Reasoning and Belief Revision with Deontic, Causal, and Arbitrary Conditionals

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Deductive reasoning is the process of drawing or evaluating conclusions from a set of premises. A key finding in the deductive reasoning literature is that the content of the premises affects the conclusions of reasoners. Using the Wason (1966) selection task, researchers have found that participants are more likely to respond in accord with normative logic when reasoning with deontic rules than other types of rules (for review, see Evans, Newstead, & Bryne, 1993). A deontic rule specifies what is permissible or obligatory given some set of circumstances. For example, *If someone is drinking beer, then that person must be at least 18 years old* (Griggs & Cox, 1982). Some researchers have claimed there is something special about reasoning with deontic rules (Cheng & Holyoak, 1985; Cosmides, 1989), while others have questioned the supporting evidence, claiming the selection task is not a reasoning task at all (Sperber, Girotto, Cara, 1995). Nevertheless, conditional reasoning theories, such as mental models and mental logic theories, have included pragmatic considerations to deal with these content effects (Braine & O'Brien, 1991; Johnson-Laird & Byrne, 2002). The current experiment examines content effects in reasoning and belief revision without using the selection task.

We presented 66 undergraduates at the University of California, Santa Barbara, with 16 problems, each containing three tasks in a fixed order. First, in the *inference identification task*, we presented participants with a conditional premise (*if p then q*) and a categorical assertion (e.g., *p*) and asked participants to identify, among multiple alternatives, what, if anything, follows from the premises. The problems' categorical assertions either affirmed the antecedent (*p*), denied the antecedent (*not p*), affirmed the consequent (*q*), or denied the consequent (*not q*). Second, in the *contradiction recognition task*, we presented a third premise that contradicted the inference that could have been drawn in the inference identification task. For example, if given *if p then q* and *p*, reasoners should infer *q*. We then told them that they know for sure that *not q* is true. The participants' task was to determine whether all three premises (*if p then q*; *p*; *not q*) were consistent. Finally, in the *belief revision task*, we asked participants, when they believed there was an inconsistency in the previous task, to resolve the inconsistency by rejecting either the conditional or categorical assertion.

We employed a 3x4 mixed-model design. The type of conditional used was a between-subjects variable with three levels: deontic, causal, and arbitrary. The logical structure of the problem was a within-subjects variable with four levels corresponding to which categorical assertion accompanied the conditional. We counterbalanced premise order within the problem set to control for order effects.

For the inference identification task, accuracy for problems with deontic rules was greater than problems for causal and arbitrary rules, particularly when the categorical assertion affirmed the consequent or denied the antecedent. Likewise, reasoners were more accurate when reasoning with deontic conditionals in the contradiction recognition task only when the categorical assertion affirmed the consequent or denied the antecedent.

For the belief revision task, we predicted that participants would revise their belief in deontic conditionals less often than arbitrary or causal conditionals because a contradiction of a deontic conditional represents a violation of the rule, but it does not disprove it. A contradiction of a causal or arbitrary rule, on the other hand, disproves it since these are empirical generalizations. This hypothesis was not supported; neither of the independent variables had an effect on revision preferences and we found no interaction.

Overall, our results provide evidence for the uniqueness of deontic reasoning without using the selection task. Participants responded in accord with normative logic more often with deontic rules than with causal or arbitrary rules, suggesting that logical reasoning is facilitated by deontic rules in a deductive reasoning task, not simply an artifact of the selection task, and theories of conditional reasoning are justified in their inclusion of pragmatic considerations.

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