

# Coreferential Interpretations of Reflexives in Picture Noun Phrases: An Experimental Approach

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## 1. Introduction

In English, reflexives (*himself*) and pronouns (*him*) have a nearly complementary distribution. That is, in the same structural position, a reflexive and a pronoun will have complementary referential domains:

- (1) Ken<sub>i</sub> saw himself<sub>i/\*j</sub>.
- (2) Ken<sub>i</sub> saw him<sub>j/\*i</sub>.

Binding Theory is the set of structural constraints on the relationship between different types of NPs and their (potential) antecedents. The following version is based on Chomsky (1981):

- (3) Binding Theory  
A: a reflexive must be bound within a local domain (roughly a sentence).  
B: a pronoun must be free (=not bound) within that same local domain.

Binding Theory can explain examples in (1) and (2): ‘himself’ is bound by ‘Ken’ within its sentence, and ‘him’ is not bound by ‘Ken’ within the sentence.

Although Binding Theory accurately predicts the complementarity of reflexives and pronouns, it has long been recognized that in certain constructions the basic Binding Theory, as outlined above, breaks down. The case we focus on here is the “picture” noun phrase, which is an NP headed by a “representational” noun such as *picture*, *film*, *photograph*, *novel*, etc., e.g. “Harry’s picture of Joe”. In a picture NP the head N itself may have several “arguments”; e.g., *Harry* and *Joe* in “Harry’s picture of Joe”; in addition, both the “possessor” and the PP are optional, as in, “a picture of Joe”, “Harry’s picture”, etc.

Reflexives in picture NPs may violate Binding Theory. An extreme case is provided by Pollard & Sag (1992). As (4) shows, a reflexive in a picture NP can take an antecedent that is not even within its sentence. Additionally, the binding in this case seems to be influenced by context. Compare (4) with (5):

- (4) John was going to get even with Mary. That picture of himself in the paper would really annoy her, as would the other stunts he had planned.
- (5) Mary was quite taken aback by the publicity John<sub>i</sub> was receiving. \*That picture of himself<sub>i</sub> in the paper would really annoy her, as would the other stunts he had planned.

To account for both the violation of the structural Binding Theory and the influence of context on these reflexives, Pollard & Sag (1992) and Reinhart & Reuland (1993) proposed to treat picture NP reflexives as a kind of anaphor not constrained by structural Binding Theory. Pollard & Sag called them “BT-exempt” anaphors, and Reinhart & Reuland called them “logophors”, drawing on certain similarities between these anaphors and the logophors found in some languages; we follow Reinhart &

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Reuland and call them logophors (or logophoric reflexives), though we remain agnostic on the question of how similar picture NP reflexives are to true logophors in other languages. Both Pollard & Sag and Reinhart & Reuland assumed that these anaphors are sensitive to non-structural, pragmatic factors.

An important issue surrounds the question of when a particular reflexive is constrained by structural Binding Theory and when it is a logophor. Reinhart & Reuland (1993) and Grodzinsky & Reinhart (1993) suggest that the interpretation of the reflexive in ellipsis contexts and in sentences in which its antecedent contains the quantifier “only” provide a kind of “test”. They assume that structural reflexives, which are constrained by BT; are bound variables. Logophoric reflexives are not constrained by BT, but are constrained by pragmatic/discourse factors, and may behave as coreferential anaphora (like pronouns).

We begin with ellipsis. Pronouns can behave as bound variables or coreferential anaphora. Example (6) is ambiguous between an interpretation in which the elided phrase contains a variable bound by the immediate subject of the elided VP (see (7)), or a pronoun coreferential with the subject of the previous sentence (see (8)). Here and in the following examples we use (6) and (7) for the bound variable and underlining for coreferentiality; and [e] indicates the elided phrase.

- (6) Alfred thinks he is a great cook, and Felix does [e], too.  
 (7) Alfred<sub>x</sub> thinks that x is a great cook, and Felix<sub>y</sub> <thinks that y is a great cook>  
 (8) Alfred thinks that he is a great cook, and Felix <thinks that he is a great cook>

Unlike pronouns, reflexives are claimed to be bound variable anaphora only (Reinhart & Reuland, 1993), so in example (11), the coreferential reading in which the elided reflexive is coreferential with the subject of the preceding sentence does not seem to be available:

- (9) Lucie praised herself, and Lili did [e], too.  
 (10) Lucie<sub>x</sub> praised x, and Lili<sub>y</sub> <praised y>  
 (11) ??Lucie praised herself, and Lili <praised herself>

We will build on this claim, though we note that it is not uncontroversial (cf., Sells et al. 1990 for discussion). Indeed, we are currently testing this claim directly in a second set of experiments (Goldwater & Runner, in progress).

Unlike structural reflexives, logophoric reflexives behave as pronouns; they can act as bound variables or coreferential anaphora. The elided reflexive in (12) can be bound by its local subject ‘Lili’ (see (13)), or be coreferential with the subject of the previous sentence ‘Lucie’ (see (14)):

- (12) Lucie liked the picture of herself, and Lili did [e], too.  
 (13) Lucie<sub>x</sub> liked the picture of x, and Lili<sub>y</sub> <liked the picture of y>  
 (14) Lucie liked the picture of herself, and Lili <liked the picture of herself>

The other test proposed by Reinhart & Reuland and Grodzinsky & Reinhart comes from the interpretation of anaphora when the antecedent contains the quantifier ‘only’. Pronouns in such a context can be either bound variable or coreferential anaphora (see (15)-(17)), reflexives can receive only bound variable interpretations (see (18)-(20)), and logophors pattern like pronouns, having either bound variable or coreferential interpretations (see (21)-(23)):

- (15) Only Alfred thinks he is a great cook.  
 (16) Alfred<sub>x</sub> is the only person(x) such that x thinks x is a great cook.  
 (17) Alfred is the only person that thinks Alfred is a great cook.  
 (18) Only Lucie praised herself.  
 (19) Lucie<sub>x</sub> is the only person(x) such that x praised x.  
 (20) ??Lucie is the only person that praised Lucie.  
 (21) Only Lucie buys pictures of herself.  
 (22) Lucie<sub>x</sub> is the only person(x) such that x buys pictures of x.  
 (23) Lucie is the only person that buys pictures of Lucie.

According to these data, then, pronouns can have both bound variable and coreferential interpretations, while structural reflexives only receive bound variable interpretations. Logophors are like pronouns, and can have both bound variable and coreferential interpretations.

## 2. Current Study

We wanted to investigate the claim that picture NP reflexives were logophors and that they could receive both bound variable and coreferential interpretations. To do this we applied the ellipsis and “only” tests in an experimental setting. The basic question we asked was: Do native English speakers interpret picture NP reflexives as both coreferential and bound variable anaphora?

The participants in the study were 16 University of Rochester undergraduates. They were seated in front of a computer monitor, and they listened to prerecorded sentences. Their task was to verify if the displayed scene matched the sentences heard by pushing a yes or no button. We monitored their eye-movements as well (though we do not report the data here).

There were four auditory conditions, what we call the Ellipsis and No-Ellipsis conditions, and the Only and No-Only conditions:

Ellipsis/No-Ellipsis condition:

Ellipsis

(24) Joe is seated below a picture of himself and Ken is, too

No-Ellipsis

(25) Joe is seated below a picture of himself and Ken is seated below a picture of himself, too

Only/No-Only condition:

Only

(26) Only Joe is seated below a picture of himself

No-Only

(27) Joe is seated below a picture of himself

There were three different visual displays. The displays divided the computer screen into quadrants. The upper two quadrants each contained a digitized framed photograph of one of three male dolls (Joe, Harry, or Ken). The lower two quadrants each contained an image of one of the three dolls, sitting, standing, or lying down. In the “Subject Match” display condition the two dolls in the lower quadrants were below pictures of the doll mentioned as the subject of the sentence (see Figure 1a). In the “Alternate Match” display condition, the two dolls were each below a picture of himself (see Figure 1b). And in the “No Match” (control) display condition, the doll mentioned as the subject of the sentence was under a picture of himself, but the second doll was under a third doll that had not been mentioned in the instructions (see Figure 1c).



a. Subject Match: both dolls seated below picture of subject

b. Alternate Match: each doll seated below a picture of himself

c. No Match: second doll seated below picture of third doll

Figure 1. Display Conditions

Additionally, three different predicates were used: *is seated below*, *is standing below*, *is lying below*. The scenes, pictures, dolls’ positions and roles, and expected “yes” vs. “no” responses were all

counterbalanced. Filler trials containing similar sentences and scenes but without the experimental variables (e.g., no reflexives, Ellipsis or ‘only’ sentences) were also included.

## 2.1 Predictions and Results

In the Ellipsis/No Ellipsis conditions (see (24)-(25)), beginning with the Subject Match display (see Figure 1a), if reflexives received a coreferential reading, which means the elided ‘himself’ was interpreted as the subject doll, there should be more “yes” responses on the Ellipsis condition than on the No-Ellipsis condition. This prediction was borne out. On about 18% of Ellipsis trials, participants’ responses indicated that the elided reflexive refers to the subject doll. While on only about 1% of No-Ellipsis trials did they interpret the reflexive as the subject doll. This difference was significant (one tailed<sup>1</sup>  $t(14) = 1.848$ ,  $p < .05$ ). This result suggests that participants were able to interpret the elided picture NP reflexive coreferentially.

In the Ellipsis/No-Ellipsis conditions (see (24)-(25)) with the Alternate Match display (see Figure 1b), if reflexives were interpreted coreferentially, meaning that the elided ‘himself’ was interpreted as the subject doll, there should be more “yes” responses on No-Ellipsis condition than on the Ellipsis condition. This prediction was also borne out. On about 87% of Ellipsis trials participants’ responses indicated that the elided reflexive refers to the non-subject doll. On the other hand, on virtually 100% of the No-Ellipsis trials participants interpreted the reflexive as referring to the non-subject doll. This difference was significant (one tailed  $t(14) = 2.646$ ,  $p < .01$ ). This result again suggests that listeners were assigning coreferential interpretations to the reflexives in picture NPs under ellipsis. Perhaps somewhat unexpectedly, the fact that for only 87% of the trials did participants respond with “yes” suggests that they were actually rejecting the non-coreferential (i.e., the bound variable) interpretation on 13% of trials. They seemed in fact to favor the coreferential interpretation.

Finally, in the Ellipsis/No-Ellipsis (control) condition with the No Match display (see Figure 1c), very few “yes” responses were expected on either condition. And indeed there were virtually zero “yes” responses.

Turning now to the Only/No-Only conditions (see (26)-(27)), in the Subject Match display, if reflexives received a coreferential reading, meaning that the participants’ responses indicated that they thought that the subject doll was the only doll below a picture of the subject doll, more “yes” responses were expected on the No-Only condition. Indeed, on about 91% of Only trials participants interpreted the reflexive as referring to the subject. This means that on 9% of trials it referred to the non-subject. On virtually 100% of No-Only trials the reflexive referred to subject. This difference was marginally significant (one tailed  $t(14) = 1.74$ ,  $p = .052$ ).

In the Only/No Only condition (see (26)-(27)) on the Alternate Match display, if reflexives could receive coreferential reading, meaning participants thought that again the subject doll was the only doll below a picture of the subject doll, more “yes” responses were expected on the No-Only condition. On about 9% of Only trials participants interpreted the reflexive as referring to (only) the subject and not the non-subject. This means that on 91% of trials participants rejected the claim that the subject doll was the only doll seated below the subject doll. On virtually 100% of No-Only trials participants interpreted reflexive as referring to subject. This difference (between the 91% and 100%) was significant (one tailed  $t(14) = 2.256$ ,  $p < .025$ ).

Again in the Only/No Only condition with the No Match (control) display, there should be all “yes” responses on both conditions and the results were virtually 100% “yes” responses.

Summarizing, the response data from this study strongly suggested that participants did interpret picture NP reflexives in the Ellipsis and “only” constructions as coreferential anaphora. This supports the claim made by Reinhart & Reuland (1993) and Grodzinsky & Reinhart (1993) that these anaphors are logophors.

In addition to the “yes”/“no” responses discussed above, we also measured latency from the onset of the auditory stimulus until the “yes”/“no” response button was pushed. Our expectation was that latency would increase on trials involving increased “competition” from multiple available interpretations. The hypothesis that both the bound variable and coreferential interpretations are available to picture NP reflexives under ellipsis and with “only” leads to the expectation that latencies should be increased on those conditions. However, this is predicted to be the case on only the Subject

<sup>1</sup>One tailed tests are used throughout because the direction of the results is clear: it is not expected for the No-Only/No-Ellipsis conditions to trigger *more* coreferential than the Only/Ellipsis condition.

Match and Alternate Match display conditions. On the No Match display condition, because the second picture is of a third doll not mentioned, there should be only one interpretation available regardless of the auditory stimulus (whether Ellipsis, No-Ellipsis, Only, or No-Only). Thus the No Match display provides a baseline. Increased latency is expected for the Subject Match and Alternate Match displays, but only on the Ellipsis and Only conditions.

Figure 2 displays the overall latency data, combining Ellipsis/Only results on the one hand (open circles) and No-Ellipsis/No-Only results on the other hand (closed boxes). Several observations can be made about these results. First, the No-Ellipsis/No-Only conditions did not vary at all across display types, Alternate Match (AM), Subject Match (SM) and No Match (NM). That is, participants' latencies were the same for the No-Ellipsis/No-Only conditions regardless of visual display. Given that the No Match display was our baseline, with no competition predicted at all, this means that on the No-Ellipsis/No-Only conditions, participants' latencies were identical in all cases to the condition in which there was no competition. This is what was expected: no competition, no increase in latency.

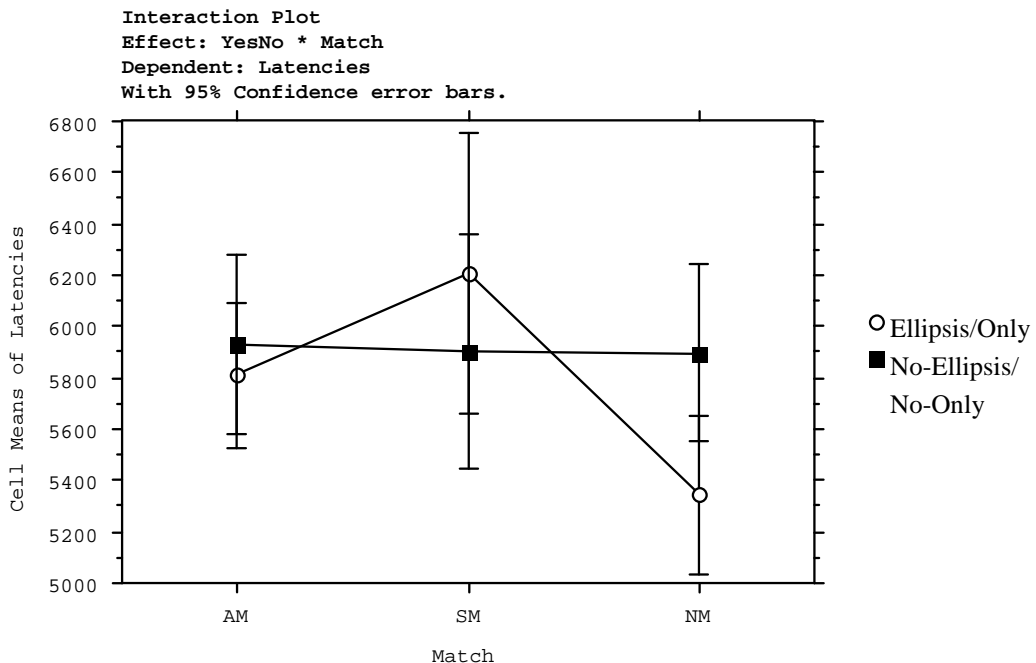


Figure 2. Overall latencies

Second, on the Ellipsis/Only conditions, the latencies on the Alternate Match and Subject Match display conditions were higher than on the No Match display condition. This is consistent with the claim that there was more competition on those conditions, leading to higher latencies. An unexpected difference is between the Alternate Match and Subject Match display conditions. The latter resulted in higher latencies. A possibility we still need to explore is that the proportion of “yes” vs. “no” responses may have also played a role in overall latencies. Recall that on the Alternate Match display condition participants had more “no” responses than on the Subject Match condition on the Only auditory condition. The overall latency data, then, are also consistent with the hypothesis that the reflexives in picture NPs are being interpreted both coreferentially and as bound variables under ellipsis and in the “only” construction.<sup>2</sup>

We also plotted the data for just the Ellipsis/Only conditions, removing the No-Ellipsis/No-Only data (Figure 3). This allowed us to see the differences between the Ellipsis (open circles) and Only (closed boxes) conditions. The predictions were that the latencies should be higher for the Alternate and Subject match conditions when compared with the No Match condition. This turned out to be the

<sup>2</sup>Since latencies were calculated from the onset of the instruction until the “yes”/“no” button was pushed, overall the Ellipsis condition and No-Only condition latencies should be smaller. Since the only analyses of interest were the comparison of the latencies across display types, this factor does not affect the overall results.

case for the Only condition. However, for the Ellipsis condition, the latencies were higher on the Subject Match display condition but the latencies on the Alternate Match and No Match display conditions were not different. Again, a possibility to be explored is that this difference may be due to the different proportions of “yes” and “no” responses across the different conditions.

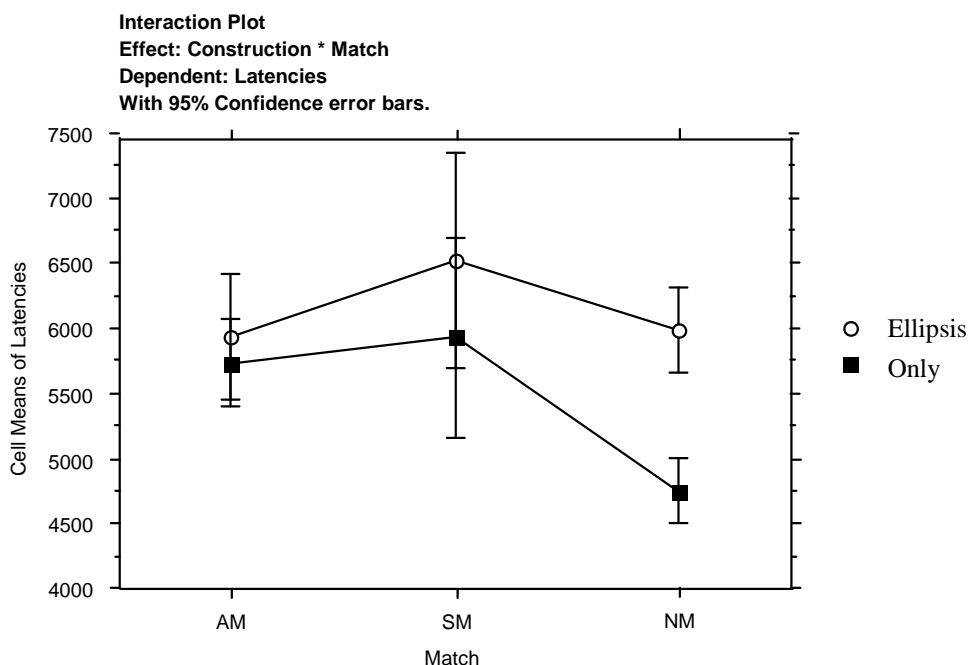


Figure 3. Latencies on Ellipsis and Only conditions

Summarizing, overall the latency data are consistent with the claim that there is more competition on the Ellipsis and Only conditions when accompanied by the Alternate Match and Subject Match displays. This mirrors the “yes”/“no” response results which showed that indeed on those conditions participants did indeed allow for multiple interpretations.

### 3. Conclusions

The coreferential interpretation was available for reflexives in picture NPs in the ellipsis and ‘only’ constructions. If the coreferential interpretation does indicate a logophoric use of the reflexive, then this study supports the claim that picture NP reflexives are logophors

This conclusion supports the view of Binding Theory advocated in Pollard & Sag (1992) and Reinhart & Reuland (1993). Structural Binding Theory applies for true argument reflexives, but the logophoric analysis applies to picture NP reflexives.

This study is part of a larger set of studies seeking to clarify the structural and pragmatic constraints on pronouns and reflexives. This includes research on picture NPs containing possessors (e.g., Joe’s picture of himself/him) (see, e.g., Runner, Sussman & Tanenhaus 2002, 2003), on the pragmatic factors affecting picture NP pronouns and reflexives (Kaiser, Runner, Sussman & Tanenhaus 2004) and on coreferential and bound variable interpretations of object reflexives (Goldwater & Runner, in progress).

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