasoning

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Which beliefs do you abandon when you discover that their consequences conflict with the facts? Suppose, for example, you have the following beliefs:

Belief 1: If the drink is cold, then it is caffeinated.

Belief 2: The drink is cold.

You make an inference of the form known as *modus ponens* (MP): The drink is caffeinated. But then you discover:

Fact: The drink is not caffeinated.

You are likely to reject any belief that is dubious or from a dubious source. Perhaps you will be more likely to reject a simple categorical assertion, such as belief 2, than a generalization, such as belief 1 (Revlis, 1974). Conversely, you will be more likely to retain believable generalizations (Dieussaert et al., 2000; Politzer & Carles, 2001). But, if your beliefs are equally plausible, then a pertinent factor is whether there is an apparent conflict between the facts and your beliefs. According to the theory of mental models, such conflicts can occur (Girotto et al., 2000). The model theory postulates that belief 1 calls for two mental models:

Cold      Caffeinated

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The first model represents the possibility in which the antecedent is true; the second model has no explicit content but represents the possibilities in which the antecedent is false. The model of the fact:

Not caffeinated

conflicts with the explicit model above, and so you should reject the conditional. In fact, the conflict is apparent, not real.

Consider a contrasting case in which you believe:

Belief 1: If the drink is cold, then it is caffeinated.

Belief 2: The drink is not caffeinated.

You can make an inference of the form known as *modus tollens* (MT), but its conclusion is contradicted by the fact:

Fact: The drink is cold.

The fact matches the explicit model of the conditional, but is not represented in the model of the categorical premise (belief 2). Hence, the theory predicts that you will be more likely to reject the categorical premise.

We carried out experiments to test these predictions. Participants were presented with scenarios such as the one above, and were asked to decide which of the beliefs they found more credible. Half of the scenarios were in the form of conflicts with MP inferences, and half of them were in the form of conflicts with MT inferences. In addition, the consequent of the conditional statement was either

affirmative or negative. And in half the scenarios, the conditional statement was the first belief in the set, and in the other half it was the second belief.

The participants were more likely to reject the conditionals in the MP scenarios (60% rejected) than in the MT scenarios (47% rejected; see also Dieussaert et al., 2000; Elio & Pelletier, 1997), but the difference was reduced when the conditionals had negative consequents. There was also a bias to believe whichever statement was presented first: for MP scenarios, the conditional was more believable when it came first in the set, but less believable when it came second. But, for MT scenarios, the effect of order was diminished.

When individuals notice the MP inconsistency, then they can readily reject the conditional, especially when it is the most recent statement in the set. MT inferences are harder, but individuals can also notice the inconsistency by, in effect, converting the scenarios into MP inconsistencies. They use the fact and the conditional to draw a conclusion, and then they notice that the conclusion conflicts with the categorical belief. And so they reject this belief.

We conclude that belief revision depends on how individuals represent their beliefs, and on how they reason about them. They may reject a belief because it merely appears to be inconsistent with the facts.

## References

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