Northumbria Research Link

Reporting conditionals with modals

Magdalena Sztencel (York St John University)
Sarah E. Duffy (Northumbria University)

Abstract

Conditionals and modals work in tandem in some instances of practical reasoning, or decision making. Consider the following example (from Kratzer 2012):

a. I want to become a mayor.
b. (*q*) I will become a mayor *only if* (*p*) I go to the pub.
c. Therefore, I *should* go to the pub.

Given what the cogniser wants (a) and the relevant circumstances (b), the conclusion that the cogniser goes to the pub comes out as necessary. Hence, the presence of the necessity modal *should* in (c). Indeed, given the context of (a), the necessity modal in (c) is simply a reflection of the necessity of *p* for *q*, which is overtly represented by the use of the 'only if *p*, *q*' construction. This chapter looks into whether indirect reports of conditionals – in particular, indirect reports which involve the use of a modal verb – are sensitive to the necessity of *p* for *q* in cases where necessity is *not* overtly represented in a conditional, as in 'if *p*, *q*' formulations.

We report on two online experiments into the relation between (i) perceived necessity or sufficiency of the truth of a conditional antecedent for the truth of the consequent, and (ii) the formulation of an indirect report of a conditional with necessity or possibility modals (*have to*, *should*, *could*). In Experiment 1, the 'necessity/sufficiency of *p* for *q*' variable was manipulated by contextually altering the number of alternative antecedents (e.g. Cummins et al. 1991; Thompson 1994; Politzer 2003). It was found that modals used in indirect reports of 'if *p*, *q*' conditionals co-vary with the number of alternative antecedents in predictable ways. This suggests that modals used in indirect reports of 'if *p*, *q*' conditionals may be a diagnostic for biconditional versus material interpretations of conditionals. The aim of Experiment 2 was to find out whether the results of Experiment 1 could be replicated in contexts which lower/eliminate the believability of the conditionals. It was found that manipulating the believability variable has no reliable effect on the results.

1. Introduction

An indirect speech report is an event e' which transmits knowledge about some prior event e (e.g. Capone 2013, 2016). In particular, in an indirect report a reporting speaker S' uses an utterance U' to report on the utterance U made by the original, or reported, speaker S. The choice of U' by S' is sensitive to the (cognitive) context of U and U' and, all things being equal, results in a belief attribution by the hearer of the indirect report (H') to S (e.g. Wilson 2000; Capone 2016; Cummins 2016).

For S' to succeed in transmitting knowledge about e to H', the relation between U and U' in indirect reports needs to be that of pragmatic same-saying; that is, U and U' need not be the same in terms of linguistic form, but they need to (sufficiently, for the purposes of the current exchange) match in terms of contextually-accessible level of speaker meaning (e.g. Cresswell 2000; Capone 2013, 2016; Wieland 2016).

In this chapter, we look at whether modalised indirect reports of 'if *p*, *q*' conditionals are sensitive to the contextually-accessible necessity versus sufficiency of *p* for *q*. If pragmatic same-saying is at stake in the formulation of U', then we should observe a correlation between, on the one hand, (i) perceived necessity or sufficiency of the truth of a conditional antecedent for the truth of the consequent, and, on the other, (ii) the formulation of an indirect report of a conditional with necessity or possibility modals (*have to*, *should*, *could*). We also look at whether there is a correlation between (i) and (ii) in contexts in which it is assumed that S' is not sure about or does not believe in the truth of U. The results of this experiment will shed light on whether a communicatively successful indirect report – i.e. one in which knowledge about e is transmitted to H' – is necessarily tantamount to a belief attribution by H' to S.

2. Conditionals and modals

It is well known that conditionals and modals are related (e.g. Clancy et al. 1997; Beller 2008; Kolodny & MacFarlane 2010; Schulz 2010; Kratzer 2012; Over et al. 2013; Krzyżanowska et al. 2013). This relationship is most obvious in the so-called explicitly modalised conditionals, where a modal expression is (typically) present in the consequent clause of the conditional. Kratzer (2012: 28) argues that the antecedent clauses of modalised conditionals often serve to restrict such modal expressions. Consider the following:

1) If a wolf entered the house, he must have eaten grandma, since she was bedridden. He might have eaten the girl with the red cap, too. In fact, that's rather likely. The poor little thing wouldn't have been able to defend herself.

The first sentence in example (1) shows that the *if*-clause can restrict the modal expression overtly represented in the consequent of the same conditional sentence (here: *must*). The successive sentences in this example show that the *if*-clause can also restrict modal expressions in subsequent discourse (here: *might*, *rather likely*, and *would*).

However, *if*-clauses can also restrict a modal which is not overtly represented in the consequent, as illustrated by the following example (from Zvolenszky 2002, cited in Kratzer 2012: 106):

2) If Britney Spears drinks Coke in public, she must drink Coke in public.

The most natural interpretation of (2) is one in which, if Britney Spears drinks Coke in public, then it must be the case that she must/is obliged to drink Coke in public. This interpretation involves both epistemic (must be the case that) and deontic (must/is obliged to) modalities. This indicates that example (2) is doubly modalised even though only one of the modals is overtly represented in the sentence.

The relation between conditionality and modality is also evidenced by some instances of practical reasoning, or decision making. Kratzer (2012: 62) considers the following example:

3) a. I want to become a mayor.
   b. I will become a mayor only if I go to the pub.
   c. Therefore, I should go to the pub.

Kratzer argues that there are two types of hidden assumptions which underlie this line of reasoning: (i) a *modal base*, which is 'a function *f* that maps a world *w* to the set of propositions that correspond to the relevant circumstances in *w*'; and (ii) an *ordering source*, which 'maps a possible world *w* to the set of propositions that correspond to what I want in *w*'. In example (3), the relevant circumstances are such that *I will become a mayor only if I go to the pub* and what I want is *to become a mayor*. With respect to this particular modal base and ordering source, the proposition that *I go to the pub* is necessary. On the assumption that *should* is a necessity modal (Kratzer 2012: 62), the modal base and ordering source analysis dictates the formulation of the conclusion in (3) with *should*.[1]

[1] If necessity is at stake here, a formulation with *must* or *have to* would be equally acceptable.

The relation between the type of modality (necessity or possibility) which arises from the modal base and ordering source, on the one hand, and the modal expression used in the formulation of the conclusion, on the other, brings us to the subject matter of the current chapter. In Kratzer's example, this relation is obvious: the relevant circumstances are such that the truth of *p* (*I go to the pub*) is necessary for the truth of *q* (*I will become a mayor*) and, indeed, this necessity is overtly represented by the use of *only if* in (3b).[2] Hence, the choice of a necessity modal, like *should*.

However, necessity need not be overt in the formulation of the antecedent, yet it will influence the choice of the formulation of the conclusion in practical reasoning. For example, let us imagine that a researcher wants to falsify his colleague's hypothesis and speculates that, if (*p*) he runs a search on a mega corpus of data, then (*q*) it is likely that his colleague's hypothesis will be falsified. The researcher has always found the corpus method reliable and he assumes that, given that the corpus contains hundreds of millions of language use samples, it very likely contains some counter-examples to his colleague's hypothesis. Given this assumption, the researcher then decides that he *should* run a search on a mega corpus of data. But notice that if there are other sufficient guarantors of the truth of *q* in the example above, like using the methods of introspection or experimentation, then the researcher would decide that he *could*, rather than *should*, run a search on a mega corpus of data.[3] If, however, the researcher happens to believe that experimentation is not a suitable method to test this particular hypothesis and if introspection has failed him in the past, he can even decide that he *has to* run a search on a mega corpus of data. So the choice of a modal in the formulation of the conclusion depends on a relevant slice of cognitive context.

3. Indirect reports of conditionals

Let us now transform some of the above instances of practical reasoning into instances of indirect reports of conditionals.

Imagine a scenario in which Anna wants to become a mayor. She asks her politically involved friend, Mary, what to do to become a mayor.

Mary says to Anna:

[2] We assume that, if a linguistic form overtly represents a concept, that concept is an attractor for that particular linguistic form, in the dynamic sense of Barsalou 2005 or Sztencel 2014 and Sztencel 2018 (see also Barsalou et al. 2010; Lebois et al. 2014).

[3] The choice between *could* or *should* here is independent of the modal expression (*likely*) which is restricted by the *if*-clause in that, regardless of whether the researcher feels he *should* or *could* run the search, he still believes it is likely that the hypothesis will be falsified if he does run the search. However, the choice of *could p* or *should p* as opposed to e.g. *will not p* is dependent on the presence of *likely* in the consequent.

4) You will become a mayor only if you go to the pub.

Anna wants to tell her husband, John, what Mary has said. Which of the following sentences would Anna be most likely to use?

a) Mary said that I *could* go to the pub if I want to become a mayor.
b) Mary said that I *should* go to the pub if I want to become a mayor.
c) Mary said that I *have to* go to the pub if I want to become a mayor.

Given the *only if* formulation (i.e. overtly represented necessity), and the representation of the ordering source in the antecedents of the reporting conditionals, (b) and (c) seem to be the only possible choices. But what is the difference between them, if any?

Let us leave conditionals for a moment and consider the following two injunctions:

5) You *have to* do X.
6) You *should* do X.

It is plausible to assume that the speakers of (5) and (6) both believe that it is necessary for the hearer to do X; that according to some set of circumstances in the world, there is no other alternative but to do *X*. In other words, it is plausible to assume that in the case of *have to* in (5) and *should* in (6) we are dealing with root necessity (see e.g. Depraetere & Reed 2006).

But there is a difference between the two modal expressions. In its root use, *have to do X* tends to indicate an obligation to *do X* or the existence of compelling reasons to *do X*. Crucially, when *have to do X* is used with the force of an injunction, there is an expectation that the hearer will *do X* (Palmer 2001). In contrast, when root *should* is used with the force of an injunction, there is no expectation that the hearer will *do X* (Coates 1983; Palmer 2001). Due to the lack of such expectation, the types of injunctions that can be made with *should* are said to communicate weak obligation (as compared with *have to do X* or *must do X*) or strong suggestion/advice (as compared with *could do X*). What this means is that the use of *should* allows one to communicate the necessity of doing X without placing/appearing to place an obligation on the hearer to do X; the use of *should*, thus, allows the speaker to mitigate a threat to the hearer's negative face-want (as in Brown & Levinson 1987).[4, 5]

[4] See Geis & Lycan (1993) on conditional formulations and politeness strategies.
[5] Notice that the use of 'weak' in 'weak obligation' is not the same as use of 'weak' in 'weak necessity' as in e.g. von Fintel & Iatridou (2008). Von Fintel & Iatridou (2008) define strong necessity modals (e.g. *must*) as those which require the prejacent (i.e. the proposition *X* in *must X*) to be true in all of the favoured worlds (worlds in the modal base which are most highly ranked by the ordering source), while weak necessity modals (e.g. *ought to*) require the prejacent (*X* in *ought to X*) to be true in all of the very best (by some additional measure) among the favoured worlds. Given the facework strategy which dictates the use of *should* over *have to*, it transpires that *should* can be used to communicate weak obligation to do X in the presence of strong

Coming back to our scenario in (4), the use of *only if* by Mary licenses Anna to use either of the two necessity modals – *should* or *have to* – in her report. Arguably, if Anna chose the *should* formulation of the report, this wouldn't be because she wanted to mitigate the threat to her own negative face-want (but it is, in principle, a possible reason). More plausibly, the choice of *should* by Anna would be indicative of Anna's ascription of politeness intentions to Mary: Anna chooses *should* because she assumes that Mary would intend to mitigate the threat to Anna's negative face.

And what about the *could* formulation? According to Depraetere & Reed (2006), *could* can be used to communicate root possibility, one which arises due to some set of circumstances in the world, a.k.a. enabling and disabling conditions (see also Kratzer 2012). This means that *could* can be used to make suggestions (Palmer 2001), but not strong suggestions as was the case with *should*. Given the necessity of *p* in example (4), which is overtly represented by the use of *only if*, the formulation with a possibility modal like *could* is inadequate.

Let us now go back to our research methods scenarios invoked above and imagine that researcher A wonders what method is most likely to falsify his colleague's hypothesis. He asks his friend, researcher B, for advice. B tells A that experimentation is not a suitable method in this case and that introspection has failed B on many occasions in the past. B then says:

7) If you run a search on a mega corpus of data, you will likely falsify the hypothesis.

A wants to tell C what B has said. Which of the following sentences would A be most likely to use?

a) B said that I *could* run a search on a mega corpus of data, if I want to falsify the hypothesis.
b) B said that I *should* run a search on a mega corpus of data, if I want to falsify the hypothesis.
c) B said that I *have to* run a search on a mega corpus of data, if I want to falsify the hypothesis.

Example (7) differs from (4) in that the necessity of *p* for *q* is not overtly represented; the conditional formulation is 'if *p*, *q*', not 'only if *p*, *q*'. Nevertheless, it is evident from the context that the corpus method is the only suitable method according to researcher B. In the

necessity to do X – example (5) is a case in point. This is not inconsistent with von Fintel & Iatridou (2008), who remain 'officially agnostic' about *should* (p.117).

light of the contextually provided domain restriction (necessity of the corpus method), formulation (a) is impossible. As was the case with example (4), formulation (b) is given preference to (c) given the facework considerations.

Compare the above scenario with one in which researcher E wonders what method is most likely to falsify his colleague's hypothesis. He asks his friend, researcher F, for advice. F tells E that there are a few methods which are equally likely to falsify the hypothesis, such as introspection, a mega-corpus study or experimentation. F then says:

8) If you run a search on a mega corpus of data, you will likely falsify the hypothesis.

E wants to tell G what F has said. Which of the following sentences would E be most likely to use?

a) F said that I *could* run a search on a mega corpus of data, if I want to falsify the hypothesis.
b) F said that I *should* run a search on a mega corpus of data, if I want to falsify the hypothesis.
c) F said that I *have to* run a search on a mega corpus of data, if I want to falsify the hypothesis.

Given the contextually provided domain restriction (two other alternatives), (a) is the most likely candidate. Formulation (b) seems likely on the assumption that E equates F's conditional with F's eventual choice of the corpus method as the preferred option and unlikely if E makes no such equation. This indicates that the use of *should X* is also consistent with the lack of necessity of X, or lack of strong necessity if you will (see footnote 5). Notice that from F's eventual choice of the corpus method as the preferred option, it does not follow that F thinks that the use of corpus is necessary. F may have advised E to use corpus because F thinks – though is not sure – that E might be a bit more likely to get funding for a corpus-based research or that E is more familiar with this method than with the others and therefore it will be easier for E to do the research. One or both of these two additional considerations, the funding or the ease of research consideration, may contribute an additional, yet tentative (notice F's lack of certainty), constraint and thus result in the preference of *should* over *could*. Another option, given F's lack of certainty, would be to see the effect of the additional constraint as allowing the grading of alternatives into better and worse (Kratzer's discussion of *kann* is relevant here, see 2012: 60) – the choice of *should p* would indicate that *p* is a

better alternative out of a set of others, but *p* is not necessary. Formulation (c) seems impossible given the provided domain restriction which calls upon other alternatives.

What this section has illustrated is that the formulation of the indirect report of a conditional can be a diagnostic for 'the relevant circumstances in *w*' in that it depends on the assumptions about 'the relevant circumstances in *w*'. In particular, the formulation of the indirect report depends on whether the truth of *p* is assumed to be necessary or not necessary for the truth of *q* – regardless of whether necessity is or is not overtly represented in the *if*-clause. We have argued that *should* and *have to* formulations can be used when the truth of *p* is assumed to be necessary for the truth of *q*, and we have suggested that *should* is likely to be preferred due to the facework considerations. We have also argued that *could* can be used when the truth of *p* is assumed not to be necessary for the truth of *q*. *Should* is also a possible candidate for multiple-alternatives contexts, but only when an additional constraint is considered. Nevertheless, we predict that *should* will not be a preferred option here due to its association with (strong) necessity.

4. Relevant circumstances in *w* = alternative antecedents

Consider the following examples (taken from Cummins et al. 1991):

9) a. If the match was struck, then it lit.
   b. The match was struck.
   c. Therefore it lit.

10) a. If Joe cut his finger, then it bled.
   b. Joe cut his finger.
   c. Therefore it bled.

Cummins et al. (1991) and Cummins (1995) demonstrate that the acceptance rate of the conclusion (c) in the inferences above depends on the domain referred to by a causal conditional: people are more likely to accept the conclusion of (10) than (9). This acceptance rate depends on the number of disabling conditions, i.e. events which could prevent the effect represented in the consequent from occurring; the match won't light if it is damp, if treated in some other way that would prevent it from lighting or if insufficient pressure is applied to it and Joe's finger won't bleed if the cut is superficial. The number of disabling conditions is in inverse proportion to the acceptability of the conclusion: the more disabling conditions, the less certainty in the sufficiency of the truth of (b) for the truth of (c).

Now, we must be careful here not to assume that Cummins et al.'s results tell us about the rates of acceptability of the conclusion in the Modus Ponens inference (i.e. $((p \supset q) \,\&\, p) \supset q$). If a person accepts/assumes the truth of the major premise (10a)/($p \supset q$) and accepts/assumes the truth of (10b)/p, then the truth of (10c)/q is guaranteed. This is because the (assumption of the) truth of the major premise guarantees the assumption of the sufficiency of the truth of the antecedent for the truth of the consequent. What the existence of disabling conditions seems to be doing here then is reduce the believability of – i.e. the acceptability of the truth of – the major premise (given the disabling conditions, the cogniser accepts that the finger may bleed, but not that it will bleed) and consequently the acceptability of the conclusion (c) from premise (b) (for short, acceptability of (b) → (c)). But it does not affect the acceptability of the conclusion in the Modus Ponens argument, which requires the assumption of the truth of the major premise.[6] The more disabling conditions there are, the less believable the major premise is.

Politzer (2003, 2004) uses the notion of complementary necessary conditions (CNCs) to refer to two kinds of implicit ceteris paribus assumptions on which the satisfaction of q depends. The first kind is called a *disabler* and it corresponds to Cummins' notion of a disabling condition (a disabler cannot be the case for q to be the case). The second kind is an *enabler*. An enabler must be the case for q to be the case; in (9) an example of an enabler would be that sufficient pressure is applied during the striking of the match and in (10) that Joe's finger is not prosthetic. According to Politzer (2003), the rate of endorsement of Modus Ponens (and Modus Tollens) decreases in three situations: (i) when the satisfaction of a CNC is denied (i.e. when a disabler is present or an enabler absent); (ii) when a doubt on the satisfaction of a CNC is suggested; and (iii) when it is stated or known that the CNC is not fully satisfied. However, as discussed above, it is more plausible to assume that a denial of or doubt in the satisfaction of a CNC – what will be referred to as a *dubious CNC state* – results in a decreased believability of the major premise (Modus Ponens simply does not go through in dubious CNC states as the truth of the major premise is not accepted/assumed).

Whereas dubious CNC states seem to cast doubt on the believability of the major premise, alternative causes, i.e. causes other than the one represented in the antecedent which

[6] Cummins (1995) studies causal, rather than logical, necessity and sufficiency and finds the effect of reversal of the causal relation on the believability of the major premise (even though she talks of the effect on the rates of acceptance of the logical arguments such as Modus Ponens or Modus Tollens).

are capable of making *q* true, seem to cast doubt on the necessity of *p* for *q*.[7] Consider the following examples:

11) a. If the brake was depressed, then the car slowed down.
    b. The break was depressed.
    c. The car slowed down.

12) a. If Larry grasped the glass with his bare fingertips, then his fingertips were on it.
    b. Larry grasped the glass with his bare fingertips.
    c. His fingertips were on it.

According to Cummins, there are many alternative causes for the conclusion (c) in (11), like going uphill or engine trouble. However, the conclusion (c) in (12) admits of few alternative causes. This difference in the number of alternative causes results in the variation in the acceptability of the inference from the observed effect (c) to the cause represented in the antecedent (b) (i.e. (c) → (b)). Thus, it appears that the more alternative causes there are, the less certainty there is about the necessity of the truth of *p* for the truth of *q*.

Thompson (1994), who investigates both causal and non-causal conditionals, argues that the acceptability of Modus Ponens and Modus Tollens inferences also depends on the availability of alternative consequents. Consider the following example:

13) a. If a person smokes, then he/she will get lung cancer.
    b. A person smokes.
    c. He/she will get lung cancer.

As above, if A rejects that (13c) follows from (13b), A cannot have assumed the truth of the major premise, the assumption of which would guarantee the sufficiency of (13b) for (13c). So what A rejects is not a conclusion in the Modus Ponens argument. As was the case with the number of disabling conditions, it transpires that what the number of alternative consequents does is affect the believability of the major premise. Crucial here is the difference between the proposition that *If a person smokes*, *then he/she will get lung cancer*, which is the major premise here, and the proposition that *If a person smokes*, *then he/she may get lung cancer*, which licences the rejection of (b) → (c) but is not our major premise. The

[7] In the examples (9)–(12), the direction of causal sufficiency and necessity corresponds to the sufficiency/necessity of *p* for *q*. If, however, the antecedents and consequents of (9)–(12) were reversed, causal sufficiency/necessity (but not inferential sufficiency/necessity) would correspond to the sufficiency/necessity of *q* for *p* (see Cummins 1995). We use *p* and *q* to refer to the antecedents and consequents of the conditionals under discussion, irrespective of the direction of causal sufficiency/necessity (though they happen to correspond).

alternative consequent to the one in (13a) is that the person will not get lung cancer. The existence of this alternative consequent lowers the believability of the major premise.

In light of the overview above, a believable conditional, i.e. one whose major premise is believable, is one for which the CNCs are satisfied and for which there are no alternative consequents. This is in line with Politzer's (2004) analysis whereby the credibility of a conditional is in inverse proportion to the number of CNCs whose satisfaction is questionable. If a conditional is believable, then the existence of no (reasonable, salient, etc.) alternative antecedents should result in the perceived necessity of *p* for *q*, i.e. in the biconditional ($p \equiv q$) interpretation of conditionals. On the other hand, the existence of alternative antecedents should maintain the presumption of the sufficiency of *p* for *q* and result in the material ($p \supset q$) interpretation of conditionals (see also Thompson 1994, 1995, 2000; von Fintel 2012).

We propose to treat the *alternative antecedents* variable as 'the relevant circumstances in *w*' which determine the perception of sufficiency versus necessity of *p* for *q*. If, as we put forward at the end of section 3, indirect reports of conditionals are a diagnostic for 'the relevant circumstances in *w*', then the formulation choices of indirect reports should be sensitive to the number of alternative antecedents. In section 3, we predicted that the existence of alternative antecedents should favour the formulation of the indirect report with *could* (the scenario in which experimentation and introspection were as good methods of testing a given hypothesis as a corpus study was), whereas no alternative antecedents (the scenario in which neither experimentation nor introspection were alternatives to a corpus study) should favour a formulation of the indirect report with *should* over *have to* (on the assumption of the facework considerations). We have devised an online experiment to test this hypothesis.

5. Experiment 1

The aim of the experiment was to find out whether modalised formulations of indirect reports of conditionals reflect the number of alternative antecedents. To do this, we devised a series of scenarios, similar to those in section 3, where the number of alternative antecedents was contextually manipulated. We have followed Politzer (2004: 105) in assuming that the conditional comes with an implicit guarantee of normality. In light of section 3, the guarantee of normality has two clauses. First, unless the satisfaction of relevant CNCs is denied/doubted or it is suggested/ known/stated that the satisfaction of relevant CNCs is or

should be denied/doubted, the credibility, or believability, of a conditional is high. Second, unless the absence of alternative consequents is denied/doubted or it is suggested/ known/stated that the absence of alternative consequents is or should be denied/doubted, the credibility, or believability, of a conditional is high.

The conditionals chosen for Experiment 1 were believable in the above sense in that the lack of satisfaction of relevant CNCs or the presence of alternative consequents was not suggested/stated in the co-text. Other contextual features which increase believability of the chosen conditionals are discussed later on in this section.

5.1. Method

Participants

139 native English speakers participated in this study (35 in Scenario 1A; 35 in Scenario 2A; 33 in Scenario 3A; 36 in Scenario 4A). 104 participants were female, 32 were male, and 3 were non-binary. There was an age range of 18 to 74 years and a mean age of 30 years. Participants were recruited online via social media postings. No participant had studied linguistics or philosophy beyond MA level.

Materials and procedure

The participants were working under one of two experimental conditions: Condition I, where there were several alternative antecedents mentioned in the co-text, and Condition II, where there were no alternative antecedents mentioned in the co-text. For each condition two scenarios were created, one involving conditional advice and the other a conditional inducement. The study comprised of four surveys (corresponding to the four scenarios), which were created using Google Forms. The social media postings advertising the study contained hyperlinks to each survey. Participants were instructed to take part in just one of the surveys.

On the opening page, participants were informed that the study formed part of a larger investigation into the reporting of other people's speech. Following informed consent, participants proceeded onto the second page, where they were presented with one test question:

Condition I: several alternative antecedents

Scenario 1A: Paul wants to buy his friend, Mary, a birthday present. He decides to consult Mary's sister, Joanne. Joanne tells Paul about the many hobbies that Mary has, such as good literature, classical music, horse-riding, and hiking. She then says to John:

If you buy Mary a good book, she'll be happy.

Paul wants to tell Frank, his roommate, what Joanne said. Which of the following sentences would Paul be ***most likely*** to use? You can tick more than one if you feel it's appropriate – if so, please indicate your first/second/third choice.

a) Joanne said that I could buy Mary a book if I want to make her happy.
b) Joanne said that I should buy Mary a book if I want to make her happy.
c) Joanne said that I have to buy Mary a book if I want to make her happy.

Scenario 2A: Tom is at his Grandma's and he's looking for a way to earn £5. Grandma tells Tom that there are many things he could do to earn £5, such as vacuuming, doing the laundry, doing the dishes, mowing the lawn or doing the shopping. She then says to Tom:

If you mow the lawn, I'll give you £5.

Tom wants to tell his mum what Grandma said. Which of the following sentences would Tom be most likely to use? You can select more than one if you think it's appropriate – if so, please indicate your first/second/third choices.

a) Grandma said that I could mow the lawn if I want to earn £5.
b) Grandma said that I should mow the lawn if I want to earn £5.
c) Grandma said that I have to mow the lawn if I want to earn £5.

Condition II: no alternative antecedents

Scenario 3A: Little Bill is irritated. He's kept a pot of water near the fire for an hour, thinking that the water would boil. But it didn't. His mum says:

If you heat the water up to 100°C – which is 212°F –, it'll boil.

Little Bill wants to tell his friend what his mum said. Which of the following sentences would Bill be most likely to use? You can select more than one if you think it's appropriate – if so, please indicate your first/second/third choice.

a) Mum said that I could heat the water up to 100°C/212°F if I want it to boil.
b) Mum said that I should heat the water up to 100°C/212°F if I want it to boil.

c) Mum said that I have to heat the water up to 100°C/212°F if I want it to boil.

Scenario 4A: A teenage girl wants to go out. Her father, annoyed with the constant mess in the girl's room, says:

If you clean your room, I'll let you go out.

The teenager is on the phone with her friend. She wants to tell her friend what her father said. Which of the following sentences would the teenager be most likely to use? You can select more than one if you think it's appropriate – if so, please indicate your first/second/third choice.

a) My father said that I could clean my room if I want to go out.
b) My father said that I should clean my room if I want to go out.
c) My father said that I have to clean my room if I want to go out

Immediately below, participants provided their answer to the test question and any other comments which they might have (marked as optional).

On the final page, participants provided demographic information: age, gender, native language(s), and country of residence. They then indicated whether or not they had studied linguistics and/or philosophy at university level and, if so, their highest level of study. All participants confirmed that they had taken part in just one of the surveys.

Predictions

In all scenarios, participants were presented with a *could*, *should*, or *have to* in the consequent and an overtly represented ordering source in the antecedent. The reporting verb *say* was used in all options as it is neutral with respect to the illocutionary point (Capone 2016).

Both scenarios in Condition I foregrounded many alternative antecedents. As such, we predict a high preference for the *could* formulation in both of these scenarios.

As for Condition II, in Scenario 3A, it is part of general knowledge that there are no alternative antecedents. On the assumption that the informants focus on the illocutionary act of the conditional (advice), we predict a high preference for the *should* formulation (in line with the facework strategies discussed in section 3). However, a combination of two factors – directness licensed by the dynamics of power relations between parents and children (e.g. Blum-Kulka 1990) and the general truth interpretation of this conditional – make available the *have to* formulation. In Scenario 4A, the father's annoyance with his teenage daughter contextually suggests that there are no other alternatives either. Due to the father's

annoyance, the assumption of an intention to mitigate the addressee's negative face-want (the sensitivity to which would be evidenced by the choice of the *should* formulation) is likely to be suspended. Hence, the *have to* formulation is likely to be favoured.

The conditionals used in this experiment were assumed to be generally believable for various contextually salient reasons. The first reason has to do with the default assumption of advice being given in good faith and an inducement being sincere in the absence of any indication to the contrary (cf. Gricean assumption that the speaker has spoken truly unless there is an indication to the contrary and Searle's sincerity conditions). In Scenario 1A, this assumption was strengthened by the fact that Joanne is Mary's sister and thus her advice is reliable and, in Scenario 2A, by choosing a grandmother, a stereotypically positive figure, as the speaker of the inducement. In Scenario 3A, the believability was strengthened by the fact that the boiling point of water is part of general knowledge, whereas, in Scenario 4A, the father's annoyance at the constant mess in his daughter's room further indicated that *p* was necessary for *q*.

5.2. Results and discussion

Condition I: material interpretation (Scenarios 1A and 2A)

(i) Preferred response: In line with our predictions, a chi-square goodness of fit test revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – among participants responding to Scenario 1A (χ^2 (2,35) = 22.69; $p < 0.0001$), as well as participants responding to Scenario 2A (χ^2 (2,35) = 43.26; $p < 0.0001$) (see Table 1). Specifically, as predicted, for both scenarios, participants demonstrated a preference for the *could* formulation, which we attribute to the presence of several alternative antecedents and thus the lack of necessity of *p* for *q*.

Table 1

	could	*should*	*have to*
Scenario 1A	65.7%	34.3%	0.0%
Scenario 2A	85.7%	5.7%	8.6%

(ii) Multiple responses: As mentioned, participants were given the option of selecting more than one response if they thought it was appropriate. When doing so, they were asked to indicate their first/second/third choices.

For Scenario 1A, the findings revealed that, in four instances where *could* was indicated as the preferred choice, *should* was selected as the second choice (and *have to* was also selected as the third choice in two of these instances). Moreover, in two instances where *should* was indicated at the preferred choice, *could* was selected as the second choice. Taken together, for Scenario 1A, there were six instances out of a possible 35 in which more than one response was deemed to be appropriate.

For Scenario 2A, the findings revealed that, in three instances where *could* was indicated as the preferred choice, *should* was selected as the second choice (and *have to* was also selected as the third choice in one of these instances). Thus, for Scenario 2A, there were three instances out of a possible 35 in which more than one response was deemed to be appropriate.

Taken together, the results indicate a significant preference for the *could* formulation, which was predicted as a favoured choice for sufficiency contexts. However, the responses to Scenario 1A were more ambivalent than the responses to Scenario 2A. We attribute the *should* formulation choices in Scenario 1A to the participants' interpretation of the conditional as Joanne's eventual choice of getting Mary a book (p) as the preferred way (the better option) for John to make Mary happy (q); such an interpretation would presuppose an assumption, on part of the participants, that there is some additional constraint which is not mentioned in the context (but see section 7).

Condition II: biconditional interpretation (Scenarios 3A and 4A)

(i) Preferred response: In line with our predictions, a chi-square goodness of fit test revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – among participants responding to Scenario 3A (χ^2 (2,33) = 16.55; $p < 0.001$), as well as participants responding to Scenario 4A (χ^2 (2,36) = 50.67; $p < 0.0001$) (see Table 2). Specifically, as predicted, for Scenario 3A, participants demonstrated a preference for the *should* formulation and, for Scenario 4A, participants demonstrated a preference for the *have to* formulation.

Table 2

	could	*should*	*have to*
Scenario 3A	0.0%	51.5%	48.5%
Scenario 4A	0.0%	11.1%	88.9%

(ii) Multiple responses: As mentioned, participants were given the option of selecting more than one response if they thought it was appropriate. When doing so, they were asked to indicate their first/second/third choices.

For Scenario 3A, the findings revealed that, in eight instances where *should* was indicated as the preferred choice, *have to* was selected as the second choice. Moreover, in four instances where *have to* was indicated at the preferred choice, *should* was selected as the second choice (and *could* was also selected as the third choice in one of these instances). Taken together, for Scenario 3A, there were 12 instances out of a possible 33 in which more than one response was deemed to be appropriate.

For Scenario 4A, the findings revealed that, in three instances where *have to* was indicated as the preferred choice, *should* was selected as the second choice (and *could* was also selected as the third choice in one of these instances). Thus, for Scenario 2A, there were three instances out of a possible 36 in which more than one response was deemed to be appropriate.

Taken together, the results indicate a strong preference for the necessity modals, as predicted for necessity contexts. The higher preference for the *have to* formulation in Scenario 4A is attributed to the father's annoyance, which is likely to result in the assumption that the negative face saving strategies have been suspended.

Conditions I and II: Compared responses

A Fisher's Exact test revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – between participants in Conditions I and II ($p < 0.0001$), with the *could* formulation being preferred among participants in Condition I, the material interpretation (75.7%), and the *have to* formulation being preferred among participants in Condition II, the biconditional interpretation (69.6%) (see Table 3).

Table 3

	could	*should*	*have to*
Condition I (Scenarios 1A and 2A)	75.7%	20.0%	4.3%
Condition II (Scenarios 3A and 4A)	0.0%	30.4%	69.6%

The results of Experiment 1 corroborate our hypothesis that modals used in indirect reports of 'if *p*, *q*' conditionals co-vary with the number of alternative antecedents in predictable ways. This indicates that root modals used in indirect reports of 'if *p*, *q*' conditionals may be a diagnostic for biconditional versus material interpretations of conditional advice and inducement. With respect to our initial predictions, the number of *have to* formulations in necessity contexts is slightly higher than we expected (we expected more *should* formulations) and may be due to the fact that our scenarios involved asymmetric parent-child contexts.

6. Experiment 2

The aim of Experiment 2 was to find out whether the results of Experiment 1 could be replicated in contexts which lower/eliminate the believability of the conditionals by invoking dubious CNC states. A positive answer would increase the reliability of the results from Experiment 1. A further set of questions that we were interested in was whether (i) the propositional attitude of belief of S' in the truth of U (or, more specifically, in the truth of the thought communicated by U) affects the choice of U' and whether (ii) the propositional attitude of belief of S in the truth of their own U – as assumed by S' – affects the choice of U'. We hypothesised that (i) and (ii) will have no effect on U'. If corroborated, the hypothesis would suggest that, when the reporting verb *say* is used by S', there should be no theoretical expectation that a successful indirect report will result in a belief attribution by H' to S.

6.1. Method

Participants

160 native English speakers participated in this study (42 in Scenario 1B; 34 in Scenario 2B; 44 in Scenario 3B; 40 in Scenario 4B). 82 participants were female, 71 were male, 2 were

non-binary, and 5 were non-specified. There was an age range of 18 to 67 years and a mean age of 32 years. Participants were recruited online via social media postings. No participant had studied linguistics or philosophy beyond MA level.

Materials and procedure

The study was comprised of four surveys (Scenario 1B, Scenario 2B, Scenario 3B, and Scenario 4B), which were created using Google Forms. The social media postings advertising the study contained hyperlinks to each survey. Participants were instructed to take part in just one of the surveys.

On the opening page, participants were informed that the study formed part of a larger investigation into the reporting of other people's speech. Following informed consent, participants proceeded onto the second page, whereby they were presented with one test question:

Condition I: several alternative antecedents

Scenario 1B: Paul wants to buy his friend, Mary, a birthday present. He knows that Mary doesn't like it when people buy her books, but that's about the only relevant thing he knows. He decides to consult Mary's sister, Joanne. Joanne tells Paul about the many hobbies that Mary has, such as good literature, classical music, horse-riding and hiking. She then says to John:

If you buy Mary a good book, she'll be happy.

Surprised at Joanne's unawareness, Paul wants to tell Frank, his roommate, what Joanne said. Which of the following sentences would Paul be most likely to use? You can tick more than one if you feel it's appropriate – if so, please indicate your first/second/third choice.

a) Joanne said that I could buy Mary a book if I want to make her happy.
b) Joanne said that I should buy Mary a book if I want to make her happy.
c) Joanne said that I have to buy Mary a book if I want to make her happy.

Scenario 2B: Tom is at his Grandma's and he's looking for a way to earn £5. Grandma tells Tom that there are many things he could do to earn £5, such as vacuuming, doing the laundry, doing the dishes, mowing the lawn or doing the shopping. She then says to Tom:

If you mow the lawn, I'll give you £5.

Tom knows that his Grandma is lying – she's so stingy that she has never ever kept a promise to give someone money. He wants to tell his mum what Grandma said. Which of the following sentences would Tom be most likely to use? You can tick more than one if you feel it's appropriate – if so, please indicate your first/second/third choice.

a) Grandma said that I could mow the lawn if I want to earn £5.
b) Grandma said that I should mow the lawn if I want to earn £5.
c) Grandma said that I have to mow the lawn if I want to earn £5.

Condition II: no alternative antecedents

Scenario 3B: Little Bill is irritated. He's kept a pot of water near the fire for an hour, thinking that the water would boil. But it didn't. His mum says:

If you heat the water up to 80°C – which is 176°F –, it'll boil.

Little Bill knows that his mum is wrong. He's been learning at school about the boiling point of water. He just thought that keeping a pot of water near the fire for an hour will heat it up to 100°C. Little Bill wants to tell his friend what his mum said. Which of the following sentences would Bill be most likely to use? You can tick more than one if you feel it's appropriate – if so, please indicate your first/second/third choice.

a) Mum said that I could heat the water up to 80°C/176°F if I want it to boil.
b) Mum said that I should heat the water up to 80°C/176°F if I want it to boil.
c) Mum said that I have to heat the water up to 80°C/176°F if I want it to boil.

Scenario 4B: A teenage girl wants to go out. Her father, annoyed with the constant mess in the girl's room, says:

If you clean your room, I'll let you go out.

The teenager isn't sure whether to trust her father on this. After all she's only 15 and he and mum made it clear that there's no going out until she's 18. She is on the phone with her friend. She wants to tell her friend what her father said. Which of the following sentences would the teenager be most likely to use? You can tick more than one if you feel it's appropriate – if so, please indicate your first/second/third choice.

a) My father said that I could clean my room if I want to go out.
b) My father said that I should clean my room if I want to go out.
c) My father said that I have to clean my room if I want to go out.

Immediately below, participants provided their answer to the test question and any other comments which they might have (marked as optional).

On the final page, participants provided demographic information: age, gender, native language(s), and country of residence. They then indicated whether or not they had studied linguistics and/or philosophy at university level and, if so, their highest level of study. All participants confirmed that they had taken part in just one of the surveys.

Predictions

We hypothesise that manipulating the believability variable will have no effect on the choice of the modalised report. That is, we predict that there will be no reliable differences between answers to scenarios A used in Experiment 1 and their counterparts B used in Experiment 2.

6.2. Results and discussion

Condition I: material interpretation (Scenarios 1B and 2B)

(i) Preferred response: In line with our predictions, a chi-square goodness of fit test revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – among participants responding to Scenario 1B (χ^2 (2,42) = 30.14; $p < 0.0001$), as well as participants responding to Scenario 2B (χ^2 (2,34) = 12.41; $p = 0.002$) (see Table 4). Specifically, as predicted, for both scenarios, participants demonstrated a preference for the *could* formulation, which we attribute to sufficiency, but not necessity, of *p* for the truth of *q*, which results from the foregrounding of many alternative causes.

Table 4

	could	*should*	*have to*
Scenario 1B	69.0%	31.0%	0.0%
Scenario 2B	61.8%	17.6%	20.6%

(ii) Multiple responses: As mentioned, participants were given the option of selecting more than one response if they thought it was appropriate. When doing so, they were asked to indicate their first/second/third choices.

For Scenario 1B, the findings revealed that, in three instances where *could* was indicated as the preferred choice, *should* was selected as the second choice. Moreover, in two instances where *should* was indicated as the preferred choice, *could* was selected as the second choice. Thus, for Scenario 1B, there were five instances out of a possible 42 in which more than one response was deemed to be appropriate.

For Scenario 2B, the findings revealed that, in three instances and one instance where *could* was indicated as the preferred choice, *should* and *have to* were selected as the second choice, respectively. Moreover, in one instance where *have to* was indicated as the preferred choice, *could* was selected as the second choice. Taken together, for Scenario 2B, there were five instances out of a possible 34 in which more than one response was deemed to be appropriate.

Taken together, the results indicate a significant preference for the *could* formulation, which was predicted as a favoured choice for sufficiency contexts.

Condition II: biconditional interpretation (Scenarios 3B and 4B)

(i) Preferred response: In line with our predictions, a chi-square goodness of fit test revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – among participants responding to Scenario 3B (χ^2 (2,44) = 14.67; p = 0.0009), as well as participants responding to Scenario 4B (χ^2 (2,40) = 49.4; p < 0.0001) (see Table 5). Specifically, as predicted, for Scenario 3B, participants demonstrated a preference for the *should* formulation and, for Scenario 4B, participants demonstrated a preference for the *have to* formulation. We attribute these choices to the necessity of *p* for the truth of *q*.

Table 5

	could	*should*	*have to*
Scenario 3B	6.8%	47.7%	45.5%
Scenario 4B	0.0%	15.0%	85.0%

(ii) Multiple responses: As mentioned, participants were given the option of selecting more than one response if they thought it was appropriate. When doing so, they were asked to indicate their first/second/third choices.

For Scenario 3B, the findings revealed that, in three instances and two instances where *should* was indicated as the preferred choice, *have to* and *could* were selected as the second choice, respectively. Moreover, in five instances and one instance where *have to* was indicated as the preferred choice, *should* and *could* were selected as the second choice, respectively. Taken together, for Scenario 3B, there were 11 instances out of a possible 44 in which more than one response was deemed to be appropriate.

For Scenario 4B, the findings revealed that, in three instances where *have to* was indicated as the preferred choice, *should* was selected as the second choice. Moreover, in two instances where *should* was indicated as the preferred choice, *have to* was selected as the second choice (and *could* was also selected as the third choice in 1 of these instances). Thus, for Scenario 4B, there were five instances out of a possible 40 in which more than one response was deemed to be appropriate.

Taken together, the results indicate a strong preference for the necessity modals, as predicted for necessity contexts.

Conditions I and II: Compared responses

A Fisher's Exact test revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – between participants in Conditions I and II ($p < 0.0001$), with the *could* formulation being preferred among participants in Condition I, the material interpretation (65.8%), and the *have to* formulation being preferred among participants in Condition II, the biconditional interpretation (64.3%) (see Table 6).

Table 6

	could	*should*	*have to*
Condition I (Scenarios 1B and 2B)	65.8%	25.0%	9.2%
Condition II (Scenarios 3B and 4B)	3.6%	32.1%	64.3%

Experiments 1 and 2: Compared responses

All conditionals used in Experiment 1 were assumed to be believable for the reasons discussed earlier. The contexts in which the conditionals in Experiment 2 were uttered were manipulated so as to lower/eliminate their believability. In Scenario 1B, we learn that the

reporting speaker S' assumes that the reported speaker S is unaware that what she said is false. However, the information that S' is surprised at the reported speaker's unawareness, and the earlier suggestion that S' does not have much relevant information about Mary, may introduce some doubt about the correctness of the reporting speaker's assumption. In Scenario 2B, the reporting speaker S' assumes that the original speaker has lied. The correctness of the reporting speaker's assumption is supported with the negative affect expressions *so stingy* and *never ever*. In Scenario 3B, the reporting speaker S' knows that what S said was false and that S is unaware that what she said is false. Nothing in this scenario casts doubt on the correctness of the reporting speaker's assumption. In Scenario 4B, S' is not sure whether what S said was true or false. The variation in believability for these scenarios is summarised in Table 7 below.

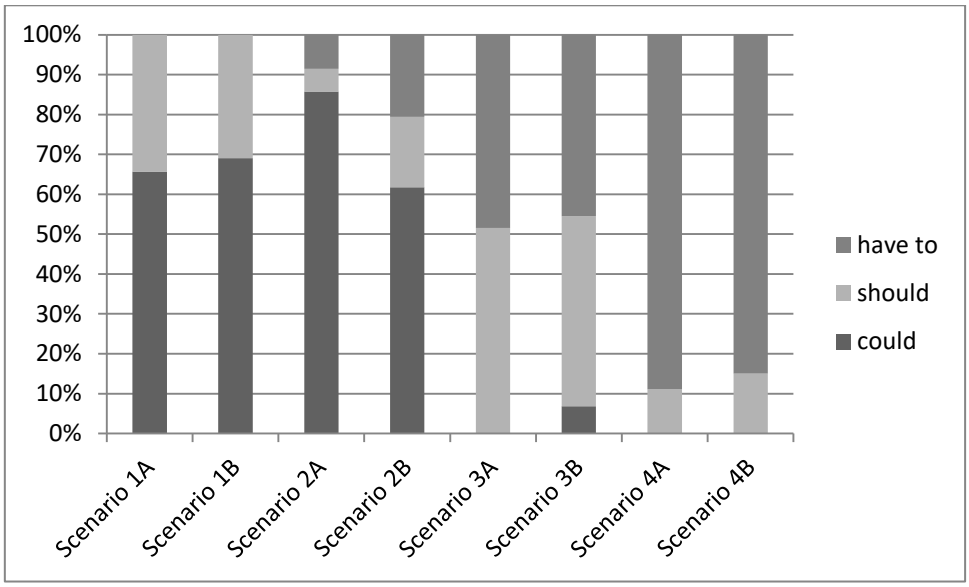
Table 7

	Condition I Sufficiency of *p* for *q*	Condition II Necessity of *p* for *q*
Advice	*1B: U may be false*	*3B: U is false*
Inducement	*2B: U is false*	*4B: U may be false*

As discussed earlier, we are interested in whether (i) the belief of S' in the truth of U has any effect on the choice of U'. All scenarios used will provide some insight into this question; from the perspective of S', in 1B S may be holding a false belief (about what her sister would like), in 3B S is holding a false belief (about the boiling point of water), in 2B S is lying (about rewarding the grandson with money) and in 4B S may be lying (about letting the daughter go out). Additionally, we are also interested in whether (ii) the belief of S in the truth of U – as assumed by S' – has any reliable effect on the choice of U'. Here, scenario 2B will be crucial as, from the perspective of S', it involves a lie. Scenario 4B will also be relevant here as it involves a potential lie.

As predicted, a Fisher's Exact test revealed no reliable differences between answers to scenarios A used in Experiment 1 and their counterparts B used in Experiment 2 ($p > 0.05$). The overall findings are illustrated in Figure 1 below.

Figure 1



The parity between the responses to counterpart scenarios in the two experiments indicates that neither the belief of S' in the truth of U, nor the belief of S in the truth of U – as assumed by S' – has any reliable effect on the choice of U'. This result raises the following question: when the reporting verb *say* is used by S', should there be a theoretical expectation that a successful modalised indirect report of a conditional U will result in a belief attribution by H' to S? It seems to us that whereas it can be assumed that a successful modalised indirect report of a conditional U with the reporting verb *say* will result in a thought attribution by H' to S (attribution of a thought assumed to be communicated by the original U), it cannot be assumed that it will necessarily result in a belief attribution by H' to S. Whether it does or does not depends on tacit assumptions, or otherwise, of cooperation, sincerity and normality (e.g. Searle 1969; Grice 1986; Politzer 2004).

This result is not surprising if one agrees that is not clear whether the verb *say* should be classed as a propositional attitude verb (e.g. Capone 2013; but see Richard 2006), an issue which is linked more broadly to the classification of predicates into factive and non-factive (e.g. Hazlett 2010) and, even more broadly, to context-dependence of heteroglossia (e.g. Martin & White 2005). Indeed, the result follows from the assumption that the verb *say* is neutral with respect to (i.e. can be used to communicate a variety of) the reporting speaker's, and, to some extent, the reported speaker's, cognitive attitudes to U.

More specifically, the fact that a modalised indirect report of a conditional U with the reporting verb *say* is neutral in the above sense is linked to the fact that we process and interpret conditionals under different cognitive conditions, including certainty and degrees of

uncertainty. Crucially, as the hearer of U, S' does not have to believe that the major premise of a conditional U is true in order to be able to reason on the assumption of its truth and, given such an assumption, entertain – though not accept – the conclusions of inferences afforded by material or biconditional interpretations. This fundamental ability to reason from a conditional U on the assumption of its truth is why S' does not have to believe in the truth of U to be able to transform a conditional U into a modalised report U' as if S' believed that U was true.

In our view, the findings of Experiment 2 draw attention to what seems to have been generally neglected by probability approaches to conditionals but what is potentially an important element in understanding the role of conditionals in our lives – the fact that we can process them on the assumption of the truth of the major premise and the related ability to entertain conclusions of classical inferences without necessarily accepting them.

7. A note on the speech act variable

The question of whether the number of alternative antecedents has an effect on the modalised reports of conditionals was the main research question in this study. However, because our participants were working with conditional advice and conditional inducements across both conditions, I and II, in both experiments, it is also relevant to ask whether the speech act variable had any effect on the modalised formulation choices.

A Fisher's Exact test also revealed a reliable difference in preferred response to the question – i.e. *could*, *should*, or *have to* – between participants in the advice conditions and those in the inducement conditions: Scenarios 1A and 2A ($p = 0.002$), Scenarios 1B and 2B ($p = 0.005$), Scenarios 3A and 4A ($p < 0.001$), and Scenarios 3B and 4B ($p < 0.001$) (see Table 8).

Table 8

		could	*should*	*have to*
Condition I: material interpretation	Scenario 1A	65.7%	34.3%	0.0%
	Scenario 2A	85.7%	5.7%	8.6%
	Scenario 1B	69.0%	31.0%	0.0%
	Scenario 2B	61.8%	17.6%	20.6%
Condition II: biconditional interpretation	Scenario 3A	0.0%	51.5%	48.5%
	Scenario 4A	0.0%	11.1%	88.9%
	Scenario 3B	6.8%	47.7%	45.5%
	Scenario 4B	0.0%	15.0%	85.0%

Let us start with Condition I (scenarios 1 and 2). In Experiment 1, the *could* formulation was more frequent in the inducement scenario (2A) than in the advice scenario (1A), which might be taken to suggest that alternative antecedents are more prominent with conditional inducements than they are with conditional advice. However, in Experiment 2, *could* was actually slightly more frequent for advice (1B) than for inducement (2B). So, whereas Experiments 1 and 2 both show a reliable difference in the formulation choices for advice versus inducement, the pattern for *could* is opposite. Having said that, at a more coarse-grained level, taken together, the *could* and *should* formulations – which are consistent with many alternative antecedents and the better and worse alternatives contexts (see section 3) – tend to be chosen more frequently for advice (1A and 1B) than for inducements (2A and 2B).

In Condition II, there is a very clear patterning with the *have to* formulation being more frequent for inducement than for advice in both experiments. However, it is not clear whether this effect is due to the speech act variable or due to the suspension of the negative face-want strategies (because of the father's annoyance).

In summary, whereas significant effects have been observed for the speech act variable, more experimental work is needed to eliminate any potential confounds.

8. Conclusion

We have found that modals used in indirect reports of 'if *p*, *q*' conditionals co-vary with the number of alternative antecedents in predictable ways, which suggests that modals used in indirect reports of 'if *p*, *q*' conditionals may be a diagnostic for biconditional versus material

interpretations of conditionals. In particular, the *could* formulation is preferred when many alternative antecedents are foregrounded (the material interpretation) whereas the *have to* formulation is preferred in contexts where there are no alternative antecedents (the biconditional interpretation). It was also found that lowering/eliminating the believability of the conditionals has no significant effect on the results. We believe that this result highlights the significance of the cognisers' ability to entertain conclusions of classical inferences on the assumption of the truth of the major premise even if they do not believe in the truth of the major premise.

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