Bound Variables and C-Command

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Abstract

It has long been assumed in linguistics that bound variable interpretations of pronouns are possible (only) when a quantified expression c-commands the pronoun. In two studies in which readers’ eye movements were recorded, we examined the processing of pronouns bound by universal quantifiers. Experiment 1 compared examples where the quantifier c-commands the pronoun (‘Every British soldier thought he killed an enemy soldier’) with examples where it doesn’t (‘Every British soldier aimed and then he killed an enemy soldier’). Although there were no first pass differences, re-reading time showed that both quantifier examples took longer to read than nonquantified controls (‘The old British soldier’), but there was no special penalty in examples when the quantifier failed to c-command the pronoun. Experiment 2 investigated intersentential binding (telescoping): ‘John Frederick/Each executive/Every executive went home. He broiled a steak. He ate dinner. Then he watched television.’ Second pass and total reading times in the region containing the first pronoun were longer for quantified examples than name examples. But there was no indication that telescoping is tightly restricted, for example, to contexts with ‘each’ or to discourses describing stereotypical events composed of predictable subevents. The results suggest that bound variable interpretations are more generally and more readily available than is often assumed. They fit well with Bosch’s (1983) attempt to limit pronoun occurrences to just two types: anaphoric referential pronouns and syntactic agreement pronouns. On this view, ‘bound variable’ interpretations without c-command are really anaphoric pronouns with inferred antecedents. This view is discussed along with the challenges it faces.

1 INTRODUCTION

Numerous psycholinguistic studies have investigated the processing of pronouns (see Gordon et al. 1999 for a recent discussion). However, with a few exceptions discussed below, these studies examined the processing of pronouns that are coreferential with some other phrase in the sentence or discourse. Here, we will focus instead on the processing of pronouns that are bound by a quantified expression, such as (1).

(1) Everyone/Nobody thinks he is a genius.

The classic approach to binding (Chomsky 1981) assumes that all noun phrases have referential indices that are either coindexed with
a c-commanding noun phrase (‘bound’) or free. For example, in (2a) the NP ‘Mary’s brother’ c-commands ‘himself’ because the first node dominating ‘Mary’s brother’ also dominates ‘himself’.¹

(2) a. [Mary’s brother]i bought a book for himselfi.
b. *[Mary’s]i brother bought a book for herselfi.

In other words, ‘Mary’s brother’ is higher in the syntactic tree (in the relevant sense) than ‘himself’ and therefore can bind ‘himself’. By contrast, in (2b) ‘Mary’ does not c-command ‘herself’. Consequently ‘Mary’ cannot bind ‘herself’ and (2b) is ungrammatical because ‘herself’ must be bound.

The notion of c-command (Reinhart 1983) has played an important role in the characterization of binding phenomena, as in (2), and also in the theory of movement (e.g. a moved interrogative phrase (‘who’) must be related to a position that it c-commands). But, the focus of the present study is the role of c-command in governing the bound variable interpretation of pronouns, as in (3a) where ‘he’ is bound by the universal quantifier ‘every (man)’.

(3) Every man thinks he is intelligent.
   a. ∀x(max(x)): x thinks x is intelligent. (bound)
   b. ∀x(man(x)): x thinks y is intelligent. (coreferential or ‘free’)

It is generally assumed that a pronoun may be bound by a quantifier (i) only if the quantifier c-commands the pronoun and (ii) the quantifier and pronoun occur in the same sentence. Hence, ‘every man’ cannot bind ‘he’ in (4) because ‘every man’ does not c-command ‘he’.

(4) He thought every man was intelligent.
   [cannot mean: For each man (x) x thought x was intelligent.]

(5) is ungrammatical on the bound variable interpretation, where every man sat down after he walked in.

(5) Every mani walked in. *Hei sat down.
   ∀x(man(x)) [walked in (x) ∧ sat down (x)]

This is due to the pronoun being in a different sentence than the quantified phrase.

¹ A node A c-commands a node B if the branching node ai most immediately dominating A either dominates B or is immediately dominated by a node aj which dominates B, and aj is of the same category type as ai (see Reinhart 1983).
The above view of how quantifiers bind pronouns is too simple. Counter-examples exist to both the c-command constraint and the same-sentence constraint. And, that is what interests us. Does the ‘classical’ view, where a pronoun may be bound by a c-commanding quantifier in the same sentence, characterize the prototypical use of bound pronouns with other less typical or less canonical uses tolerated? Or is the classical view simply not the correct approach at all to bound variable interpretations of pronouns?

Existing psycholinguistic studies reinforce the concern that c-command is not fully adequate as a characterization of the circumstances under which bound anaphora is allowed. Hirschberg & Ward (1991) reported auditory and written questionnaire studies, examining several types of sentences. Even in sentences like (6), where ‘AI’ fails to c-command ‘it’s’, perceivers report a fair number of bound variable interpretations, where people who study AI think AI is critical to cognitive science.

(6) People who study linguistics think it’s critical to cognitive science, and so do people who study AI [think it’s crucial to cognitive science].

Sentences without c-commanded pronouns, like (6), received 24% bound interpretations in the auditory questionnaire, 30% bound in the written test. Sentences with c-commanded pronouns received 42% bound interpretations in the auditory questionnaire, 48% in the written test.

Gordon & Hendrick (1998) also studied bound interpretations and reported results similar to those of Hirschberg and Ward. They had participants rate the acceptability of sentences on a 5-point scale where 5 is fully acceptable. They found that non-c-command sentences were rated as being less acceptable than c-command sentences. In cases where the quantifier preceded the pronoun the difference was small but significant. In sentences where the pronoun preceded the quantifier, acceptability was degraded strongly, as summarized in Table 1.

The off-line studies of Hirschberg & Ward (1991) and Gordon & Hendrick (1998) suggest that c-command may provide part of the account of binding pronouns. Bound variable interpretations of pronouns are more acceptable when the pronoun is c-commanded by its binder than when it is not, at least in sentences not specially designed to contextually support binding. However, c-command cannot provide the complete account of bound variable interpretations: clearly bound variable interpretations are possible in some cases without c-command
Table 1 Results of Gordon Hendrick’s (1998) rating study

<table>
<thead>
<tr>
<th>C-command?</th>
<th>Sentence Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. yes</td>
<td>Each girl decided what she could do. 4.83</td>
</tr>
<tr>
<td>b. no</td>
<td>Each girl’s parents decided what she could do. 4.05</td>
</tr>
<tr>
<td>c. yes</td>
<td>She decided what each girl could do. 2.43</td>
</tr>
<tr>
<td>d. no</td>
<td>Her parents decided what each girl could do. 2.42</td>
</tr>
</tbody>
</table>

and are rated somewhat acceptable, even if less so than cases obeying the c-command restriction.

The classic c-command approach seems better able to deal with the ‘core’ cases of binding. For example, it can explain why (7), is ungrammatical: the negative does not c-command ‘his’ and therefore cannot bind it.

(7) * Nobody joined the army and his mother joined the navy.

The classic c-command approach also explains the lesser acceptability of binding in non-c-command environments. However, this theory by itself cannot explain the permissibility of binding without c-command.

An alternative approach is to reject the c-command approach to bound variable interpretations, at least in the case of universal quantifiers. One such theory is offered by Williams (1997) who suggests that anaphoric dependencies must be either forward (the pronoun follows its binder) or backwards and down (the pronoun precedes but is c-commanded by its antecedent). Williams’ approach readily explains the non-c-command examples of bound variable interpretation because the binder in those examples precedes the pronoun. But on this approach it is less clear why c-command should have affected the prevalence of bound variable interpretations or their rated acceptability in the studies reviewed above, and unacceptability of (7) is left unexplained.

In what follows we present two on-line (eye movement recording) studies. The question in Experiment 1 is whether readers spend less time processing a bound pronoun when the quantified expression c-commands the pronoun than when it does not.

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2 This example is due to Kyle Johnson, who notes that it contrasts with ‘No man joined the army and his mother the navy’, which he analyses as across-the-board movement of the verb, creating a structure where ‘nobody’ c-commands ‘his’.
EXPERIMENT 1

2.1 Method

Participants. Thirty-two members of the University of Massachusetts community received payment or course credit for their participation in the study. All participants were native English speakers with normal or corrected vision and were naive with respect to the purpose of the study.

Materials. Sixteen sentences were constructed with four versions of each. The sentence either began with a quantifier (‘Every’) or a NP (‘The old British soldier’) and contained either a conjoined clause or a complement clause, as illustrated in (8):

(8) a. Every British soldier aimed and then he killed an enemy soldier. (Quantifier-Conjoined)
   b. Every British solder thought that he killed an enemy soldier. (Quantifier-Complement)
   c. The old British soldier aimed and then he killed an enemy soldier. (NP-Conjoined)
   d. The old British soldier thought that he killed an enemy soldier. (NP-Complement)

In the a version (Quant-Conj), the subject of the first clause contained a universal quantifier. The second clause was a conjoined clause with a pronominal subject. The quantified expression does not c-command the subject of the conjoined clause. In the b version (Quant-Comp), the second clause was an embedded complement clause and therefore the quantified subject of the first clause c-commands the subject of the second clause. The c version (NP-Conj) and the d version (NP Comp) are the non-quantified counterparts of the a and b versions, respectively. These conditions serve as controls because they differ in structure in the same way that the a and b versions differ. However, because the c and d versions do not contain quantifiers, the pronoun in these versions is coreferential with the subject of the first clause (i.e. it need not be bound).

The sentence presentations were counterbalanced so that each participant saw only one version of each sentence. The sixteen experimental sentences were embedded in 80 filler sentences that consisted of a wide variety of structures. All experimental sentences appear in Appendix 1.
Predictions. If c-command correctly characterizes the central cases of pronominal binding, we might expect the reader to take longer to process the pronoun (and immediately following word) in (8a) where the c-command constraint is violated, than in (8b), where it is not. Because (8a) and (8b) differ in structure, the difficulty of (8a) should appear as a larger difference between (8a) and its control (8c) than the difference between (8b) and its control (8d).

Apparatus. Eye movements were recorded by a Fourward Technologies Dual Purkinje Eyetracker (Generation V). The eyetracker has a resolution of less than 10′ of arc. The participants' view of the screen was binocular, but only the right eye was monitored for eye location. The signal from the eyetracker was sampled every millisecond by a 486 computer. The average vertical and horizontal positions of the eye were compared with those of the previous position to determine whether the eye was fixated or moving. The sentences were double-spaced and presented on a NEC MultiSync 4FG colour monitor. During the experiment, all participants were seated 60 cm from the monitor and three characters equalled 1° of visual angle. The luminance of the screen was adjusted to a level of brightness that was most comfortable for the participant and then held constant throughout the study. The experimental room was dark except for a small indirect light that enabled the experimenter to keep notes during the experiment.

Procedure. When participants arrived for the experiment, they were given a general description of the experimental situation and procedure. Participants were told that they would be expected to read a series of sentences on a computer screen while their eye movements were monitored. They were also told that they would occasionally be asked comprehension questions about the sentence they had just read. They were told that two statements would appear on the screen and that they were to choose the one which they thought was correct. They were given clear instructions about which key to press to make their choice. Approximately 25% of the sentences were followed by a question. After each participant understood the procedure, a bite bar was prepared which served to eliminate head movements.

Once the participant was seated in front of the monitor, an initial calibration procedure that took approximately five minutes was completed. The calibration of the eye tracking system was checked regularly to ensure that accurate records were being obtained. Calibration was checked on a screen that appeared between each
sentence. The screen consisted of two rows of five boxes arranged parallel to each other. Additionally, a single box appeared in the centre of the screen between the two rows of boxes. The top row of boxes corresponded to the location of the first line of text. Between each trial, the participant was asked to fixate on the box in the center of the screen, then on the centre of the top row of boxes. Next, the participant was asked to move his/her eyes across the top row, box by box, to the left. The far-left box marked the location of the first letter of the sentence. As soon as the experimenter determined that the participant was fixating on the far-left box, the sentence was presented onto the screen. The participant was told ahead of time to click a button to erase the sentence from the screen after reading it. Once the sentence had been erased and the trial ended, the two rows of boxes again appeared on the screen. The participants were told to fixate on the far-left box when they were ready for the next sentence. This procedure was repeated throughout the entire practice and experimental sessions.

2.2 Results

Trials on which there was a track loss (3% of the trials) were eliminated from the data analyses. The sentences were divided into four regions: (1) the beginning of the sentence, (2) the target region (the pronoun and the following verb, ‘he killed’ in the example), (3) the post target region (all words following the target up to but not including the final word of the sentence, ‘an enemy’), and (4) the end of the sentence (‘soldier’). Then 2 (quantifier v. NP) × 2 (complement clause v. conjoined noun clause) analyses of variance (ANOVA) were carried out for each region. In addition, a more global reading time measure (see below) was also subjected to 2 × 2 ANOVAs based on participant variability (F1) and item variability (F2).

The earliest point at which we would expect any theoretically interesting differences to emerge across the sentences is when the reader first encountered the target area. Obviously, since we didn’t control the frequency of the lexical items across the variations that exist at the beginning of the sentences, differences between conjoined and complement examples could be present because of frequency effects, word length effects and familiarity or plausibility effects, all of which can influence eye fixation times (Rayner 1998) and so on. However, the average reading time for the beginning of the sentence across the different sentence types was 1608 ms, and analyses based on (1) raw time, (2) milliseconds per character (ms/char), and (3) deviation from the expected reading time all revealed no differences in first pass reading.
Table 2 Mean first pass reading time (ins) for the beginning of the sentence (B-O-S), target, post-target, and end of sentence (E-O-S) regions and the time to complete (TTC) reading the sentence (in ms) after first entering the target region. The values in parentheses are the re-reading times. The B-O-S first pass time is expressed in milliseconds per character to adjust for length differences.

<table>
<thead>
<tr>
<th></th>
<th>B-O-S</th>
<th>Target</th>
<th>Post-T</th>
<th>E-O-S</th>
<th>TTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quant-Conj</td>
<td>37.8</td>
<td>376</td>
<td>418</td>
<td>573</td>
<td>1825</td>
</tr>
<tr>
<td>Quant-Comp</td>
<td>35.8</td>
<td>361</td>
<td>468</td>
<td>534</td>
<td>1996</td>
</tr>
<tr>
<td>NP-Conj</td>
<td>37.2</td>
<td>381</td>
<td>416</td>
<td>563</td>
<td>1673</td>
</tr>
<tr>
<td>NP-Comp</td>
<td>36.3</td>
<td>390</td>
<td>428</td>
<td>560</td>
<td>1777</td>
</tr>
</tbody>
</table>

time for this region, all Fs < 1. Therefore, we then examined first pass and rereading times for the target region, the post-target region, and the end of the sentence (see Table 2). Note that these regions are all identical across conditions and thus all analyses were on the raw reading times. We also examined the amount of time that it took the reader to complete reading the sentence once he/she entered the target region; we'll refer to this measure as ‘time to complete’ in Table 2 and it is likewise based on identical words.

The ANOVA on the time to complete the sentence after reaching the target word revealed that sentences that began with a quantifier took longer to read than those that did not (1911 ms for quantifier sentences v. 1725 ms for NP sentences), F1(1, 31) = 4.29, p < 0.05, F2(1, 15) = 4.97, p < 0.05, and sentences with a complement clause took longer to read than those with conjoined clauses (1887 for complement clauses v. 1749 for conjoined clauses), F1(1, 31) = 4.22, p < 0.05, F2(1, 15) = 4.78, p < 0.05, and the interaction was nonsignificant.

The virtue of eye movement data is that they can yield more precise measures of exactly where these differences emerged (Rayner 1998; Rayner et al. 1989). Analysis of first pass reading times revealed that there were no significant differences across conditions. Thus, all effects were due to re-reading.\(^3\) In the Target region, re-reading times were longer when there was a quantifier than when there was not (118 ms \(v.\) 77 ms), F1(1, 31) = 6.17, p < 0.05, F2(1, 15) = 4.66, p < 0.05 and there was no interaction with sentence type. Likewise, readers spent more time re-reading the beginning of the sentence when there was a

\(^3\) Re-reading, or second pass reading time, was computed as the average time in a region (via regressions) after initial reading. If participants did not make a regression on a trial, a second-pass time of zero was used for that trial.
quantiﬁer than when there was not (228 ms v. 123 ms), F1(1, 31) = 6.52, p < 0.05, F2(1, 15) = 9.05, p < 0.01, and again no interaction with sentence type. These effects are largely due to the fact that (1) readers made lots of regressions from the end of the sentence region in quantiﬁer sentences (35% of the trials in comparison to less than 20% of the trials in the NP sentences), F1(1, 31) = 11.64, p < 0.01, F2(1, 15) = 11.72, p < 0.01, and (2) these regressions typically landed in either in the beginning of the sentence or the target region.

The other effect that is apparent in the re-reading times is that the complement clauses resulted in longer re-reading times than conjoined clauses in the post-target region (133 ms v. 73 ms), F1(1, 31) = 6.28, p < 0.05, F2(1, 15) = 5.12, p < 0.05. The reason underlying this effect was not as apparent in the data, but appeared to be due to the fact that readers were more likely to regress out of the post-target region in the complement than in the conjoined cases (14% v. 7%), though the effect was only marginal (p roughly .10 in both the participants and items analyses). However, these regressions resulted in longer re-reading times when the reader then moved left-to-right through the post-target region in the complement sentences than the conjoined sentences. It is interesting to note that the effect of complement clause was temporally an earlier occurring effect since it resulted largely from regressions out of the post-target region whereas the quantiﬁer effect occurred primarily as a result of regressions out of the end of the sentence.

2.3 Discussion

Reading times for the sentence, excluding all time before the target (pronoun) was reached, took longer for bound variable sentences (like 8a and 8b) than coreferential NP sentences (8c,d), independent of whether the pronoun was c-commanded by the quantiﬁer (8b) or not (8a). Complement clause sentences also were read slower than conjoined sentences. The complement v. conjoined sentences differ from each other structurally. Further, the initial clause in the conjoined sentences (× aimed, enrolled, planted, etc.) often places tight restrictions on the expected content of the following clause whereas the initial (matrix) clause in the complement sentences (× thought, knew, emphasized) places few restrictions on the content of the complement clause. In general predictable material is processed more quickly than less predictable material (Rayner 1998). Thus, presumably the difference in the predictability of the second clause
could explain why the conjoined clauses were read faster than the complement clauses.

The results of Experiment 1 do not support a central role for c-command in restricting the relation between a pronoun and a universally quantified expression that binds it. At least, there is no discernible processing advantage for examples where the binder c-commands the pronoun. What this suggests, to our minds, is either that a theory of bound-variable interpretations must be developed which only demands that the binder be more prominent than the pronoun (by Williams 1997) or that apparent bound variable interpretations have more than one source. As noted above, Williams (1997) suggested a theory where anaphoric dependence must be forwards, the binder precedes the bindee, or backwards and down, i.e. the binder follows but c-commands the bindee. This kind of approach to binding would treat c-command as just one means of achieving prominence. Being subject of the first or highest clause of a sentence (or discourse), as in our experimental sentences, would thus suffice to render the subject prominent and capable of binding a pronoun without difficulty or disruption, though serious difficulties remain for this approach, as pointed out earlier. The alternative, that bound variable interpretations may arise from more than one source, will be discussed below, after Experiment 2.

In Experiment 2 we examined another constraint on binding, namely, that the quantifier and variable (pronoun) must appear in the same sentence. By definition, a quantifier in one sentence cannot c-command any phrase in a separate sentence. So evidence that intersentential bound variables can be processed smoothly would be further evidence that c-command need not be satisfied to obtain a bound variable interpretation of a pronoun bound by a universal quantifier.

3 EXPERIMENT 2

Experiment 2 tests the processing of sentences in which the pronoun and quantifier appear in separate sentences. Generally a quantifier cannot take scope outside the clause or sentence in which it occurs (see Heim 1982) as illustrated in sentence (9) where ‘he’ is not easily bound by ‘every’ (Poesio & Zucchi 1992).

(9)  a. ?Every boy arrived at noon. He sat down.
    b. ?Every dog came in. It lay under the table.
However, there are well-known examples where a quantifier appears to take scope outside its sentence, as in (10). The phenomenon has come to be known as ‘telescoping’ (Roberts 1989).

(10) Each degree candidate walked to the stage. He took his diploma from the dean and returned to his seat.

In (10), ‘He’ acts as if it is bound by ‘each’, despite the existence of an intervening sentence boundary. Telescoping examples like (10) have been claimed to be most natural in a discourse describing an event made up of a predictable series of subevents. Intuitively they are more natural with the quantifier ‘each’ than with ‘every’ and they are virtually impossible with ‘all’ (see Poesio & Zucchi 1992 for example).

Various analyses of telescoping have been proposed. Working with Discourse Representation Theory Kamp (1981), Roberts (1989) suggested an account where the sentence containing the telescoped pronoun is accommodated, resulting in a (tripartite) representation of that sentence with a reconstructed restrictor (shown in the left box in Figure 1 (top panel)). For the second sentence in (10), this results in the accommodated structure in Figure 1 (top), which is comparable to the structure for an ‘if ..then’ clause, instead of the simpler structure in Figure 1 (bottom panel). The boxes in Figure 1 represent partial models. In effect, the arrow in the top panel of Figure 1 indicates that every model in which there is a degree candidate can be extended to a model where the degree candidate took his diploma.

The representation in the top panel means that for each \( x \) in the domain of discourse, if \( x \) is a degree candidate, \( x \) took his diploma.
from the dean. Poesio & Zucchi (1992) developed this account and elaborated the conditions on this type of accommodation restricting it to an event made up of predictable sub-events or a step of a salient script activated by the context.

In Experiment 2, we investigated the processing of four-sentence discourses like those in (11). Six versions of each discourse were constructed. The initial subject NP in the first sentence of the discourse was instantiated by either a proper name (11a,d) or by the quantifier ‘each’ (11b,e) or ‘every’ (11c,f).

(11) a. John Frederick went home. He broiled a steak. He ate dinner.
   b. Each executive went home. He broiled a steak. He ate dinner.
   c. Every executive went home. He broiled a steak. He ate dinner.
   d. John Frederick went home. He ate dinner. He broiled a steak.
   e. Each executive went home. He ate dinner. He broiled a steak.
   f. Every executive went home. He ate dinner. He broiled a steak.

Sentence four: Then he watched television.

The second and third sentences described events that typically occur later in time than the event described in sentence one. The fourth sentence was the same in all six conditions. In the expected order versions (11a–c), the order of the sentences mirrors the expected order of the events described. For example, coming home, broiling food and eating dinner provides a likely sequence of early evening events. By contrast, in the unexpected order versions (11d–f) the position of sentence 2 and 3 sentence was reversed, resulting in a less likely sequence of events once the third sentence is encountered.

The Name versions (11a,d) serve as a base-line where no telescoping is involved (i.e. the pronoun takes a normal referential antecedent). We expected the universal quantifier versions to take longer than the name versions in the region of the first pronoun. If it’s true that telescoping examples are easier to process with ‘each’ than with ‘every’, then we expect the reading time for sentence two to be shorter in telescoping discourses with ‘each’ (11b,e) than in corresponding discourses with ‘every’ (11c,f). This prediction is clearest for the (b- and c-) examples where the expected order of sentences occurs and thus the discourse may be seen as describing an event made up of a series of likely sub-events.

5 Technically they cast this as: ‘A context c may link S to a restrictor ['] only if ['] ∼ S is a step of a salient script in c.’
Assuming that the order of a sequence of past tense sentences conversationally implies the likely order of the events described, the expected order discourses (11a–c) should be read more quickly than the unexpected order (11c–f) discourses, other things being equal. What about the interaction between subject type and order of sentences? The prediction here depends on one’s assumptions about telescoping. If the presence of content describing predictable subevents (in the expected order) is critical, readers may not recover a telescoping analysis in (11e,f) at all. In this case, we might expect indications of confusion in (11e,f).

In short, we expect an effect of subject type (name < universal and each < every) when the pronominal subject of sentence two is processed. We also expect an effect of order in sentence three, at least for the Name Condition, since it is the relative order of sentences two and three that is either expected or unexpected. In addition, examples with ‘each’ (11b) may be read more quickly than examples with ‘every’ (11c) in the expected order examples where the telescoping analysis is predicted to be more readily available.

3.1 Method

Participants. Thirty-six members of the University of Massachusetts community received payment or course credit for their participation in the study. All participants were native English speakers with normal or corrected vision and were naive with respect to the purpose of the study.

Materials. 24 sentences like (11) were constructed with six versions of each (as described above). All materials appear in Appendix I

Procedure and apparatus. These were the same as for Experiment 1.

3.2 Results

Trials on which there was a track loss (4% of the trials) were eliminated from the data analyses. The data were analysed in terms of the critical regions illustrated in (12):

\[
\begin{array}{cccc}
1 & 2 & 3 & 4 \\
... & He broiled & a steak. & He ate dinner. \\
5 & Then he watched television.
\end{array}
\]

(12)
The results are presented in Table 3 in terms of first pass, second pass and total reading times for each of the critical regions. Analyzing all six conditions together for effects of subject, order and their interaction, Region 1 (Pronoun + Verb) revealed a significant effect of subject in second pass reading time (F1(2, 70) = 4.38, p < 0.01; F2(2, 46) = 6.32, p < 0.01) and in total reading time (F1(2, 70) = 4.40, p < 0.01; F2(2, 46) = 5.03, p < 0.01). Because of the length difference between regions 1–4 in the expected order (a–c) and the unexpected order conditions (d–f) we also performed analyses on ms/char and deviation from regression measures. An ANOVA on these two measures in second pass and total times for Region 1 confirmed the significant effect of subject that we found on raw reading times (ms/char, second pass: F1(2, 70) = 3.90, p < 0.05; F2(2, 46) = 6.06, p < 0.01; ms/char, total time: F1(2, 70) = 3.91, p < 0.01; F2(2, 46) = 4.93, p < 0.01; deviation from regression, second pass: F1(2, 70) = 4.46, p < 0.01; F2(2, 46) = 6.86, p < 0.01; deviation from regression, total time: F1(2, 70) = 4.46, p < 0.01; F2(2, 46) = 7.02, p < 0.01). As expected, the Name conditions (a,d) were read faster than the corresponding Quantifier conditions.

In Region 2, the effect of subject was significant in second pass reading time by items (F2(2, 46) = 3.18, p < 0.05) but only marginal by participants. (F1(2, 70) = 2.88, p = 0.06). In the ms/char measure the same effect was significant in Region 2 by participants (F1(2, 70) = 3.63, p < 0.05) but was only marginal by items (F2(2, 46) = 2.98, p = 0.06). The ANOVA on the deviation from regression for the same region yielded a marginally significant effect by participants and items (F1(2, 70) = 3.01, p = 0.055; F2(2, 46) = 2.88, p = 0.06).

In Region 3, the beginning of sentence three, there was an interaction of subject and order in first pass reading time in the ms/char measure (F1(2, 70) = 3.88, p < 0.03; F2(2, 46) = 3.49, p < 0.05)
and an interaction in total time was fully significant in the deviation from regression measure \( (F1(2, 70) = 3.91, p < 0.05; F2(2, 46) = 4.98, p < 0.01) \). The expected order condition was read substantially faster than the unexpected order, but only in the Name condition. Region 4 showed this same pattern, though it was not significant. No effects were significant in Region 5.

To determine whether the difference between the each \((b,e)\) and every \((c,f)\) conditions was significant, the same analyses were performed including only these conditions. In Region 2, the first-pass raw times were marginally faster by participants for each than for every \((F1(1, 35) = 3.2, p = 0.08)\).

Because of the length difference between regions 1–4 in the expected order \((a–c)\) and the unexpected order conditions \((d–f)\), we performed an additional analysis by combining these regions into one (regions 1–4 are now contained in region 1; region 2 was the same as Region 5 in the prior analyses), as below:

1. He broiled a steak. He ate dinner.

2. Then he watched television.

Table 4 contains the reading times for Region 1. Region 1 now contains the same number of characters across all six conditions. We performed an ANOVA on the reading time of this region for all six conditions. We found a significant effect of subject on first pass reading time \((F1(2, 70) = 3.27, p < 0.05; F2(2, 46) = 3.36, p < 0.05)\). For total time, this effect was only significant by participants \((F1(2, 70) = 3.47, p < 0.05; F2(2, 46) = 1.48, p < 0.05)\). Also for total time, there was an effect of order, significant only by participants \((F1(1, 35) = 5.30, p < 0.05; F2(1, 23) = 1.2, p > 0.05)\). There were no other significant effects.

Comparing only conditions \((a)\) and \((d)\), the Name conditions, an ANOVA on second pass times yielded a marginally significant effect of order in the items analysis \((F2(1, 23) = 3.85, p = 0.06; F1(1, 35) = 2.9, p < 0.05)\). For total time, this effect was significant, but only by participants \((F1(1, 35) = 7.11, p < 0.05; F2(1, 23) = 2.3, p > 0.05)\).

In the previous analysis with five regions we observed faster reading times for each than every (albeit only marginally significant by participants) in region 2. However, the raw reading times of the now longer Region 1 showed the opposite trend: every was read
Table 4 First pass, second pass (in square brackets) and total reading times (in round brackets) in ms for Experiment 2.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Region 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1395 [96] (1498)</td>
</tr>
<tr>
<td>b</td>
<td>1506 [176] (1688)</td>
</tr>
<tr>
<td>c</td>
<td>1469 [210] (1680)</td>
</tr>
<tr>
<td>d</td>
<td>1483 [191] (1697)</td>
</tr>
<tr>
<td>e</td>
<td>1562 [151] (1730)</td>
</tr>
<tr>
<td>f</td>
<td>1390 [278] (1678)</td>
</tr>
</tbody>
</table>

faster than each. An ANOVA on the first pass reading times of the each/every conditions (c–d and e–f) yielded a significant effect of subject (F1(1, 35) = 5.14, p < 0.05; F2(1, 23) = 5.41, p < 0.05). A similar marginally significant effect was observed for second pass (F1(1, 35) = 3.76, p = 0.06; F2(1, 23) = 2.95, p < 0.05). There were no other significant effects.

3.3 Discussion of Experiment 2

The cost of telescoping was clearly observed in Region 1 in second pass and total times: the Name condition was read faster than the universal quantifier conditions. This was predicted given Roberts (1989) analysis where the telescoping examples are attributed a more complex semantic structure (see Figure 1).

Intuitions suggest that telescoping is easier with ‘each’ than with ‘every’. Numerically this pattern was observed. However, the advantage of the each over the every condition was not supported statistically.

The manipulation of expected versus unexpected order of events emerged clearly for the Name condition. The unexpected order took

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6 Analyses of regressive eye movement patterns were not particularly informative. The only significant effect for regressions out of a region was in the analysis with only two regions. Here, there was an effect of subject (F1(2, 70) = 5.11, p < 0.01, F2(2, 46) = 5.51, p < 0.01) such that readers regressed out of Region 1 less frequently in the name condition (4.5%) than in the each (7.5%) and every (12%) conditions. For Region 2, readers regressed out of the region more frequently when every (5%) was present than when each (3.5%) was present, though the effect was only marginally significant F1(1, 35) = 3.11, p = 0.08, F2(1, 23) = 3.05, p = 0.09. For regressions into a region, in the analysis with only two regions there was an effect of order (F1(1, 35) = 13.23, p < 0.001, F2(1, 23) = 8.35, p < 0.01) such that readers were more likely to regress into Region 1 in the unexpected order condition (9%) than in the expected order condition (4%). There was also an interaction (F1(1, 35) = 3.35, p = 0.07, F2(1, 23) = 12.30, p < 0.01) such that readers regressed into the region in the every condition much more frequently when the order was unexpected (10%) than when it was expected (2%), whereas there was no difference for the each condition (7% in the unexpected order and 6% in the expected order).
substantially longer to read in the combined region but only in the Name condition. For the universal quantifier conditions, the combined region did not take longer in the unexpected order condition than the expected order condition. Possibly readers did not compute the telescoping analysis in (11e,f), taking these passages to be somewhat incoherent. However, there was really no indication in the eye movement record that readers were especially confused in these conditions (i.e. there were not lots of regressions and there were generally not overly long fixations). Thus, we suspect that in (11e,f) readers have an alternative to construing the passage as a sequence of ordered events. Given the universal quantifier in the sentence, they may instead construe the passage as being evidence about the shared properties of the denotation of the first nominal (executives in (11)), as illustrated in (13).

(13) Each executive drove a Saab. He had a house in the suburbs. He played golf at the local country club.

In (13) three properties (driving a Saab, having a house in the suburbs, playing golf at the local country club) are attributed to each executive. The content of these properties makes it difficult to interpret them as episodic and there is no sense in which (13) describes a complex event composed of predictable subevents. What (13) suggests is that telescoping is a broader phenomenon than has been realized, extending beyond complex events with predictable substructure to situations where individual members of a set (executives) share predictable properties. On this shared property construal, the temporal order of events is not critical, accounting for the order-insensitivity of the universal quantifier passages. The lack of a robust difference between the each and every conditions may also follow from this non-episodic interpretation: claiming that ‘every executive’ exhibits certain properties makes it natural to use ‘every’, a quantifier that seems to focus on the exhaustivity of the speaker’s claim, whereas ‘each’ is strongly distributive and focuses on the individual members denoted by the set associated with the nominal (‘executives’; see Tunstall, 1998, for evidence). If this account is correct, it does not necessarily disconfirm Poesio & Zucchi (1992) approach to telescoping, but it does suggest that describing a predictable sequence of subevents is only one characteristic use of telescoping and only that use favors each over every and requires a natural order of subevents.
4 GENERAL DISCUSSION

The results from our experiments suggest that obtaining the equivalent of a bound variable interpretation of a pronoun is a more general phenomena than might have been expected. No special penalty attends the processing of a pronoun with a quantifier antecedent that does not c-command it (Experiment 1). Quantifier sentences took longer to process than corresponding sentences with names or definite descriptions (Experiments 1 and 2) regardless of whether the quantifier c-commanded the pronoun or not. In Experiment 2, the absence of a significant difference between ‘each’ and ‘every’, as well as the fact that unexpected order sentences took no longer to read than expected order sentences in the quantifier conditions, also suggests that arriving at the equivalent of a bound variable interpretation without c-command is not a highly restricted process available only in very specialized contexts. We think this fits well with the classification of pronoun occurrences proposed by Bosch (1983).

Bosch argues that pronouns fundamentally occur in only two basic uses: as anaphoric referential pronouns (APs) and as syntactic agreement pronouns (SPs). APs refer to a contextually salient object in context or occur in a sentence with two independent references by two referring expressions that have the same referent, as in ‘When John had finished, he left’. SPs are purely syntactic and no reference occurs. They include the pronoun in examples like ‘John loves his mother’ and ‘Everyone thinks he is intelligent’. Only SPs are governed by nonpragmatic conditions—either the c-command condition or its semantic equivalent couched in terms of function-argument structures.

What is of particular interest for present purposes is Bosch’s analysis of pronouns in classic problematic cases of anaphora, including E-type pronouns (Evans 1980) such as ‘them’ in (14).

(14) John owns a few sheep and Harry vaccinates them every spring.

‘Them’ is anaphorically related to ‘a few sheep’ but is not bound by it. As Bosch points out, if the pronoun were bound, (14) would be synonymous with (14’).

(14’) A few sheep are such that John owns them and Harry vaccinates them every spring.

But, unlike (14), (14’) doesn’t imply that Harry vaccinates all of John’s sheep, nor does it imply that John only owns a few sheep. Pointing
out that inferred referents must be assumed to be available for APs on
anyone’s account of anaphora, Bosch argues that E-type pronouns are
simply normal anaphoric pronouns. He offers a comparable analysis of
‘donkey’ sentences (Geach 1968; Kamp 1981; Heim 1982), illustrated
in (15).

(15) If any man owns a donkey, he beats it.
(15’) #If no man owns a donkey, he beats it.

If (15) contained bound variables, then (15’), with a negative subject,
should be acceptable. But it clearly is not. However, if ‘donkey’
pronouns, like E-type pronouns, are anaphoric pronouns, then the
unacceptability of (15’) is expected.

Another classic problem is illustrated by the ‘paycheck’ sentence
(Karttunen 1969) in (16) and Bosch’s example (17).

(16) The man who gave his paycheck to his wife was wiser than the
man who gave it to his mistress.
(17) The man who gave his paycheck to his wife was wiser than the
woman who left it with her flatmate.

In Bosch’s system, ‘his’ in the phrase ‘his paycheck’ is an SP and
the phrase is interpreted as something like ‘one’s paycheck’. Because
Bosch assumes complex functions (properties) are the referents of SP-
containing complex predicates, he assumes the same for SP-containing
NPs. It is to this complex function ‘one’s paycheck’ that ‘it’ refers in
(16) and (17).

To summarize, Bosch treats the problematic pronoun occurrences in
(9)–(11) as anaphoric referential pronouns taking inferred antecedents
as their referents. The central arguments he provides include the
independent need to assume inferred antecedents (e.g. ‘there’ in ‘Fred
is a New Yorker but he hasn’t lived there for years’, see Postal
1969; Lakoff & Ross 1972 among others), the failure of alternative
classifications of pronoun occurrences to correctly capture the range of
pronoun occurrences, and the correlation between the accessibility of
inferred referents and the acceptability of anaphora. For example, he
contrasts the ‘paycheck’ sentence in (18) with (19).

(18) Julius puts his money into the bank, but his granny prefers to keep
it safely under her mattress.
(19) The vicar bought his aspidistra pot from Mrs Mulroy, and Julius got it in a jumble sale.

Knowledge of social conventions renders the complex function ‘one’s money’ readily available as the referent of ‘it’ in (18) but in (19) ‘one’s aspidistra pot’ is less readily accessible as a complex function and ‘it’ is taken to refer to the vicar’s aspidistra pot.

Bosch’s proposal has many virtues. However, it also faces a major challenge. Because it treats all non-SP pronouns as anaphoric, their distribution and interpretation is governed only by pragmatic appropriateness. But it is unclear whether pragmatic theory is up to the task of, for example, supplying the maximality/uniqueness implication required for E-type pronouns, such as the implication that Harry vaccinates all of John’s sheep in (14), or limiting the availability of inferred referents such as the complex function needed for ‘paycheck’ sentences. (See Kadmon 2001, p. 80–81 for discussion of problems with a general maximality/uniqueness restriction, and her Section 4.2.3 for a defence of a ‘realistic’ maximality/uniqueness requirement.)

Assuming that Bosch’s approach is tenable, we now turn to a discussion of how it applies to the sentences tested in our experiments. It fits well with the present findings that suggest a rather general availability of pronouns with quantifier antecedents that don’t c-command them. In the sentences tested in Experiment 1, it classifies the non-c-commanded pronoun as an AP and the c-commanded one as an SP. This correctly predicts that our (8a) should be unacceptable or infelicitous, indicated by ‘#’ below, with a negative subject, as in (20a), because the AP in (8a) requires a referent. However (8b) should be acceptable with a negative subject (20b) because the pronoun in (8b) is an SP and an SP does not refer.

(20a) #No British soldier aimed and then he killed an enemy soldier.

(b) No British soldier thought that he killed an enemy soldier.

Similarly it correctly predicts that the pronoun in (8a) should be replaceable by a suitable NP maintaining an anaphoric relation between the NP and the referent invoked by the quantifier, but that the SP in (8b) should not, as illustrated in (21).

(21a) Every British soldier aimed and then the bastard killed an enemy soldier.
b. #Every British soldier thought that the bastard killed an enemy soldier.

If indeed the pronoun in (8a) is an AP, then the referent must be invoked by the first clause of (8a) and only the pragmatic maximality requirement gives rise to the impression of a bound variable interpretation. This predicts that exceptions should be tolerated more readily in (8a) than in (8b). We are unsure whether the prediction is confirmed outright, but we do perceive a distinction at least, as indicated in the cross-speaker discourses in (22) and (23).

(22) a. Every British soldier aimed and then he killed an enemy soldier.
    b. ?Yes, but not Sam (the youngest British soldier).

(23) a. Every British soldier thought that he killed an enemy soldier.
    b. #Yes, but not Sam (the youngest British soldier).

In other words, Speaker B cannot simultaneously agree with Speaker A by confirming A’s utterance with ‘yes’ and qualify the universal statement in (23). But perhaps this is less odd in (22).

We think that our experimental findings and the above considerations encourage Bosch’s approach to anaphora. They suggest in effect that our non-c-command sentences in Experiment 1 are really not so different from the telescoping sentences tested in Experiment 2. One oddity on this view is summarized in (24).

(24) a. Every hockey player came in and he was handsome.
    b. Every hockey player came in. He was handsome.
    c. Every hockey player came in. He was handsome. He was polite. He was a model citizen.

7 One interesting issue on this account is the choice of a singular v. plural anaphoric pronoun. What might be expected is that a plural pronoun would refer to the referents invoked by the quantifier phrase. In examples like (8a), a plural pronoun would yield a collective interpretation. Presumably the speaker selects a singular pronoun to signal the distributive interpretation. The intuitions below seem to support the idea that pronoun choice is related to properties of the predicate contained in the clause with the pronoun and is independent of the maximality requirement or implication.

(i) a. √Every student picked up a chair because he wanted to be able to sit.
    b. ?Every student picked up a chair because he wanted to be able to sit together.

(ii) a. /Every student picked up a chair because they wanted to be able to sit.
    b. √Every student picked up a chair because they wanted to be able to sit together.
If (24a) is really not so distinct from (24c), why is (24b) so odd? This is the question that must be answered if our approach is to ultimately prove tenable. At the moment, we do not have a convincing account.8

The ability to use quantifiers and to compute bound variables is a basic human capacity that is fundamental to natural languages. The phenomena is clearly complicated and no single study is going to resolve all questions concerning the circumstances under which variable binding is permitted or reveal the nature of the mechanisms that underlie true and apparent variable binding. What the present study contributes is additional evidence that c-command does not suffice to characterize bound variable-like interpretations. Interpreted in Bosch’s framework, the results suggest that telescoping examples and intrasentential non-c-command examples may be more closely related than has previously been assumed. This analysis highlights the need for pragmatic theory and psycholinguistic theory to develop detailed explanatory accounts of the process by which referents may be inferred and used to arrive at interpretations similar to true bound variable-interpretations.

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8 What we envision is something along the following lines: Although conjoined clauses often behave like independent sentences, they do not invariably do so (see Frazier & Clifton submitted). In (24b) the context may already be fixed when the pronoun is processed. This may inhibit an anaphoric relation to an inferred antecedent in (24b). In (24b) there is no alternative but to take the second sentence to be a continuation of the first (in the sense of the Centering Theory). Hence, infelicity occurs.

Of course, in (24c) the context should again already be fixed before the pronoun is processed, as in (24b). However, in (24c) the second sentence need not be a continuation of the first. It may instead belong in a discourse segment with the highly parallel third and fourth sentences. Indeed, intuitively what salvages (24c) in the spoken language seems to be an intonation appropriate for lists, where sentences 2, 3, and 4 are treated as comparable items on the list. In effect, the discourse structure might look something more like (i) below than like a simple discourse continuation of the sort required in (24b).

(i) Every hockey player came in:
   He was handsome.
   He was polite.
   He was a model citizen.

If this speculation is correct, then both the looser transition between the first and second sentence in (24c) ([ S [ S S S ]] ) than in (24b) and the evidence from sentences 3 and 4 present only in (24c) may help the perceiver to recognize that ‘he’ refers to a representative example invoked by the quantifier phrase. This would help to explain the contrast between (24b) and (24c). It would also help explain the surprising acceptability of (ii), pointed out to us by Emmon Bach.

(ii) He approached the stage.
   He took his diploma from the dean.
   He returned to his seat.
   Thus did each degree candidate receive his diploma.

In (ii) the perceiver must simply assume the existence of some unknown referent for ‘he’. In the final sentence, it becomes clear that the relation of that referent to the quantifier is that of a representative example. Neither Williams’ (backwards and down) nor Roberts’ (discourse subordination) approach readily accounts for the example.
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APPENDIX A MATERIALS FOR EXPERIMENT 1

(1) a. Every British soldier aimed and then he killed an enemy soldier.
b. Every British soldier thought that he killed an enemy soldier.
c. The old British soldier aimed and then he killed an enemy soldier.
d. The old British soldier thought that he killed an enemy soldier.

(2) a. Every new student enrolled and then he failed to show up for the course.
b. Every new student openly admitted that he failed to show up for the course.
c. The new student enrolled and then he failed to show up for the course.
d. The new student openly admitted that he failed to show up for the course.

(3) a. Every reporter checked the facts and then he wrote a factual exposé.
b. Every reporter checked carefully that he wrote a factual exposé.
c. The young reporter checked the facts and then he wrote a factual exposé.
d. The young reporter checked carefully that he wrote a factual exposé.
(4) a. Every small business owner complained verbally and then he wrote an official letter of protest.
b. Every small business owner later emphasized that he wrote an official letter of protest.
c. The angry small business owner complained verbally and then he wrote an official letter of protest.
d. The angry small business owner emphasized that he wrote an official letter of protest.

(5) a. Every lawyer argued the issue and then he backed off due to the judge's instructions.
b. Every lawyer argued persuasively that he backed off due to the judge's instructions.
c. The passionate lawyer argued the issue and then he backed off due to the judge's instructions.
d. The passionate lawyer argued that he backed off due to the judge's instructions.

(6) a. Every homeowner was pleased by the zoning change and he thanked his representative profusely for supporting the regulation.
b. Every homeowner claimed to friends that he thanked his representative profusely for supporting the regulation.
c. The new homeowner was pleased by the zoning change and he thanked his representative profusely for supporting the regulation.
d. The new homeowner claimed to friends that he thanked his representative profusely for supporting the regulation.

(7) a. Every gardener prayed for rain and then he watered the garden himself.
b. Every gardener knew it was best that he watered the garden himself.
c. The gardener prayed for rain and then he watered the garden himself.
d. The gardener knew it was best that he watered the garden himself.

(8) a. Every Midwestern farmer planted corn and then he worried endlessly about the weather.
b. Every Midwestern farmer admitted freely that he worried endlessly about the weather.
c. The Midwestern farmer planted corn and then he worried endlessly about the weather.
d. The Midwestern farmer admitted freely that he worried endlessly about the weather.

(9) a. Every applicant called first and then he sent a resume and three letters of reference.
b. Every applicant had reason to believe that he sent a resume and three letters of reference.
c. The successful applicant called first and then he sent a resume and three letters of reference.
d. The successful applicant had reason to believe that he sent a resume and three letters of reference.
(10) a. Every researcher studied the issue and then he conducted his own experiment.
b. Every researcher reported proudly that he conducted his own experiment.
c. The young researcher studied the issue and then he conducted his own experiment.
d. The young researcher reported proudly that he conducted his own experiment.

(11) a. Every chef learned about herbs and then he created a new masterpiece of light cuisine.
b. Every chef believed wholeheartedly that he created a new masterpiece of light cuisine.
c. The novice chef learned about herbs and then he created a new masterpiece of light cuisine.
d. The novice chef believed wholeheartedly that he created a new masterpiece of light cuisine.

(12) a. Every broker started a technology portfolio and then he made lots of money.
b. Every broker at the conference bragged that he made lots of money.
c. The young broker started a technology portfolio and then he made lots of money.
d. The young broker at the conference bragged that he made lots of money.

(13) a. Every model ate lots of carrots and she lost ten pounds.
b. Every model was delighted that she lost ten pounds.
c. The plump model ate lots of carrots and she lost ten pounds.
d. The plump model was delighted that she lost ten pounds.

(14) a. Every mother worried a lot and then she raised slightly neurotic children.
b. Every mother worried that she raised slightly neurotic children.
c. The mother worried a lot and then she raised slightly neurotic children.
d. The mother worried that she raised slightly neurotic children.

(15) a. Every female doctor studied for years and then she started a community clinic.
b. Every female doctor dreamed repeatedly that she started a community clinic.
c. The female doctor studied for years and then she started a community clinic.
d. The female doctor dreamed repeatedly that she started a community clinic.

(16) a. Every actress dreamed of a serious role and then she was cast as a seductress.
b. Every actress complained often that she was cast as a seductress.
c. The actress dreamed of a serious role and then she was cast as a seductress.
d. The actress complained often that she was cast as a seductress.
APPENDIX B  MATERIALS FOR EXPERIMENT 2
(TELESCOPING EXPERIMENT)

(1)  a. John Frederick went home. He broiled a steak. He ate dinner. Then he watched television.
   b. Each executive went home. He broiled a steak. He ate dinner. Then he watched television.
   c. Every executive went home. He broiled a steak. He ate dinner. Then he watched television.
   d. John Frederick went home. He ate dinner. He broiled a steak. Then he watched television.
   e. Each executive went home. He ate dinner. He broiled a steak. Then he watched television.
   f. Every executive went home. He ate dinner. He broiled a steak. Then he watched television.

(2)  a. Little J. Killington woke up. He ate breakfast. He went to school. At 10 he had his milk.
   b. Each Kindergartener woke up. He ate breakfast. He went to school. At 10 he had his milk.
   c. Every Kindergartener woke up. He ate breakfast. He went to school. At 10 he had his milk.
   d. Little J. Killington woke up. He went to school. He ate breakfast. At 10 he had his milk.
   e. Each Kindergartener woke up. He went to school. He ate breakfast. At 10 he had his milk.
   f. Every Kindergartener woke up. He went to school. He ate breakfast. At 10 he had his milk.

(3)  a. The old democratic senator announced his campaign. He raised money. He got elected. Very quickly he forgot his promises to the electorate.
   b. Each successful politician announced his campaign. He raised money. He got elected. Very quickly he forgot his promises to the electorate.
   c. Every successful politician announced his campaign. He raised money. He got elected. Very quickly he forgot his promises to the electorate.
   d. The old democratic senator announced his campaign. He got elected. He raised money. Very quickly he forgot his promises to the electorate.
   e. Each successful politician announced his campaign. He got elected. He raised money. Very quickly he forgot his promises to the electorate.
   f. Every successful politician announced his campaign. He got elected. He raised money. Very quickly he forgot his promises to the electorate.

(4)  a. That model walked down the platform. She turned around. She walked back. She disappeared behind the curtain.
b. Each model walked down the platform. She turned around. She walked back. She disappeared behind the curtain.

c. Every model walked down the platform. She turned around. She walked back. She disappeared behind the curtain.

d. That model walked down the platform. She walked back. She turned around. She disappeared behind the curtain.

e. Each model walked down the platform. She walked back. She turned around. She disappeared behind the curtain.

f. Every model walked down the platform. She walked back. She turned around. She disappeared behind the curtain.

(5) a. That clever carpenter built a house. He made customized furniture. He sold the house. He made lots of money.

b. Each clever carpenter built a house. He made customized furniture. He sold the house. He made lots of money.

c. Every clever carpenter built a house. He made customized furniture. He sold the house. He made lots of money.

d. That clever carpenter built a house. He sold the house. He made customized furniture. He made lots of money.

e. Each clever carpenter built a house. He sold the house. He made customized furniture. He made lots of money.

f. Every clever carpenter built a house. He sold the house. He made customized furniture. He made lots of money.

(6) a. Fred Baxter came home. He changed clothes. He went to the movies. Then he went to a bar.

b. Each banker came home. He changed clothes. He went to the movies. Then he went to a bar.

c. Every banker came home. He changed clothes. He went to the movies. Then he went to a bar.

d. Fred Baxter came home. He went to the movies. He changed clothes. Then he went to a bar.

e. Each banker came home. He went to the movies. He changed clothes. Then he went to a bar.

f. Every banker came home. He went to the movies. He changed clothes. Then he went to a bar.

(7) a. That stewardess enrolled in class. She studied hard. She took the exam. She got a promotion.
b. Each stewardess enrolled in class. She studied hard. She took the exam. She got a promotion.
c. Every stewardess enrolled in class. She studied hard. She took the exam. She got a promotion.
d. That stewardess enrolled in class. She took the exam. She studied hard. She got a promotion.
e. Each stewardess enrolled in class. She took the exam. She studied hard. She got a promotion.
f. Every stewardess enrolled in class. She took the exam. She studied hard. She got a promotion.

(8) a. That applicant received a personal invitation. He went for an interview. He failed the written test. Naturally he did not get the job.
b. Each applicant received a personal invitation. He went for an interview. He failed the written test. Naturally he did not get the job.
c. Every applicant received a personal invitation. He went for an interview. He failed the written test. Naturally he did not get the job.
d. That applicant received a personal invitation. He failed the written test. He went for an interview. Naturally he did not get the job.
e. Each applicant received a personal invitation. He failed the written test. He went for an interview. Naturally he did not get the job.
f. Every applicant received a personal invitation. He failed the written test. He went for an interview. Naturally he did not get the job.

(9) a. This homeowner in the tv commercial opened the front door. He picked up the mail. He read the newspaper. He drank coffee.
b. Each homeowner in the tv commercial opened the front door. He picked up the mail. He read the newspaper. He drank coffee.
c. Every homeowner in the tv commercial opened the front door. He picked up the mail. He read the newspaper. He drank coffee.
d. This homeowner in the tv commercial opened the front door. He read the newspaper. He picked up the mail. He drank coffee.
e. Each homeowner in the tv commercial opened the front door. He read the newspaper. He picked up the mail. He drank coffee.
f. Every homeowner in the tv commercial opened the front door. He read the newspaper. He picked up the mail. He drank coffee.

(10) a. That visitor borrowed a book. He read it quickly. He returned it to the library. He borrowed a new book.
c. Every visitor borrowed a book. He read it quickly. He returned it to the library. He borrowed a new book.
d. That visitor borrowed a book. He returned it to the library.
   He read it quickly. He borrowed a new book.

e. Each visitor borrowed a book. He returned it to the library.
   He read it quickly. He borrowed a new book.

f. Every visitor borrowed a book. He returned it to the library.
   He read it quickly. He borrowed a new book.

(11) a. Some local critic rented a film. He liked the film.
   He wrote a review. He surprised us by praising the director.

b. Each local critic rented a film. He liked the film.
   He wrote a review. He surprised us by praising the director.

c. Every local critic rented a film. He liked the film.
   He wrote a review. He surprised us by praising the director.

d. Some local critic rented a film. He wrote a review.
   He liked the film. He surprised us by praising the director.

e. Each local critic rented a film. He wrote a review.
   He liked the film. He surprised us by praising the director.

f. Every local critic rented a film. He wrote a review.
   He liked the film. He surprised us by praising the director.

(12) a. That chef cooked a regional speciality on tv.
   He ate, smiling into the camera. He washed the dishes himself.
   Then he took questions from the audience.

b. Each chef cooked a regional speciality on tv.
   He ate, smiling into the camera. He washed the dishes himself.
   Then he took questions from the audience.

c. Every chef cooked a regional speciality on tv.
   He ate, smiling into the camera. He washed the dishes himself.
   Then he took questions from the audience.

d. That chef cooked a regional speciality on tv.
   He washed the dishes himself. He ate, smiling into the camera.
   Then he took questions from the audience.

e. Each chef cooked a regional speciality on tv.
   He washed the dishes himself. He ate, smiling into the camera.
   Then he took questions from the audience.

f. Every chef cooked a regional speciality on tv.
   He washed the dishes himself. He ate, smiling into the camera.
   Then he took questions from the audience.

(13) a. Thomas Brookner chose a topic. He researched the area.
   He wrote an outstanding essay for the class.
   He received a lot of praise.

b. Each journalist chose a topic. He researched the area.
   He wrote an outstanding essay for the class.
   He received a lot of praise.

c. Every journalist chose a topic. He researched the area.
   He wrote an outstanding essay for the class.
   He received a lot of praise.

d. Thomas Brookner chose a topic.
   He wrote an outstanding essay for the class.
   He researched the area. He received a lot of praise.
e. Each journalist chose a topic.
   He wrote an outstanding essay for the class.
   He researched the area. He received a lot of praise.

f. Every journalist chose a topic.
   He wrote an outstanding essay for the class.
   He researched the area. He received a lot of praise.

(14) a. That traveller selected a book. He bought it on the spot.
   Then he went back to his hotel.
   He put it in his briefcase immediately.

b. Each traveller selected a book. He bought it on the spot.
   Then he went back to his hotel.
   He put it in his briefcase immediately.

c. Every traveller selected a book. He bought it on the spot.
   Then he went back to his hotel.
   He put it in his briefcase immediately.

d. That traveller selected a book.
   He bought it on the spot. Then he went back to his hotel.

(15) a. That child picked out an apple.
   He paid for it with correct change. He ate it quickly.
   He enjoyed it.

b. Each child picked out an apple.
   He paid for it with correct change. He ate it quickly.
   He enjoyed it.

c. Every child picked out an apple.
   He paid for it with correct change. He ate it quickly.
   He enjoyed it.

d. That child picked out an apple.
   He ate it quickly. He paid for it with correct change.
   He enjoyed it.

(16) a. This doctoral candidate walked up to the podium.
   He received a diploma with a big smile. He walked off stage.
   He went back to his seat.

b. Each doctoral candidate walked up to the podium.
   He received a diploma with a big smile. He walked off stage.
   He went back to his seat.
c. Every doctoral candidate walked up to the podium. He received a diploma with a big smile. He walked off stage. He went back to his seat.

d. This doctoral candidate walked up to the podium. He walked off stage. He received a diploma with a big smile. He went back to his seat.

e. Each doctoral candidate walked up to the podium. He walked off stage. He received a diploma with a big smile. He went back to his seat.

f. Every doctoral candidate walked up to the podium. He walked off stage. He received a diploma with a big smile. He went back to his seat.

(17) a. That camper washed clothes on Monday. He dried them immediately. He put them back on. They became dirty again in no time.

b. Each camper washed clothes on Monday. He dried them immediately. He put them back on. They became dirty again in no time.

c. Every camper washed clothes on Monday. He dried them immediately. He put them back on. They became dirty again in no time.

d. That camper washed clothes on Monday. He put them back on. He dried them immediately. They became dirty again in no time.

e. Each camper washed clothes on Monday. He put them back on. He dried them immediately. They became dirty again in no time.

f. Every camper washed clothes on Monday. He put them back on. He dried them immediately. They became dirty again in no time.

(18) a. That musician called a friend. He made a date for the concert. He bought tickets immediately. But he never went.

b. Each musician called a friend. He made a date for the concert. He bought tickets immediately. But he never went.

c. Every musician called a friend. He made a date for the concert. He bought tickets immediately. But he never went.

d. That musician called a friend. He bought tickets immediately. He made a date for the concert. But he never went.

e. Each musician called a friend. He bought tickets immediately. He made a date for the concert. But he never went.

f. Every musician called a friend. He bought tickets immediately. He made a date for the concert. But he never went.

(19) a. That housewife went to the market. She looked at all the produce. She bought just a few potatoes. Then she went home.

b. Each housewife went to the market. She looked at all the produce. She bought just a few potatoes. Then she went home.
c. Every housewife went to the market.
   She looked at all the produce. She bought just a few potatoes.
   Then she went home.

d. That housewife went to the market.
   She bought just a few potatoes. She looked at all the produce.
   Then she went home.

e. Each housewife went to the market.
   She bought just a few potatoes. She looked at all the produce.
   Then she went home.

f. Every housewife went to the market.
   She bought just a few potatoes. She looked at all the produce.
   Then she went home.

(20) a. Some actress bought an issue of Vanity Fair.
   She subscribed at once. She read it regularly.
   But she only liked the advertisements.

b. Each actress bought an issue of Vanity Fair.
   She subscribed at once. She read it regularly.
   But she only liked the advertisements.

c. Every actress bought an issue of Vanity Fair.
   She subscribed at once. She read it regularly.
   But she only liked the advertisements.

d. Some actress bought an issue of Vanity Fair.
   She read it regularly. She subscribed at once.
   But she only liked the advertisements.

e. Each actress bought an issue of Vanity Fair.
   She read it regularly. She subscribed at once.
   But she only the advertisements.

f. Every actress bought an issue of Vanity Fair.
   She read it regularly. She subscribed at once.
   But she only liked the advertisements.

(21) a. That woman in the reading group played volleyball before class.
   She got sweaty. She didn’t take a shower. The room smelled.

b. Each woman in the reading group played volleyball before class.
   She got sweaty. She didn’t take a shower. The room smelled.

c. Every woman in the reading group played volleyball before class.
   She got sweaty. She didn’t take a shower. The room smelled.

d. That woman in the reading group played volleyball before class.
   She didn’t take a shower. She got sweaty. The room smelled.

e. Each woman in the reading group played volleyball before class.
   She didn’t take a shower. She got sweaty. The room smelled.

f. Every woman in the reading group played volleyball before class.
   She didn’t take a shower. She got sweaty. The room smelled.

(22) a. That model called an interior designer. She got advice.
   She decorated her apartment with care.
   All her friends liked the place.

b. Each model called an interior designer. She got advice.
   She decorated her apartment with care.
   All her friends liked the place.
c. Every model called an interior designer. She got advice.
   She decorated her apartment with care.
   All her friends liked the place.

d. That model called an interior designer.
   She decorated her apartment with care.
   She got advice. All her friends liked the place.

e. Each model called an interior designer.
   She decorated her apartment with care.
   She got advice. All her friends liked the place.

f. Every model called an interior designer.
   She decorated her apartment with care.
   She got advice. All her friends liked the place.

(23) a. That girlfriend found out the date of Sam’s birthday.
   She planned a party. She invited his friends.
   She couldn’t understand why not everybody came.

b. Each girlfriend found out the date of Sam’s birthday.
   She planned a party. She invited his friends.
   She couldn’t understand why not everybody came.

c. Every girlfriend found out the date of Sam’s birthday.
   She planned a party. She invited his friends.
   She couldn’t understand why not everybody came.

d. That girlfriend found out the date of Sam’s birthday.
   She invited his friends. She planned a party.
   She couldn’t understand why not everybody came.

e. Each girlfriend found out the date of Sam’s birthday.
   She invited his friends. She planned a party.
   She couldn’t understand why not everybody came.

f. Every girlfriend found out the date of Sam’s birthday.
   She invited his friends. She planned a party.
   She couldn’t understand why not everybody came.

(24) a. That schoolgirl borrowed a tent. She went camping.
   She returned the tent in good repair.
   Then she told stories about the camping trip.

b. Each schoolgirl borrowed a tent. She went camping.
   She returned the tent in good repair.
   Then she told stories about the camping trip.

c. Every schoolgirl borrowed a tent. She went camping.
   She returned the tent in good repair.
   Then she told stories about the camping trip.

d. That schoolgirl borrowed a tent.
   She returned the tent in good repair.
   She went camping. Then she told stories about the camping trip.

e. Each schoolgirl borrowed a tent.
   She returned the tent in good repair.
   She went camping. Then she told stories about the camping trip.

f. Every schoolgirl borrowed a tent.
   She returned the tent in good repair.
   She went camping. Then she told stories about the camping trip.
REFERENCES


