Comprehending the pronouns *her*, *him*, and *his*:
Implications for theories of referential processing

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Abstract

The research investigated how comprehenders use structural information during co-reference resolution of the pronouns *her*, *him*, and *his*. In Experiment 1, participants read sentences containing the pronoun *her* in object position, functioning as SPEC or NP and preceded by one of three types of NPs in subject position (e.g., “Mary/Mark/They saw her friend/yesterday...”). In Experiment 2, additional participants read similar sentences, containing the unambiguous pronouns *him* or *his*. The results of both experiments showed that the type of NP occurring in subject position influenced processing on both SPEC and NP pronouns. These results were inconsistent with claims that comprehenders consider only those antecedents that are structurally available as antecedents, following Chomsky’s (1981) Binding Theory (Clifton, Kennison, & Albrecht, 1997; Nicol & Swinney, 1989). In Experiment 3, subject type did not influence processing of NP pronouns when the context contained a highly salient, structurally available antecedent. Implications for theories of referential processing are discussed.

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those shown in 1. A probe word was presented imme-
diately following the pronoun him or the reflexive
1a. The boxer told the skier that the doctor for the team
would blame him for the recent injury.
1b. The boxer told the skier that the doctor for the team
would blame himself for the recent injury.

pronoun anaphor himself. The probe word was either
semantically related or unrelated to one of the three
previously occurring nouns: boxer, skier, or doctor.
Participants judged whether the probe word was an
English word or nonword (i.e., lexical decision judg-
ment). In sentences containing the pronoun him, as in
1a, the nouns boxer and skier were structurally available
as antecedents, following Binding Theory, but the noun
doctor was not. In sentences containing the reflexive
pronoun anaphor himself, as in 1b, the noun doctor
was the only structurally available antecedent. The results
showed that a significant priming effect was observed
when probe words were related to nouns that were
structurally available as antecedents. When probe words
were related to nouns that were not structurally avail-
able antecedents, priming was not observed. Nicol and
Swinney (1989) concluded that no priming was observed
for words related to structurally unavailable antecedents
because they had not been considered during co-refer-
ence resolution.

In contrast, Badecker and Straub (2002) proposed
that the initial set of candidate antecedents contains
both discourse entities that are structurally available
and structurally unavailable as antecedents, following
Binding Theory (Chomsky, 1981). A series of exper-
iments were reported that employed a multitask sen-
tence comprehension paradigm. Participants read
sentences presented word-by-word. After each sentence,
participants carried out a probe recognition task, in
which participants judged whether a probe word had
occurred in the preceding sentence. Participants also
answered intermittent yes–no comprehension questions.
The results showed that structurally unavailable ante-
cedents influenced reading time on sentences containing
pronouns and anaphors. Participants read sentences
similar to those in 2. In 2a and b, there is one struc-
turally available antecedent for the pronoun him (i.e.,
the subject of the main clause John). The subject of the
subordinate clause (i.e., Bill or Jane) is structurally un-
available as an antecedent. The results indicated that
reading time
2a. John thought that Bill owed him another chance to
solve the problem.
2b. John thought that Jane owed him another chance to
solve the problem.

was longer when the gender of the structurally un-
available antecedent matched with a structurally avail-
able antecedent (and the gender of the pronoun), as in
2a, than when the gender of the two mismatched, as
in 2b. The same pattern of results was observed when
the sentences contained a reflexive pronoun anaphor, as
shown in 3. For the reflexive pronoun anaphor, the
3a. John thought that Bill owed himself another chance
to solve the problem.
3b. Jane thought that Bill owed himself another chance
to solve the problem.

subject of the subordinate clause (i.e., Bill) was the only
structurally available antecedent. The subject of the
main clause (i.e., John or Jane) was structurally un-
available as an antecedent. Reading time was longer
when the structurally unavailable antecedent matched in
gender with the structurally available antecedent (and
the anaphor), as in 3a, than when the genders of the two
mismatched, as in 3b.

In a recent investigation reported by Sturt (2003),
additional evidence was provided that structurally un-
available antecedents can influence co-reference resolu-
tion. Furthermore, Sturt (2003) showed that structurally
available and structurally unavailable antecedents in-
fluence processing at different points in time during co-
reference resolution. Sturt (2003) recorded participants'
eye movements as they read
4a. Jonathan was pretty worried at the hospital. He
remembered that the surgeon had pricked himself
with a used syringe needle.
4b. Jennifer was pretty worried at the hospital. She
remembered that the surgeon had pricked herself
with a used syringe needle.
4c. Jonathan was pretty worried at the hospital. He
remembered that the surgeon had pricked himself
with a used syringe needle.
4d. Jennifer was pretty worried at the hospital. She
remembered that the surgeon had pricked herself
with a used syringe needle.

sentences similar to those in 4. First fixations and first
pass reading times on the region containing the reflexive
pronoun anaphor himself or herself were longer when
there was a gender mismatch between the anaphor and
the gender stereotype associated with the structurally
available antecedent, surgeon, as in 4c and d, than when
the genders of the two matched, as in 4a and b. Readers'
rereading of the region containing the anaphor as
measured in second pass reading time was influenced by
an interaction involving the type of structurally un-
available antecedent (i.e., the subject of the second
sentence he or she) and the structurally available ante-
cedent. When the structurally unavailable antecedent
matched the gender of the structurally available ante-
cedent, as in 4a and c, second pass reading time was
longer when the gender of the anaphor mismatched the
gender stereotype of the structurally available anteced-
ent than when the gender of the anaphor matched the
gender stereotype of the structurally available ante-
cedent, 4c and a, respectively. When the structurally un-
available antecedent mismatched the gender of the
structurally available antecedent (i.e., the anaphor him-
self with the antecedent surgeon), as in 4b and d, second pass reading time did not differ for sentences in which the structurally available antecedent’s gender matched or mismatched the gender of the reflexive pronoun anaphor, 4b and d, respectively. In Sturt’s (2003) Experiment 2, he showed that the gender of structurally unavailable antecedents sometimes caused participants to settle on a final, ungrammatical interpretation of the anaphor. Sturt (2003) proposed that binding constraints “act as a defeasible filter,” applied at the earliest stages of processing, but later violated.

The research described in this paper provides additional evidence that structurally unavailable antecedents can influence co-reference resolution of pronouns during sentence comprehension. Furthermore, the results provide clear evidence against the view that the initial set of candidate antecedents contains only those discourse entities that are consistent in gender with the pronoun or anaphor being resolved. The results are also compatible with the view that the initial set of candidate antecedents contains only those discourse entities that are consistent in number with the pronoun or anaphor being resolved. Three self-paced reading experiments are reported. In each experiment, reading time was measured on sentences modeled on those tested previously by Clifton et al. (1997). Sentences contained the English pronouns her, him, and his. The English pronoun her is syntactically ambiguous, functioning either as a noun phrase (NP) or as a specifier (SPEC), as shown in 5a and b. In contrast, the pronouns him and his are syntactically unambiguous; the pronoun him functions as an NP, and the pronoun his functions as a SPEC, as shown in 5c and d. For NPs occurring as direct objects, the antecedent cannot be the subject of the same clause, as shown in 5a 5a. They saw her. Direct Object (NP).  
5b. They saw her friend. Possessive (SPEC).  
5c. They saw him. Direct Object (NP).  
5d. They saw his friend. Possessive (SPEC).  
and c. If the subject of the sentence was intended to be co-referent with the direct object, a reflexive pronoun would be used, as shown in 6b and d. For pronouns occurring in object position and functioning as SPEC, the subject of the same clause would be structurally available as an  
6a. *John, saw him.  
6b. John, saw himself.  
6c. *Mary, saw her.  
6d. Mary, saw herself.  
7a. John, saw his friend.  
7b. Mary, saw her friend.

antecedent, as shown in 7. In Clifton et al.’s (1997) Experiment 1, participants read sentences containing the pronoun her disambiguated either as an NP or SPEC or containing the unambiguous pronouns his and him. Pronouns occurred in object position and were preceded by one of three types of verbs: (1) verbs that occur most frequently with human direct objects (e.g., harassed); (2) verbs that occur most frequently with inanimate direct objects (e.g., prepared); or (3) verbs that occur equally often with human and inanimate direct objects (e.g., hurry). Reading time was measured using a self-paced phrase-by-phrase moving window. Example sentences are shown in 8. Presentation regions are indicated by the slash. The second presentation region contained the past tense form of the verb harass, prepare, or hurry. The results indicated that reading comprehension was not influenced by the type of verb preceding the pronoun her. Furthermore,

8a. The producers/VERBED/her/frequently/during rehearsals/of the play about World War II.
8b. The producers/VERBED/her/secretary/during rehearsals/of the play about World War II.
8c. The producers/VERBED/him/frequently/during rehearsals/of the play about World War II.
8d. The producers/VERBED/his/secretary/during rehearsals/of the play about World War II.

Clifton et al.’s (1997) Experiment 2 further explored the only reading time difference observed in Experiment 1. Reading time was generally slower in SPEC conditions (8b and d) than NP conditions (8a and c). The hypothesis tested in Clifton et al.’s (1997) Experiment 2 was that reading time in SPEC conditions was longer because readers consulted the subject of the sentence attempting to establish co-reference. In the sentences tested in Experiment 1, the subject was plural (e.g., “The producers harassed her/his secretary, . . .”). In Experiment 2, sentences contained subject NPs that were singular or plural and the unambiguous pronouns him or his. Sample sentences are provided in 9. The results showed

9a. The supervisors/paid/him/yesterday/to finish/typing the manuscript./  
9b. The supervisor/paid/him/yesterday/to finish/typing the manuscript./  
9c. The supervisors/paid/his/assistant/to finish/typing the manuscript./  
9d. The supervisor/paid/his/assistant/to finish/typing/the manuscript./  

that reading time was determined by an interaction of subject type (singular versus plural NP) and structure type (SPEC pronoun versus NP pronoun). Reading time on SPEC conditions was longer when the subject of the
The research described in this paper investigated whether characteristics associated with an NP occurring in subject position could influence co-reference resolution on SPEC and NP pronouns occurring in object position within the same clause. If comprehenders consider only structurally available nouns during co-reference resolution, as suggested by Nicol and Swinney (1989) and Clifton et al. (1997), then an effect of subject type would be expected in SPEC conditions, but not in NP conditions. However, if comprehenders consider structurally unavailable as well as structurally available discourse entities during co-reference resolution, as suggested by Badecker and Straub (2002) and Sturt (2003), then an effect of subject type could occur in both SPEC and NP conditions. Three experiments are reported in this paper. In Experiments 1 and 2, reading time was measured on sentences in which the type of NP occurring in subject position was varied. The subject NP was a male proper name, female proper name or the plural pronoun they. In the sentences tested in Experiment 1, the ambiguous pronoun her occurred in object position and functioned either as a SPEC or NP pronoun. In Experiment 2, similar sentences were tested, but the sentences contained the unambiguous pronouns him or his, occurring in object position. The results of both Experiments 1 and 2 showed that the type of NP occurring in subject position influenced processing in both SPEC and NP pronouns. A third experiment showed that having a highly salient antecedent available for NP pronouns eliminated the subject type effect observed in NP conditions in Experiments 1 and 2. Taken together, these results provide new insight into the processes involved in the co-reference resolution of pronouns during sentence comprehension.

Experiment 1

Reading time was measured on sentences containing the ambiguous pronoun her in object position, functioning either as an NP or SPEC. The type of NP occurring in subject position was varied. The subject NP was a male proper name, a female proper name, or the plural pronoun they. Table 1 displays sample sentences. If comprehenders consider only structurally available discourse entities during co-reference resolution, as suggested by Nicol and Swinney (1989) and Clifton et al. (1997), then the effect of subject type would be expected in SPEC conditions, but not in NP conditions. If comprehenders consider structurally unavailable as well as structurally available discourse entities during co-reference resolution, as suggested by Badecker and Straub (2002) and Sturt (2003), then an effect of subject type could occur in both NP and SPEC conditions.

Method

Participants

Sixty-six undergraduates at Oklahoma State University, who were fluent speakers of American English and who were naïve to the purposes of the experiment, participated in exchange for course credit.

Materials

Thirty sentence sets were constructed by modifying those used in Clifton et al. (1997). For the materials constructed and used in this experiment, 22 items contained verbs occur most frequently with inanimate objects (i.e., watched, graded, searched, needed, painted, studied, prepared, measured, lost, retrieved, burned, publicized, mentioned, tore, unloaded, signed, submitted, inspected, monitored, replaced, documented, and viewed). Seven items contained verbs that occur equally often with inanimate and human direct objects (i.e., approved, obeyed, dressed, failed, carried, liked, and analyzed). One item contained a verb that occur most frequently with human direct objects (i.e., deceived). Each set of experimental sentences that were constructed had six versions. Three versions were SPEC continuations, and three

Table 1
Sample sentences from Experiment 1

<table>
<thead>
<tr>
<th>SPEC conditions</th>
<th>NP conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan <em>watched</em> <em>her</em> <em>classmate</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
<td>Susan <em>watched</em> <em>her</em> <em>yesterday</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
</tr>
<tr>
<td>Carl <em>watched</em> <em>her</em> <em>classmate</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
<td>Carl <em>watched</em> <em>her</em> <em>yesterday</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
</tr>
<tr>
<td>They <em>watched</em> <em>her</em> <em>classmate</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
<td>They <em>watched</em> <em>her</em> <em>yesterday</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
</tr>
</tbody>
</table>

Note. The asterisks indicate presentation boundaries.
versions were NP continuations. In SPEC conditions, a noun followed the pronoun. In NP conditions, an adverb followed the pronoun. The noun and adverb in each set was closely matched in length and printed frequency (as assessed by Francis & Kučera, 1982). The subject of SPEC and NP sentences was one of three types: (1) a female proper name; (2) a male proper name; or (3) the plural pronoun they. The proper names that were used were unambiguous in terms of gender (e.g., Mary, Mark). Proper names were selected to closely matched in length and printed frequency. Appendix contains a complete list of these materials.

Procedure
Sentences were presented on a cathode ray tube (CRT) controlled by MicroExperimental Laboratory II (MEL2) on an IBM compatible microcomputer. Sentences were presented using a phrase-by-phrase self-paced moving window (Kennedy & Murray, 1984). This procedure involved the use of preview dashes. Readers were first presented with an array of dashes; each dash corresponded to the position of a letter in the current sentence. When the reader manually pressed the “/” key, which was labeled with a sticker on which was written the word “NEXT,” the first presentation region of the sentence appeared, replacing the corresponding dashes. When the reader completed reading the first presentation region and manually pressed the key again, the second presentation region appeared, replacing the corresponding dashes, and the first presentation region disappeared and was replaced with corresponding dashes. This procedure was repeated until the last presentation region was read. Each sentence was followed by a YES/NO comprehension question. Participants pressed the “z” and “x” keys for YES and NO, respectively. Participants used the index finger on the right hand for the NEXT key and the index and middle fingers on the left hand for YES and NO. The 30 experimental sentences were intermixed with 90 filler sentences in a random order. Six counterbalancing lists were used to ensure that each item was viewed in each condition equally often across participants. Each participant was randomly assigned to a counterbalancing list and tested individually in a private well-lit cubicle. Each participant was given a practice session of 16 sentences, followed by the set of experimental sentences, which consisted of 120 sentences. Each session lasted between 30 and 45 min.

Experimental design
A 3 × 2 repeated measures design was used. The two within-participant factors were type of subject (female proper name versus male proper name versus plural pronoun) and type of structure (NP versus SPEC).

Results and discussion
Comprehension questions were answered correctly 94% of the time, indicating participants complied with the instructions to comprehend the sentences. Reading times for each presentation region were initially trimmed. Observations longer than three standard deviations above or below a participant’s mean reading time for a region were eliminated, resulting in a loss of less than 1% of observations. Table 2 displays mean reading time for the eight presentation regions by condition. Analyses of variances (ANOVA) were conducted using presentation region, structure type, and type of subject. All ANOVAs reported in this paper were carried out for participants (F1) and sentences (F2), following Clark (1973). An α level of .05 was used. Reading time was significantly influenced by an interaction of presentation region, structure type, and type of subject, F1(14, 406) = 2.44, MSE = 82.293, p < .05, F2(14, 406) = 2.09, MSE = 30.460, p < .05, indicating that the interaction between subject type and structure type varied across regions. The interaction involving presentation region justified conducting additional ANOVAs for each presentation region. For these

Table 2
Mean reading time (standard errors) in milliseconds for each presentation region by condition from Experiment 1

<table>
<thead>
<tr>
<th>Subject type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEC conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female name</td>
<td>427 (18)</td>
<td>483 (19)</td>
<td>450 (16)</td>
<td>493 (23)</td>
<td>501 (26)</td>
<td>561 (24)</td>
<td>505 (19)</td>
<td>763 (47)</td>
</tr>
<tr>
<td>Male name</td>
<td>450 (18)</td>
<td>495 (25)</td>
<td>440 (13)</td>
<td>530 (31)</td>
<td>546 (22)</td>
<td>618 (30)</td>
<td>543 (18)</td>
<td>757 (36)</td>
</tr>
<tr>
<td>They</td>
<td>407 (15)</td>
<td>457 (20)</td>
<td>453 (17)</td>
<td>468 (19)</td>
<td>506 (21)</td>
<td>582 (27)</td>
<td>543 (20)</td>
<td>788 (34)</td>
</tr>
<tr>
<td>NP conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female name</td>
<td>428 (20)</td>
<td>480 (18)</td>
<td>435 (12)</td>
<td>537 (28)</td>
<td>645 (31)</td>
<td>637 (39)</td>
<td>534 (17)</td>
<td>742 (31)</td>
</tr>
<tr>
<td>Male name</td>
<td>458 (21)</td>
<td>489 (20)</td>
<td>448 (16)</td>
<td>572 (32)</td>
<td>606 (35)</td>
<td>566 (24)</td>
<td>522 (17)</td>
<td>731 (37)</td>
</tr>
<tr>
<td>They</td>
<td>428 (20)</td>
<td>452 (17)</td>
<td>439 (16)</td>
<td>501 (20)</td>
<td>499 (18)</td>
<td>533 (20)</td>
<td>517 (16)</td>
<td>712 (36)</td>
</tr>
</tbody>
</table>

Note. Region 3 contained the pronoun her.

\(^1\) Huynh–Feldt significance levels and errors are reported with unadjusted degrees of freedom for all analyses involving presentation region (see Huynh & Feldt, 1970).
additional ANOVAs, structure type and type of subject were used as the two within-participant factors. Regions 1 and 2 contained the subject of the sentence and the verb, respectively. Region 3 contained the pronoun. Region 4 contained the adverb or noun that disambiguated the pronoun in NP and SPEC conditions, respectively. The remainder of the sentence was presented in four additional regions (regions 5–8). The most notable results were observed at regions 4–6. Fig. 1 displays mean reading time for the region containing the pronoun and the three following regions (regions 3–6) in SPEC and NP conditions.

The results indicated that the type of subject occurring in sentences influenced co-reference resolution in both SPEC and NP conditions, a result inconsistent with Nicol and Swinney (1989) and Clifton et al. (1997). Overall, the results showed that in SPEC conditions, reading time was longest when the subject of the sentence was a male proper name. However, in NP conditions, reading time was longest when the subject of the sentence was a female proper name. This pattern was most strongly observed at the two regions following the region containing the disambiguating adverb or noun (regions 5 and 6), resulting in a significant subject type × structure type interaction, $F_1(2, 130) = 8.04$, $MSE = 190.397$, $p < .05$, $F_2(2, 58) = 8.34$, $MSE = 86.570$, $p < .05$ and $F_1(2, 130) = 6.69$, $MSE = 176.728$, $p < .05$, $F_2(2, 58) = 9.24$, $MSE = 80.179$, $p < .05$, respectively.

Significant main effects were observed at regions 4–6. Reading time at these regions was shortest for conditions containing the plural pronoun they in subject position, resulting in significant main effects of type of subject, $F_1(2, 130) = 4.96$, $MSE = 147.024$, $p < .05$, $F_2(1, 29) = 6.07$, $MSE = 71.441$, $p < .05$, $F_1(2, 130) = 3.31$, $MSE = 65.312$, $p < .05$, $F_2(1, 29) = 7.61$, $MSE = 66.589$, $p < .05$, and $F_1(2, 130) = 11.91$, $MSE = 225.296$, $p < .05$, $F_2(2, 58) = 3.38$, $MSE = 29.852$, $p < .05$, respectively. At regions 4 and 5, reading time was longer for sentences containing NP pronouns than SPEC pronouns, resulting in a significant main effect of structure type, $F_1(1, 65) = 10.92$, $MSE = 157.242$, $p < .05$, $F_2(1, 29) = 6.07$, $MSE = 71.441$, $p < .05$ and $F_1(1, 65) = 21.74$, $MSE = 428.148$, $p < .05$, $F_2(1, 29) = 7.61$, $MSE = 66.589$, $p < .05$, respectively. At region 6, the main effect of structure type was not significant, $F_s < 1$.

**Specifier conditions**

In SPEC conditions, the NP in subject position was a structurally available antecedent. Consequently, comprehenders were expected to consider the subject NP during co-reference resolution of the SPEC pronoun in object position. The results indicated that the type of subject occurring in the sentence strongly influenced processing on SPEC pronouns. When the NP in subject position was a female proper name, co-reference could be grammatically achieved. However, when the NP in subject position was a male proper name or the plural pronoun they, co-reference could not be grammatically achieved. When the subject of the sentence was a female proper name reading time was significantly faster than when the subject of the sentence was a male proper name. This pattern was observed most strongly for the two regions following the disambiguating noun (regions 5 and 6), $F_1(1, 65) = 4.22$, $MSE = 68.273$, $p < .05$, $F_2(1, 29) = 5.01$, $MSE = 30.917$, $p < .05$ and $F_1(1, 65) = 4.53$, $MSE = 106.364$, $p < .05$, $F_2(1, 29) = 8.09$, $MSE = 48.167$, $p < .05$, respectively. At region 4, the region containing the disambiguating adverb or noun, reading time did not differ for these two proper name conditions, $F_s < 1.36$, $ps > .05$. When the subject of the sentence was the plural pronoun they, reading time was faster than when the subject of the sentence was a male proper name. This difference was significant at region 4, $F_1(1, 65) = 7.49$, $MSE = 130.662$, $p < .05$, $F_2(1, 29) = 17.01$, $MSE = 59.032$, $p < .05$, but not at the following two regions (regions 5 and 6), $F_s < 1.03$. No reading time advantage was observed for sentences containing a female proper name in subject position over sentences containing the plural pronoun in subject position: region 4, $F_s < 2.69$, $p > .05$; regions 5 and 6, $F_s < 1.03$.

The present results contradict Badecker and Straub’s (2002) claim that the initial set of candidate antecedents contains only those discourse entities that are consistent in gender with the pronoun or anaphor being resolved.
The present results showed that processing difficulty occurred when the subject NP was rejected as a possible co-referent of the pronoun on the basis of gender information. Reading time was longer when the subject of the sentence was a male proper name than when it was a female proper name. However, no processing difficulty was observed when the subject NP was rejected as a possible co-referent of the pronoun on the basis of number information, supporting Badecker and Straub’s (2002) additional claim that the initial set of candidate antecedents contains only those discourse entities that are consistent in number with the pronoun or anaphor being resolved.

The present results contrast with Clifton et al.’s (1997) Experiment 2 results in which readers took longer to resolve SPEC pronouns when the subject of the sentence was a plural NP (versus a singular NP). Clifton et al. (1997) claimed that the processing difficulty in sentences containing a plural subject and a singular SPEC pronoun “can be traced to the disruption caused when an [structurally available] antecedent of a pronoun clashes with the pronoun in number” (p. 289). This account is consistent with the view that the initial set of candidate antecedents can contain discourse entities that are incompatible in number with the pronoun being resolved. Subsequent processing then must occur in order to reject the plural subject NP as the antecedent of the SPEC pronoun. Reconciling these contrasting patterns of data can be achieved with either of two possibilities. One possibility is that Clifton et al.’s (1997) observation of longer reading time for plural (versus singular) subject NPs represents a Type I error.

Accepting this supposition results in concluding that the initial set of candidate antecedents contains only those discourse entities that are compatible in number with the pronoun being resolved. On the other hand, a second possibility carries with it three assumptions: (1) the initial set of candidate antecedents can contain discourse entities that are incompatible in number with the pronoun being processed; (2) the failure to observe evidence of this in the present experiment is due to the rapid elimination of the plural pronoun they as a possible co-referent of a singular pronoun; the elimination occurs so rapidly that no measurable processing difficulty occurred; and (3) the plural pronoun they can be eliminated as a possible co-referent of a singular pronoun more quickly than the type of plural subject NPs tested in Clifton et al.’s (1997) Experiment 2 (e.g., supervisors). The former possibility appears to be the most elegant explanation. However, the latter possibility merits serious consideration as well as attention in future research.

**NP conditions**

In NP conditions, co-reference between the subject of the sentence and the pronoun her could not be grammatically achieved in any condition. In all conditions, the pronoun was intended to refer to an entity not yet mentioned by name in the discourse. The results indicated that when the NP occurring in subject position was the same gender as the pronoun, reading time was longest among the three subject type conditions. At region 6, two regions downstream from the disambiguating adverb, reading time in female proper name conditions was longer than reading time in male proper name conditions, $F_1(1,65) = 6.75, \ MSE = 161.206, p < .05, F_2(1,29) = 5.37, MSE = 75.828, p < .05$ and in plural pronoun they conditions, $F_1(1,65) = 8.56, MSE = 359.532, p < .05, F_2(1,29) = 11.02, MSE = 163.699, p < .05$. At region 5, reading time was significantly longer in female proper name conditions than in plural pronoun they conditions, $F_1(1,65) = 35.84, MSE = 700.074, p < .05, F_2(1,29) = 29.02, MSE = 317.990, p < .05$, but not significantly longer than in male proper name conditions, $F_s < 1.36, ps > .05$. Reading time in plural pronoun they conditions was significantly shorter than in male proper name conditions at the disambiguating region and following region (regions 4 and 5), $F_1(1,65) = 8.61, MSE = 163.596, p < .05, F_2(1,29) = 7.82, MSE = 74.272, p < .05$ and $F_1(1,65) = 10.69, MSE = 376.000, p < .05, F_2(1,29) = 12.23, MSE = 16.376, p < .05$, respectively.

These results contrast with Clifton et al.’s (1997) results that showed that readers were not influenced by the type of NP occurring in subject position when resolving an NP pronoun occurring in object position. The results of the present experiment showed that readers took longer to process regions following the NP pronoun when the subject of the sentence was a female proper name than when the subject of the sentence was a male proper name. Furthermore, in the present experiment, readers also took longer to process regions following the NP pronoun when the subject of the sentence was a male proper name than when it was the plural pronoun they. The present results suggest that readers may generally take longer to terminate the search for an antecedent when the initial set of candidate antecedents contained a structurally unavailable entity that is similar in gender or number with the pronoun being resolved. In the present experiment, readers took the longest to terminate antecedent search when the structurally unavailable antecedent was consistent in both number and gender with the pronoun being resolved, i.e., when the sentence contained a female proper name in subject position. Readers terminated antecedent search fastest when the structurally unavailable antecedent was inconsistent in number with the pronoun being resolved, i.e., when the sentence contained the plural pronoun they in subject position. Clifton et al.’s (1997) failure to observe a difference among conditions containing NP pronouns may have been due to the fact that Clifton et al.’s (1997) sentences contained gender ambiguous NPs, which were not strongly stereotyped for gender. Readers may only delay the termination of
antecedent search when the structurally unavailable NP is strongly stereotyped to refer to one gender over the other and there is a gender match between the NP and the pronoun or anaphor being processed.

The gender match effect observed in the NP conditions of the present experiment was similar to the pattern observed in Badecker and Straub (2002). However, Badecker and Straub’s (2002) sentences contained an antecedent for the pronoun (see 2a and b). The present results showed that the longer reading time observed by Badecker and Straub (2002) could have been observed even without a structurally available antecedent being present in the context. Their results may have resulted because of a match in gender between the pronoun and the structurally unavailable subject, rather than resulting only from a match in gender between the structurally unavailable subject and the structurally available antecedent.

**Specifier versus NP conditions**

Readers appeared to take longer initially to process NP conditions than SPEC conditions when the subject of the sentence was a female proper name. The difference in reading time was significant at regions 4-6: $F_1(1, 65) = 5.05$, $MSE = 64,904$, $p < .05$, $F_1(2, 29) = 2.56$, $MSE = 29,437$, $p > .05$; $F_1(1, 65) = 33.49$, $MSE = 388,326$, $p < .05$; $F_1(2, 29) = 21.90$, $MSE = 312,616$, $p < .05$; and $F_1(1, 65) = 5.04$, $MSE = 192,742$, $p < .05$, $F_1(2, 29) = 4.21$, $MSE = 87,325$, $p < .05$, respectively. When the subject of the sentence was a male proper name or the plural pronoun *they*, reading time at regions 4 and 5 was longer on NP conditions than SPEC conditions; however, the differences failed to reach significance in both participant and item analyses (male proper name conditions: region 4, $F_1(1, 65) = 3.11$, $MSE = 56,420$, $p > .05$; $F_1(2, 29) = 2.36$, $MSE = 25,751$, $p > .05$ and region 5, $F_1(1, 65) = 3.35$, $MSE = 118,920$, $p > .05$; $F_1(2, 29) = 2.54$, $MSE = 52,215$, $p > .05$, and plural pronoun *they* condition: region 4, $F_1(1, 65) = 5.90$, $MSE = 37,843$, $p < .05$; $F_1(2, 29) = 3.71$, $MSE = 17,137$, $p > .05$ and region 5, $F_5s < 1$). For male proper name and plural pronoun *they*, a reversal occurred at region 6; reading time was longer in SPEC conditions than in NP conditions, $F_1(1, 65) = 5.16$, $MSE = 187,627$, $p < .05$; $F_1(2, 29) = 5.30$, $MSE = 39,732$, $p < .05$ and $F_1(1, 65) = 6.16$, $MSE = 79,527$, $p < .05$; $F_1(2, 29) = 6.17$, $MSE = 36,260$, $p < .05$, respectively. These present results provided no clear evidence against Clifton et al.’s (1997) proposal that readers initially treated the pronoun *her* in an underspecified fashion during processing, as proposed in Clifton et al. (1997).

**Other significant results**

The only remaining significant results were the following. Reading time on regions 1 and 2 was shortest when the subject was the plural pronoun *they*, resulting in a significant main effect of subject type: region 1, $F_1(2, 130) = 4.93$, $MSE = 43,538$, $p < .05$, $F_2(2, 58) = 4.36$, $MSE = 19,840$, $p < .05$ and region 2, $F_1(2, 130) = 4.28$, $MSE = 50,173$, $p < .05$, $F_2(2, 58) = 5.16$, $MSE = 22,770$, $p < .05$. Neither the main effect of structure type nor the interaction between structure type and type of subject was significant for these regions, $Fs < 1$. The longer reading time in singular proper name conditions may be a frequency effect as the plural pronoun they occurs roughly 300 times more frequently than proper male and female names do, on average (as assessed by Francis & Kućera, 1982). However, as an anonymous reviewer suggested, another possibility is that because of the verbs used, sentences were more plausible with plural subjects than with singular subjects (e.g., *They painted...* versus *Mary painted...*).

Lastly, reading time at the last presentation region of the sentence (region 8) was longer in SPEC conditions than NP conditions, resulting in a significant main effect of structure type, $F_1(1, 65) = 5.78$, $MSE = 164,661$, $p < .05$; $F_1(1, 29) = 2.60$, $MSE = 74,705$, $p < .12$. Reading time was not significantly influenced by subject type or an interaction of structure type and type of subject, $Fs < 1$.

In summary, the conclusions drawn from these results regarding the consideration of structurally unavailable entities during co-reference resolution in the NP pronoun *her* must be considered with one caveat. The pronoun *her* is syntactically ambiguous. It is possible that the effect of subject type observed in NP conditions occurred because the pronoun *her* could also function as SPEC. The purpose of Experiment 2 was to determine whether the effect of subject type in NP conditions would occur when sentences contained the unambiguous pronoun *him*.

**Experiment 2**

In Experiment 2, reading time was measured on sentences similar to those tested in Experiment 1. Sentences contained the unambiguous pronouns *him* and *his*, rather than the ambiguous pronoun *her*. Table 3 displays sample sentences.

**Method**

**Participants**

Seventy-eight additional undergraduates at Oklahoma State University, who were fluent speakers of American English and who were naive to the purposes of the experiment, participated in exchange for course credit.

**Materials**

The materials used in Experiment 1 were modified for use in Experiment 2. The pronoun *her* was exchanged for the pronouns *his* and *him* to form grammatical
Apparatus and procedure
The apparatus and procedure were the same as described in Experiment 1.

Experimental design
The design was the same as in Experiment 1.

Results
Comprehension questions were answered correctly 93% of the time, indicating participants were fully engaged in the task. Reading times for each presentation region were initially trimmed as in Experiment 1, resulting in a loss of less than 1% of observations. Table 4 displays mean reading time for the eight presentation regions by condition. Reading time was significantly influenced by an interaction of presentation region, structure type, and type of subject,

$$F_1(14, 1078) = 2.16, \text{MSE} = 55,750, p < .05, F_2(14, 406) = 3.04, \text{MSE} = 50,149, p < .05,^1$$

indicating that the interaction between structure type and type of subject varied across regions. The interaction involving presentation region justified conducting additional ANOVAs for each presentation region. As in Experiment 1, the most notable results were observed in regions 4–6. Fig. 2 displays mean reading time on the region containing the pronoun and the three following regions (regions 3–6) in SPEC and NP conditions.

As in Experiment 1, the results of these ANOVAs indicated that processing on both SPEC and NP pronouns was influenced by the type of subject occurring in the sentences. In SPEC conditions, reading time was longest when the subject of the sentence was a female proper name. In NP conditions, reading time was longest when the subject of the sentence was a male proper name. The interaction between type of structure and subject type was significant at the two regions following the pronoun (regions 4 and 5),

$$F_1(2, 154) = 12.04, \text{MSE} = 158,336, p < .05, F_2(2, 58) = 4.39, \text{MSE} = 60,839, p < .05$$ and $F_1(2, 154) = 7.60, \text{MSE} = 113,342, p < .05, F_2(2, 58) = 5.10, \text{MSE} = 43,113, p < .05$, respectively.

The interaction approached significance at region 6, $F_1(2, 154) = 2.58, \text{MSE} = 46,686, p < .08, F_2(2, 58) = 1.24, \text{MSE} = 17,884, p > .05$.

### Table 3
Sample sentences from Experiment 2

<table>
<thead>
<tr>
<th></th>
<th>SPEC conditions</th>
<th></th>
<th>NP conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPEC conditions</strong></td>
<td></td>
<td></td>
<td><strong>NP conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Susan <em>watched</em> <em>his</em> <em>classmate</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
<td>464 (21)</td>
<td>530 (23)</td>
<td>473 (19)</td>
<td>582 (28)</td>
</tr>
<tr>
<td>Carl <em>watched</em> <em>his</em> <em>classmate</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
<td>450 (17)</td>
<td>527 (25)</td>
<td>457 (14)</td>
<td>515 (23)</td>
</tr>
<tr>
<td>They <em>watched</em> <em>his</em> <em>classmate</em> <em>during</em> <em>the open rehearsals</em> <em>of the</em> <em>school play.</em></td>
<td>416 (16)</td>
<td>515 (26)</td>
<td>454 (15)</td>
<td>539 (28)</td>
</tr>
<tr>
<td><strong>His</strong> (SPEC) conditions</td>
<td></td>
<td></td>
<td><strong>Him</strong> (NP) conditions</td>
<td></td>
</tr>
<tr>
<td>Female name</td>
<td>464 (21)</td>
<td>530 (23)</td>
<td>473 (19)</td>
<td>582 (28)</td>
</tr>
<tr>
<td>Male name</td>
<td>450 (17)</td>
<td>527 (25)</td>
<td>457 (14)</td>
<td>515 (23)</td>
</tr>
<tr>
<td>They</td>
<td>416 (16)</td>
<td>515 (26)</td>
<td>454 (15)</td>
<td>539 (28)</td>
</tr>
<tr>
<td>Female name</td>
<td>471 (20)</td>
<td>526 (24)</td>
<td>478 (18)</td>
<td>591 (25)</td>
</tr>
<tr>
<td>Male name</td>
<td>476 (22)</td>
<td>516 (20)</td>
<td>490 (21)</td>
<td>627 (30)</td>
</tr>
<tr>
<td>They</td>
<td>418 (14)</td>
<td>504 (23)</td>
<td>468 (17)</td>
<td>535 (25)</td>
</tr>
</tbody>
</table>

Note. Region 3 contained the pronoun *him* or *his.*
Significant main effects were observed. The significant main effect of type of subject, indicated that reading time in the plural pronoun *they* condition was shortest among the three subject type conditions for region 4, $F(1, 77) = 5.57$, $MSE = 97.285$, $p < .05$, $F(2, 58) = 4.15$, $MSE = 37.284$, $p < .05$. At region 5, the main effect of subject type approached significance: $F(1, 74) = 4.06$, $MSE = 50.147$, $p < .05$, $F(2, 58) = 1.97$, $MSE = 19.056$, $p > .05$. At region 6, the main effect of subject type was not significant, $F$s $< 1.98$, $ps > .15$. The significant main effect of structure type (NP versus SPEC) indicated that reading time was longer for NP than SPEC at the three regions following the pronoun (regions 4 and 5), $F(1, 77) = 7.34$, $MSE = 185.501$, $p < .05$, $F(2, 58) = 3.31$, $MSE = 69.227$, $p < .08$ and $F(1, 77) = 6.13$, $MSE = 139.604$, $p < .05$, $F(1, 29) = 4.94$, $MSE = 54.115$, $p < .05$. At region 6, the main effect of structure type was significant by participants only, $F(1, 77) = 5.93$, $MSE = 71.583$, $p < .05$, $F(1, 29) = 2.39$, $MSE = 27.405$, $p > .05$, respectively.

**Specifier conditions**

As in Experiment 1, reading time on SPEC pronouns was significantly influenced by type of NP occurring in subject position. When co-reference could be achieved between the SPEC pronoun *his* and the subject of the sentence, i.e., when the subject of the sentence was a male proper name, reading time was faster than when the subject of the sentence was a female proper name and co-reference could not be achieved. The pattern was strongest for the two regions following the pronoun (regions 4 and 5), $F(1, 77) = 14.30$, $MSE = 248.322$, $p < .05$, $F(2, 29) = 9.16$, $MSE = 93.852$, $p < .05$ and $F(1, 77) = 10.49$, $MSE = 173.467$, $p < .05$, $F(1, 29) = 4.43$, $MSE = 66.533$, $p < .05$, respectively. As in Experiment 1, reading time in the plural pronoun *they* condition did not differ significantly from the condition in which co-reference could be grammatically achieved, i.e., the male proper name condition, $F$s $< 1.43$, $ps > .05$. The plural pronoun *they* condition was read more quickly than the female proper name condition at the two regions following the pronoun (region 4, by participants only, and region 5 by participants and items), $F(1, 77) = 4.60$, $MSE = 69.512$, $p < .05$, $F(1, 29) = 1.68$, $MSE = 26.586$, $p > .05$ and $F(1, 77) = 11.69$, $MSE = 192.854$, $p < .05$, $F(1, 29) = 7.22$, $MSE = 73.921$, $p < .05$, respectively.

**NP conditions**

As in Experiment 1, reading time on NP pronouns occurring in object position was significantly influenced by the type of NP occurring in subject position of the sentence. Reading time was longest when the NP in subject position matched the gender of the pronoun in object position. The effect was observed at regions 4 and 5. Readers took longer processing the pronoun *him* when the subject of the sentence was a male proper name than when the subject of the sentence was a female proper name. The difference failed to reach significance in regions 4 and 5 when analyzed separately, $F$s $< 3.51$, $ps > .05$ and $F$s $< 2.49$, $ps > .05$, respectively. However, when reading time for these two regions were pooled, the difference was significant, $F(1, 77) = 4.45$, $MSE = 74.865$, $p < .05$, $F(2, 29) = 5.63$, $MSE = 63.895$, $p < .05$. Readers took longer to process region 4 when the subject of the sentence was a male proper name than when the subject of the sentence was the plural pronoun *they* at region 4, $F(1, 77) = 19.16$, $MSE = 329.085$, $p < .05$, $F(2, 29) = 25.20$, $MSE = 126.409$, $p < .05$. At region 5, these conditions were not significantly different, $F$s $< 2.49$, $ps > .05$. Readers took longer processing region 4 when the subject of the sentence was a female proper name than when the subject of the sentence was the plural pronoun *they*. The difference was significant by participants only, $F(1, 77) = 10.03$, $MSE = 119.409$, $p < .05$, $F(1, 29) = 3.37$, $MSE = 45.816$, $p > .05$. At region 5, these conditions were not significantly different, $F$s $< 1$.

**Specifier versus NP conditions**

Further analyses revealed that for male proper name conditions, reading time on the region following the
pronoun (region 4) was significantly longer for the NP pronoun *him* than for the SPEC pronoun *his*, $F_1(1, 77) = 23.22$, $MSE = 493,256$, $p < .05$, $F_2(1, 29) = 17.77$, $MSE = 189,394$, $p < .05$. Reading time at this region did not differ significantly for either when the subject of the sentence was a female proper name or the plural pronoun *they*, $F$s $< 1$. Reading time at the following regions (region 5) was significantly longer in SPEC than NP conditions when the subject of the sentence was a female proper name: $F_1(1, 77) = 14.83$, $MSE = 344,134$, $p < .05$, $F_2(1, 29) = 11.18$, $MSE = 132,070$, $p < .05$. At region 6, the reading time difference for SPEC and NP conditions for female pronoun name conditions was significant by participants only, $F_1(1, 77) = 10.84$, $MSE = 120,852$, $p < .05$, $F_2(2, 58) = 2.74$, $MSE = 46,315$, $p > .05$, respectively. Reading time at these regions (regions 5 and 6) did not differ for SPEC and NP conditions when the subject of the sentence was a male proper name conditions or plural pronoun *they* conditions, $F$s $< 2.81$, $p > .05$.

Other significant results
As in Experiment 1, reading time on the first presentation region of the sentence was shortest when the region contain the plural pronoun *they* than when it contained the male or female proper name. This resulted in a significant main effect of type of subject, $F_1(2, 154) = 11.81$, $MSE = 121,973$, $p < .05$, $F_2(2, 58) = 12.64$, $MSE = 46,962$, $p < .05$.

Reading time on the disambiguating region and the following region (regions 4 and 5) was significantly influenced by the type of subject occurring in sentences. Reading time in plural pronoun *they* conditions was shortest among the three conditions: $F_1(2, 154) = 5.57$, $MSE = 97,285$, $p < .05$, $F_2(2, 58) = 4.15$, $MSE = 37,289$, $p < .05$ and $F_1(2, 154) = 4.06$, $MSE = 50,147$, $p < .05$, $F_2(2, 58) = 1.97$, $MSE = 19,056$, $p < .05$, respectively. The main effect of subject type failed to reach significance at region 6, $F_1(2, 154) = 1.98$, $MSE = 48,793$, $p < .15$, $F_2(2, 58) = 1.21$, $MSE = 18,699$, $p < .05$.

Discussion
The results of the present experiment were consistent with those observed in Experiment 1, indicating that the overall pattern of results observed in Experiment 1 was not simply due to the ambiguity of the pronoun *her*. The results of both Experiments 1 and 2 showed that processing on SPEC pronouns as well as NP pronouns occurring in object position was influenced by the type of subject occurring in sentences, discontinuing Nicol and Swinney’s (1989) and Clifton et al.’s (1997) claims that during co-reference resolution only structurally available antecedents are included in the initial set of candidate antecedents. In both Experiments 1 and 2, readers processed SPEC pronouns more slowly when the subject of the sentence was singular and differed in gender with the pronoun being resolved. Readers processed SPEC pronouns most quickly when the subject of the sentence was the plural pronoun *they*, suggesting that comprehenders rapidly used grammatical number information to eliminate it as a candidate antecedent. Readers appeared to use number information more rapidly than gender information associated with the proper name. These results were inconsistent with Badecker and Straub’s (2002) claim that the initial set of candidate antecedents contain only those discourse entities that are consistent in number and gender with the pronoun or anaphor being resolved. The present results suggested that the initial set of candidate antecedents contained those discourse entities that were consistent in number. However, gender information appeared not to be used during the generation of the set of candidate antecedents.

An important question is whether the type of elimination of the subject as a viable co-referent using semantic gender information that occurred in SPEC conditions also occurred in NP conditions. The results of the two experiments suggested that the answer to this question is no. In NP conditions, readers spent more time reading regions following the pronoun when the subject of the sentence matched in gender with the pronoun. Reading time on these regions was fastest when the subject of the sentence was the plural pronoun *they*. The results observed in NP conditions were also inconsistent with Badecker and Straub’s (2002) claim that the set of candidate antecedents contains only those discourse entities that are compatible in gender and number with the pronoun or anaphor being resolved. The most plausible interpretation of the results observed in NP conditions is that readers had to make the inference that the pronoun referred to a yet unmentioned entity. The processes involved in making this inference were influenced by the structurally unavailable subject of the sentence. Comprehenders took longer to terminate antecedent search processes when the set of candidate antecedents contained a structurally unavailable candidate that was the same gender as the pronoun being resolved. Antecedent search processes could be terminated most quickly when the set of candidate antecedents differed in grammatical number with the pronoun being resolved.

The comparison of reading times on NP and SPEC conditions yields a consistent pattern in both Experiments 1 and 2. When co-reference could be achieved in SPEC conditions, reading time was faster in SPEC conditions than in NP conditions. When co-reference could not be achieved in SPEC conditions, there was no difference (Experiment 2) or a small difference (Experiment 1) in reading time between SPEC and NP conditions immediately following the pronoun, but a large
difference downstream where reading time was longer for SPEC conditions than NP conditions. These results are consistent with the view that the processing that is carried out on NP and SPEC pronouns is influenced by whether there is a structurally available and viable coreferent in the discourse. Initially, processing is facilitated in SPEC conditions versus NP conditions when the context contains a structurally available, viable coreferent. Later, processing is impeded in SPEC conditions versus NP conditions when the structurally available antecedent is not a viable coreferent, in terms of number and gender information.

A comparison of the results observed in Experiments 1 and 2 reported in this paper suggested that antecedent search occurred differently for sentences containing the pronoun her and the pronouns him and his and containing a singular subject. When the proper name conditions were submitted to ANOVAs, using experiment (her versus him, his) as the between-participant factor and the three within-participants factors, presentation region, type of structure (SPEC versus NP) and gender mismatch (match versus mismatch), significant differences involving the between-participant factor experiment were observed. These differences appeared to be related to the time course of processing. The gender match and gender mismatch effects that were observed occurred earlier for sentences containing the unambiguous pronouns his and him than for sentences containing the ambiguous pronoun her. Reading time was significantly influenced by an interaction between experiment, region, and structure, \( F(7, 944) = 6.24, \text{MSE} = 144, 207, p < .05 \), \( F(7, 406) = 5.03, \text{MSE} = 56, 756, p < .05 \).

The primary region of difference was the region following the pronoun (region 4). At this region, reading time was significantly influenced by the interaction between experiment \( \times \) type of structure \( \times \) gender match, \( F(1, 142) = 6.59, \text{MSE} = 100, 835, p = .05, F(1, 58) = 4.20, \text{MSE} = 48, 394, p < .05 \). When sentences contained the pronoun her, the differences between gender match and mismatch conditions was strongest two regions following the pronoun (regions 5 and 6). When sentences contained the pronouns him and his, the differences between gender match and gender mismatch conditions occurred at the region following the pronoun (region 4). These results may indicate that the use of semantic gender information occurred more rapidly for the pronouns him and his than for the pronoun her. Faster processing in general for the masculine pronouns than for her is plausible given the differences in printed frequency between the two (him: 2572 versus her-NP: 1107, his: 6891 versus her-SPEC: 1925, as assessed by Francis & Kučera, 1982). As lexical access may be achieved earlier for the masculine pronouns than for the pronoun her, co-reference resolution may have begun earlier for masculine pronouns and the pronoun her. There was no evidence that the differences observed between Experiments 1 and 2 were caused by the ambiguity of the pronoun her. Overall, reading time was not significantly longer in conditions containing the pronoun her than in containing his and him, \( F_s < 1.35, ps > .05 \). Furthermore, when plural pronoun they conditions from Experiments 1 and 2 were compared in ANOVAs using experiment (her versus him, his) as the between-participant factor and the two within-participants factors, presentation region and type of structure (SPEC versus NP), no significant interactions involving the between-participant factor experiment were observed, \( F_s < 1 \). This finding is consistent with Clifton et al.’s (1997) data, in which there were no processing differences observed between her and him and his when the subject of the sentence was plural.

In sum, the results of Experiments 1 and 2 suggest that the effect of subject type observed in NP conditions occurs relatively late in processing as comprehenders decide to terminate the search for an antecedent, inferring that the pronoun refers to a yet to be mentioned discourse entity. This explanation implies that no effect of subject type would be observed in NP conditions when antecedent search ends more quickly than it did in Experiments 1 and 2. The purpose of Experiment 3 was to explore this possibility. In Experiment 3, reading time was measured on NP conditions containing either the pronoun her or him and containing one of the three types of NPs occurring in subject position. Each sentence was preceded by a context sentence that provided a highly salient, structurally available antecedent for the NP pronoun. If the effect of the structurally unavailable antecedent occurs late in processing as comprehenders decide to terminate antecedent search, inferring that the pronoun refers to an unmentioned entity, then no effect of subject type would occur.

The previous results of Badecker and Straub (2002) and Sturt (2003), at first glance, provide counter-evidence to this proposed explanation for the results observed in Experiments 1 and 2 in this paper and the proposed motivation for Experiment 3. In both previous investigations, effects of a structurally unavailable discourse entity were observed in sentences in which the pronoun or anaphor being resolved could be linked with a structurally available antecedent present in the discourse (see Badecker and Straub’s examples in 2 and 3 and Sturt’s examples in 4). However, a closer inspection of these materials suggests that antecedent search may not have terminated quickly during their experiments, as the match between the pronoun and the structurally available antecedent may not have been strong enough to lead readers to conclude rapidly that the available antecedent was the intended antecedent. In Badecker and Straub’s (2002) materials, the sentences appeared to leave open a possibility that the pronoun was coreferent with an unmentioned entity. In general, comprehenders always have available the possibility that
a pronoun refers to an unmentioned entity. Discourse context can serve to increase or to decrease the saliency of this possible interpretation. In Badecker and Straub's (2002) isolated sentences, antecedent search may have been carried on even after the structurally available antecedent was linked as a possible co-referent of the NP pronoun, as the comprehender could not be sure that the structurally available antecedent was the intended antecedent. It is possible that comprehenders took longer to terminate the search when the set of candidate antecedents contained entities that matched in gender with the pronoun. In Sturt's (2003), investigation, the effect of the structurally unavailable antecedent was observed late in processing, during readers' rereading of the sentences (i.e., second pass reading time). The second pass reading time results on the anaphor and the preceding region showed that the structurally unavailable antecedent influenced the amount of rereading taking place on these regions in sentences in which the gender of the reflexive pronoun anaphor (herself) mismatched the gender stereotype of the structurally available antecedent (surgeon) (see 4c versus 4d). Due to the poor fit between the anaphor and the structurally available antecedent, readers may have continued antecedent search, despite the presence of a structurally available antecedent. During the prolonged antecedent search, the structurally unavailable antecedent may have influenced processing, specifically the decision to terminate antecedent search.

**Experiment 3**

In Experiment 3, an additional group of participants read pairs of sentences. The second sentence in each pair was similar to the NP conditions tested in Experiments 1 and 2. The sentences contained either her or him. The first sentence of the pair contained a highly salient, structurally available antecedent for the NP pronoun. As in Experiments 1 and 2, the type of subject occurring in the second sentence was varied. Table 5 displays sample sentences from Experiment 3. The experiment aimed to determine whether the effect of subject type would influence processing on NP pronouns, when the context contained an available antecedent for the NP pronoun.

**Method**

**Participants**

Seventy-eight additional undergraduates at Oklahoma State University, who were native speakers of American English and naïve to the purposes of the experiment, participated in exchange for course credit.

**Materials**

Thirty sets of sentence pairs were constructed. Twenty-one of the 30 verbs used in these materials were the same as those used in Experiments 1 and 2. Nine verbs were not used previously (i.e., knew, neglected, saw, brought, examined, chased, found, sketched, and offered). For all sets of sentence pairs, the second sentence of each pair was similar to the sentences used in Experiments 1 and 2, as it contained a pronoun used as an NP and occurring in object position. The first sentence of each pair provided an unambiguous antecedent for the pronoun that occurred in the second sentence. Each set of sentences contained six versions. The second sentence either contained the pronoun him or her. The NP in subject position of the second sentence was a male proper name, female proper name, or the plural pronoun they.

**Procedure**

The procedure was the same as described in Experiments 1 and 2. Seventy filler sentences were constructed to be similar to experimental sentences in that they were composed of sentence pairs containing proper names. Six counterbalancing lists were used to ensure that each item was viewed in each condition equally often across participants. Each participant was randomly assigned to a counterbalancing condition and tested individually in

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Sample sentences from Experiment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>Sample sentences</td>
</tr>
<tr>
<td>Conditions containing the pronoun him</td>
<td></td>
</tr>
<tr>
<td>Sentence 1</td>
<td>*Billy *complained about *having <em>a stomach ache.</em></td>
</tr>
<tr>
<td>Sentence 2</td>
<td>*Laura *watched *him *closely *throughout *the <em>day.</em></td>
</tr>
<tr>
<td></td>
<td>*Michael *watched *him *closely *throughout *the <em>day.</em></td>
</tr>
<tr>
<td></td>
<td>*They *watched *him *closely *throughout *the <em>day.</em></td>
</tr>
<tr>
<td>Conditions containing the pronoun her</td>
<td></td>
</tr>
<tr>
<td>Sentence 1</td>
<td>*Lucy *complained about *having <em>a stomach ache.</em></td>
</tr>
<tr>
<td>Sentence 2</td>
<td>*Laura *watched *her *closely *throughout *the <em>day.</em></td>
</tr>
<tr>
<td></td>
<td>*Michael *watched *her *closely *throughout *the <em>day.</em></td>
</tr>
<tr>
<td></td>
<td>*They *watched *her *closely *throughout *the <em>day.</em></td>
</tr>
</tbody>
</table>
a private well-lit cubicle. Each participant was given a practice session of 16 sentences, followed by the set of experiment, which consisted of 100 sentence pairs (30 experimental sentence pairs and 70 filler sentence pairs). Each participant received a unique random order of experimental and filler sentences. Each session lasted between 30 and 45 min.

**Experimental design**

A 2 × 3 repeated measures design was used with type of pronoun (him versus her) and subject type (female name versus male name versus plural personal pronoun they) as within-participants factors.

**Results and discussion**

Comprehension questions were answered correctly 95% of the time, indicating participants were fully engaged in the task. Reading times per presentation region were initially trimmed as in Experiments 1 and 2. This removed less than 1% of observations. Table 6 displays mean reading time for the presentation regions of the second sentence of the pair for each of the conditions. ANOVAs were conducted using presentation region, pronoun type, and type of subject as the three within-participant factors. Reading time was not significantly influenced by an interaction of presentation region, pronoun type, and type of subject, $F$s < 1. However, reading time was significantly influenced by the interaction of presentation region and type of subject, $F_{(154)} = 2.98$, $MSE = 167,616$, $p < .05$, $F_{(58)} = 2.75$, $MSE = 63,264$, $p < .05$, indicating that the differences among the levels of subject type varied across regions. The interaction involving presentation region justified conducting additional ANOVAs for each presentation region. These were conducted using pronoun type and type of subject as the two within-participant factors. The second sentence of each sentence pair began at region 5. Regions 5 and 6 contained the subject of the second sentence and the verb of the second sentence, respectively. Region 7 contained the pronoun her or him. Region 8 contained the adverb, respectively. The remainder of the sentence was presented in three additional regions (regions 5–7).

The results indicated that when a single highly salient, structurally available antecedent was available in the context, the co-reference resolution of the NP pronouns her and him was not influenced by the structurally unavailable subject. The results showed that reading time in the second sentence was influenced by type of subject only on the first two presentation regions, which contained the subject and the following verb (in Table 6, regions 5 and 6, respectively). As in Experiments 1 and 2, reading time on these regions was fastest for plural pronoun conditions, resulting in a main effect of subject type, $F_{(154)} = 11.55$, $MSE = 281,757$, $p < .05$, $F_{(58)} = 9.53$, $MSE = 137,404$, $p < .05$ and $F_{(154)} = 11.20$, $MSE = 82,768$, $p < .05$, $F_{(58)} = 5.74$, $MSE = 28,324$, $p < .05$, respectively. At these regions, neither the main effects of type of pronoun nor the interactions were significant, $F$s < 1.78, $ps > .05$. Reading time on the region containing the pronoun (region 7) and following regions (regions 8–11) was not significantly influenced by either factor or by an interaction of factors, $F$s < 2.60, $ps > .05$.

The absence of a subject type effect on the NP conditions tested in this experiment supports the view that the extent to which structurally unavailable entities will influence co-reference resolution can be determined by whether co-reference is achieved and how quickly co-reference is achieved. Finding a good fit between an antecedent and the pronoun being processed presumably terminates the process of searching for an antecedent. When no antecedent is available or when the fit between a structurally available antecedent and the pronoun is less strong, the process of searching for an antecedent is allowed to continue, during which time structurally unavailable antecedents can exert an influence on processing time.

**Table 6**

Mean reading time in milliseconds for each presentation region of sentence 2 by condition from Experiment 3

<table>
<thead>
<tr>
<th>Subject type</th>
<th>Presentation region</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Her conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female name</td>
<td></td>
<td>589 (22)</td>
<td>480 (12)</td>
<td>416 (10)</td>
<td>490 (15)</td>
<td>508 (13)</td>
<td>539 (17)</td>
<td>843 (36)</td>
</tr>
<tr>
<td>Male name</td>
<td></td>
<td>552 (25)</td>
<td>467 (13)</td>
<td>412 (10)</td>
<td>476 (14)</td>
<td>519 (18)</td>
<td>549 (18)</td>
<td>874 (34)</td>
</tr>
<tr>
<td>They</td>
<td></td>
<td>519 (17)</td>
<td>435 (13)</td>
<td>423 (12)</td>
<td>472 (14)</td>
<td>490 (14)</td>
<td>549 (17)</td>
<td>923 (37)</td>
</tr>
<tr>
<td><strong>Him conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female name</td>
<td></td>
<td>592 (24)</td>
<td>484 (12)</td>
<td>426 (8)</td>
<td>473 (13)</td>
<td>492 (12)</td>
<td>571 (21)</td>
<td>865 (27)</td>
</tr>
<tr>
<td>Male name</td>
<td></td>
<td>604 (22)</td>
<td>483 (14)</td>
<td>421 (10)</td>
<td>481 (13)</td>
<td>504 (14)</td>
<td>544 (18)</td>
<td>900 (42)</td>
</tr>
<tr>
<td>They</td>
<td></td>
<td>503 (17)</td>
<td>443 (14)</td>
<td>419 (14)</td>
<td>476 (18)</td>
<td>489 (15)</td>
<td>559 (22)</td>
<td>903 (42)</td>
</tr>
</tbody>
</table>

*Note. Region 7 contained the pronoun her or him.*
Additional analyses were carried out in order to confirm that the effects of structure type in NP conditions that were observed in Experiments 1 and 2 were statistically larger than the null effect of structure type observed in Experiment 3. The NP conditions from Experiment 1 and the her conditions from Experiment 3 were submitted to ANOVAs, using experiment as the between-participant factor and structure type as the within-participant factor. The experiment × structure type interaction was significant for the two regions following the disambiguating noun or adverb (regions 5 and 6 in Experiment 1 and regions 9 and 10 in Experiment 3), $F_1(2, 282) = 6.87$, $MSE = 135,005$, $p < .05$, $F_2(2, 116) = 5.62$, $MSE = 56,203$, $p < .05$ and $F_1(2, 282) = 4.59$, $MSE = 106,829$, $p < .05$, $F_2(2, 116) = 5.28$, $MSE = 48,773$, $p < .05$, respectively. Similar analyses were carried out for the NP conditions from Experiment 2 and him conditions from Experiment 3. The experiment × structure interaction was significant for the region following the pronoun (region 4 in Experiment 2 and region 7 in Experiment 3), $F_1(2, 308) = 8.32$, $MSE = 87,893$, $p < .05$, $F_2(2, 116) = 4.18$, $MSE = 34,486$, $p < .05$.

**General discussion**

The research described in this paper provides additional evidence that the initial set of candidate antecedents generated during co-reference resolution contains discourse entities that are not structurally available as antecedents, according to the principles of Binding Theory (Chomsky, 1981). These results provide evidence against earlier claims that only structurally available antecedents are considered as antecedents during co-reference resolution (Clifton et al., 1997; Nicol & Swinney, 1989). However, the results are consistent with more recent studies demonstrating the effects of structurally unavailable antecedents on the resolution of pronouns and anaphors (Badecker & Straub, 2002; Sturt, 2003).

The three reading experiments reported in this paper showed that the structurally unavailable subject of the sentence influenced processing on NP pronouns occurring in object position when no structurally available antecedent was available (Experiments 1 and 2), but did not influence processing on NP pronouns occurring in object position when the discourse contained a highly salient, structurally available antecedent (Experiment 3). In Experiments 1 and 2, readers took longer to process NP pronouns occurring in object position when the structurally unavailable antecedent was the same gender as the pronoun than when the structurally unavailable discourse entity’s gender was different than the pronoun. Reading time was shortest when the structurally unavailable discourse entity was the plural pronoun *they*.

The proposed explanation for the observed results is that there is a relatively late occurring decision stage of processing during which comprehenders decide to terminate antecedent search. In the NP conditions tested in Experiments 1 and 2, comprehenders terminated antecedent search, inferring that the pronoun referred to an unmentioned discourse entity. When the set of candidate antecedents contained a structurally unavailable entity that matched the gender of the pronoun, comprehenders took longer to terminate antecedent search than when the set contained a structurally unavailable entity that mismatched the gender of the pronoun. In Experiment 3, the context contained a highly salient antecedent as well a structurally unavailable antecedent. Comprehenders were able to terminate the antecedent search so rapidly that the structurally unavailable subject did not have time to influence processing.

This proposed decision stage is envisioned as operating after earlier stages of processing, such as those proposed by Sturt (2003) and Garrod and colleagues (Garrod, 1994; Garrod & Sanford, 1994; Garrod & Terras, 2000; Sanford, Garrod, Lucas, & Henderson, 1983). These two stages are bonding and resolution. Bonding occurs when a link is made between the pronoun or anaphor and one or more candidate antecedents. Resolution involves the evaluation of a link created during the bonding phase and the integration of the link into the semantic interpretation of the sentence. Resolution may also involve re-computation of a link, if it is found to be implausible. The resolution phase may result in a link being successfully integrated into the semantic interpretation of the sentence. The decision stage motivated by the present research is needed to account for processing that occurs when a link is not found for a pronoun or anaphor or when none of the available links come to be successfully integrated into the semantic interpretation. In these circumstances, comprehenders continue processing, either inferring the pronoun or anaphor refers to an unmentioned entity or maintaining multiple possible interpretations until later context supports one of the links over others. The decision stage is envisioned as being influenced by the evaluations of links carried out by the resolution stage of processing, particularly if a particular link is evaluated as being highly salient. However, the decision stage of processing is viewed as a separate stage that functions to stop the process of antecedent search either when a highly satisfying link has been evaluated or when the links that have been evaluated are sufficiently unsatisfying as to warrant moving on without integrating the available links.

This theoretical account contrasts with Sturt’s (2003) view of co-reference resolution. He argued that binding constraints are applied at the earliest stages of processing, but can be violated during later processing. Sturt’s view appears to be one in which the first stage of processing is bonding between the pronoun and candidate antecedents. Binding constraints determine which bonding
relationships are formed. The links that are formed then are evaluated during the resolution stage. Evaluation occurs and re-computation of links, if necessary. It is during re-computation when binding constraints can be violated, i.e., when structurally unavailable antecedents become linked with pronouns or anaphors. In contrast, the view of co-reference resolution developed to account for the results described in this paper is one in which the first stage of co-reference resolution is the generation of a set of candidate antecedents. Structurally available and unavailable antecedents are included in this set. The second stage involves bonding. Binding constraints serve to guide the link of pronouns and antecedents. These links are evaluated during a resolution stage. This stage can result in a link being integrated into the semantic interpretation of the sentence. However, when no link is generated because there are no structurally available antecedents in the context or when available links fail to meet a threshold of acceptability, the comprehender may decide to terminate antecedent search. When the decision to terminate antecedent search is made, the comprehender may infer that the pronoun refers to an unmentioned entity or the comprehender may form a link between the pronoun or anaphor and a structurally unavailable antecedent, in violation of binding constraints.

The results from SPEC conditions in Experiments 1 and 2 provide evidence against Badecker and Straub’s (2002) claim that the initial set of candidate antecedents contains only those discourse entities that are consistent in gender and number with the pronoun or anaphor being resolved. The results in Experiments 1 and 2 showed that in SPEC conditions, reading time was longest when the subject of the sentence, which was structurally available as an antecedent, differed in gender with the pronoun than when the subject of the sentence was the same gender. The present results do not support the view that the initial set of candidate antecedents contains only those discourse entities that are consistent in gender with the pronoun or anaphor being resolved. In contrast, the present results are consistent with the view that the initial set of candidate antecedents contains only those discourse entities that are consistent in number with the pronoun or anaphor being resolved. The strongest support for the view is that in NP conditions, reading time was fastest among the three subject type conditions when the subject of the sentence was the plural pronoun they, indicating that the plural pronoun they was not initially included in the set of candidate antecedent.

The results observed in Experiments 1 and 2 for sentences containing plural subjects contrast with Clifton et al.’s (1997) observation that readers took longer to resolve SPEC pronouns occurring in object position when the subject of the sentence was plural rather than singular. They claimed that the subject of the sentence was considered during co-reference resolution and the number mismatch resulted in processing difficulty. Reconciling these conflicting patterns of results can be achieved in two possible ways. On one hand, Clifton et al.’s (1997) result may have been a Type I error. On the other hand, the initial set of candidate antecedents may be initially formed to exclude discourse entities whose number is incompatible with the pronoun being processed. However, two additional assumptions must be met: (1) the plural pronoun they can be rapidly rejected as a possible co-referent for a singular SPEC pronoun; the rapid elimination can occur without measurable processing difficulty occurring and (2) the plural pronoun they can be rejected as a possible co-referent more rapidly than the type of plural NPs used in Clifton et al.’s (1997) materials (e.g., supervisors). Further research is required to determine which of these accounts is correct.

An even more noteworthy difference between the present results and the results of Clifton et al. (1997) is related to the fact that Clifton et al. (1997) did not observe an effect of subject type (singular versus plural) on the processing of NP pronouns. In the present experiment, the type of NP occurring in subject position influenced processing on an NP pronoun occurring in object position. The inconsistency between the two investigations is likely related to the difference in the type of singular NPs occurring in subject position in the two sets of materials. In Clifton et al. (1997), the materials contained subject NPs that were gender ambiguous (e.g., supervisor, producer, and tutor). In the present research, the materials contained subject NPs that were gender specific proper names (e.g., Mark, Mary). In Clifton et al.’s (1997) NP conditions, the structurally unavailable gender ambiguous subject NPs may not have influenced comprehenders’ decisions to delay the termination of antecedent search, as the gender match between the pronoun and the structurally unavailable subject was weak.

The present results shed a new light on Badecker and Straub’s (2002) primary finding that reading time was longer when a structurally unavailable antecedent matched in gender with the pronoun being resolved and the structurally available antecedent (see examples in 2 and 3). The gender match effect observed by Badecker and Straub (2002) could have been due to the gender match between the structurally unavailable subject and the pronoun rather than due to the gender match between the structurally unavailable subject and the structurally available antecedent. It is also possible that in the Badecker and Straub (2002) results, the gender match effect resulted from both sources of gender match.

The theoretical account of the present results may also be viewed as consistent with the results of Nicol and Swinney (1989), as the cross modal priming methodology may have caused the early termination of antecedent search during listening comprehension. The presentation
of the lexical decision probe word may have resulted in participants switching attention from the listening comprehension task to the secondary visual word processing task. When participants switched attention away from the listening task, structurally available antecedents may have already been activated and linked with the pronoun or anaphor being resolved. However, at the time the probe word was presented, the structurally unavailable antecedents may not have yet been sufficiently activated to influence performance on the lexical decision task. If antecedent search had not been interrupted, the structurally unavailable candidate antecedent could have then influenced processing. This view of Nicol and Swinney's data supposes that bonding between pronouns (or anaphors) and structurally available antecedents occurs earlier than bonding between pronouns (or anaphors) and structurally unavailable antecedents. Sturt's (2003) data provided evidence that the bonding occurring between an anaphor and a structurally available antecedent occurred earlier than bonding between an anaphor and a structurally unavailable antecedent, as evidence of the former was observed on first fixations and first pass reading time and evidence of the latter was observed quite late in processing, in second pass reading time.

Lastly, the issue of whether the pronoun her is treated in an underspecified manner during processing appears to be undecided. The results of Experiment 3 and the results of the plural pronoun they conditions in Experiments 1 and 2 support this conclusion. In these cases, no significant processing differences between her and him/his conditions were observed. When reading time in Experiments 1 and 2 was compared, readers appeared to generate the gender match effect in NP conditions and a gender mismatch effect in SPEC conditions earlier in sentences containing him/his (Experiment 2) than in sentences containing her (Experiment 1). As the pronouns him and his occur more frequently than the pronoun her, it is possible that co-reference resolution occurs more rapidly for him and his than for her. This possibility warrants further research.

In sum, these results provide a better understanding of the process of co-reference during sentence comprehension. All entities, both structurally available and structurally unavailable, are included in the initial set of potential antecedents. The extent to which structurally unavailable candidate antecedents will be considered during co-reference resolution is determined by whether a good match is found between the pronoun and a structurally available antecedent. When a good match is found, the process of antecedent search is terminated, eliminating the possibility that structurally unavailable candidate antecedents will influence processing. When a possible match is not found or a possible match is evaluated and found to be weak, the process of antecedent search continues. During this time, a structurally unavailable antecedent may influence processing.

Appendix

The following sentences were used in Experiment 1. Asterisks indicate presentation boundaries. Sentence subjects were either a female proper name; a male proper name; or the plural pronoun they. The pronoun was followed either by an adverb for NP conditions or by a noun for SPEC conditions.

1. Mary[Mark]They *needed *her *often*group *to take part *in *the games *on Saturdays.*
2. Lisa[Mike]They *retrieved *her *often*child *before *the afternoon *field *trips.*
3. Ann[Ned]They *burned *her *today*friend *during *the demonstration *of *the *new product.*
4. Ruth[Stan]They *prepared *her *routinely*classmates *during *long study sessions *in *the library.*
5. Jane[Ron]They *studied *her *weekly*friend *during *long *sessions *in *the *counseling clinic.*
6. Pam[Stan]They *monitored *her *everyday*employees *because *there was *a report about *someone shoplifting.*
7. Lori[Brad]They *publicized *her *nearly*family *every week *in *the local *political magazine.*
8. Cora[Paul]They *measured *her *twice*sister *for *the luxurious *bridal *gown.*
9. Sara[John]They *searched *her *abruptly*companions *at *the concert *last *Saturday.*
10. Lynn[Eric]They *replaced *her *yesterday*assistant *with *only *a day's *notice.*
11. Sue[Tom]They *mentioned *her *frequently*companions *at dinners *with *business *partners.*
12. Rita[Lyle]They *lost *her *twice*cousin *during *trips *to *the local mall.*
13. Tina[Rick]They *deceived *her *briefly*sister *before *the surprise party *on *Monday.*
14. Nina[Bill]They *painted *her *twice*friend *during *the carnival *at the *middle school.*
15. Dawn[Pete]They *viewed *her *periodically*competitors *during *the exhibit *matches *in the gymnasium.*
16. Iris[Will]They *graded *her *routinely*classmates *on *terribly *difficult *final exams.*
17. Kate[Greg]They *inspected *her *nearly*family *every time *the building *was *entered.*
18. Mia[Tim]They *submitted *her *often*friend *for scholarships *sponsored *by *the college.*
19. Julie[Ralph]They *documented *her *recently*family *for *the *local *census *report.*
20. Cathy[Bobby]They *signed *her *Wednesday*guitarist *to *a lucrative *multi-record *deal.*
21. Molly[Harry]They *unloaded *her *often*sister *at the curb *outside *of the rehabilitation *hospital.*
22. Nancy[Travis]They *approved *her *today*father *for *the promotion *as company *vice president.*
23. Susan[Carl]They *watched *her *yesterday*classmate *during *the open rehearsals *of *the *school play.*
24. Trisha[Martin]They *tore *her *frequently*daughter *away *from *many favorite *afternoon activities.*
25. Marcy[Larry]They *failed *her *Saturday*students *on the Challenging *obstacle *course.*
26. Erica[Barry]They *carried *her *away*son *after *the bomb *exploded *in the school yard.*
Appendix (continued)
27. Betty|Bruce|They *analyzed *her *regularly|relatives *during *several *afternoon *therapy sessions.*
28. Jill|Phil|They *obeyed *her *twice|cousin *during *the trip *to *Lake Texoma.*
29. Linda|Nathan|They *liked *her *immediately|roommate *after *being *introduced *in the dormitory.*
30. Tammy|Trevor|They *dressed *her *carefully|classmate *after *the all night *slumber *party.*

References


