

# Testing the Influence of QUDs on Conditional Perfection

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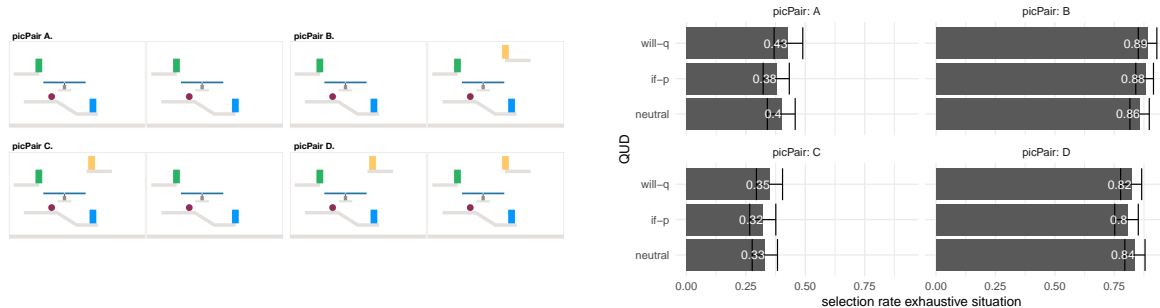
**Introduction** A longstanding subject of research in the context of natural language conditionals, e.g., expressions of the form “If  $p$ ,  $q$ ” ( $p \rightarrow q$ ), is their interpretation as biconditionals, a phenomenon that became known as *Conditional Perfection* (CP) (Geis & Zwicky, 1971). The perfected interpretation of  $p \rightarrow q$  involves an additional pragmatic inference (besides  $p \rightarrow q$ ): “ $q$  only if  $p$ ” or directly “If not  $p$ , not  $q$ ” ( $\neg p \rightarrow \neg q$ ). The degree to which a conditional is perfected seems to vary strongly between conditionals — leading to the question about the factors that influence whether and to what extent a conditional is perfected. This is what we aim to investigate here. More concretely, we aim to test a theory proposed by von Fintel (2001) which predicts the occurrence of CP to be influenced by a question-under-discussion (QUD): when the QUD puts the focus on the consequent (what if  $p$ ?), the conditional is interpreted as an exhaustive list of consequences of the antecedent  $p$ , hence CP is not expected, whereas when the QUD shifts the focus to the antecedent (will  $q$ ?), an exhaustive list of conditions for  $q$  is expected thereby triggering perfection.<sup>1</sup> This theory has been tested empirically before (Cariani & Rips, 2016; Farr, 2011) yielding conflicting results. We will present a novel experiment using visual stimuli (scenes of block arrangements) that explicitly show a very constrained context and should thereby not elicit latent, uncontrolled beliefs, which likely happens in experiments that use text-based stimuli (see Cariani & Rips, 2016).

**Experiment** 300 native English speaker were recruited via the online Platform Prolific. The cleaned data comprises data from 282 participants (103 male, 175 female, 1 other) with a mean age of 32.8 (range 18 – 84).<sup>2</sup> **Design & Material.** We use a  $3 \times 4$  within-subject design, manipulating the QUD, as encoded in an question (*neutral*, *if-p*, *will-q*) of an interlocutor, and the shown stimulus (picPair A-D). Each stimulus is a pair of what we call an exhaustive (left picture) and a non-exhaustive situation (right picture). In exhaustive situations the consequent-block (blue block in Fig. 1(a)), only falls when the antecedent-block (green block) falls and in non-exhaustive situations, there is a second reason for the consequent-block to fall, either because of its position on the edge or because of another falling block (yellow block). **Hypothesis.** According to the theory from von Fintel (2001), we should see an effect of the QUD on the selection rate of the exhaustive situation: participants are expected to choose the exhaustive situation more often with QUD=*will-q* than with QUD=*if-p* since contrary to the non-exhaustive situation, the exhaustive situation represents a biconditional interpretation of the conditional. **Procedure.** First, participants saw 8 training trials with animations of block arrangements to get familiar with the physical behavior of the blocks. In the subsequent test phase (12 critical + 6 control trials) participants first read a dialogue between two persons, Ann and Bob. After participants finished reading Ann’s question and Bob’s response<sup>3</sup>, they were shown two situations and were asked to select the one that they rated as more likely described by Bob. **Results.** Figure 1(b) shows the proportion of participants who selected the exhaustive situation as the situation that Bob is more likely to describe. We run a Bayesian logistic regression model (using brms, Bürkner, 2017) that predicts participants’ choice (exhaustive vs. non-exhaustive situation) based on the QUD and the picture pair, using default priors, varying intercepts and slopes per participant for both predictors and an interaction term.

<sup>1</sup>Levels QUD:*neutral*: “Which blocks do you think will fall?”, *if-p*: “What happens if the antecedent-block falls?”, *will-q*: “Will the consequent-block fall?”

<sup>2</sup>Anonymized link to preregistration: [https://osf.io/47w85?view\\_only=dd070669fad44969b698698f7e413dc3](https://osf.io/47w85?view_only=dd070669fad44969b698698f7e413dc3).

<sup>3</sup>In all critical trials, Bob’s response is “If the antecedent-block falls, the consequent-block will fall” where ‘antecedent-’ and ‘consequent-’ were replaced by the appropriate randomly assigned color, ‘BLUE’ or ‘GREEN’.



(a) 4 critical stimuli where, for each pair, the exhaustive situation is on the left and the non-exhaustive situation on the right.

(b) Bars are average selection rates for the exhaustive situation separately for each QUD and stimulus (pic-Pair), errorbars are 95% bootstrap confidence intervals.

Figure 1: Stimuli and results of critical trials.

We find strong evidence for the hypothesis formulated above for stimuli A (posterior probability 0.95). For the remaining stimuli the posterior probabilities are 0.70 (B), 0.83 (C) and 0.71 (D). The overall effect of the QUD in the predicted direction has an estimated posterior probability of 0.95.

**Discussion & Conclusion** Our overall results show a tendency in line with our hypothesis based on the QUD-account on CP even though the data is not conclusive. Two aspects are particularly interesting thereof: on the one hand, the effect of the QUD on the selection rate of the exhaustive situation (larger for *will-q* than for *if-p*) seems to be larger for stimuli A+C than for B+D. On the other hand, in the former two stimuli, the conditional does not tend to be perfected to the same extent as in the latter two: the selection rate for the exhaustive situation is constantly below 0.5 in A+C but close to ceiling in B+D. A possible explanation for both observations may lie in the set of *salient* alternative utterances available to the speaker. In B+D, the second cause for the consequent-block to fall in the non-exhaustive situation can clearly be communicated with a salient alternative conditional, ‘green or yellow → blue’ which would be more informative than the uttered conditional ‘green → blue’. This may explain the large values of the selection rates of the exhaustive situation which also makes a potential effect of the QUD harder to detect. Contrary to that, in A+C, the second cause is visible in the non-exhaustive situation, but there is no salient alternative conditional.<sup>4</sup> Quite the opposite, there is an alternative conditional for the exhaustive situation that discriminates both: ‘only blue → green’ which might explain the large difference in the selection rates for the exhaustive situation across QUDs in A+C as compared to B+D. In a follow-up experiment, we plan to investigate the interaction between QUDs, context and alternative utterances.

## References

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<sup>4</sup>Alternatives in the non-exhaustive situation for A+C are rather ‘blue falls’ or ‘blue might fall’.