Title
Issues in Reasoning about Iffy Propositions: A meta-analysis of thinking about what is true, possible or irrelevant in reasoning from or about propositions

Permalink
https://escholarship.org/uc/item/7mp8z50w

Journal

ISSN
1069-7977

Author
Schroyens, Walter

Publication Date
2007

Peer reviewed
We present a meta-analysis of truth-table evaluation tasks, in which people evaluate contingencies as (in)consistent with a proposition or making it true or false. There is a clear need for this review. In recent literature overgeneralizations based on a biased subset of studies have been presented as ‘fact’ and used to argue against mental-models theory (Johnson-Laird & Byrne, 2002). Given that critics got the facts wrong, the critiques are suspect and in need of a critical revision.

Consider \(<\text{if A then C}>\) conditionals. They express relations between an Antecedent \(<\text{A}>\) and a Consequent \(<\text{C}>\). Both can be either true or false, implying we have four possible truth contingencies: TT\(<\text{A and C}>\), TF\(<\text{A and not- C}>\), FT\(<\text{not-A and C}>\), and FF\(<\text{not-A and not-C}>\). These cases are referred as TT, TF, FT and FF (‘T’: Truth or ‘F’: Falsity of, respectively the antecedent/consequent).

In truth-table evaluation tasks, people evaluate the four truth-contingencies. In some tasks, people reason from conditionals. One judging whether contingencies are possible or impossible given that the conditional is true. In other tasks, one is instructed to reason about conditionals. One does not know if the conditional is true and has to judge whether the contingencies make \(<\text{if A then C}>\) true or false, or are irrelevant to its truth-value. These "three-option" tasks all include ‘irrelevant’ as a 3rd response alternative.

Figure 1 depicts adult truth-table task evaluation performance with content-neutral indicative \(<\text{if A then C}>\) conditionals. Hence, it does not include non-adult, non-evaluation tasks with non-neutral and/or, non-\(<\text{if,then}>\) conditionals. (See, Schroyens, 2007, for the complete list of studies and detailed results). About ten studies could also not be included because they presented insufficient information about the exact evaluation of the truth-contingencies. Studies using implicit referencing do not use ‘not’ to convey falsity/denial; instead they use a specific instance of the contrast-class of the negated object to establish denial (e.g., any letter that is not an A). Explicit FF cases make use of explicit negations (i.e. ‘not’; as in ‘not A and not-2’). It is clear from Figure 1 that the implicitness effect and the task effect are only observed on false-antecedent cases (FT and FF). Combined over FF and FT we have a respectable task-format effect (F(1,37) = 53.3703, Mse = .031, p < .0001) and a sizable implicitness effect (F(1,37) = 16.614, Mse = .031, p < .001). These effects are not obtained with true-antecedent cases (F’s < 1.1).

Looking at only acceptance rates, we do not know whether task-format effects reflect a shift towards ‘false’ or ‘irrelevant’ judgments of cases deemed ‘possible’ in two-option tasks. We are similarly still ignorant about the exact nature of implicitness effects in three-option tasks. There are only two implicit two-option tasks; we therefore only discuss the more reliable responses rates on explicit two-option tasks. The TF(Possible) and FF(Possible) rates are .520 and .884. The task-format effect on explicit FF cases, .884 vs. .493 (d = .391) is almost completely explained by the .389 selection rate of FT(Irrelevant); the comparable FT(Impossible) and FF(False) rates remain stable across the two explicit tasks; .116 vs. .118. The picture seems somewhat more complicated for FT. The task-format effect on explicit FT, .520 vs. .155(d = .364), is mostly explained by the .271 FT(Irrelevant) selection rates. Part of the task effect seems captured by a slight increase in FT(Impossible) versus FF(False): .480 vs. .573 (d = .097).

The .494 vs. .098 implicitness effect on FF (d = .396) is captured by a .389 vs. .737 (d = .348) increase of irrelevancy judgments of implicit FF cases. The implicitness-effects on FT (.156 vs. .055; d = .101) reflect a similar shift toward irrelevant judgments for implicit cases (.271 vs. .434).

**Conclusion** The truth-table task literature shows it is wrong of mental-models critics to state false-antecedent cases are judged irrelevant by a majority. All arguments based on a presumed majority of irrelevant responses are therefore fallacious. Only implicit FF cases in three-option tasks are judged irrelevant in a majority of cases. Critiquing theories on the basis of a biased sample of studies (for which mental-models theory by itself has an account), is not an example of theoretical rigor and exactitude.

**References**