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# Conceptual muddles: Truth vs. Truthfulness, Logical vs. Psychological Validity, and the non-monotonic vs. defeasible nature of human inferences.

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Deductive logic is concerned with logical validity (henceforth 'L-validity'). An inference is L-valid only when it must necessarily be true *if* the premises are true. This classic definition has a built-in truth-assumption. The truth of L-valid inferences is always a hypothetical truth, not a factual truth. This means that the factual truth of the premises and/or conclusion does not affect L-validity and that a L-valid inference cannot become L-invalid by adding new information. Technically speaking, deductive logics are *monotonic*. This stands in apparent contrast with the psychological evidence to the contrary, showing that the premise or conclusion believability affects the reasoning process. Common-sense reasoning is *defeasible* and *non-monotonic* in nature. A conclusion that is believed to be true at one point can be considered false later, and an inference that is considered valid at one point can later be revoked and re-evaluated as invalid. (Note that we used the unqualified term 'valid', not 'L-valid'). Consider, e.g., the classic benchmark example: "If it is a bird, then it can fly. Tweety is a bird. Hence, Tweety can fly." This is a L-valid argument. Assuming it is true that 'if something is a bird, then it can fly' and assuming that Tweety is a bird, it follows necessarily that it would be true that Tweety can fly. People will nonetheless retract the conclusion that 'Tweety the bird can fly' when being given the information that Tweety is in fact an ostrich.

Some theorists have created polemics between what they call 'logic theories' and their own probabilistic theories of human reasoning. The core argument against theories of human deduction is their presumed incapability of dealing with the defeasibility of common-sense reasoning. I will argue that there is only an *apparent* contrast between logic's monotonicity and common-sense reasoning's defeasibility. It is only when we are sure that people are reasoning hypothetically that defeating an inference would show that the monotonicity of deductive logics is problematical.

Let us assume that people aim to establish L-validity. If so, people are abandoning the truth-assumption when defeating an inference. The existence of ostriches falsifies the claim that 'if something is a bird, then it can fly. It is not always true that when something is a bird, it can fly. If people abandon the truth-assumption when confronted with the added information, they are shifting from one notion of validity (i.e., L-validity) to another notion of validity (let's call it P-validity). This means that they are not changing an *L-valid* inference into a *L-invalid* inference, but are changing an L-valid inference into a *P-valid* inference. This example indicates that though defeasible, common-sense reasoning is not necessarily non-monotonic.

Theorists who argue against logic theories contest that questioning the literal truth of, e.g., 'if it is a bird, then it can fly' is involved in defeasible reasoning: "surely [this] mischaracterizes people's cognitive attitude towards this and a million other commonsense generalizations" (Oaksford & Chater, 1998, p. 5). This claim as regards the psychological 'truthfulness' of a logically false conditional is not congruent with reality. We asked 150 first-year psychology undergraduates to judge whether the conditional is strictly speaking false when the context either did or id not include TF cases. These cases reflect situations where the antecedent is satisfied while the consequent is not (e.g., birds that do *not* fly). When there were TF cases, 83% of them said it is strictly speaking false. In case there were no such falsifying TF cases, 89% said the conditional was true. Moreover, with the false conditionals, 91% selected a conditional of the form 'if p then possibly q' as the best description of the situation. With a true conditional, 93% effectively preferred 'if p then q' as the best description. This first study used abstract materials (coloured figures). In a second study we asked 44 first-year psychology students to "think about the fact that for instance ostriches and penguins are also birds (and can not fly)." Thirty-eight (86%) of them judged the conditional to be false. In short, the falsity of the conclusion 'Tweety flies' in real everyday inference, license the conclusion that "if it is a bird, then it can fly" is a false utterance.

To ground their intuition pump, Oaksford and Chater (1998) appeal to the comforting idea that there is true commonsense knowledge. "If our commonsense descriptions of the world and of ourselves are not candidates for truth then precious little else of what we call our commonsense knowledge of the world will be candidates for truth. We would then be in the paradoxical position of having to provide a system of human inference that is always based on false premises but which is nonetheless apparently capable of guiding successful action in the world!" (Oaksford & Chater, 1998, p. 5). There is really only an apparent contradiction (a paradox), not a contradiction. It is not problematical that there is preciously little (if any) knowledge that is strictly true. The induction problem still exists: every generalization is a potential over-generalization. However, the fact that some birds do not fly does not make it senseless to use the generalization that birds fly. An absolute truth is universally applicable, but if something is not universally applicable then this does not imply that it is inapplicable. It might be inapplicable (applicable to none) or applicable to some (but not all). The demonstrable fact that most of our commonsense generalizations are false (i.e., not strictly true), marks that they only have a certain degree of truth: They are false, but applicable. Verity is not verisimilitude.

# References

Oaksford, M., & Chater, N. (1998). *Rationality in an uncertain world*. Hove, UK: Psychology Press.