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Anaphoric Islands and Anaphoric Forms: The Role of Explicit and Implicit Focus

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Abstract

Two experiments are reported in which people resolve references to sets of entities (e.g. lies) that have previously been introduced either explicitly into a text (“the lies”) or implicitly via a cognate verb (a form of the verb “to lie”). Pronominal references to such entities were judged as relatively unacceptable, and required longer judgement times when judgements were positive, compared to cases in which the antecedent was explicit. This finding suggests that the inference from the activity of lying to a set of lies is made in the backwards direction (Garnham & Oakhill, *Quarterly Journal of Experimental Psychology*, 40A, 719-735) . Results with full noun phrase anaphors show a different pattern, with no penalty in either times or acceptability judgements for the implicit case. The results are discussed in terms of Sanford and Garrod’s (1981, *Understanding written language*) hypotheses about reference processing and the notion of the centrality of an antecedent in a scenario.

Looking back to “Anaphoric Islands”

In an influential paper, Postal (1969) noted that, although the interpretation of “them” in (1) should clearly be Max’s parents, (1) is not an allowable way of expressing this intended message in English.

(1) Max is an orphan and he deeply misses them.

Using an analogy from the work of Haj Ross (1967) on what were then regarded as movement rules in syntax, Postal argued that lexical items, “orphan” in this case, are *anaphoric islands* to what he called outbound anaphora, where the lexical item is supposed to contain the antecedent for an anaphor outside of it. Postal considered the anaphoric island phenomenon to be all-or-none, and argued that the constraint was a syntactic one.

Garnham and Oakhill (1988) showed that attempts to refer into anaphoric islands both slowed people down and reduced judgements of acceptability, compared to the case where the antecedent was explicit. However, a substantial number of positive acceptability judgements were still recorded in the anaphoric islands versions. Furthermore, pronominal references into anaphoric islands are relatively common in everyday language (e.g. Oakhill & Garnham, 1992; Ward et al., 1991). In Garnham and Oakhill’s (1988) materials, unlike in (1), there was a morphological relation between the lexical item that was the anaphoric island and the obvious way of presenting the antecedent explicitly, as in (2).

(2) Little Billy always lies to his mother, but they are never convincing.

Following the publication of Postal’s paper, a number of linguists (e.g. Tic Douloureux, 1971; Lakoff & Ross, 1972; Corum, 1973; Watt 1975) suggested that the anaphoric island phenomenon was graded, rather than all-or-none, and that morphological relatedness was one of the factors that made anaphoric reference into an anaphoric island more acceptable. Later, Gregory Ward (Ward, Sproat, & McKoon, 1991; Ward 1997)

proposed that the constraints on reference into anaphoric islands are pragmatic in nature, rather than syntactic. From a psycholinguistic point of view, this idea suggests that attempts to refer into anaphoric islands should be understood in the context of general theories of anaphoric reference and inference.

One such theory is the one developed by Tony Sanford and colleagues (and in particular Simon Garrod, see Sanford & Garrod, 1981 for an early, detailed exposition). A crucial component of this theory is the distinction between explicit and implicit focus. Explicit focus contains representations of things recently mentioned in a text, and is the natural domain in which pronouns find their reference. Implicit focus provides a so-called extended domain of reference, including items whose existence is implied in a text, but not explicitly stated. References to items in implicit focus typically require full noun phrase anaphors. Sanford and Garrod’s presentation of their ideas reflects the shift in thinking from linguistic expressions as the antecedents for anaphors to representations of objects introduced by linguistic expressions (discourse referents) as antecedents.

A somewhat separate question is: how easy, or difficult, is it for anaphoric elements to pick up referents from their appropriate domain of reference, and, indeed, how hard is it for them to pick up referents from an inappropriate domain? A related issue is what factors affect the search for referents, and whether they are the same in the two domains of reference. The results of the classic study of full NP anaphora by Haviland and Clark (1974) are readily reinterpretable in the Sanford and Garrod framework. In (3) the antecedent for “the beer” is not explicit, but beer is a reasonably probable component of picnic supplies (in 1970s California!) and so can be thought of as existing in the extended domain of reference.

(3) We checked the picnic supplies. The beer was warm.

The second sentence of (3) is readily interpreted, but reading is slowed down compared with the case in which beer is explicitly mentioned as in (4).

(4) We got some beer out of the trunk. The beer was warm.

Later work has shown that the reading of full NP anaphors is not always slowed down when the antecedent is implicit, and hence in the extended domain of reference (e.g., Garrod & Sanford, 1981; Walker & Yekovitch, 1987). Indeed, there are cases where the interpretation of pronouns that refer to objects (apparently) in the extended domain of reference is not slowed either (Ward et al., 1991; Cornish et al., 2005). The qualification “apparently” is added, because it may be that implicit focus contains representation of a small number of items that are not explicitly mentioned in the text. The exact characterisation of these cases is not yet clear, but it appears to involve some notion of centrality of the implied object in the scenario presented in the text.

Postal (1969) restricted his discussion of NP-anaphora and anaphoric islands to pronouns rather than full noun phrase anaphors. On one reading of Postal, it might be expected that full NP anaphors that attempt to refer into anaphoric islands would also be problematic. However, (5) is not unacceptable in the way that (1) is.

(5) Max is an orphan and he deeply misses his parents.

One explanation would be that Max’s parents are in the extended domain of reference associated with the mention of Max, so that “his parents” does not have to be interpreted via an anaphoric reference into “orphan”. Garnham and Oakhill (1988), like Postal, considered only the pronominal cases. In the experiments presented below we compared these cases directly with parallel cases using full NP anaphors. As in the original study, we use examples where there is word form identity between the verbal anaphoric island (“lies” in (2)) and the head noun of the corresponding NP, “the lies”, and cases where this identity

is broken, by switching to the past tense (“lied” vs. “lies”). In both cases, however, a morphological relationship exists between the two forms, which distinguishes them from the Haviland and Clark picnic supplies/beer examples. Our interest was in the comparison of the pronoun and the full NP cases, and the extent to which our results could be accommodated into Sanford and Garrod’s framework, augmented by the notion of centrality in a scenario. For the full NP anaphors, we predicted little or no effect on acceptability as a function of the type of antecedent, but possibly an effect on reading times, depending on how readily available an antecedent for “the lies” is made by use of a form of the verb “to lie”, and to what extent the morphological relationship aids the search for a referent.

Experiment 1

Method

Participants. The participants were 32 members of the staff and student populations of Sussex University, who had not previously taken part other similar experiments. They were paid for their participation.

Materials. Thirty-two sets of experimental materials were constructed, and four passages were created from each set of materials. Each passage began with an introductory sentence, which was presented in two separate displays, with the division indicated by the / in (6).

(6) In our village there is an artist called Marvin/who is quite well known.

The passage then introduced, either directly or indirectly, a set of items of a particular kind (e.g., sketches) that would be referred to in the following sentence using an anaphoric noun phrase (e.g., “the sketches”) or a pronoun (e.g., “they”). When the items were introduced directly, a noun (e.g., “sketches”) was used, as in (7).

(7) Every Sunday he makes sketches by the river.

In the versions in which the items were introduced indirectly, a cognate verb (e.g., “sketches”) was used, as in (7’).

(7’) Every Sunday he sketches by the river.

The last sentence included the anaphoric reference as in (8).

(8) The sketches/They are admired by everyone.

Each passage therefore comprised four parts, which were shown in separate displays to the participants. The participants’ task was to judge whether the final part of the passage, containing the repeated reference to the set of items, was a sensible continuation from the rest of the passage. The four passages derived from one set of materials are shown in Table 1.

Table 1 about here

In addition to the 32 experimental items, 12 filler items were created in which the final part of the passage was not a sensible continuation from what had gone before. Participants were expected to answer “no” to these items. There were three items of the four types mentioned above, which were the same for all participants. An example is shown in (10).

(10) Although the vineyard owner is a very busy man
he still likes to help his staff with the bottling process
He corks the wine with his own hands.
The corks are all inserted by machine.

Apparatus. The experiment was run on a PC fitted with an Advantech PCLabCard to provide millisecond-accurate timing, and a version of the TSCOP software (Norris, 1984).

The four parts of the passages were presented one at a time on the computer's monitor, with each display starting 8 spaces from the left-hand side of the screen. In front of the screen, on a bench, were two response buttons, one labelled "YES" and the other "NO".

Design. There were two main factors of interest. The first was whether the antecedent was provided explicitly by a noun or indirectly via a verb. The second was whether the anaphor was a full noun phrase or a pronoun. Both factors varied within subjects and within materials. Four lists of materials were produced, with 8 items in each of the four main experimental conditions. One passage from each material set occurred in each list, and across the experiment each item occurred in every condition. Equal numbers of participants saw each of the four lists.

Procedure. The participants were tested individually in a small quiet laboratory. The order of the passages was randomised separately for each list. Participants were instructed to read the passages at their normal reading speed as though they were reading a book or a magazine. They were told not to spend too much time thinking about their answer to the question about whether the last display followed sensibly from the rest of the passage, but to base their answer on their first impressions. They were also told that there were no definitely right or wrong answers, but that we expected that most of the time they would think the answer was obviously "yes" or obviously "no".

The participants sat in front of the computer screen with the response buttons on the desk in front of them. At the beginning of each passage the prompt "NEXT ITEM" appeared on the screen. When it appeared, participants had to press the button on the side of their dominant hand to display the first part of the passage. Further presses displayed the other three parts of the passage. When the final part of the passage appeared it had a "*Y/N*" prompt at the end of the line as a reminder that a judgement was needed.

Participants had to press the appropriate button, “yes” or “no”, to indicate whether they thought it was a sensible continuation from the rest of the passage. The time between passages, during which the screen was blank, was 1 second. In case some people found that this time was too short, participants were instructed that they could pause for as long as they wished when they saw the words “NEXT ITEM”. All participants answered “yes” with their dominant hand and “no” with their other hand. They were not told whether or not their answers were correct.

Before the experiment proper there were 6 practice trials to familiarize participants with the experimental procedure and with the kind of passages they would be reading. There was 1 passage in each of the four conditions defined by the factors of type of antecedent and type of anaphor, and two passages that were intended to elicit “no” responses.

Results

Times to make positive judgements. Out of a total of 1024 responses to experimental passages, 175 (17%) were negative. In addition 28 data points (3%) were replaced because they lay more than 2.5 standard deviations above the participant’s mean. These data points were replaced by the cutoff value. The remaining times were subject to two analyses of variance, one in which participants was the random factor and one in which passages was the random factor. The mean times to make positive judgements are shown in Table 2.

Table 2 about here

There was a significant main effect of type of antecedent (noun phrase vs. verb), $F1(1, 31) = 6.27, p = .017$, Cohen's $d = .44$; $F2(1, 31) = 5.64, p = .024$, Cohen's $d = .42$. There was also an interaction between this factor and type of anaphor (noun phrase vs. pronoun), $F1(1, 31) = 5.11, p = .031$, Cohen's $d = .57$; $F2(1, 31) = 4.47, p = .042$, Cohen's $d = .54$. The interaction of antecedent type and anaphor type was explored using post-hoc repeated measures t-tests (Bonferroni corrected). For the implicit (verb based) antecedent only, the noun anaphor (Mean = 2128ms) was significantly faster to resolve than the pronoun (Mean = 2464ms), $t_1(31) = 3.74, p < .001$, Cohen's $d = .66$, $t_2(31) = 3.16, p = .003$, Cohen's $d = .56$. In contrast for the explicit (noun) antecedent the noun anaphor response time (Mean = 2136ms) did not differ from the pronoun anaphor (mean = 2066ms), $t_1(31) = 0.78, p = 0.44$, $t_2(31) = 1.07, p = 0.29$. Judgements were faster following anaphors with noun phrase antecedents than following anaphors with verbal antecedents, though this effect was confined to pronominal anaphors.

Number of Positive Judgements. The percentage of positive judgements in the main experimental conditions is also shown in Table 2. Both main effects and their interaction were significant: Type of antecedent, $F1(1, 31) = 24.22, p < .0001$, Cohen's $d = .88$; $F2(1, 31) = 27.11, p < .0001$, Cohen's $d = .94$; Type of anaphor, $F1(1, 31) = 22.80, p < .0001$, Cohen's $d = .76$; $F2(1, 31) = 17.41, p < .0001$, Cohen's $d = .68$; Interaction, $F1(1, 31) = 17.40, p < .0001$, Cohen's $d = 1.05$, $F2(1, 31) = 23.60, p < .0001$, Cohen's $d = 1.2$. The interaction for antecedent type by anaphor was explored using post-hoc repeated measure t-tests (Bonferroni corrected). For the implicit (verb) antecedent only, the noun anaphor was significantly more accurately resolved (Mean = 89.8%) than the pronoun (Mean = 63.3), $t_1(31) = 8.99, p < .001$; $t_2(31) = 10.46, p < .001$, both Cohen's $d > 1.5$. In contrast, accuracy

for the explicit (noun) antecedent the noun anaphor (Mean = 90.2%) did not differ from the pronoun anaphor (Mean = 88.3%), $t_1(31) = .64$, $p = .52$; $t_2(31) = .75$, $p = .46$

There were fewer positive judgements for pronominal anaphors with verbal antecedents than for the other three conditions.

Discussion

In a direct comparison, we found that pronominal and full noun phrase anaphors behave differently with immediately preceding verbal antecedents. Noun phrase anaphors were not affected, either in the number of positive judgements or the time to make a positive judgement, when a nonstandard (implicit) verbal antecedent replaced the standard noun phrase antecedent. Pronouns were affected on both scores¹.

Experiment 1 used passages in the present tense, so that there was a superficial match between the implicit “verbal” antecedent (“lies” the verb) and the explicit nominal antecedent (“lies” the noun). Garnham and Oakhill (1988) showed that, at least in the case of pronominal antecedents, this superficial match increased the number of positive judgements that a pronoun was acceptable following an implicit verbal antecedent. It is possible that such superficial matching might have affected the results in the verbal conditions of Experiment 1, and in particular that it might have masked some difficulty in the case of the full noun phrase anaphors. We therefore repeated Experiment 1 with the passages in the past tense, so that the exact superficial match between the verb (e.g. “lied” in this second Experiment) and the cognate plural noun (“lies”) was broken.

Experiment 2

Method

Participants. The participants were 32 members of the staff and student populations of Sussex University, who had not taken part in Experiment 1 or any other similar experiment. They were paid for their participation.

Materials. The materials were based on those used in Experiment 1. Each passage had all verbs changed from present to past tense. The four passages derived from one set of materials are shown in Table 3.

Table 3 about here

Apparatus. The apparatus was the same as that used in Experiment 1.

Design. The design was the same as that of Experiment 1.

Procedure. The procedure was the same as in Experiment 1.

Results

Times to make positive judgements. Out of a total of 1024 responses to experimental passages, 149 (15%) were negative. In addition 29 data points (3%) were replaced because they lay more than 2.5 standard deviations above the participant’s mean. These data points were replaced by the cutoff value. One participant answered “no” to every item in one condition, and this missing cell mean was replaced by the participants’ mean plus the condition mean minus the grand mean. The remaining times were subject to two analyses of variance, one in which participants was the random factor and one in which passages was the random factor. The mean times to make positive judgements are shown in Table 4.

 Table 4 about here

There was a main effect of type of antecedent (noun phrase vs. verb), $F1(1, 31) = 19.81, p < .001$, Cohen's $d = .79$; $F2(1, 31) = 13.05, p < .005$, Cohen's $d = .64$. There was also an interaction between this factor and type of anaphor (noun phrase vs. pronoun), which just missed conventional levels of significance in the by-subjects analysis, $F1(1, 31) = 3.98, p = .055$, Cohen's $d = .51$, $F2(1, 31) = 6.17, p < .05$, Cohen's $d = .63$). As in Experiment 1, the interaction for antecedent type by anaphor was explored using post-hoc repeated measure t-tests (Bonferroni corrected). As in Experiment 1, judgements were faster following anaphors with noun phrase antecedents than following anaphors with verbal antecedents. For the implicit (verb based) antecedent only, the noun anaphor was significantly faster to resolve (Mean = 1936ms) than the pronoun (Mean = 2186ms), $t_1(31) = 3.75, p < .001$, Cohen's $d = 0.66$, $t_2(31) = 5.24, p < .001$, Cohen's $d = .93$. In contrast, for the explicit (noun) antecedent the noun anaphor (Mean = 1842ms) response time did not differ from the pronoun anaphor (Mean = 1826ms), $t_1(31) = 0.24, p = 0.81$, $t_2(31) = 0.27, p = 0.79$.

Number of Positive Judgements. The percentage of positive judgements in the main experimental conditions is also shown in Table 6. Both main effects and their interaction were significant: Type of antecedent, $F1(1, 31) = 35.86, p < .0001$, Cohen's $d = 1.07$; $F2(1, 31) = 53.73, p < .0001$, Cohen's $d = 1.3$; Type of anaphor, $F1(1, 31) = 40.67, p < .0001$, Cohen's $d = 1.1$; $F2(1, 31) = 42.25, p < .0001$, Cohen's $d = 1.1$; Interaction, $F1(1, 31) = 38.76, p < .0001$, Cohen's $d = 1.5$; $F2(1, 31) = 51.27, p < .0001$, Cohen's $d = 1.8$. The interaction of antecedent type by anaphor was again explored using repeated measures t-tests (Bonferroni corrected).

For the implicit (verb) antecedent only, the noun anaphor was significantly more accurately resolved (Mean = 94.0%) than the pronoun (Mean = 60.0%), $t_1(31) = 13.37$, $p < .001$; $t_2(31) = 15.4$, $p < .001$, all Cohen's $d > 2.3$. In contrast, in the accuracy data for the explicit (noun) antecedent, the noun anaphor (Mean = 95.0%) did not differ from the pronoun anaphor (Mean = 93.0%), $t_1(31) = 0.78$, $p = 0.44$; $t_2(31) = .90$, $p = .37$. As in Experiment 1, there were fewer accurate judgements for pronominal anaphors with verbal antecedents than for the other three conditions.

Discussion

The results of Experiment 2 were similar to those of Experiment 1². Noun phrase anaphors were not affected, either in the number of positive judgements or the time to make a positive judgement, when a nonstandard (implicit) verbal antecedent replaced the standard noun phrase antecedent. Pronouns were affected on both counts.

Experiment 2 broke the superficial match between the verbal and noun phrase antecedents, so it was not possible to explain the lack of effects for full noun phrase anaphors in Experiment 1 on the basis of a superficial match between the anaphor and the implicit verbal antecedent.

General Discussion

We investigated the processing of (attempted) anaphoric references into anaphoric islands, as described by Postal (1969). We compared anaphoric references using pronouns, as we had previously studied in Garnham and Oakhill (1988), with references back to the same object using full definite noun phrase anaphors. For the case of pronoun anaphors we found, as in Garnham and Oakhill (1988), that understanding references into anaphoric islands (“Little Billy lies.....they (= the lies)...”) were slowed by about 400ms compared with parallel references with NP antecedent (“Little Billy tells lies.....they (= the lies)...”). The same

slowing was found when the exact parallelism between “lies”(V) and “lies”(N) was broken by switching to the past tense. We did not replicate the substantial decrease in positive judgements about the acceptability of the sentences in the past tense (without exact parallelism) compared with the present tense found by Garnham and Oakhill (1988). For full noun phrase anaphors, reading times were approximately the same as for pronominal anaphors with NP antecedents, though the comparison is compromised by the length difference between the two types of anaphor. This result held for both verbal and NP antecedents. Similarly, acceptability judgements for NP anaphors were always high, even when the antecedent was verbal, and were similar to those for pronominal anaphors with NP antecedents.

These results are readily explained within Sanford and Garrod’s theory of reference processing. For the pronoun anaphors, an NP antecedent places the relevant reference entity into explicit focus, which makes the anaphor both easy to process and perfectly acceptable. A verbal antecedent is most obviously thought of as placing the relevant reference entity into implicit focus (the extended domain of reference). It is hard to link a pronominal anaphor in such a case, and the sentence is relatively unacceptable because a pronoun should have an antecedent in explicit focus. The NP anaphors, however, are able to find antecedents in the extended domain of reference. They are acceptable even when the antecedent is verbal. In the examples that we used, sketches, for example, are a very likely component of a scenario in which an artist is described as sketching. A noun phrase anaphor can, therefore, pick up this antecedent with little processing difficulty. The morphological relation between “lies”, the plural noun, and “lies” or “lied”, the verb form, may aid this processing.

One unresolved issue is why a pronoun referring back into an anaphoric island incurs a processing penalty when pronouns in the centrality conditions in Cornish et al.'s (2005) experiments do not. For example in (11), it (= Mark's beard) causes no more problem when (11b) is omitted than when it is included.

(11a) Have you noticed that Mark isn't shaving.

(11b) His straggly beard makes him look like a tramp.

(11c) Yes, in fact he's really allowing it to grow now.

One possibility is that, although sketches appear to be central to the activity of sketching, the scenario in our sketching passage is actually about an artist living in a village, and sketches are not so central in that scenario. A beard (or at least the presence of facial hair), on the other hand, is central to a scenario in which a man is shaving. However, even if this idea is correct, we still need to explain why there is no time penalty for the noun phrase anaphor with a verbally introduced antecedent in these passages, even though there is such a penalty in the standard Haviland and Clark (1974) bridging inference cases. It may be, as suggested above, that lexical overlap (“lies”/”lies” or “lies”/”lied”) provides a crucial aid to mapping, but only in the extended domain of reference.

Another possibility for explaining the difference between our results and those of Cornish et al. is that anaphoric islands are, indeed, a special case where a syntactic constraint (on grammaticality) applies, and that people are slowed down because they are reading an ungrammatical sentence. Further work is needed to decide between these possibilities. Such work should include the development of an independent measure of centrality, so that the effect of centrality can be properly assessed.

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Footnote

¹It might be thought that the explicit (noun phrase) antecedent, noun phrase anaphor condition is contaminated by a “repeated name” penalty (Gordon, Grosz, & Gilliom, 1993). However, there was no evidence that such a penalty occurred. Despite the greater length of the crucial part of the sentence in the noun phrase anaphor condition, reading times were only 70 ms longer in that condition than in the pronominal anaphor, explicit antecedent condition (both F_s n.s.). In Experiment 2 the corresponding reading time difference was only 16 ms (both F_s n.s.).

²A combined analysis of the data from Experiments 1 and 2 provided no evidence, either in times or in judgements, for any difference in the pattern of the results between the two experiments (i.e. there were no interactions that included the experiment factor).

Table 1

The four passages created from one of the sets of materials used in Experiment 1.

Explicit antecedent, noun phrase anaphor

In our village there is an artist called Marvin
who is quite well known.

Every Sunday he makes sketches by the river.

The sketches are admired by everyone.

Explicit antecedent, pronominal anaphor

In our village there is an artist called Marvin
who is quite well known.

Every Sunday he makes sketches by the river.

They are admired by everyone.

Implicit antecedent, noun phrase anaphor

In our village there is an artist called Marvin
who is quite well known.

Every Sunday he sketches by the river.

The sketches are admired by everyone.

Implicit antecedent, pronominal anaphor

In our village there is an artist called Marvin
who is quite well known.

Every Sunday he sketches by the river.

They are admired by everyone.

Table 2

Mean times to read and make a judgement about the final display and proportions of “yes” judgements (in parentheses) in Experiment 1

	<u>Type of anaphor</u>					
	Noun phrase		Pronoun			
	Times	Prop.	Times	Prop.	Times	Prop.
Antecedent		“YES”		“YES”		“YES”
Explicit (noun phrase)	2136	90.2	2066	88.3	2101	89.25
Implicit (verb phrase)	2128	89.8	2464	63.3	2296	76.55

Table 3

The four passages created from one of the sets of materials used in Experiment 2

Explicit antecedent, noun phrase anaphor

In our village there was an artist called Marvin

who was quite well known.

Every Sunday he made sketches by the river.

The sketches were admired by everyone.

Explicit antecedent, pronominal anaphor

In our village there was an artist called Marvin

who was quite well known.

Every Sunday he made sketches by the river.

They were admired by everyone.

Implicit antecedent, noun phrase anaphor

In our village there was an artist called Marvin

who was quite well known.

Every Sunday he sketched by the river.

The sketches were admired by everyone.

Implicit antecedent, pronominal anaphor

In our village there was an artist called Marvin

who was quite well known.

Every Sunday he sketched by the river.

They were admired by everyone.

Table 4

Mean times to read and make a judgement about the final display and proportions of “yes” judgements (in parentheses) in Experiment 2

	<u>Type of anaphor</u>					
	Noun phrase		Pronoun			
	Times	Prop.	Times	Prop.	Times	Prop.
Antecedent		“YES”		“YES		“YES
Explicit (noun phrase)	1842	95	1826	93	1834	94
Implicit (verb phrase)	1936	94	2186	60	2061	77