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Current issues in conditionals

Abstract: The concept of conditionality is central to human thought and action. Conditionals are thus a widely studied topic in cognitive science. The present paper introduces the main topics addressed in this special issue and aims to provide a non-exhaustive overview of the recent research on grammatical aspects of conditionals (i.e. morphosyntax, semantics and pragmatics) and conditional reasoning.

Keywords: conditionals; morphosyntax; semantics; pragmatics; reasoning

1 Introduction

The concept of conditionality is central to human thought and action. Conditionals are thus a widely studied topic in cognitive science. The present paper introduces the main topics addressed in this special issue and aims to provide an overview of some recent research on grammatical aspects of conditionals and conditional reasoning. Moreover, I will show how the contributions of the present issue build upon and expand our knowledge of conditionals.

The paper is guided by three main interrelated questions: Firstly, what are the morphosyntactic structures of conditional sentences in one language and across languages? Secondly, how can one derive the different meanings that conditionals in natural language convey? Thirdly, how do descriptions and formal accounts of natural language conditionals connect with the psychological theories of reasoning? Accordingly, this paper is structured as follows: In Section 2, I will review recent literature on the morphosyntax of conditionals. In Section 3, I will review recent literature on the semantics and pragmatics of conditionals. In Section 4, I will review recent literature on the psychological theories of conditional reasoning. Section 5 concludes the paper.

2 Morphosyntax of conditionals

Research on the morphosyntax of conditional clauses has investigated properties such as the shape and distribution of conditional complementizers, verb movement/I-to-C-movement within the antecedent clause, the distribution of conditional clauses (sentence final, sentence initial), and the possibility that adverbial conditional clauses involve syntactic operator movement, see Bhatt and Pancheva (2006). The latter might possibly be in complementary distribution with the independently available fronting operation of a given language, see Haegeman (2003, 2006, 2010). Different types of conditionals exhibit different attachment heights of the consequent's clausal spine, giving rise to or ameliorating various syntactic scope options.

The contributions to syntactic issues of conditionals that I review below differ with respect to their specificity. Aiming at a more general account, Weisser's (2019) work considers V1-conditionals and argues that they should be given an equal treatment vis-à-vis adverbial conditionals. Csipak (2019) considers and analyzes relevance conditionals in German, which exhibit a V3-structure, including their peculiar interpretive options. Finally, Blümel (2019) shows that adnominal conditionals in German by and large pattern syntactically with restrictive relatives.

We need to distinguish canonical vs. noncanonical structures of conditionals. The former is usually characterized by the presence of a conditional complementizer such as English *if,* German *wenn* 'if' or Mandarin

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ruguo 'if'. The latter can take different syntactic forms of, for example, conjunction/disjunction (cf. Culicover and Jackendoff 1997; Klinedinst and Rothschild 2012; van Rooj and Franke 2012; Weisser 2015) in English as in (1a) or I-to-C-movement (Iatridou and Embick 1994). While strategies like the ones in (1a) to express conditionals are rare in English, they are very common in Mandarin Chinese through the use of particles such as *jiu* 'then' (cf. Lin 2007) or *ye* 'also' in Mandarin Chinese as in (1b).

(1) a. *You come closer and/or I will kiss you.*
     b. *Xiaozhang   zou,   wo   jiu/ye   zou.*
         Xiaozhang   go   I   then/also   go
         'If Xiaozhang leaves, I will (also) leave.'

Liu (2017) proposes a derivation for the conditionality of *jiu* by treating it as a focus-marker that takes semantic scope over the first conjunct at Logical Form (LF). It remains to be explored whether such an analysis can apply to other particles triggering conditional interpretations in conjunctive sentences. Whether and how such conditionals are syntactically related to canonical conditionals taking a conditional connective (CC) remains an ongoing debate. Weisser (2019), for example, argues that less canonical conditionals in English and German such as conditional conjunction (1a) and V1 conditionals (2) are derived by movement from a sentence final and/or structurally lower position, just as it has been argued for canonical ones. That is, he gives new arguments for their analytical assimilation, thus challenging opposite claims in the literature (e.g. Reis and Wöllstein 2010 for V1-conditionals in German).

(2) *Had I gone, I would have called.*
     (Weisser 2019: 22)

While Liu (2017) assumes that Mandarin *p, jiu q* does not convey meanings beyond the conditional one as in regular conditionals, structural differences can cause interpretive effects. Csipak (2019) starts out with the well-known fact that V3 word order in German conditionals (as in (3)) triggers an obligatory "biscuit" or relevance conditional reading. She suggests that the observation generalizes to other adverbial clauses, like causal, concessive and temporal ones: In each case, a V3-order correlates with a peculiar "biscuit" interpretation, in contrast to the V2-counterpart in which the adverbial clause is structurally integrated. To derive the right word order, she assumes that the adverbial clause (*wenn du Durst hast* in (3)) is base-generated in the Specifier of ActP (speech act phrase, see Krifka 2014) dominating CP, allowing a regular V2 syntax (and semantics) for the residual structure.

(3) *Wenn   du   Durst   hast*,   *ich   habe   Saft   im   Kühlschrank.*
     if   you   thirst   have   I   have   juice   in.the   fridge
     'If you are thirsty, I have juice in the fridge.'
     (Csipak 2019: 2)

Blümel (2019) examines German conditionals in attributive function, so-called adnominal conditionals (Lasersohn 1996; Frana 2017), and shows that they exhibit numerous parallels to restrictive relative clauses. He thus suggests that they adjoin at the NP-level and advocates a semantic treatment along Frana's lines.

(4) *Ich   kannte   die   Konsequenzen,   falls   ich   erwischt   werden   würde.*
     I   knew   the   consequences   if   I   caught   be   would
     'I knew what the consequences would be if I would get caught.'
     (Blümel 2019: 2)

In addition to syntactically marked conditionals, Bhatt and Pancheva (2006: 5) state that, "Languages can also mark the antecedent through inflectional morphology on the verb in the antecedent clause. Examples of such languages include West Greenlandic, Turkish, and Basque". I.e. these languages appear to employ special conditional morphology on the verb (seemingly independent of mood distinctions). However, in many languages, the question of morphology is more relevant when it comes to counterfactual conditionals, as

they utilize tense, aspect or mood inflection on the verb for expressing counterfactuality. Among the questions these observations raise is this: In order to express counterfactuality, which grammatical strategies do languages employ that have no or little verbal morphology? For example, Mandarin Chinese has documented counterfactual conditionals, even though it has limited morphology [Wu 1994; Jiang 2000; Hsu 2014; Jiang 2014; see also Jiang's (2019) survey of different ways to express counterfactuality in Mandarin including the use of relative tense].

3 Semantics and pragmatics of conditionals

In the formal semantic literature, it has been long debated how to compositionally derive the different meanings that conditionals in natural language convey (cf. von Fintel 2007, von Fintel 2011, von Fintel 2012). One of the most influential theories of conditionals has been the restrictor analysis proposed by Kratzer (1986, 1991): in this approach, conditionals receive a formal treatment in possible world semantics. Most crucially, a CC such as English *if* does not have a distinctive conditional meaning on its own and *if*-clauses are used to restrict modal operators or generic frequency operators. The restrictor analysis of conditionals and CCs has inspired many insightful follow-up studies (e.g. Arregui 2005; Grosz 2012; Liu 2012) through which it becomes clear that the interpretation of conditional sentences is subject to a process of semantic and pragmatic modulation, that is, the semantic and pragmatic properties of a conditional can be affected by narrow linguistic context and broad pragmatic context.

On the pragmatic side, one of the most studied phenomena in the past two decades relates to the so-called "conditional perfection" (CP). Using example (5), Geis and Zwicky (1971) claim that upon hearing the sentence (5a), the hearer can also infer (5b), whereby the semantically weaker conditional sentence (5a) is "perfected" to a semantically stronger "biconditional" one as in (5c).

(5)   a. *If you mow the lawn, I will give you 5 dollars.*
          (Geis and Zwicky 1971)
       b. *If you don't mow the lawn, I won't give you 5 dollars.*
       c. *If and only if you mow the lawn, I will give you 5 dollars.*

Some researchers relate CP to cases of pragmatic enrichment, e.g. as a Gricean conversational implicature (cf. van der Auwera's 1997; Horn's 2000 different takes on this). Furthermore, van Canegem-Ardijns and van Belle (2008) point out that conditionals differ in the cancellability of the invited inference, as is shown in the minimal pair in (6). This means that whether the form of 'if p, q' is perfected to a biconditional is subject to contextual manipulations.

(6)   a. *If you mow the lawn, I will give you 5 dollars. #But if you don't mow the lawn, I will give you 5 dollars anyway.*
       b. *If the weather is good tomorrow, I'll go for a swim. But if the weather is not good tomorrow, maybe I'll go for a swim anyway.*
          (van Canegem-Ardijns and van Belle 2008)

Other researchers take a different stance from a developmental and processing perspective. For example, Noveck et al. (2011) argue that if CP is indeed a case of pragmatic inferences, it should be linked to extra effort. That is, it should increase in availability with age or further processing time, which is contrary to the existing literature. Bonnefond et al. (2012), for instance, report on a self-paced task and an EEG (electroencephalography) study on 'Affirmation of the Consequent' (AC). AC arguments of the general form "1) If p, q. 2) q. // 3) Therefore p." (with "//" meaning "3) as a logical inference from the premises of 1) and 2)") are logically invalid (i.e. to be rejected), but should be accepted on pragmatic grounds due to CP (i.e. to be endorsed), because a biconditional "If and only if p, q" interpretation of 1) would entail "If q, p", making AC acceptable. Bonnefond et al.'s results show that rejecters of AC arguments took longer than endorsers and that both rejecters

and endorsers of AC produced an N200 wave that is associated with a violation of expectations, which cast doubt on the pragmatic accounts of CP.

Back to the semantic side again, natural language possesses CCs that are arguably semantically biconditional, for example, *on condition that* or the so-called exceptive conditionals e.g. English *only if, except if, unless* or Mandarin *chufei, cai* (cf. Montolío 2000; Alexe 2013; Espino and Villar 2016). It is not clear to what extent these exceptive CCs resemble or differ from one another in one language and across languages. Take for example the English exceptive CCs *except if* and *unless*: While some authors hold that they are semantically equivalent (Geis 1973; Declerck and Reed 2000), others argue that they differ in establishing exceptive spaces of different kinds (Dancygier and Sweetser 2005). In Spanish, apparently similar exceptive CCs differ in their ability to combine with mood: *Excepto si/salso si* (counterparts of English *except if*) can be combined with either indicative or subjunctive, whereas *a menos que/a no ser que* (counterparts of English *unless*) can only be combined with the subjunctive mood (Espino et al. 2015: 41). A similar contrast also holds between French *si* and *à condition que* (Liu 2019b), which might reflect their differences in semantics and pragmatics, or syntax.

To my knowledge, the role of such CCs remains understudied although they can influence the interpretation of conditional sentences in various ways. For example, a conditional sentence will get a counterfactual reading via the use of past perfect in English or through a combination of present perfect and subjunctive mood in German. In comparison, counterfactuality can be realized by specific CCs such as *yaobushi* 'if-not' in Mandarin Chinese as (7), as discussed in Jiang (2019), among others. However, how the counterfactuality of e.g. (7) is compositionally derived and what role the CC *yaobushi* plays remains unclear. While conditionals and negation are both acknowledged NPI (i.e. negative polarity item) licensors (von Fintel 1999; Giannakidou 1998), *yaobushi* 'if-not' does not license NPIs (cf. Ippolito and Su 2014 for their analysis of the negative infix as light negation).

(7) *Yaobushi   tianqi   hao,   women   buhui   lai.*
     if-not   weather   good,   we   NEG-can come
     'If the weather had not been good, we wouldn't have come.'

While it is controversial whether conditional perfection involves pragmatic inferences, conditionals undoubtedly induce pragmatic inferences at the levels of presuppositions and implicatures (e.g. Visconti 1996). In Liu (2019a), for instance, I report on rating studies in German and English, testing the interaction between CCs and NPIs in indicative conditionals. The results show that the nonveridicality property of indicative conditionals (Giannakidou 1998) can be affected by the choice of CCs and certain NPIs. In both languages, the presence of NPIs (i.e. *ever/at all* and their German counterparts *jemals/überhaupt*) lowers subjects' ratings of protagonist/speaker credence, that is, conveys a weakened speaker commitment towards the antecedent. In German, *falls* ('if, in case') showed a commitment-weakening effect in comparison to *wenn* (ambiguous between 'if' and 'when') too: for scenarios like (8), subjects rated S3 significantly higher for S2 with *wenn* than with *falls*. No such difference was found for English *if* vs. *in case* though.

(8) a. S1: *Melanie sucht nach einem Sommerkleid.*
              'Melanie is looking for a summer dress.'
     b. S2: *Sie denkt: „ Wenn/Falls ich ein schönes finde, kaufe ich es sofort.“*
              'She thinks, "If I find a nice one, I will buy it immediately."'
         S3: *Glaubt Melanie, dass sie ein schönes Kleid findet?*
              'Does Melanie believe that she will find a nice dress?'

Logical connectives and operators in natural language have been a key empirical domain of study in theoretical and experimental semantics and pragmatics. While CCs have not taken up an important role so far, especially in comparison to the well-studied negation, disjunction and quantifiers, they deserve serious considerations due to their multifaceted meaning aspects (e.g. presuppositions, implicatures) and their interaction with the rest of conditionals (cf. Liu 2012).

In addition to the secondary meanings expressed by CCs as exemplified above, conditionals can also convey additional (causal, epistemic) connections between the antecedent and the consequent. Krzyżanowska et al. (2017), for example, report on an experiment on the so-called "missing-link" conditionals such as "*If a fish has eyes, it swims*". Their results indicate that discourse coherence (when *p* and *q* are on the same topic) is insufficient for a conditional *If p, then q* to be assertable, which is the case given probabilistic relevance, i.e. when the antecedent is relevant for the consequent. Furthermore, the nature of such connections is still unclear. Krzyżanowska (2019) explores the possibility of treating the link as a Gricean scalar implicature and argues against it with diagnostic tests. Furthermore, Skovgaard-Olsen et al. (2019) provide experimental evidence that the reason relation reading is part of the semantic content for indicative conditionals and can be best understood as a conventional implicature.

4 Conditional reasoning

Conditionals are of common interest to linguists, logicians, psychologists and philosophers. However, researchers from these disciplines usually take different approaches. In propositional logic, conditionals of the form "If p, q" are related to material implication. Researchers of different fields have criticized this analysis. In linguistics, one of the crucial arguments against the truth-functional analysis of natural language conditionals is that it yields inadequate interpretations (cf. von Fintel 2007, von Fintel 2011, von Fintel 2012). For example, in the biscuit conditionals from Austin's (1956) example (i.e. *There are biscuits on the sideboard if you want them*), the falsity of the *if*-clause should not make the sentence true, contrary to material implication that is true when the antecedent is false. Psychologists, in contrast, are more interested in the underlying reasoning processes and their development. For example, the suppositional theory (Evans and Over 2004) and the mental model theory (Johnson-Laird and Byrne 2002 and subsequent works), henceforth MMT, are both committed to the idea that people reason by thinking of possibilities. In the case of conditionals, the former theory argues that people only think about the possibilities where the antecedent is true, e.g. only the cases where John is sick in (9). The latter theory claims that people only think of true possibilities: that is, among the four possibilities (9), the third possibility that makes the sentence false is not considered, only the other three true possibilities.

(9)   *If John is sick, he will stay at home.*
    a. Possibility 1:   John is sick; he will stay at home.
    b. Possibility 2:   NOT(John is sick); he will stay at home.
    c. Possibility 3:   John is sick; NOT(he will stay at home).
    d. Possibility 4:   NOT(John is sick); NOT(he will stay at home).

There has been some experimental support in favor of the MMT using Spanish conditionals (cf. Espino et al. 2009; Espino and Villar 2016). However, its general validity needs to be further examined across languages. For this purpose, I conducted two experiments in German (Liu 2019b). In the first experiment, I tested the German CC *unter der Bedingung, dass* 'on condition that' in comparison to *wenn* 'if', *falls* 'if', *im Falle, dass* 'in the case that'. I found that the former triggered significantly higher validity ratings in the Affirmation of the Consequent (AC) inference than the latter three, although all the four CCs triggered similar validity ratings in the Modus Ponens inference. As AC inferences are semantically valid only for biconditionals, I take it to mean that German *on condition that* tends to be biconditional, while restraining myself from concluding that it is semantically biconditional.

The second experiment used a 4×2 factorial design based on Espino et al. (2009). The factor "CC" has four levels (*wenn, falls, im Falle, dass* and *unter der Bedingung, dass*); the factor "Conjunction" (i.e. p, q) has two levels (i.e. p&q, not-p&q,). Subjects read test scenarios as in (10); the dependent variable was the reading time (RT) of conjunctive sentences. The "truth" principle of the MMT claims that people think of true possibilities when they process conditionals. Due to this, the possibilities that people think of while processing simple and biconditionals differ in that in the latter case, the possibility of not-p&q (i.e. a true possibility

for conditionals but a false possibility for biconditionals) should be excluded and thus it would take long to process the conjunction if primed by a biconditional. However, I was not able to verify the MMT as Espino and Villar (2016) did: except for a negation effect, there was no reading time difference between German *on condition that* and the other tested CCs. Possible reasons for this need to be explored in future studies.

(10)   a.   S1: *Dennis kaufte einen Blumenstrauß für seine Freundin.*
           S1: Dennis bought one bouquet for his girlfriend
           'Dennis was buying a bouquet for his girlfriend.'
      b.   S2: *Die Blumenladenverkäuferin hat ihm gesagt:*
           S2: the bouquet vendor has to him said
           'The bouquet vendor told him:'
      c.   S3: *Wenn es Narzissen gibt, gibt es Rosen.*
           S3: if it lilies gives, gives it roses
           'If there are lilies, there are roses.'
      d.   S4: *Als Dennis sich umschaute, stellte er fest:*
           S4: as Dennis himself looked around, figured he out
           'When Dennis looked around, he found out:'
      e.   S5: *Es gab (keine) Narzissen und es gab Rosen.*
           S5: it gives (no) lilies and it gives roses
           'There were (no) lilies and there were roses.'
      f.   S6: *Dennis ließ sich einen wunderschönen Strauß zusammenstellen.*
           S6: Dennis let himself a wonderful bouquet made
           'Dennis had a wonderful bouquet made. '
      g.   S7: *Hat Dennis Schokolade gekauft?*
           S7: has Dennis chocolate bought
           'Did Dennis buy chocolate?'

While the results in Liu (2019b) are less conclusive concerning the MMT, they provide empirical evidence for the biconditional tendency of *on condition that*, which was claimed in the descriptive literature (Montolío 2000; Alexe 2013), and simply assumed in the psychology literature (Espino and Villar 2016).

5 Conclusion

In this paper, I provide a short review of research questions related to conditionals currently under investigation. To achieve a more comprehensive understanding of conditionals and conditional reasoning across languages and language users, it is important to bring together investigations centered around different forms and meanings of conditionals in typologically diverse languages and strengthen the connection between linguistic approaches to conditionals and psychological theories of conditional reasoning. The present special issue is a first important step in this direction.

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