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The Effect of Antecedent Complexity in the Processing of Noun Phrase Ellipsis*

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Kim, Nayoun and Frazier, Michael. 2022. The effect of antecedent complexity in the processing of noun phrase ellipsis. *Discourse and Cognition* 29:4, 17-35. The current study investigated the effect of antecedent complexity on the time-course of antecedent retrieval for Noun Phrase Ellipsis (NPE) with the aim to understand whether the structural content associated with the antecedent have an impact on the online processing of NPE. We found that while NPE structures are more taxing to process in real-time than similar constructions with pronominal anaphora, the complexity of the antecedent yielded no observable reading-time differences nor differences in accuracy. This pattern of results is broadly compatible with both pointer-based and cost-free copying accounts of ellipsis processing (Frazier and Clifton 2001; Martin and McElree 2008, 2009, 2011) but inconsistent with approaches to ellipsis resolution in which the antecedent must be re-built in the ellipsis-site. However, crucially, the absence of an observable antecedent-competition effect (Van Dyke and McElree 2006; Jäger, Engelmann, and Vasishth 2017) is suggestive evidence in favor of the cost-free copying accounts (Frazier and Clifton 2001, 2005). Future work should attempt to expand the range of complexity-based manipulations (in both the degree and the nature of complexity) to ensure that results of this kind are reliable across a range of antecedent structures. **(Sungkyunkwan University and University of Leipzig)** (191 words)

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sentence processing, pointer-based mechanisms, cost-free copying mechanisms

1. Introduction

One of the fundamental questions in the study of the processing of elliptical constructions is whether the structural content associated with the antecedent is retrieved in the resolution of ellipsis (Martin and McElree 2008, 2009, 2011; Paape, Nicenboim, and Vasishth 2017; Kim, Brehm, and Yoshida 2019). The resolution of ellipsis requires the retrieval of an antecedent because the antecedent contains the grammatical and semantic information required for the interpretation of the ellipsis. First, the interpretation of the ellipsis is grammatically contingent on the antecedent. This means that an ellipsis-site can only be interpreted when a linguistic antecedent is present within the sentence (van Riemsdijk 1978; Chung, Ladusaw, and McCloskey 1995; Lasnik 2001; Merchant 2001, 2013)[1]. When no linguistic antecedent is present (i.e., in an out-of-the-blue context), the sentence becomes ungrammatical, as illustrated in (1a). When there is a linguistic antecedent located in the antecedent clause, however, as in (1b), the sentence becomes acceptable, indicating that the ellipsis-site is grammatically dependent on the antecedent.

(1) a. *Elena's is in the other room.
b. Sue's key to the cells must be in the locker and Elena's [Noun Phrase Ellipsis] is in the other room.

Further evidence that the ellipsis-site is syntactically controlled by the antecedent comes from the penalty caused by voice mismatch. It is known that the voice associated with the antecedent clause and the elided constituent should match, a subcase of the more general requirement for antecedent-ellipsis parallelism in terms of grammatical features (Sag 1976; Williams 1977; Fiengo and May 1994). When parallelism fails, as in (2), the sentence becomes unacceptable (although see Dalrymple, Shieber, and Pereira 1991; Hardt

[1] Herein we confine our attention to intra-sentential ellipsis; the licensing mechanisms of cross-sentential (or even cross-utterance) ellipsis are similar but introduce additional complications which are not relevant to the present study (see Frazier and Clifton 2006 for more the role of discourse structure in ellipsis).

1993;Kehler 2000; Merchant 2013 for exceptions to this generalization).

(2) *Peter was murdered, but we do not know who.

Additionally, the ellipsis-site is semantically contingent on the antecedent. The meaning associated with the Noun-Phrase Ellipsis (henceforth NPE)-site in the second conjunct should be the same as the interpretation conveyed by the antecedent. Thus, attempting to interpret the NPE-site in (3) with the meaning of *flower in the garden*, which mismatches that of its antecedent, renders the sentence unacceptable. This suggests that the recovered content associated with the ellipsis-site is semantically dependent on the antecedent.

(3) ?Sue's key to the cells must be in the locker room and Elena's [NPE flower from the garden] is in the room.

Given that ellipsis reveals such grammatical and semantic dependence, we can assume that the resolution of elliptical constructions involves the following procedures: In (4), the reader first recognizes that something is missing in the second conjunct. Specifically, the possessive marked noun "*Elena's*" and the verb, in combination allow the reader to recognize that some element must be missing, since possessive NPs are not suitable subjects on their own (Kim et al. 2019).

(4) Sue's key to the cells must be in the locker room and Elena's [Noun Phrase Ellipsis] is in the room.

Since the ellipsis-site is semantically and syntactically dependent on the antecedent (see Merchant 2001), one of the processes that the ellipsis-site triggers is the reactivation of the left-context and search for the antecedent in memory. A constituent that can serve as the antecedent must be reactivated when the parser encounters the ellipsis-site, and a dependency relation with the ellipsis-site constructed. The question is, when the left-context is accessed, what/how much information about the antecedent is reactivated, and, consequently, whether and to what extent the internal structure of the antecedent can impact the time-course of ellipsis processing.

2. Literature Review

Much work on real-time ellipsis processing has focused on understanding the form of the representation built at the ellipsis-site (Frazier and Clifton 2005; Martin and McElree 2011; Phillips and Parker 2014). The question of whether the size and complexity concerning the antecedent correlates with the retrieval speed at the ellipsis-site has been less well-studied, and has yielded conflicting results. On the one hand, some previous research shows no processing costs at the ellipsis-site regardless of the complexity/size of the antecedent, providing evidence that structure may not be built at the ellipsis-site (Frazier and Clifton 2001; Martin and McElree 2008). Other studies, however, suggest that a more complex antecedent can elicit slower reading times at the ellipsis-site compared to a simpler antecedent, which has been taken as evidence that syntactic structure is constructed on-line within the ellipsis-site to parallel that of the antecedent (Murphy 1985; Hall 2021).

Recent models of ellipsis resolution lend support to models that propose reactivation of the antecedent using pointer-based mechanisms (McElree, Foraker, and Dyer 2003; Martin and McElree 2008, 2009, 2011). Pointer-based accounts of ellipsis resolution hypothesize that already-processed items are encoded in memory with certain (morphological and syntactic) features, and that when these features match those which the parser can retrieve from the ellipsis-site (based upon cues from the non-elided portion of the ellipsis-hosting clause), items in memory with matching features are reactivated. Since cues provided by the ellipsis-site's context trigger direct access to the materials in memory in a parallel fashion, partially or fully matching memory representations can exert interference effects (Anderson and Neely 1996; Van Dyke and McElree 2006; Jäger et al. 2017). This results in a lower overall retrieval accuracy but a constant time-course regardless of the content of the antecedent's memory representation. Thus, one of the key predictions of the pointer-accounts of ellipsis resolution is that the antecedent's complexity (whether measured in number of words or in number of syntactic nodes) will not have an impact on retrieval speed at the ellipsis-site (Martin and McElree 2008, 2009, 2011).

Frazier and Clifton (2000), in one of their experiments, manipulated the complexity associated with the antecedent and compared the retrieval speed at the Verb Phrase Ellipsis (VPE) site. They manipulated the complexity of the

antecedent, where, as in the following examples, (5a) contains the simple antecedent and (5b) the complex one. At the ellipsis-site, they found no reading time difference between the two instances, irrespective of the complexity of the antecedent. Under a naive reading of the "copying" theory, because the whole structure of the antecedent, including lexical items and the syntactic configuration, must be reproduced in the ellipsis-site, it is expected that the processing of the ellipsis-site will be slowed down by the increased size or the complexity of the antecedent. However, although the whole structure of the antecedent must be copied into the ellipsis-site, Frazier and Clifton (2001, 2005) propose that the parser employs a cost-free copying mechanism when the syntactic scope of the ellipsis is unambiguous, as signaled by "did" in the example. Under this mechanism, the structural component of the antecedent is copied/shared to the ellipsis-site by means of a pointer mechanism; the ellipsis-site and the antecedent are linked via of the pointer. As a result, no processing penalty arises at the ellipsis-site regardless of the antecedent complexity, because the structure of the antecedent is referenced again at the ellipsis-site rather than being constructed anew.

(5) a. Sarah left her boyfriend last May. Tina did too. Short antecedent
b. Sarah got up the courage to leave her boyfriend last May. Tina did too. Long antecedent

(Frazier and Clifton 2000: 132)

Martin and McElree (2008) also manipulated antecedent complexity in the antecedent clause (*understood Roman mythology vs. understood Rome's swift and brutal destruction of Carthage*), as in (6) in the VPE construction using a Speed Accuracy Tradeoff (SAT) task. The retrieval speed as well as the response accuracy was examined at the end of the sentence. Although the accuracy was affected by the complexity associated with the antecedent, the retrieval speed at the ellipsis-site did not differ between the simple antecedent and the complex one. These results can be best accounted in terms of the memory-pointer mechanism where candidate antecedent memory representations are reactivated proportionately to the match between their features and those of the cues at the ellipsis-site (Martin and McElree 2011 manipulated the antecedent complexity to investigate the reading times for different elliptical constructions, obtaining similar results).

(6) a. Simple antecedent
The history professor [understood Roman mythology], but the principal was displeased to learn that [the over worked students/*the overly worn books] attending summer session did not.

b. Complex antecedent
The history professor [understood Rome's swift and brutal destruction of Carthage], but the principal was displeased to learn that [the over worked students/*the overly worn books] attending summer session did not.
(Martin and McElree 2008: 895)

The above experiments indicate that the size/complexity of the antecedent does not impact the speed of ellipsis resolution. Thus, it has been argued that the online resolution of ellipsis is best modeled as a memory-pointer retrieval process. Other studies, however, suggest the converse: Increased reading times can sometimes be observed at the ellipsis-site depending on the antecedent's complexity (Murphy 1985). In (7), an example of VPE, the antecedent is more complex (and linearly further from the ellipsis-site) in (7b) than (7a). They found that the longer distance between the ellipsis-site and the antecedent engenders longer reading times in ellipsis resolution. Based on this, Murphy (1985) concluded that the structural component associated with the antecedent should have an impact on the real-time processing of ellipsis.

(7) a. Jimmy swept the floor. Later, his uncle did too.
b. Jimmy swept the tile floor behind the chairs free of hair and cigarettes. Later, his uncle did too.
(Murphy 1995: 294)

Given the mixed state of results in the present literature, we propose an experiment testing the effect of antecedent complexity in a different, and somewhat understudied, type of ellipsis. We investigate whether the complexity of the antecedent impacts the real-time processing of NPE. We make use of some signature properties of ellipsis, as discussed below, and hypothesize that if the resolution of ellipsis involves reconstructing the structure of the antecedent, the reactivation of a more complex structure for the antecedent should elicit slowdown effects in real-time processing. Alternatively, a

pointer-based reactivation mechanism predicts no such reading time penalty. Taking NPE constructions as an object of study has several advantages: Most importantly, the recognition of the NPE comes earlier than the end of the sentence, which also has the advantages of reducing the risk of reading time slowdown being obscured by the "wrap-up" effect[2] at the sentence end (Just and Carpenter 1980). Similarly, the non-predicative nature of nominal ellipses may reduce the influence of potential discourse-coherence effects (Kehler 2002) on participants' behavior. This study, then, aims to investigate how antecedent retrieval is affected by the structural complexity of the antecedent in the processing of NPE.

3. Experiment

We investigate whether the structural complexity of the antecedent and the processing complexity of the ellipsis correlate with each other (Murphy 1985; Paape et al. 2017). As reviewed earlier, some previous studies have found that the structure of the antecedent does not influence the processing of the ellipsis-site, plausibly because the ellipsis-site contains a pointer to an already-processed representation held in memory (Martin and McElree 2008, 2009, 2011). Others however have found evidence that the structure of the antecedent may influence the processing of the ellipsis-site, perhaps because the structural content is copied into the ellipsis-site rather than simply being reactivated (Murphy 1985; Hall 2021). In this study, we manipulated the complexity of the antecedent (thereby increasing the distance between the onset of the antecedent and the ellipsis-site both in number of words and in number of branching nodes) and investigated whether it impacts the processing of the NPE-site.

3.1. Participants, Materials, and Methodology

In this experiment, 43 native speakers of English with no history of

[2] The so-called wrap-up effect is the well-documented difficulty effect, indexed by reading-time slow-downs among other measures, that occurs at the end of a clause or sentence. Theoretical analyses of the effect differ (see Warren, White, and Reichle 2009 for a partial review); for our purposes, it is important simply to exclude them from the measurement region because they reflect processes of clausal integration which are not relevant to our research question.

language/reading disorders were recruited from the *Prolific Academic Platform.* They were compensated at a rate of approximately $8 USD/hr.

Critical experimental items consisted of 16 sentence sets in a 2×2 within-subjects factorial design, where *Complexity* (Complex vs. Simple) and *Structure of the second clause* (NPE vs. Pronoun) were manipulated. The complex antecedent included two possessive marked nouns followed by a head noun and the simple antecedent included a head noun. In Table 1 below, this manipulation corresponds to the difference between the nested possessive NP "*John's kettle's lid*" and the simpler singly-possessed NP *John's lid*[3]. The structure of the second clause differed in whether it included an NPE or simply an overt pronoun. The pronoun *it* was included as the baseline condition, as pronoun-antecedent resolution is immune to the structure associated with the antecedent (Kim and Yoshida, in prep). A sample set of stimuli is summarized in Table 1. A total of 16 items were distributed in a pseudo-randomized manner as a way of avoiding participants encountering identical experimental items in a row. In addition to the current experimental items, we also included 32 filler sentences that involved irrelevant manipulations. These fillers approximately matched experimental items in complexity and length.

<Table 1> Example Set of Stimuli for the Experiment

Factors		Examples
Complexity	Structure of the second clause	
Complex	*NPE*	John's kettle's lid was gorgeous and Mary's was lovely, to be frank.
Simple	*NPE*	John's lid was gorgeous and Mary's was lovely, to be frank.
Complex	*Pronoun*	John's kettle's lid was gorgeous and it was lovely, to be frank.
Simple	*Pronoun*	John's lid was gorgeous and it was lovely, to be frank.

3) This manipulation inevitably causes the linear distance from the ellipsis to the left edge of its antecedent to vary among conditions, but the distance to the right edge of the antecedent remains constant. Because the element of working memory that is the target of the retrieval process will be completed at the termination of the constituent, we do not expect this discrepancy to introduce a confound into our results. Future designs should, however, consider other structural configurations that allow the distance to the left edge of the antecedent to be held constant, perhaps by introducing adverbial modifiers into the intervening span.

3.2. Procedure

The experiment was deployed using the IbexFarm web-based presentation platform for running self-paced reading experiments (Drummond 2013). Subjects participated in the experiment remotely by clicking a link distributed via Prolific. Experimental items were presented in a word-by-word manner. Subjects were advised to read the sentences at a natural pace and answer the comprehension questions after each sentence. Initially a stimulus sentence was presented as a row of dashes; participants pressed the space bar to replace a substring of dashes with the word. Upon pressing the space bar again, the next unmasked dash was substituted for the next word, and the preceding word was, as before, replaced with dashes (Just, Carpenter, and Woolley 1982; Kim and Noh 2019; Choe 2022). Subjects were given four practice sentences before the experiment. All the experimental items were succeeded by a comprehension question, which could be answered using either the keyboard or the mouse. The time participants spent on each word was automatically recorded in the server. Subjects received instant feedback in cases where their answer was wrong. Comprehension questions were diversified, targeting different regions of the sentence. An example of the comprehension question was “Was something not normal?” or “Was the word ‘angry’ in the sentence?” and was diversified with respect to the targeted region and difficulty. The mean accuracy for the comprehension questions for the experimental items was 91%. The experiment took approximately 20-25 minutes to complete. Upon the completion of the experiment, participants were provided an experimental code to enter into the Prolific platform for monetary compensation.

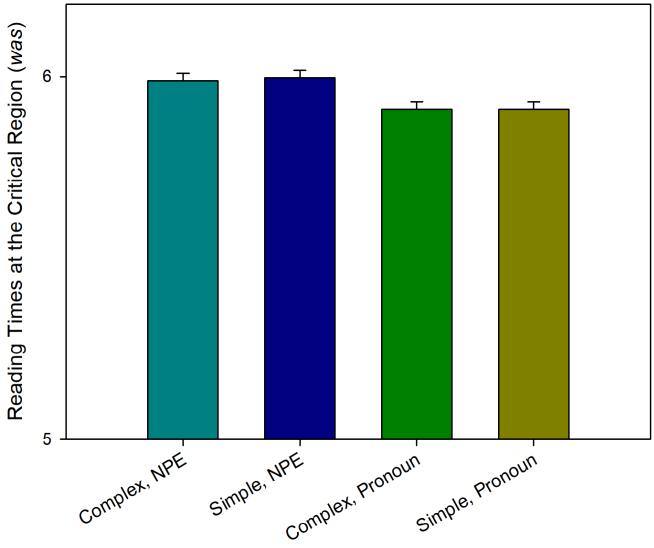
3.3. Predictions

Upon encountering the coordinative connective *and*, the parser needs to retrieve information associated with the antecedent because both conjuncts in a coordinated structure should contain a gap across the board (Coordinate Structure Constraint (CSC) as well as Across-the Board (ATB) movement restriction; Ross 1967; Williams 1978). If the parser reproduces the structure of the antecedent in the resolution of ellipsis (Murphy 1985), then when the antecedent involves a more complex structure, the processing of ellipsis should be more challenging to process than the antecedent with the simple structure.

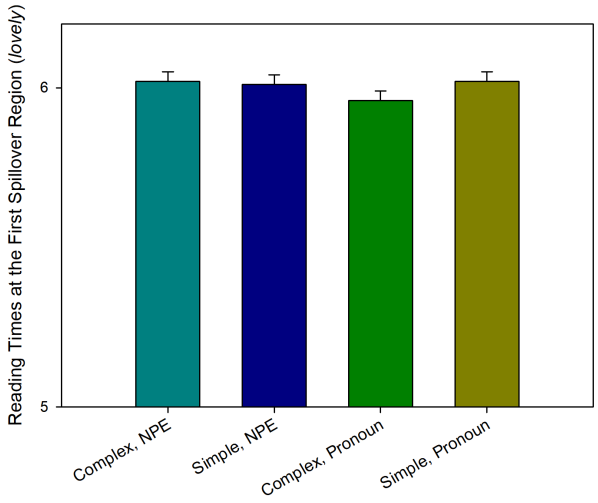
On the other hand, if the parser does not need to re-create the structure of the antecedent, and can instead appeal to the pointer-retrieval direct-access mechanism in ellipsis resolution, then the complexity of the antecedent should not exert difficulty effects in the processing of the NPE-site. On the former hypothesis, then, we expect reading-time slowdowns at or shortly after the ellipsis-site in the *Complex* conditions. On the latter hypothesis, we expect only a difference between the *NPE/Pronoun* conditions, since the *NPE* conditions will still require a retrieval operation that can be omitted in the *Pronoun* conditions, but one which is not sensitive to antecedent complexity.

Regardless of the retrieval mechanism, we expect no differential processing costs for the pronoun conditions between complex vs. non-complex antecedents, because the reader does not need to access the structural information associated with the pronoun.

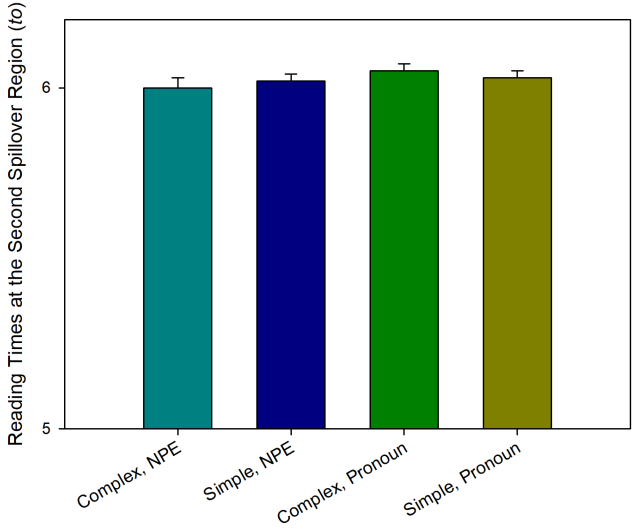
4. Results



<Figure 1> Reading Times at the Critical Region



<Figure 2> Reading Times at the First Spillover Region



<Figure 3> Reading Times at the Second Spillover Region

<Table 2> Summary of Results of Linear Mixed-Effects Regression for the Critical Region and the First and Second Spillover Regions

	Estimate	SE	t-value	p-value
Critical Region (*was*)				
(Intercept)	5.95	0.03	186.89	
Complexity	−0.01	0.02	−0.29	$p > 0.05$
Structure of the second clause	**−0.09**	**0.02**	**−4.90**	***p*<0.001**
Complexity × Structure of the second clause	0.01	0.04	0.17	$p > 0.05$
First Spillover region: Spillover region after the Critical Region (*lovely*)				
(Intercept)	6.00	0.04	133.42	
Complexity	−0.02	0.02	−0.96	$p > 0.05$
Structure of the second clause	−0.03	0.02	−1.01	$p > 0.05$
Complexity × Structure of the second clause	−0.07	0.04	−1.68	$p > 0.05$
Second Spillover region: Spillover region two words after the Critical Region (*to*)				
(Intercept)	6.03	0.04	161.63	
Complexity	−0.01	0.02	−0.15	$p > 0.05$
Structure of the second clause	0.02	0.02	1.39	$p > 0.05$
Complexity × Structure of the second clause	0.03	0.03	1.00	$p > 0.05$

The accuracy of the comprehension question was 91% and did not differ between conditions (simple antecedent: 90%, complex antecedent 91%). At the critical region (*was,* in the example illustrated in Table 2), a main effect of *Structure of the second clause* was observed ($\beta = -0.09$, *SE=0.02, t=−4.90, p<0.001*) such that sentences with NPE were read slower than sentences with the pronoun *it*. This is expected under both accounts of ellipsis retrieval. No main effect of *Complexity* ($\beta = -0.01$, *SE=0.02, t=−0.29, p>0.05*) nor an interaction between *Complexity* and *Structure of the second clause* was observed ($\beta = 0.01$, *SE=0.04, t=0.17, p>0.05*). This suggests that an additional operation in the recovery of the antecedent in the ellipsis-site (compared to processing a pronoun) elicits reading time slowdown (Frazier and Clifton 1998).

At the first spillover region (*lovely*), no effects were significant. No main effects of *Complexity* ($\beta = -0.02$, *SE=0.02, t=−0.96, p>0.05*) nor *Structure of the second clause* ($\beta = -0.03$, *SE=0.02, t=−1.01 p>0.05*) were observed, nor was an interaction between *Complexity* and *Structure of the second clause* ($\beta = -0.07$, *SE=0.04, t=−1.68, p>0.05*).

At the second spillover region (*to*) again, no effects were significant. No main effects of *Complexity* (β =−0.01, SE=0.02, t=−0.15, p>0.05) nor *Structure of the second clause* (β = 0.02, SE=0.02, t=1.39 p>0.05) were observed, nor was an interaction between *Complexity* and *Structure of the second clause* (β =0.03, SE=0.03, t=1.00, p>0.05).

5. Discussion

We predicted that the reading times at the NPE-site should be affected by the structural complexity associated with the antecedent if the structural content is retrieved and reconstructed at the ellipsis-site (Murphy 1985; Paape et al. 2017; Kim and Yoshida in prep). This is because copying of the antecedent into the NPE-site should be more costly as the structural complexity of the antecedent increases. The current finding shows no complexity effect in either the pronoun conditions or the NPE conditions. At first glance, this seems to be opposed to the retrieval of the structural content associated with the antecedent when the NPE-site is processed. Upon further consideration, however, there are actually two possibilities.

First, it could be that the structural content associated with the antecedent is not retrieved at the NPE-site at all. Under this scenario, the retrieval of the antecedent to the NPE-site is simply contingent on retrieving the featural content associated with the antecedent, based on the content-addressable memory mechanism (Lewis, Vasishth, and Van Dyke 2006). Since this mechanism of retrieval directly relies on the featural information of the antecedent, no structural information need be retrieved, and the ellipsis-site can be represented as a simple pointer to the memory representation of the previously processed structure (Martin and McElree 2008, 2009, 2011).

On the other hand, the absence of a complexity effect is also compatible with the cost-free copying view that Frazier and Clifton (2001) suggest. If structural information can be retrieved at no cost to the parser, such a mechanism could be difficult to distinguish from a content-addressable pointer mechanism. On a cost-free copying account, an *ellipsis/no-ellipsis* difference is still expected due to the burden of finding the antecedent (Frazier and Clifton 1998); it is just that the internal structure of the antecedent is predicted not to modulate the difficulty. The slowdown effect at the critical region in ellipsis sentences relative to the pronoun cases is clear evidence that some kind of

retrieval of the antecedent took place. While these results are not themselves enough to adjudicate between cost-free copying and pointer mechanisms, they are inconsistent with accounts according to which the antecedent material must be reconstructed in the ellipsis-site.

One further consideration, while not conclusive, may provide a suggestive reason to prefer the cost-free copying account over the cue-based pointer mechanism account. While the representation of a pointer to the antecedent structure in memory is in principle structure-insensitive, a known property of content-addressable memory retrieval systems of this kind is their susceptibility to similarity-based interference — when multiple memory traces are featurally similar, slowdown effects can occur because the similar representations are strongly activated by similar amounts by the feature-matching mechanism, creating difficulty in retrieving the correct one (Anderson and Neely 1996; Van Dyke and McElree 2006; Jäger et al. 2017). Similarity-based interference effects are somewhat counterintuitive, but the basic theoretical mechanism is uncomplicated: As the parser proceeds left-to-right through its input, it attempts to associate the feature-structures (matrices of, for example, *gender*, *number*, *animacy*, and *person* features) of the constituents that it is accepting with those of a set of recently processed constituents held in active memory.

The features of the current input are compared in parallel, via a content-addressable access mechanism, to those of the elements of the memory store, and if a match is found, a dependency between the current input and the matching element in active memory can be established — either via agreement or co-indexation and referential identity. Such a mechanism is demonstrably fast and efficient, and resembles the profile of human parsing behavior in many long-distance-dependency contexts, but it also displays a characteristic error signal: When multiple elements in active memory overlap considerably in their feature-structures, difficulty effects such as reading-time slowdowns are commonly observed, because the similar activation levels of the multiple candidate antecedents impede the parsing system's ability to select the correct one (see Lewis et al. 2006 *et seq.* for detailed discussion of this phenomenon.).

The *Complex* conditions, were such an effect present, would be expected to show a decrease in response accuracy (or possibly an increase in reading time), but no such effect was observed. Given that the structure of the second clause manipulation yielded a reliable result at the critical region, the absence of such an interference effect weighs somewhat in favor of the cost-free copying

explanation.

Overall, this result contributes to our understanding of antecedent retrieval for ellipsis in two ways. Most importantly, the absence of a complexity effect is difficult to explain by approaches to antecedent retrieval that take this operation to require recapitulation of the structure-building operations that yielded the antecedent. Additionally, the pattern of effects between the complex conditions shows no evidence of antecedent competition, the characteristic signal of content-addressable retrieval, which in turn suggests that something like the cost-free copying analysis of Frazier and Clifton (2001) may be more appropriate for the processing of ellipsis-antecedent relations of this kind.

Future research should investigate whether and how the complexity of the antecedent impacts the resolution of dependencies other than the elliptical ones. In the current study, the parser can only confirm an elliptical interpretation of its input once it encounters the possessive noun and the following verb in the second conjunct (see the examples in Table 1). Since this occurs after the parser accepts the coordinator *and*, reactivation of some information associated with the first conjunct is expected to take place, due to general grammatical constraints on coordinated structures: The so-called "coordinate structure constraint" (CSC) and "across-the-board movement" (ATB) restrictions (Ross 1967; Williams 1978) stipulate that movement or other transformations out of only one conjunct within a coordinated structure are illicit unless an equivalent operation applies out of its sister conjunct, and the sensitivity of the parsing system to constraints of this kind is amply attested (cf. the well-known *active-filler* effect). Long-distance dependencies that are subject to different constraints (possibly control or raising structures) are thus a valuable potential testbed to which the retrieval process in elliptical construction can be compared. Testing different dependencies with respect to the complexity of the antecedent may thus be informative about the extent to which the structure of the antecedent is retrieved upon integration of downstream cues (Frazier and Clifton 2001, 2005; Martin and McElree 2008, 2009, 2011). Additionally, such an experiment could distinguish whether difficulty effects in retrieval of the antecedent are due to decay of the antecedent's memory representation over time, or instead to the structural complexity of the antecedent itself.

6. Conclusion

In this study, we investigated the effect of antecedent complexity on the time-course of antecedent retrieval for NPE, finding that while NPE structures are (at the critical region where the ellipsis-site is first recognizable) more taxing to process in real-time than similar constructions with pronominal anaphora, the complexity of the antecedent yields no observable reading-time differences nor differences in accuracy. This pattern of results is inconsistent with approaches to ellipsis resolution in which the antecedent must be re-built in the ellipsis-site, and is broadly compatible with both pointer-based and cost-free copying accounts of ellipsis processing (Frazier and Clifton 2001; Martin and McElree 2008, 2009, 2011). However, crucially, the absence of an observable antecedent-competition effect is suggestive evidence in favor of the latter approach. Future work should attempt to expand the range of complexity-based manipulations (both in degree and nature of complexity; for example, adjuncts or relative clauses should be added instead of recursive possessors) to ensure that results of this kind are reliable across a range of antecedent structures.

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