Independence conditionals and inferentialism

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“If we had no faults, we would not take so much pleasure in noticing those of others.”

(La Rochefoucauld, 1665)

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Two cases for the psychology of reasoning to study

An example of what I will call an *independence conditional* is:
"If your children are vaccinated, they will not get autism."

An example of what I will call a *raccoon conditional* is:
"If pigs have no wings, raccoons cannot breathe under water."
(inspired by Krzyżanowska et al., 2017).

In this talk, I will try to draw attention to the importance of studying independence conditionals and answering questions about them.

Raccoon conditionals

Many accounts of conditionals imply *if p then q* is true when *p* and *q* are true. In these accounts, *if p then q* can be true when *p* and *q* are independent.

What I call "raccoon conditionals" are used to try to support the view that that those accounts should be rejected and replaced by the position that *if p then q* can only be true when there is a relation between *p* and *q*.

Do people dislike such conditionals for pragmatic reasons (Cruz et al., 2016; Lassiter, 2022) or semantic reasons (Douven et al., 2020)?

Truth condition inferentialism

Krzyżanowska at al. (2017) and Douven et al. (2020) have used raccoon conditionals to argue for *truth condition inferentialism*.

This is the hypothesis that a "standard" conditional *if p then q* is true if and only if there is "compelling" argument from *p* to *q*. This argument could appeal to background information, but *q* cannot follow from the background information alone.

A negative aim of this talk will be to critique the arguments for truth condition inferentialism.

Raccoon concessive conditionals

It is commonly agreed that a concessive conditional, *Even if not-p, q*, is often true when *not-p* and *q* are independent. But

"Even if pigs have no wings, raccoons cannot breathe under water"

does not seem any more assertable than my first example. This point by itself suggests that truth condition inferentialism does not explain why raccoon conditionals are unassertable.

Independence conditionals

It is easy to construct silly raccoon conditionals, but there are a great many true, sensible, and helpful conditionals, *if p then q*, in which *p* and *q* are independent, and indeed, the whole point of which is to convey this independence:

"If your children are vaccinated, they will not get autism."

Note that the above example could be interpreted as a (false) *dependence conditional,* claiming that there is a vaccine for autism. How do we distinguish assertable independence conditionals from unassertable raccoon conditionals, on the hand, and dependence conditionals, on the other?

Another example

Suppose that an exam is so easy that we are justified, perhaps by a formal statistical test, in asserting:

"If you do not attend the lectures, you will pass that exam."

The above conditional might be equivalent to a use of "Even if", but that does not tell us which is the more fundamental use. And for these examples to be independence conditionals, this conditional must be one too:

"If you attend the lectures, you will pass that exam."

Delta-p: A reminder

Delta-p measures the extent to which *p* affects *q*, raising P(*q*), not affecting P(*q*), or lowering P(*q*):

P(*q*|*p*) - P(*q*|*not-p*)

P(*q*|*p*) - P(*q*)

When delta-p is positive, *p* is *positively correlated* with *q*, and when it is negative, *p* is *negatively correlated* with *q*. When it is 0, *p* and *q* are *independent*.

Delta-p: Claims and results

Over et al. (2007) introduced the *probabilistic truth table task* to study the effect of delta-p has on P(*if p then q)*. The effect was weak in our results. Other researchers have found evidence that delta-p has to be positive for the *conditional probability hypothesis*, P(*if p then q*) = P(*q*|*p*), to hold (Skovgaard-Olsen et al., 2016a,b). These findings are used to try to support inferentialism in psychology.

But other studies have implied that there is not a strong effect of delta-p (Oberauer et al, 2007; Pfeifer, 2022; Singmann et al., 2014).

The full negations design

We can distinguish between an affirmative / affirmative (AA) case, *if p then q*, an affirmative / negative (AN) one, *if p then not-q*, and so on for NA and NN.

A full negations version of the probabilistic truth table task studies all the cases: AA, AN, NA, and NN. Over et al. (2007) did this, but others have not in their studies of delta-p.

Note that my vaccine example is an AN form, and my exam example is an NA.

Other relevant psychological results

In truth table studies, people infer that *if p then q* is true when *p* and *q* are true, and there is a tendence to say that *if p then q* is "void" when *p* is false (Skovgaard-Olsen et al., 2017). The conditional probability hypothesis, that P*(if p then q)* = P(*q*|*p*), has been confirmed for a wide range of conditionals (Cruz & Over, 2022; Over & Cruz, 2022).

These results support a de Finetti and Ramsey account of how people understand conditionals (Sanfilippo et al., 2020). There is then a debate between this account and inferentialism, since P(*q*|*p*) is high when P(*q*) is high and *q* is independent of *p*.

The debate is not “spurious”!

Referring to Krzyżanowska et al. (2017), Douven et al. (2022) try to support their inferentialism by saying:

“To avoid spurious debate, it is to be noted that linguists and philosophers have long recognized that there are special classes of conditionals … which do not require the existence of a connection between their antecedent and consequent. These include … non-interference conditionals … Krzyżanowska and coauthors explicitly propose their brand of inferentialism as a semantics for standard conditionals ...”

But it is circular to say that your theory applies to “standard” cases, which are the ones your theory applies to.

Belief "bias" or evidence against?

Douven et al. (2018) themselves found evidence against their version of inferentialism.

They found that people endorse *if p then q* simply when they have a high degree of belief in *q*, i.e., P*(q)* is high, though there is not a compelling argument from *p* to *q*.

For some of us, this finding disconfirms their theory (Cruz & Over, 2022; Over & Cruz, 2022). But they argue that it is the result of "belief bias", which is the tendency of people to endorse arguments merely because they have a high degree of belief in the conclusions.

Festino as an example

In the psychology of reasoning, belief bias was first identified in studies of syllogisms. Consider Festino in the second figure:

No addictive things are inexpensive.

Some cigarettes are inexpensive.

Therefore, some cigarettes are not addictive things.

This is a valid syllogism, but it has an unbelievable conclusion.

Some people will reject its validity as a result of belief bias.

Fallacious Festino

Fallacious Festino has a believable conclusion, and there will be a tendency to endorse it as valid:

No addictive things are inexpensive.
Some cigarettes are inexpensive.
Therefore, some addictive things are not cigarettes.

Thompson and Evans (2012) outline possible explanations of this bias in their insightful study of informal belief bias. Our higher level Type 2 reasoning may sometimes not be engaged when we think about argument validity or strength.

The coloured patches

The judgments in Douven et al. (2018) are not about difficult syllogisms or informal arguments, or hotly debated political matters. They are about coloured patches, blue or green, and inferences about them should be Type 1 processes about sensations. Where patch 1 is pure blue, and patch 14 is pure green, in a sorites series, consider:

"If patch 14 is green, then patch 1 is blue."

From what Douven et al. argue, people will endorse the above conditional because of belief bias. But on the other hand, they will reject it, since there is obviously no compelling argument to support it. Is this position falsifiable?

Belief bias and raccoon examples

From what Douven et al. (2018) argue about belief bias, there should be a tendency to accept the following conditionals:

“If grass is green, then the sky is blue.”

“If pigs have no wings, raccoons cannot breathe under water.”

On the other hand, the above examples should be rejected, as there is no compelling argument to support them.

Is this position falsifiable?

Where is this belief bias in other studies?

Krzyżanowska et al. (2021) compare "Roses are plants and roses have thorns" and "If roses are plants, then roses have thorns". The former was found to be assertable and not the latter. But where was the belief bias effect?

"If roses are plants, then roses have thorns" should be highly assertable given what Douven et al. claim about belief bias.

Assertability should be studied in a *full* context and with a *full* negations manipulation: AA, AN, NA, NN.

What makes the "bias" a mistake?

It is correct, from the probabilistic point of view, to compare conditionals closely with inferences. Inferences provide us with conditional probabilities in a Ramsey test. The judgment, of a high probability that the sky is blue given that grass is green, could come from applying Bayes theorem, and we do not hold that this inference is a normative bias.

The use of "bias" by Douven et al. is normative, because the result they are referring to violates their truth conditions. In contrast, we are not inclined to accuse participants of making a mistake when they falsify truth condition inferentialism in experiments.

Problems with MP

Douven et al. stress that MP is not logically valid in their account. There can be a compelling inductive or abductive argument from *p* to *q* when *p* is true and *q* is false.

However, MP is one of the most highly endorsed inferences in experiments, and Skovgaard-Olsen at al. (2017) have shown that people judge *if p then q* false when *p* is true and *q* is false, even if there is a positive correlation between *p* and *q* and thus an argument from *p* to *q*.

Problems with MP: Attempted replies

Douven et al. (2020, 2022) claim that there is not a compelling argument between *p* and *q* when *p* is true and *q* is false. But then how can MP be invalid?

People supposedly do not endorse MP at 100% because they imagine a possible case in which *p* is true and *q* is false. But if there is not a compelling argument from *p* to *q* in such an example, they should, by inferentialism, find *if p then q* false in it and not MP invalid.

What is an example of a context in which *if p then q* and *p* are true and *q* is false?

Centering

One-premise centering: inferring *if p then q* from *p & q*.

Two-premise centering: inferring *if p then q* from *p* and *q*.

According to inferentialism, centering is invalid, and people should not endorse it.

But people endorse it (Cruz et al., 2016). They endorse it even when *p* and *q* are independent, and even when *p* is negatively correlated with *q* in general (Skovgaard-Olsen et al., 2017).

Pragmatics

From the way I have referred to pragmatics during this talk, you can infer that I believe we use pragmatics to interpret *if p then q* as a dependence or independence conditional.

Intuitionists are rightly dissatisfied with vague references to pragmatics in accounts of conditionals. They demand a full account of the pragmatic inferences referred to.

But they also need pragmatics to explain how we infer that *if p then q* is a "standard" conditional, with their inferentialist truth conditions, and not a "non-standard" conditional.

A polite request

Douven et al. (2022), "May we request anyone wanting to rescue their semantics of conditionals by invoking pragmatics to at least sketch how the pragmatic explanation of whatever exactly it is that they are trying to explain pragmatically is supposed to go?"

Cruz et al. (2016) and Evans (2020) made a start on supplying an answer to this request, before it was made. Lassiter (2022) has done more than sketch a reply to it, by developing a notion of *discourse coherence*.

Two notions of coherence

Logical coherence **is consistency with probability theory. If people fail to be coherent in this sense, e.g., by falling outside a (logical) coherence interval in their reasoning, a Dutch book can be made against them.**

Discourse coherence **is a pragmatic notion, about whether the discourse is on an agreed common topic and fits together in other ways. There is evidence that a common topic in discourse is as pragmatically necessary for conjunctive and disjunctive assertions as it is for conditional assertions (Cruz et al., 2016; Lassiter, 2022).**

Is a unified Bayesian account possible?

A context for the vaccine example

It is easy to imagine an exchange in which someone tries to promote the false claim that vaccination causes autism.

In such contexts, interpreting "If you are vaccinated, you will not develop autism" as a negation and an independence conditional would have discourse coherence. Jonathan Evans has reminded me of Wason & Jones (1963).

In the context I have described, "Pigs do not have wings" and "If you are vaccinated, pigs will not have wings" do not have discourse coherence.

A common topic

Consider now:

"If you take extra vitamin C, your cold will be gone in 5 days, and if you do not take extra vitamin C, your cold will be gone in 5 days."

There are two missing links in the above, but we do see how it could be relevant to coherent discourse on the best way to get over a cold. It is often important to establish that *p* and *q* are independent, and conditionals can help us to do this when they are used in pairs, *if p then q* and *if not-p then q*.

A polite return request

May we request anyone wanting to rescue their semantics of conditionals by making a claim that uses of *if p then q* are ambiguous, with different truth conditions for "standard" conditionals and others, to give us at least a sketch of how we can tell in any given pragmatic context whether *if p then q* is being used as a "standard conditional" or some other kind?

We can apparently reply to their question if they can reply to ours. Recall: "If you get vaccinated, you will not get autism".

Is a use of this conditional intended to convey that there is a vaccination against autism or that vaccination and autism are independent of each other?

Independence conditionals and the intervals

If they take extra vitamin C, their cold will be gone in 5 days.

Their cold will not be gone in 5 days.

Therefore, they have not taken extra vitamin C.

Putting P($q|p$) = P(q) into the MT coherence interval, we find its interval to be [0, 1]. Inferentialists might claim that these are inferences are then "useless". However, the *contingent*, as it is, coherence level of [0, 1] is informative.

As we have been stressing, it is important to know that p and q are independent.

Excluded: Explicit causal conditionals

There are uses of conditionals with explicit causal connections between the antecedent and consequents:

"If you eat a death cap mushroom, it will poison you."

"If you eat a death cap mushroom, it will cause you to die."

These uses are quite easy to pick out. They can then be given perhaps some kind of inferentialist truth conditions. Over et al. (2007) were explicitly careful not to use such conditionals in their experiments.

Conclusions

Independence conditionals are common in our language. They can sometimes be expressed by *Even if not-p, q*, but even when they are, there is usually an independence *if p then q* at least implicit in the context. They fulfill an important role in our reasoning. They are "standard" *if p then q* in any reasonable sense of the word.

How people decide whether any given use of *if p then q* should be interpreted as an independence or dependence conditional is a serious problem we all need to address in our research.