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Imperfect ellipsis: Antecedents beyond syntax?

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Abstract

Ellipsis is subject to both syntactic conditions and discourse conditions. Here we explore the discourse condition that favors antecedents that are part of the main assertion of an utterance. We argue that the main assertion tendency is best captured in the processor, not the grammar. Two experiments test verb phrase ellipsis examples with antecedents in a conditional. One suggests that, because of the main assertion tendency, a reader considers full conditional antecedents and not just verb phrase antecedents. However, when the antecedent of the conditional expresses already given information and essentially becomes redundant, fewer full conditional antecedents are chosen for the verb phrase ellipsis, as if the consequent clause has become the assertion of the conditional sentence with the if-clause essentially cancelling out. The second experiment explores examples where a modal is added inside the if-clause, rendering the conditional counterfactual. As in other examples of flawed or imperfect ellipsis, the non-actuality entailment/implicature improves the acceptability of such examples.

1. Introduction

The grammar and processing of ellipsis has been of interest for a considerable time (Sag, 1976, Williams, 1977, Grinder and Postal, 1971, Hardt, 1993, Dalrymple et al., 1991, Rooth, 1992, Fiengo and May, 1994, Johnson, 1996, Lobeck, 1995, Merchant, 2001, 2004, 2008a,b, Reinhart, 1991; Carlson, 2002, Murphy, 1985, Mauner et al, 1995, Tanenhaus and Carlson, 1990, Garnham, 1987, Garnham et al., 1987, 1998, Martin and McElree, 2008). In the present paper, we explore both syntactic and discourse constraints on ellipsis. Rather than treating discourse constraints as part of the grammar of ellipsis (Hardt and Romero, 2004, Kehler, 2002, but also Frazier and Clifton, 2006) we characterize at least one discourse constraint as being part of the processing mechanism. We begin with an introduction to the problem, and then report two experiments examining the marginality of ellipsis with antecedents inside a conditional, and the source of the marginality. We argue that the best account is to treat the syntactic requirements in the grammar, but the discourse requirement as a processing preference for an antecedent to be part of the main assertion of an utterance.

2. Processing ellipsis

There is considerable evidence for the claim that there is syntactic structure in an ellipsis site. Linguistic evidence includes evidence showing that the elided constituent must have internal parts. For example, the elided constituent contains a trace in (1), from Fiengo and May (1994), see also Kennedy (2003).

- (1) I know which book Max read, and which Oscar didn't.

In (2), from Grinder and Postal (1971) the elided constituent (*have a spouse*) is required in order to find a referent for the pronoun *he*.

- (2) My aunt doesn't have a spouse but your aunt does and he is lying on the floor.

In (3), due to Lasnik (2001), the scope of *many* with respect to *each* depends on structure in the ellipsis site.

- (3) Each of the linguists criticized some of the other linguists but I'm not sure how many of the other linguists [each of them criticized].

See Merchant (2001) for evidence showing that the availability of preposition stranding in sluicing depends on the availability of preposition stranding in overt questions in the language. See also Frazier and Clifton (2005) for psycholinguistic evidence.

The linguistic arguments (e.g., those above) showing that there is syntactic structure in the ellipsis site have a further implication when we consider the real time comprehension of ellipsis sentences. If the elided constituent has syntactic structure, where does it come from? The comprehender cannot unelide the constituent. So it would seem that the syntactic structure must come from somewhere – presumably from the syntactic structure of the antecedent.¹ Thus, it is natural to assume that arguments showing that syntactic structure is present in the ellipsis site suggest that an elided constituent must have a matching antecedent.

Certain psycholinguistic evidence receives a natural explanation on the assumption that the antecedent of VP ellipsis and the elided constituent must match syntactically, certain morphological details aside. Arregui et al. (2006) argued that the acceptability of flawed antecedents depends on how easily the antecedent may be repaired at LF, using the parser's normal repair mechanisms. For example, they found that antecedents with only a deverbal head were not acceptable. Examples like (4) were accepted only 17% of the time in speeded acceptability judgments.

- (4) The comet was nearly unseeable, but John did.

Similarly, elided verb phrases with nominal gerundive antecedents were accepted only a third of the time. Elided verb phrases with verbal gerundive antecedents were accepted significantly more often (roughly, 60% of the time). Arregui et al. argued that these and other results support the claim that that elided verb phrases must have syntactically matching antecedents to be grammatical, but that readers can find an ungrammatical sentence acceptable if the grammatical alternative can easily be reconstructed.

There's also evidence that, although listeners and readers generally prefer to integrate new material with material that immediately preceded it when integration takes place within a single sentence ("late closure;" Frazier, 1978; cf. Frazier & Clifton, 1996), the preference for recency does not operate when integration is taking place at the level of discourse structure rather than syntactic structure. Rather, they prefer to integrate newly-asserted material with material that appeared earlier in the discourse as part of a main assertion, rather than as presupposed or parenthetical material. Frazier and Clifton (2005) formulated the "Main assertion hypothesis," in (5):

- (5) Main assertion hypothesis: Other things equal, comprehenders prefer to relate material in a new sentence to the main assertion of the preceding sentence.

¹Note that any particular examples showing that syntactic matching is required may only show that matching is required in those examples, as a reviewer emphasized. So, as usual, what must be compared are not individual principles but entire theories. In some theories, Merchant (2004) for example, ellipsis is licensed by semantic conditions, not syntactic conditions. Thus, ellipsis may not uniformly require a syntactically matching antecedent. In our own approach, examples of ellipsis without a syntactically-matching antecedent are treated as ungrammatical, though they may be acceptable under particular conditions (see Frazier 2008, to appear).

They provided evidence for this hypothesis by showing that readers and listeners were likely to take the antecedent for an elided phrase to be part of the main assertion of a preceding sentence, e.g., part of the main clause not a relative clause. For example, in a written questionnaire, Frazier and Clifton (2005) found that, while readers were relatively more likely to interpret the elided verb phrase with respect to the immediately-preceding phrase *went to Europe* within a single sentence, as in (6a), when a sentence boundary intervened as in (6b), they were more likely to interpret the elided verb phrase with respect to the matrix verb phrase of the preceding sentence. They attributed this to the dominance of the discourse representation relative to the syntactic representation across sentence boundaries. In other words, after a sentence has been parsed and interpreted, the syntactic representation becomes less salient, and the discourse representation becomes relatively more salient.

- (6) a. John said Fred went to Europe and Mary did too.
 b. John said Fred went to Europe. Mary did too.

Frazier and Clifton (2006) observed a similar preference for main clause antecedents even when the main clause preceded the subordinate clause, as in (7a). Roughly three quarters of the responses indicated main clause verb phrase antecedents whether the main clause came first (7a) or last (7b).

- (7) a. Mary laughed after she made a joke about the supervisor. Then Tina did too.
 b. After Mary laughed she made a joke about the supervisor. Then Tina did too.

To make sure that the results were due to the main assertion preference and not to tree geometry per se, Frazier and Clifton showed that when the main clause was a potential epistemic clause, simply conveying the certainty with which the speaker was making the assertion in the complement clause, then the number of matrix antecedent interpretations was reduced. Thus, as expected given a main assertion preference, (8a) led to significantly fewer matrix verb phrase responses than (8b), which is not open to an epistemic interpretation. (To make sure that the results could not be attributed to the matching of person features per se of the subjects in (8a), we ran a control study showing that person feature matching had no influence in counterparts to (8) with verbs like *announce* which are not open to an epistemic interpretation.)

- (8) a. I think Mary smokes. Sam does too.
 b. The teacher thinks Mary smokes. Sam does too.

The preference for relating new sentences to the main assertion of the preceding sentence could be attributed to the salience of the main assertion in the discourse representation (Frazier and Clifton, 2005, section 3). Walker, Gough and Wall (1968; described in Fodor, Bever and Garrett, 1974) showed that, in a task where participants simply listen to a sentence followed by two words and must indicate whether both words were part of the sentence or not, an advantage was found when both words are drawn from the main clause of a sentence rather than one or both being words contained in a relative clause. This suggests that even without the need to find an antecedent, the main assertion is more accessible than other material.

In a self paced reading study², we explicitly investigated whether the main-assertion tendency is tied to ellipsis. Testing sentences like those in (9), we found 198 ms faster reading for a second elliptical sentence when its antecedent was the main assertion of the preceding sentence (as in 9a) than when its antecedent was in the subordinate clause of the preceding sentence (9b).

- (9)
- a. Stacy will publish a novel. Her sister won't.
 - b. Jim announced that Stacy will publish a novel. Her sister won't.
 - c. Stacy will publish a novel. Her sister won't publish anything.
 - d. Jim announced that Stacy will publish a novel. Her sister won't publish anything.

This effect was not limited to elliptical sentences. The second sentence of (9c) was read 269 ms faster than the second sentence of (9d), a nonsignificantly larger effect than observed for the elliptical sentences. In fact, the main assertion tendency appears to be very general, not limited to sentences containing anaphoric or elided constituents. We suggest that the same discourse integration preferences may hold for overt material in a sentence and for the unpronounced material we claim exists inside an ellipsis site.

Given our characterization of ellipsis, verb phrase ellipsis with a conditional antecedent, such as (10), should amount to a 'catch-22.' In a conditional sentence, neither the antecedent clause nor the consequent clause is asserted (or entailed). The main assertion of a conditional sentence is the conditional relation. This predicts ellipsis with an antecedent in a conditional should have only limited acceptability because simultaneously satisfying both the syntactic condition requiring the antecedent to be a verb phrase and the discourse (main assertion) preference will not be possible. We first tested this prediction in a speeded acceptability judgment study testing sentences like (10). Indeed, the sentences were accepted only 52% of the time. (Note that there are some exceptions to the marginality of such examples – a matter that we take up in connection with Experiment 2 below.)

- (10) If John went to the store, he bought Twinkies. George did too.

If indeed the marginal quality of (10) is due to the processor's inability to simultaneously satisfy syntactic conditions requiring a verb phrase antecedent and discourse conditions (favoring an antecedent that corresponds to the main assertion) then we would expect examples like (10) to not only be relatively marginal, as just shown, but also to receive both main clause verb phrase interpretations (*George bought Twinkies too*) and full conditional interpretations (*If George went to the store, George bought Twinkies too*). We would also expect that examples with Bare Argument Ellipsis (BAE) "George too" would reveal more full conditional responses than the examples with verb phrase ellipsis, since the BAE examples can satisfy discourse constraints without violating a syntactic requirement that the antecedent be a verb phrase. Finally, we would expect that if a context already provided the information in the antecedent clause, then fewer full conditional responses would be given, since the main assertion might then in effect correspond to the consequent clause. Put differently, the antecedent clause might effectively cancel out when it expresses only given information. These three predictions were tested in Experiment 1.

3. Experiment 1

We conducted a written questionnaire study to test the prediction that verb phrase ellipsis sentences would receive a substantial number of full conditional responses, though fewer than BAE (which lacks a VP antecedent requirement), and to test whether these responses would in fact decrease when the lead-in sentences established the consequent as the (essentially) 'asserted' information.

²This study is not reported in detail here. Briefly, 48 undergraduates read 16 sentences like those in (9), 4 in each version shown there, in a whole-sentence self-paced reading task. The mean reading times for the second sentence were 1185, 1383, 1486, and 1755 ms for sentences like (9a, b, c, d), respectively, and the time cost of having the second sentence refer back to the subordinate clause rather than the main clause of the first sentence was statistically significant.

3.1 Method

3.1.1 Materials—Twenty hypothetical conditional sentences were written with four versions of each as shown in (11). In all examples, a full conditional sentence appeared and the subject of its antecedent clause was the same as the subject of the consequent clause. In (11a), the conditional sentence was followed by a sentence with VPE and *too*. In (11b), the auxiliary *do* was eliminated, creating a BAE sentence corresponding to the VPE sentence. In (11c) and (11d), a lead-in sentence preceded the conditional and the ellipsis. The lead-in contained the information in the antecedent of the conditional. All items appear in Appendix 1.

- (11)
- a. If John went to the store, he bought Twinkies. George did too.
 - b. If John went to the store, he bought Twinkies. George too.
 - c. Mary is sure that John went to the store. If John went to the store, he bought Twinkies. George did too.
 - d. Mary is sure that John went to the store. If John went to the store, he bought Twinkies. George too.

Two alternative interpretations were written for each item. For instance, the interpretations of (11) are *It's also true of George that he bought Twinkies.* and *It's also true of George that if he went to the store he bought Twinkies.* In the former interpretation, the antecedent of the ellipsis is simply the consequent clause. In the latter, it is the full conditional.

3.1.2 Participants and Procedures—Twenty-four University of Massachusetts undergraduates, working individually in a 20-minute session, completed a written questionnaire. An additional nine participants were tested, eight of whom were rejected for giving an obviously incorrect answer to a filler question and one was rejected to maintain counterbalancing. There were four counterbalanced forms of the questionnaire, each with five discourses in each of the four versions illustrated in (11). Across the four forms, each item was tested equally often in each form. Six participants received each questionnaire form.

The experimental items were combined with 24 other items from another unrelated experiment plus two filler items. The same randomization was applied to each of the four questionnaire forms and the resulting questionnaires were printed. Participants were instructed to read each item and comprehend it, and then look at the two alternative interpretations that followed each item and mark the one that most closely matched their interpretation. The frequency of each choice was recorded.

3.2 Results

Table 1 presents the percentages with which the shorter interpretation was chosen (the consequent interpretation, e.g., for (11), *It's also true of George that he bought Twinkies*). It also presents the complementary percentage with which the longer, conditional, interpretation was chosen (e.g., *It's also true of George that if he went to the store he bought Twinkies*). Consequent interpretations were chosen more frequently for VPE (11a, c) than for BAE (11b,d) items, 50 vs. 36% ($F(1,23) = 5.248$, $p < .04$; $F(1,19) = 7.023$, $p < .02$). Consequent interpretations were also chosen more frequently when there was a lead-in sentence (11c,d) than when there was not (11a,b), 51.5 vs. 34% ($F(1,23) = 8.63$, $p < .01$; $F(1,19) = 10.24$, $p < .005$). The interaction between the two factors did not approach significance ($F < 1$).

3.3 Discussion

The results of the experiment confirmed the predictions of the main assertion preference. Without a lead-in sentence, verb phrase ellipsis received 57% full conditional responses, indicating that the main assertion preference influences interpretation even when a syntactic verb phrase is present which in principle might antecede the elided phrase. BAE showed even more full conditional responses than verb phrase ellipsis sentences did.³

The effect of the lead-in sentences was to decrease the number of full conditional responses. Treating the main assertion preference as a processing preference derived from information structure considerations, the effect of the lead-in is easy to characterize. In effect, as the discourse is processed incrementally, the antecedent of the conditional effectively drops out for sentences like ours, past tense episodic conditional sentences, where the antecedent becomes largely redundant.

We note that the main assertion hypothesis (in (5)) is not limited to elliptical sentences. As pointed out by reviewers of an earlier version of this paper, nonelliptical versions of sentences like we used (e.g., *If John went to the store, he bought Twinkies. George bought Twinkies too.*, corresponding to (11a)) are only marginally acceptable, like our elliptical sentences.⁴ This follows from the main assertion hypothesis, on the assumption that a reader will attempt to integrate one sentence with the main assertion of a prior sentence, just as the reader presumably attempts to identify elided material with the main assertion of a prior sentence when the identification must take place in a discourse representation. We realize that this assumption leaves questions unanswered. For instance, one might ask if the ellipsis or the material to be integrated with prior discourse is itself not a main assertion but instead is subordinated (e.g., in a complement or a relative clause), will its preferred discourse antecedent be similarly subordinated? Alternatively, perhaps parallelism between the ellipsis sentence and the antecedent sentence *and* discourse salience might both affect the processing of elided constituents in presupposed environments (see Moulton, 2008). One might also ask whether the presence of *too* in our materials encourages integration with an antecedent that corresponds to entire phrase that falls in the scope of *too*? (We doubt that the presence of *too* provides a full explanation of our results. In earlier work (Frazier, 2002), we have shown that the main assertion principle applies even when there is no additive particle; see discussion of (9), above))

Rather than pursuing these questions, let us turn to a discussion of the marginality of verb phrase ellipsis with an antecedent inside a conditional (see the earlier discussion of the written speeded acceptability judgment study that we conducted using the same sentences as the a-form tested in Experiment 1). In contrast to the hypothetical conditional sentences studied in Experiment 1, it seems that in sentences with counterfactual conditional antecedents, ellipsis is much better. For example, Garnham et al. (1998) tested examples like those in (12) in a reading time study, and found that sentences with distant antecedents took longer than those with nearby antecedents.⁵

³We leave the exact analysis of BAE outside of the scope of this paper since we think it raises a host of questions quite distinct from those we are addressing here. We note only that our original hypothesis was that the bare argument might substitute for all occurrences of a name. As Chris Potts pointed out to us, this predicted that focusing the name so that it already introduced a variable should lead to more full conditional responses but this prediction was not confirmed in an auditory interpretation study.

⁴We note, however, that our experimental technique of assessing how ambiguity is resolved applies only to elliptical sentences, not to their unambiguous non-elliptical counterparts.

⁵On the potential difficulty of distant antecedents, see also Murphy, 1985, but for conflicting evidence Frazier and Clifton, 2005, Martin and McElree, 2008. It may be important in the Garnham study that a closer antecedent is available. Indeed even in the Garnham study the distant antecedent was especially difficult with the main clause, suggesting perhaps that people tried the subordinate clause first but ended up with the main clause interpretation

- (12)
- a. The art thieves might have taken both the Van Goghs from the gallery, if they hadn't set the alarm off, but fortunately they didn't.
 - b. If the art thieves hadn't set the alarm off, they might have might have taken both the Van Goghs from the gallery, but fortunately they didn't.
 - c. The art thieves might have taken both the Van Goghs from the gallery, if they hadn't set the alarm off, but fortunately they did.
 - d. If the art thieves hadn't set the alarm off, they might have might have taken both the Van Goghs from the gallery, but fortunately they did.

In these examples, an antecedent for the elided verb phrase seems acceptable in either the if-clause or the consequent clause of the conditional. One important factor, we suggest, is the counterfactual nature of these sentences.

In independent work on VPE with flawed antecedents, Frazier, 2007; Frazier and Clifton (in progress) we have shown that elided constituents without perfectly matching antecedents (e.g., an active ellipsis clause with a passive antecedent) are more acceptable when the antecedent has a non-actuality implicature than when it does not. By non-actuality implicature, what we mean is something stronger than that the sentence doesn't entail that some described state of affairs holds. Rather, the non-actuality implicature is an implicature that the state of affairs described does not obtain in the actual world. For example, uttering *John is eager to be in Paris* implies that John is not in Paris. Many of the attested examples of ellipsis without a syntactically-matching antecedent discussed in the linguistics literature support a non-actuality implicature, as in (13), which is discussed by Hardt (1993) and by Kehler (2002).

- (13) This information could have been released by Gorbachov but he chose not to.
[Daniel Shorr, NPR, 10/17/92, reported by D. Hardt]

We have shown that when the antecedent clause contains a modal verb, or *want*, or *eager to*, this increases the acceptability of examples with a syntactic mismatch between the antecedent and the elided clause (Grant, Frazier & Clifton, in progress). There are two sorts of explanations one might give for this effect. The non-actuality implicature may serve to implicitly focus the antecedent clause because of the contrast between the actual state of affairs and the state of affairs described (the 'goal' state). In this case, the actual antecedent VP would be 'recycled': repaired by the parser into a form matching the elided constituent (Arregui et al., 2006). Alternatively, perhaps the antecedent for the elided constituent is provided by the representation of the implicature itself (NOT-this information was released in W_0). According to the former suggestion, recycling of the antecedent at LF is easier because the processor is confident that the mismatched clause is the source for the antecedent of the elided VP. According to the latter suggestion, where the representation of the implicature IS the antecedent for the elided VP, the antecedent would not itself be syntactic, e.g. it might be a property tied to a syntactic VP. (There are of course many open questions here. One way to think about this is along the lines of a 'structured proposition', Krifka, 2006, where some but not all of the syntactic structure of the input is preserved in the semantic output.) In any case, Experiment 2 tests the hypothesis that VPE with an antecedent inside a conditional will be more acceptable when the antecedent carries a non-actuality implicature (arguably an entailment in this case, though not in the other cases tested by Grant et al., in progress). If the hypothesis is supported, the results, like the results of Experiment 1, will suggest that an elided VP may take an antecedent that goes beyond surface syntax or LF of the 'source' VP – the VP providing the material for recycling or the VP of the clause conveying the non-actuality implicature.

4. Experiment 2

4.1 Methods

4.1.1 Materials—Twenty-four sentences like those in (14) were constructed with three versions of each (all appear in Appendix 2). One version contained a simple past in both the conditional sentence and the ellipsis sentence, as in (14a). A second version (14b) contained the same conditional sentence as the a-form, but the ellipsis sentence appeared in the conditional perfect (*would have*). This form was included as a control for ‘matching’ of sentence one and sentence two in terms of mood: in (14a) the conditional sentence structure might conflict with the choice of an indicative past tense in the ellipsis sentence; (14b) is a control for this possibility. The third version (14c) contained the conditional perfect in both the conditional sentence and the ellipsis sentence.

- (14)
- a. If John went to the store he bought Twinkies. George did too. [simple past, hypothetical, simple past ellipsis]
 - b. If John went to the store he bought Twinkies. George would have too. [simple past, hypothetical, modal ellipsis]
 - c. If John had gone to the store he would have bought Twinkies. George would have too. [simple past, nonactuality, modal ellipsis]

In roughly half of the items (by our judgment, the first ten in Appendix 2), the consequent clause entailed or strongly implied the antecedent clause, e.g., if someone bought Twinkies, that person probably went to the store. In the other half of the items, the consequent did not imply the antecedent, e.g., if someone went skiing, that person didn’t need to have gone to Colorado. This manipulation provided an indirect check of whether ‘long’ antecedent (full conditional) responses in Experiment 1 might be due only to the consequent implying the antecedent rather than due to the size of the linguistic antecedent chosen. If this were the case, then the items where the antecedent was implied should be more acceptable than those where it wasn’t, since the main assertion requirement could be satisfied by entailment while still choosing a VP antecedent. All items appear in Appendix 2.

4.1.2 Participants and Procedures—A total of 96 University of Massachusetts undergraduates were tested in a computer-administered questionnaire. Each saw a total of 108 sentences, including the 24 sentences used in Experiment 2 and filler sentences plus sentences from several unrelated experiments. The materials were presented in an individually-randomized order on a computer monitor. Some of the sentences, including the Experiment 2 sentences, were presented together with a 5-point acceptability rating scale; subjects had been instructed to rate them as a “5” if they were something that “a native speaker of English could say or understand without noting anything peculiar or odd or ungrammatical or confusing about it” and as a “1” if the sentence were clearly unacceptable in this sense, and were encouraged to use the entire scale. The remaining sentences were either presented with a similar 5-point plausibility rating scale, or with a numbered selection of possible interpretations to be chosen. Participants indicated their ratings and interpretations by typing a number on a computer keyboard.

If the non-actuality implicature/entailment hypothesis is correct, then the non-actual (counterfactual) (14c) will receive higher acceptability ratings than the hypothetical conditionals in (14a,b). If on the other hand, the predicted lesser acceptability of (14a) is due to the mismatch between the conditional form of the first sentence and the use of the simple past in the ellipsis sentence, then (14b) and (14c) should pattern together.

4.2 Results

The mean ratings (5 = highly acceptable) appear in Table 2, both for all the items and broken out by whether or not the consequent implied the antecedent.

As expected, there was a significant effect of the non-actual (c) forms being rated as more acceptable than the other forms (overall $F(2,190) = 90.32$; $F(2,44) = 89.26$; $p < .001$; the contrast between the (c) form and the other forms was highly significant, while the overall difference between the (a) and the (b) forms was not). This confirms the main hypothesis of the experiment, suggesting that the antecedent for VP ellipsis need not be an already available VP when the antecedent is counterfactual or supports a non-actuality implicature.

There was a marginal interaction of implicational status and condition ($F(2, 190) = 4.32$, $p < .02$; $F(2, 44) = 2.80$, $p < .08$). The penalty of the simple past (a) forms compared to the nonactuality (c) forms was present for both items where the consequent implied the antecedent and items where it did not, but was marginally smaller in the former case than in the latter case ($F(1, 95) = 7.42$, $p < .01$; $F(1,22) = 3.77$, $p < .07$). This may suggest the existence of a process in Experiment 2 along the lines of what happened in Experiment 1, where the antecedent was cancelled when it was redundant with the consequent. I.e. when a consequent that implicates the antecedent is denied by the non-actuality implicature of its modal, the antecedent is also denied and disregarded. The (b) forms also seemed to behave differently for the two types of items. These forms were included to check whether examples were more acceptable when the antecedent sentence and the ellipsis sentence matched in terms of mood, but the effect was not significant in the overall data. However, the rated acceptability of the (b) forms improved over the (a) forms for the subset of materials in which the consequent did not imply the antecedent ($p < .05$), while the (b) forms were nonsignificantly worse than the (a) forms for materials where the consequent implied the antecedent. It is not clear to us why the improvement was limited to the subset of items where the consequent did not entail the antecedent. It's possible that adding the modal to the consequent brings about a true improvement, but when the antecedent is implicated by the consequent, it is interpreted as being redundant and thus is cancelled out.

4.3 Discussion

An imperfect antecedent is more acceptable if it conveys a non-actuality implicature than if it doesn't. Matching the mood of the antecedent and ellipsis clause cannot account for the effect, since the experimental form (14c) was far more acceptable than the mood-control (14b). The advantage of the non-actual form could be explained by the implicit focusing of states of affairs that contrast with actual states of affairs, or it might receive an account based on taking a representation of the nonactual state of affairs as the antecedent. Discriminating among these two accounts of the non-actuality effect must remain work for the future.

A reviewer was concerned that the results of Experiment 2 might be due to the presence of *too*. In a separate study (Grant et al., in progress), we have investigated non-actuality implicatures in sentences with or without an active/passive voice mismatch. The examples did not contain the additive particle (as in (15)). Nevertheless, the presence of a non-actuality implicature improved the rating of examples significantly, especially for examples with a voice mismatch (15b).

- (15)
- a. A trip was planned for August but Anne didn't.
 - b. A trip should be planned for August but Anne didn't.
 - c. Someone planned a trip for August but Anne didn't.

d. Someone should plan a trip for August but Anne didn't.

The fact that non-actuality implicatures improve the acceptability of (especially non-matching) ellipsis sentences that do not contain *too* suggests that it is not the additive particle that is responsible for the non-actuality implicature effect.

Turning to grammatically-based discourse accounts, it might seem tempting to approach the Experiment 2 results from the perspective of Kehler's (2000, 2002) claim that syntactic conditions on verb phrase ellipsis do not hold when a cause-effect discourse coherence relation obtains between the antecedent clause and the ellipsis clause. Given that conditionals are closely related to cause-effect statements, this approach might seem tempting. But we doubt this is the right approach because there is a much broader generalization about non-actuality implicatures which clearly extends beyond clauses related by Cause-Effect discourse coherence relations. In examples with voice mismatches between the antecedent and ellipsis clause, we find significantly higher acceptability judgments when the antecedent supports a nonactuality implicature even though the clauses are connected by a Resemblance (similarity, contrast) discourse coherence relation. Similarly in ambiguous examples of ellipsis with potential antecedents in a main clause or a relative clause, we find more relative clause interpretations when the relative clause conveys a non-actuality implicature.⁶

Examples like (16a), due to an anonymous reviewer, or (16b) a counterpart including *too*, seem to be easy to parse. The question is whether this is a problem for the present approach.

- (16) a. If you try hard, then you will succeed. If you don't, you won't.
b. If John works hard, then he'll succeed. If you do, you will too.

Note that our account does not categorically exclude sentences that violate the main assertion tendency. Rather, it predicts that finding an antecedent that is the main assertion of the preceding utterance is one factor or one pressure on comprehension. Clearly there are others such as parallelism. The predictions of a preference for parallelism may converge with the predictions of the main assertion hypothesis, as in (6b), or the two principles may make opposing predictions, as in (8a). The latter sorts of examples show that parallelism alone will not suffice to account for which instances of ellipsis are acceptable or which analysis is preferred. Even in examples like (16) it is not entirely clear why the examples are so easy to process. The idea behind (16) may itself be already familiar (almost a cliché) and (16) may easily be read as an aphorism (many-time conditional) rather than a hypothetical about a single occasion. Further, in addition to the parallelism of the antecedent sentence and the ellipsis sentence, what may make the sentence very acceptable is the negation of

⁶Another possibility is a semantic approach to the results of Experiment 2, as pointed out to us by a reviewer. If conditionals involve some sort of modal quantification and if the verb phrase in the consequent contains a world variable that is bound by the modal quantifier (with the antecedent clause providing the restriction), then there is an independent problem with a VP antecedent in a consequent because it would in essence turn a bound variable into a free one. The reviewer goes on to note that the improvement with *would* follows quite naturally assuming that *would* allows for easier accommodation of an implicit *if*-clause than an indicative form does. In short, the non-actuality implicature (or the presence of *would*) would make it easier to interpret *George did too* as *If John/George went to the store, he would have bought Twinkies too*.

We think this semantic approach to our data is interesting and in many ways quite plausible. It does open up some questions. For example, is the relation between the *if*-clause, which supplies a restrictor on the world variable, and the world variable, really a case of binding? If not, it isn't clear that the contrast between the examples is really one of bound versus free world variables (though there might be some corresponding account couched in terms of the vagueness of the world of evaluation or some such notion). It also isn't clear to us why this account wouldn't predict that (14c) should pattern with (14b), which contains a modal in the ellipsis clause, since on this approach it is the modal in the ellipsis clause which ameliorates the free world variable problem. Also, this semantic account would seem to explain an improvement in the acceptability of examples with a non-actuality implicature in the antecedent only in the case of conditionals. As mentioned in connection with (14), the presence of a non-actuality implicature also improves the status of non-conditional examples. In order to predict such an improvement, as well as predict a difference between (14b) and (14c), it appears that the semantic account would have to be developed further, perhaps requiring a non-uniform treatment of effects we have attributed to the effects of non-actuality implicatures.

both the *if*- and the *then*-clause in the ellipsis sentence. We wonder if (17), though clearly grammatical, might be a bit harder to process than (16).

(17) If you buy expensive materials, your clay won't be wet. If you don't, it will.

In any case, we do not wish to deny that examples of ellipsis can be found with antecedents that are not part of the main assertion. Much of our own data shows that this is a possibility, if generally not the most preferred possibility in cases of ambiguity.⁷

Hardt and Romero (2004) suggest that a certain configuration must hold between the antecedent clause and the ellipsis clause in a discourse tree. The results of Experiment 1 are difficult for any theory in which constraints on ellipsis are couched in terms of the geometry of the discourse representation (e.g., whether a clause containing the antecedent bears a particular structural relation to the clause containing the elided constituent). The tree geometry is not what changed in Experiment 1: it was the information structure, specifically, what information was already given. However, if theorists who cast constraints in terms of discourse trees assume that information-structure influences the shape of the discourse tree incrementally as more material is encountered, then the present results presumably could be recast in those terms. Our own preference is to model the results directly in terms of information structure notions, but nothing would prohibit coding the constraints in two stages: first, information structure could be used to adjust the structure of discourse trees, and then constraints on the structural relations between antecedent clause and ellipsis clause could be cast in terms of discourse trees.

5. Conclusions

Interpreting language as it arrives involves constant reference to a context that is changing as new input is encountered. Here we have investigated how syntactic constraints and discourse constraints are simultaneously honored in ellipsis examples with antecedents in conditional sentences. On our view, even if an elliptical sentence is strictly speaking grammatical (i.e., it observes the grammatical conditions on ellipsis), it will not be fully acceptable and easy to process if it fails to honor a discourse constraint on how elided (and overt) material is to be related to prior discourse. Indeed, we have been developing an approach where processing is crucial to giving a restrictive theory of the grammar of ellipsis while still accounting for the data in detail. Examples with antecedents in conditionals are typically grammatical if the main clause (consequent) verb phrase is taken to be the antecedent, but they will be felicitous only if the prior discourse is such that this verb phrase corresponds to the main assertion of the speaker. On the other hand, we have argued elsewhere (Arregui et al., 2006) that verb phrase ellipsis with voice mismatches are ungrammatical, but may be acceptable when the antecedent may be repaired at LF using normal parsing mechanisms, especially when the antecedent clause conveys a non-actuality implicature.

In Experiment 1 we take this argument further by suggesting that the current form of the syntactic and discourse representation changes as a function of the syntax of the input and discourse updating. In effect, inferences supported by prior discourse may allow an antecedent clause of a conditional to drop out if already asserted information entails its truth. This sort of effect is expected, we think, if linguistic intuitions are reflecting the output of the entire language system. Identifying empirical constraints on how and when linguistic

⁷Indeed, we have suggested (Frazier and Clifton, 2005) that the main assertion tendency is due to the salience of main assertions in the discourse representation. However, we suspect that for an elided constituent that is in an embedded/presupposed context, the pressure favoring an antecedent in the main assertion is less strong than when the elided clause is itself a main assertion.

representations are updated will presumably allow a more detailed picture of how and why listeners/readers comprehend discourse the way they do.

With respect to non-actuality implicatures, we do not yet have a strong argument about whether it is the implicit focus conveyed by the contrast between the goal-state and the actual state of affairs that is at issue, or the representation of the implicature itself. In either case, it appears that non-actuality implicatures play a rather pervasive role in the processing of ellipsis (see Grant et al., in progress for evidence that they influence choice of antecedent in ambiguous ellipsis examples and the acceptability of flawed antecedents). Indeed, non-actuality implicatures may be important because non-actual 'goal'-states may play a fundamental role in organizing discourse. A protagonist's goal or intent may supply the glue that makes the various components of a discourse cohere. Indeed, we suspect that the classic split-antecedent examples from Webber (1978) in (18) are possible in part because the individual conjuncts that provide the source for the antecedent (*wants to sail around the world, wants to climb Kilimanjaro*) describe goal-states (*wants*).

- (18) Bob wants to sail around the world and Alice wants to climb Kilimanjaro, but neither of them can because money is too tight.

In any case, the present studies suggest that there are circumstances where syntactic conditions on ellipsis may be relaxed due to the state of the discourse representation when the ellipsis clause is encountered.

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Appendix 1: Materials used in Experiment 1, with optional elements parenthesized. Each was followed by a two-choice interpretation question

1. (Mary is sure that John went to the store.) If John went to the store, he bought Twinkies. George (did) too.

2. (We're positive Lucy went to college.) If Lucy went to college, she studied physics. Fred (did) too.
3. (I'm quite sure my niece took a linguistics course.) If she took linguistics, she loved syntax. My nephew (did) too.
4. (Webber went after any impossible rebound.) If Webber tried, he got the rebound. Shaq (did) too.
5. (Clearly Paul's a talented speaker.) If Paul was at the conference, he was articulate. Victor (was) too.
6. (We can be sure George went to Bertucci's.) If he went to Bertucci's, he ordered pizza. Bill (did) too.
7. (Undoubtedly Carey went out.) If she went out, she danced all night. Sally (did) too.
8. (It's clear Marcy visited France.) If she went to France, she went to Paris. Pam (did) too.
9. (We all knew Karl found some wood.) If he found some wood, he built a bookcase. Tom (did) too.
10. (We found out Stan went skiing). If he went skiing, he injured himself. Dan (did) too.
11. (Ruth clearly went on vacation.) If Ruth went on vacation, she flew to Venice. Paula (did) too.
12. (Katy went to Friendly's last night.). If she went to Friendly's, she had a sundae. Anita (did) too.
13. (Gregory showed up for his doctor's appointment.) If Gregory showed up for the appointment, he arrived late. William (did) too.
14. (Jaime cooked dinner yesterday.) If Jaime cooked dinner, she overcooked the vegetables. Tina (did) too.
15. (George cleaned up the kitchen.) If George cleaned up the kitchen, he used the dishwasher. Sam (did) too.
16. (Luke ran the marathon.) If Luke ran the marathon, he got sick. Richard (did) too.
17. (Martha lied.) If Martha lied, she told a whopper. Alice (did) too.
18. (Colin called.) If Colin called, he spoke to Anne. Andrew (did) too.
19. (Henry grew vegetables last summer.) If Henry grew vegetables, he planted tomatoes. Paul (did) too.
20. (Kristen brought a dessert.) If Kristen brought dessert, she baked a pie. April (did) too.

Appendix 2: Materials used in Experiment 2, with alternatives indicated by parentheses and pipes. Each was followed by a 5-point acceptability scale

1. If John (went|had gone) to the store, he (bought|would have bought) Twinkies. George (did too|would have too).
2. If Marcy (went|had gone) to France, she (went|would have gone) to Paris. Pam (did too|would have too).

3. If Martha (lied|had lied), she (told|would have told) a really big lie. Alice (did too|would have too).
4. If Henry (grew|had grown) vegetables, he (planted|would have planted) tomatoes. Paul (did too|would have too).
5. If Paula (went|had gone) to New York, she (went|would have gone) to the Metropolitan Museum. Henrietta (did too|would have too).
6. If Anita (married|had married) someone, she (married|would have married) a high school sweetheart. Fiona (did too|would have too).
7. If Giorgio (got|had got) hurt, he (broke|would have broken) a leg. Mario (did too|would have too).
8. If Sam (bought|had bought) a book, he (bought|would have bought) a detective novel. Karl (did too|would have too).
9. If my niece (took|had taken) a geometry course, she (loved|would have loved) computing areas. My nephew (did too|would have too).
10. If Webber (tried|had tried), he (got|would have gotten) the rebound. Shaq (did too|would have too).
11. If Paul (was|had been) at the conference, he (was|would have been) articulate. Victor (was|would have too).
12. If Lucy (went|had gone) to college, she (studied|would have studied) physics. Fred (did too|would have too).
13. If Stan (went skiing|had gone skiing), he (injured|would have injured) himself. Dan (did too|would have too).
14. If Carey (went|had gone) out, she (danced|would have danced) all night. Sally (did too|would have too).
15. If George (went|had gone) to Bertucci's, he (ordered|would have ordered) pizza. Bill (did too|would have too).
16. If Ruth (went|had gone) on vacation, she (flew|would have flown) to Venice. Paula (did too|would have too).
17. If Katy (went|had gone) to Friendly's, she (had|would have had) a sundae. Anita (did too|would have too).
18. If Gregory (showed|had shown) up for the appointment, he (arrived|would have arrived) late. William (did too|would have too).
19. If Luke (ran|had run) the marathon, he (got|would have gotten) sick. Richard (did too|would have too).
20. If Jaime (cooked|had cooked) dinner, she (overcooked|would have overcooked) the vegetables. Tina (did too|would have too).
21. If Susan (took|had taken) a psychology class, she (took|would have taken) statistics. Mary (did too|would have too).
22. If Steven (bought|had bought) a book, he (bought|would have bought) The Grapes of Wrath. Stan (did too|would have too).
23. If Virginia (sold|had sold) vegetables, she (made|would have made) a lot of money. Ethel (did too|would have too).

24. If Chuck (hired|had hired) a student, he (hired|would have hired) a smart one. Lyn (did too|would have too).

Table 1

Percentage of Consequent (short) and Conditional (long) Interpretations, Experiment 1

Condition	Percentage Consequent	Percentage Conditional
(11a) VPE, no leadin	42.5	57.5
(11b) BAE, no leadin	26	74
(11c) VPE, leadin	57	43
(11d) BAE, leadin	46	54

Table 2

Mean Ratings (5 = highly acceptable), Experiment 2

Condition	Overall	Antecedent implied	Antecedent not implied
(14a) (Simple past)	2.56	2.71	2.48
(14b) (Past, modal ellipsis)	2.67	2.61	2.74
(14c) (Nonactuality)	3.80	3.73	3.92