

1996

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Jill N. Beckman

University of Massachusetts, Amherst

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Recommended Citation

Beckman, Jill N. (1996) "Double Objects, Definiteness and Extraction: A Processing Perspective," *University of Massachusetts Occasional Papers in Linguistics*: Vol. 22 , Article 3.
Available at: <https://scholarworks.umass.edu/umop/vol22/iss1/3>

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Double Objects, Definiteness and Extraction: A Processing Perspective*

Jill N. Beckman

University of Massachusetts, Amherst

1. Introduction

English double object constructions have attracted considerable attention in both the theoretical syntax and sentence processing literature. In addition to explorations of the basic structure of the double object construction and its relationship to the NP PP dative structures, early syntactic treatises on the double object construction in English considered cases of extraction such as (1) and (2).

- (1) Which patient did the nurse bring the doctor?
- (2) Who did I buy a hat?

Fillmore (1965) claimed that extraction of the indirect object, or goal, in sentences such as (2) is ungrammatical, a position taken up by subsequent writers (Klima 1970, Kuroda 1968, Oehrle 1976). The majority of the literature on this topic treats as ungrammatical any goal extraction from a double object construction, without regard for factors such as the definiteness of the remaining object or D-linking (Pesetsky 1987) of the extracted noun phrase.

Both the syntactic and the parsing literature are occupied with accounting for the ungrammaticality of (1) and (2), either via grammatical constraints such as restrictions on ambiguity in grammatical relations (Hankamer 1973, Klima 1970) or on the mapping of lexical items to terminal nodes in syntactic structure (Woolford 1986), or via universal parsing limitations (Fodor 1978, Jackendoff and Culicover 1971, Langendoen, Kalish-Landon and Dore 1976). (See §2). However, as this paper will establish, this earlier research is built on a shaky foundation, as there is considerable evidence to show that goal extractions are not uniformly ungrammatical for native English speakers. By systematically manipulating the contrast in definiteness exemplified in (3), it is possible to show that, in certain circumstances, the "ungrammatical" goal extraction is preferred to the grammatical theme extraction by a majority of native speakers.

*I would like to thank Lyn Frazier for invaluable assistance during every stage of this project. In addition, this work has benefited from comments and discussion from Chuck Clifton, Mike Dickey, Kyle Johnson, Janina Rado, Jeff Runner, Lisa Selkirk, Ellen Woolford and the members of the spring 1994 Second-Year Seminar at UMass. Special thanks to the innumerable population of native speakers who were pestered with "Which patient did the nurse bring the doctor?" at regular intervals.

- (3) a. Which player did the coach take the trainer?
 b. Which player did the coach take a trainer?

In particular, when the post-verbal NP is indefinite, as in (3b), a goal interpretation of the extracted NP is preferred by a 3-to-1 margin. That is, when presented with a sentence such as (3b), speakers prefer the structure in (4a) to that in (4b).

- (4) a. Which player_i did the coach take e_i a trainer?
 b. Which player_i did the coach take a trainer e_i?

An examination of the role of definiteness in the interpretation of the filler NP will constitute the central thrust of the current research, explored in §3. I will establish that the reported resistance of goals to extraction is an effect derived from a Definiteness Asymmetry Constraint, which requires that the second object in a double object construction not exceed the first in definiteness.¹ The availability of object gap sites for extracted *which*-NPs is therefore limited by the definiteness of the object remaining in situ.² Only if *which*-NPs are less definite than *the*-NPs can the response patterns found in both on- and off-line studies be accounted for.

While the research reported here was unable to draw any firm conclusions concerning the process of gap-location and on-line structure assignment in double object extractions, it is relevant to the general question of how and where gaps are posited on-line. The relevance of the current research to various theories of filler-gap processing is discussed in §4.

The on- and off-line measures employed in the investigation of definiteness effects discussed in §3 reveal an additional aspect of double object extraction which merits further attention: the existence of "dialects" of speakers who vary in their treatment of double object extractions.³ While the on-line evidence reveals that native American English speakers are quite consistent in the interpretation of extracted constituents, the extent to which goal extractions are incorporated in the production grammar of speakers varies considerably. Through the compilation of off-line grammaticality judgments, it is possible to place speakers along a continuum, the two ends of which correspond to "goal extractions considered ungrammatical" and "goal extractions considered grammatical". Interestingly, however, all speakers treat this construction similarly in on-line experiments, suggesting that the grammar used in parsing differs considerably from the

¹Throughout this paper, the discussion is couched in terms of "definiteness", which is perhaps the most familiar and/or accessible term available. That definiteness is the appropriate characterization of the dimension relevant in double object extractions is not at all clear. Specificity, in the sense explored in Enç (1991), is one obvious alternative to consider. Interested readers are referred to Enç's discussion of weak determiners and specificity effects on NP distribution, as well as Pesetsky's (1987) examination of different types of *wh*-phrases and their discourse properties (also characterized by Enç as specificity).

²Comrie (1981:192) provides some discussion of "topic-worthiness" in terms of an animacy hierarchy which "reflects a natural human interaction among several parameters, which include animacy in the strict sense, but also definiteness... and various means of making an entity more individuated - such as giving it a name of its own, and thereby making it also more likely as a topic of conversation." This notion is clearly relevant to extraction, but has not been considered for English, to the best of my knowledge.

³The use of the term 'dialect' to describe linguistic variation not correlated with regional or social factors has engendered criticism in prior work. Nonetheless, for ease of reference and lack of a better label, I will continue to refer to the divisions in question as dialects throughout this paper.

production grammar of a particular speaker. This finding, which runs counter to the default assumption that parsing by an individual proceeds according to that speaker's idiolect, raises serious questions for frequency-based models of syntactic parsing. The dialect research is discussed in §5.

2. Background: Early Literature on Double Object Extractions

Within the realm of generative syntactic theory, a great deal of attention has been paid over the past 20 years to the structure of and relationship between two English constructions which I will refer to here as the dative and double object constructions, shown in (5) and (6) below.

- (5) a. Zeke mailed a package to Isaac.
 b. Isaac told the story to the innocent bystander.
 c. Chomsky will give the seeds to the hungry bird.
- (6) a. Zeke will mail Isaac a package.
 b. Isaac told the innocent bystander a story.
 c. Chomsky will give the hungry bird the seeds.

In the early years of generative syntax, the relationship between the sentences in (5) and those in (6) was assumed to be transformational; the rule of Dative Shift applied to move the prepositional object in (5) to the postverbal object position in (6) (Emonds 1972, Fillmore 1965, Fischer 1971, Jackendoff and Culicover 1971, Klima 1970, Kuroda 1968). However, subsequent work, (e.g. Dowty 1978, Green 1974) focusing on a lack of complete productivity in the dative-double object mapping, decried the transformational analysis. For example, while many verbs allow pairings such as those shown in (5) and (6) above, others do not:

- (7) a. Isaac referred a man to the specialist.
 b. Zeke donated the gift to charity.
- (8) a. *Isaac referred the specialist a man.
 b. *Zeke donated charity the gift.

In addition to occupying a place in the theoretical spotlight during the early development of transformational grammar, datives and double object constructions were also the focus of considerable attention in some of the earliest literature addressing processing issues. Much of this research concentrated on an attempt to make a connection between the ungrammaticality of a construction and some (language-independent) processing factor which is relevant for parsing that construction. In particular, a number of researchers addressed the apparent ungrammaticality of dative questions like those given in (9) below.

- (9) a. *Which patient did the nurse bring the doctor?
 b. *Who did you send the woman?
 c. *Who did you give a book?

Various accounts of the ungrammaticality of (8) were proposed in the 1970's. For example, Klima (1970) and Ruwet (1973) explored the Constraint on Relational Ambiguity Principle, given in (10) below (phrasing taken from Langendoen, Kalish-Landon and Dore 1976:199-200).

- (10) Syntactic transformations may not create structures that permit the existence of syntactic ambiguity that depends solely on the grammatical relations of two constituents in a sentence.

This principle, which was alleged to be a linguistic universal, would correctly prevent the derivation of dative questions, since there is no structural information in any of the sentences in (9) which makes clear which of the two NP objects is the theme/patient and which is the goal. However, as Langendoen, Kalish-Landon and Dore (1976) note in their review of the principle given in (10), this predicts that dative passives such as (11) should be ungrammatical as well, as they suffer from the same ambiguity problem. (That is, either (12a) or (12b) could be the underlying structure for (11).)

- (11) The rich client was offered the young lawyer by the senior partner.
- (12) a. The senior partner offered the rich client the young lawyer.
b. The senior partner offered the young lawyer the rich client.

Limiting the principle to apply only to cases of A'-movement, rather than A-movement cases such as passivization is not sufficient, as Langendoen, Kalish-Landon and Dore (1976) provide A'-movement examples from French which are both relationally ambiguous and grammatical. Ultimately, Langendoen, Kalish-Landon and Dore (1976) propose, the ungrammaticality or unacceptability of dative questions such as (9) resides in some language-independent aspect of the parsing mechanism.

A variety of authors in the 1970's addressed the question of double object extraction and sentence processing mechanisms, among them Jackendoff and Culicover (1971) and Langendoen, Kalish-Landon and Dore (1976). While these constitute interesting historical precursors to the current research, they are not directly relevant to the project as developed here. The discussion will, consequently, be focused on the work of Fodor (1978), which directly influenced the development of this project.

Within the context of a general theory of filler-gap processing, a parsing-based approach to the unacceptability of dative questions is outlined in Fodor (1978). Working from a data base comprised of intuitions concerning filler-gap constructions, Fodor attempts to provide a model of the parser which will a) reliably detect doubtful gaps (i.e. gaps which are possible in a given structure, but not obligatory, as with optionally transitive verbs), and b) avoid positing gaps where none occur. These goals are achieved, Fodor claims, by a parsing model which ranks the possibility of a gap as secondary, subordinate to the possibility of a lexical constituent. The constraint within Fodor's theory of parsing which is relevant to dative questions is the XX Extraction Principle, given in (13) below (Fodor 1978:444):

- (13) If at some point in its derivation a sentence contains a sequence of two constituents of the same formal type, either of which could be moved or deleted by a transformation, the transformation may not apply to the first constituent in the sequence.

This principle, which Fodor conceives of as a constraint on the application of transformations in the grammar, will prohibit the extraction of goal NPs from

double object constructions. That is, a sentence such as (14a) should be the only grammatical question which can be formed from the declarative sentence in (15). The XX Extraction Principle will rule out the creation of (14b).

- (14) a. Who_i did you bring the doctor e_i?
 b. Who_i did you bring e_i the doctor?
 (15) You brought the doctor the patient.

If the XX Extraction Principle holds in English, the extracted constituent in a dative question should always be interpreted as the theme, rather than as the goal. This prediction is apparently borne out by additional dative question data, where one of the objects is not animate:

- (16) a. What did he bring the doctor?
 b. Which folder did the secretary send the lawyer?
 c. What kind of letter did you write the banker?

As Fodor predicts, gaps for the fillers in (16) are assigned as follows:⁴

- (17) a. What_i did he bring the doctor e_i?
 b. Which folder_i did the secretary send the lawyer e_i?
 c. What kind of book_i did the teacher read the class e_i?

While the XX Extraction Principle initially seems a promising avenue to explore, it appears to be inadequate on at least two counts. First, the principle cannot be a universal principle of parsing. Langendoen, Kalish-Landon and Dore (1976) collected data on English demonstrating that 22% of their subject population consistently associated the extracted NP with the first possible gap site rather than the second in sentences such as (18). (That is, the structures in (19) were assigned, rather than the structures (20) required by the XX Extraction Principle.)

- (18) a. Who did you show the woman?
 b. Who did you send the woman?
 (19) a. Who_i did you show e_i the woman?
 b. Who_i did you send e_i the woman?
 (20) a. Who_i did you show the woman e_i?
 b. Who_i did you send the woman e_i?

Langendoen, Kalish-Landon and Dore's (1976) findings show that, while the majority of speakers in their study who found dative questions to be acceptable treated the extracted constituent as a theme, in keeping with the predictions of the XX Extraction Principle, there is a population of speakers for whom the extracted

⁴It is important to note that these gap assignments are those which seem to be the correct ones, based on off-line introspection. This may well be an instance in which pragmatic factors play a significant role in determining the final interpretation. To anticipate the coming discussion of definiteness, when the post-verbal NP is indefinite and the filler NP is inanimate, as in (i), there is a sense of anomaly due to a conflict between pragmatic factors (biasing toward a theme interpretation) and definiteness (biasing toward a goal interpretation).

(i) ?Which folder did the secretary send a lawyer?

NP was treated as a goal. The XX Extraction Principle cannot, therefore, be a parsing universal.

The second suggestion of inadequacy derives from more recent on-line work in filler-gap parsing, in particular that research which supports the Active Filler Strategy. While Fodor's work stimulated considerable experimental research in filler-gap processing, her gap-as-second-resort model was developed on the basis of intuitions concerning processing, rather than actual on-line data. A sizable body of subsequent research (Crain and Fodor 1985, De Vincenzi 1990, Frazier 1987, Frazier and Clifton 1989, Frazier and Flores d'Arcais 1989, Nagai *to appear*, Stowe 1986) has failed to substantiate the predictions of the gap-as-second-resort model proposed by Fodor (1978). Rather, there is strong evidence that the Active Filler Strategy, given in (21) below, guides parsing of filler-gap constructions.

(21) ACTIVE FILLER STRATEGY

Assign an identified filler as soon as possible; i.e., rank the option of a gap above the option of a lexical noun phrase within the domain of an identified filler.

As Frazier and Flores d'Arcais (1989:332) note, the Active Filler Strategy "specifies that...fillers are assigned to the first possible position in a syntactic phrase marker....This predicts that the filler should be assigned to the leftmost position from which it might have been extracted."

The Active Filler Strategy and Fodor's XX Extraction Principle make contradictory predictions about preferred gap-location strategies for dative questions. According to the Active Filler Strategy, speakers should posit a gap immediately following the verb, the first possible gap location, when facing a dative question.⁵ In double object constructions, this initial gap site corresponds to the goal NP, meaning that dative questions in which the goal is extracted should be easier to parse than dative questions in which the theme is extracted. In contrast, the XX Extraction Principle predicts that the extraction of a goal NP from a double object construction should be ungrammatical or unacceptable, as the goal is the first of two formally identical constituents. Only theme extraction should be viable in dative questions.

To the extent to which any clear consensus on the acceptability of English dative questions exists in the syntactic and parsing literature, the predictions of the XX Extraction Principle, rather than those of the Active Filler Strategy, seem to be supported. Most authors report that sentences such as (22), in which either the filler or the post-verbal NP is pragmatically plausible as a goal, are ungrammatical with a goal interpretation of the filler (Emonds 1972, Fillmore 1965, Fodor 1978, Jackendoff and Culicover 1971, Klima 1970, Kuroda 1968).

⁵The predictions of the two parsing models discussed here are defined in terms of the S-Structure linear order of the two object NPs involved. While I have sidestepped the question of the appropriate syntactic structure to be assigned to English double object constructions, this will not significantly affect what follows. In any of the familiar syntactic proposals (e.g. Chomsky 1981, Larson 1988, Oehrle 1976) for double object constructions, the goal appears in the leftmost position at S-Structure. I remain non-committal on the question of which, if any, of these proposed syntactic structures is computed in the course of parsing, and whether the double object construction is syntactically derived from the NP PP dative in English. The latter is not directly relevant to the question of on-line gap location, as it has been convincingly demonstrated elsewhere that the derivational history of a sentence plays a minimal role in on-line processing (Fodor, Bever and Garrett 1974, Fodor and Garrett 1967).

- (22) Which patient did the nurse bring the doctor?

Fillmore (1965) further reports that double object extractions in which the filler is the only plausible goal in the sentence, as in (23), are ungrammatical.⁶

- (23) a. *Who did I buy a hat?
b. *Who did you give this book?

Were these judgments valid for native English speakers as a whole, the universality of the Active Filler Strategy as a parsing principle would be called into question. However, more systematic explorations of this question demonstrate that goal extractions are clearly acceptable for a great many native English speakers.⁷ Furthermore, the definiteness of the post-verbal NP in such constructions has a significant influence on speakers' parsing of the construction. The effects of definiteness on on-line interpretation are discussed in §3.

3. Definiteness and Filler Interpretation

3.1 Extraction data

While previous research has converged on the apparent marginality of goal extraction from double object constructions in English, no attempt has been made to systematically probe the effects of different types of fillers or objects.⁸ The key observation to be explored in the current research is the impact which the definiteness of the post-verbal NP has upon processing ease and filler interpretation in double object extraction cases. In cases in which both the filler and post-verbal NP are human, and thus plausible goals, examples such as (24a) cause a marked sense of garden-pathing for many speakers. When the post-verbal NP is indefinite, as in (24b), this feeling of difficulty lessens considerably and perhaps disappears entirely. Further, for many speakers surveyed informally, a theme interpretation of the filler is the most accessible one for (24a), but a goal interpretation of the filler is readily available with (24b) (as shown in (25)).

- (24) a. Which child did the teacher assign the student aide?
b. Which child did the teacher assign a student aide?
- (25) a. Which child_i did the teacher assign the student aide e_i?
b. Which child_i did the teacher assign e_i a student aide?

⁶Hankamer (1973:52) reports that any extraction from a double object structure is ungrammatical, giving the following examples:

- a. *Who did you lend your pipe tool?
b. *What did Harry sell Jerome?

These judgments are not shared by most native speakers.

⁷By informally surveying five native speakers with the sentences in (23), I found considerable variation in judgments, ranging from completely bad to completely good. Thus, even the data cited in the early literature cannot be treated uniformly.

⁸Oehrle (1976) does note in passing that Langendoen, Kalish-Landon and Dore (1976) failed to control for intonation, NP definiteness or pronominal vs. non-pronominal objects in their investigation of double object extraction, but does not explore these factors himself.

3.1.1 Off-line Interpretation

To test more systematically the intuitions concerning definiteness and filler interpretation noted above, two questionnaire studies were conducted. In Study 1A, 12 native speakers of American English (undergraduates in an introductory linguistics course) were presented with three double object extractions (embedded in a set of filler items) and asked to indicate which of two paraphrases matched their first intuition about the meaning of the sentence (Initial Response). Later, the subjects were asked to note whether the paraphrase not initially selected was also a possible interpretation (Secondary Response). A sample item is given in (26) below (the full questionnaire is provided in Appendix A):

- (26) Which patient did the nurse bring the doctor?
- a. The nurse brought a patient the doctor; which patient was it?
 - b. The nurse brought the doctor a patient; which patient was it?

Four different versions of the questionnaire were constructed. Two versions of the questionnaire included the question shown above, with the paraphrases either in the order given or in the opposite order (so that no subject saw either all theme paraphrases first or all goal paraphrases first). The remaining two versions of the questionnaire also varied the presentation order of goal and theme paraphrases, but reversed the filler and the post-verbal noun phrase, in an attempt to control for any lexical biases associated with particular NPs or noun-verb combinations. (That is, some subjects saw "Which doctor did the nurse bring the patient?") Results are given in TABLE 1 below.

TABLE 1. Study 1A Filler Interpretation: Percent Goal vs. Percent Theme

<i>Initial Response</i>		<i>Secondary Response⁹</i>	
<i>% Goal</i>	<i>% Theme</i>	<i>% Goal</i>	<i>% Theme</i>
19.4	80.6	50.0	50.0

Subjects overwhelmingly preferred the theme paraphrase to the goal paraphrase.

Unfortunately, these findings are potentially suspect, in that the goal paraphrases provided were all declaratives in which an indefinite goal was paired with a definite theme. As I discuss in §3.2, this type of definiteness asymmetry is problematic; subjects may have shied away from the goal paraphrases even if they would have found them to be preferable otherwise. In order to confirm the theme interpretation preference with post-verbal definite NPs, a second questionnaire study (Study 1B) was conducted using slightly modified materials. A sample item is given in (27); the full questionnaire is provided in Appendix B.

⁹Secondary response percentages given throughout reflect the proportion of total secondary responses provided, rather than the proportion of secondary responses with respect to the total number possible. That is, half of the cases in which subjects indicated that the non-primary paraphrase was also a possible interpretation were theme paraphrases, and half were goal paraphrases.

- (27) Which patient did the nurse bring the doctor?
 a. The nurse brought the patient the doctor.
 b. The nurse brought the doctor the patient.

In this study, no secondary responses were solicited. The results are presented in TABLE 2; 21 native English speakers served as subjects.

TABLE 2. Study 1B Filler Interpretation: Percent Goal vs. Percent Theme

% Goal	% Theme
18.8	81.2

Given the similarity of these findings to those from Study 1A, it is safe to conclude that there is a very strong preference for a theme interpretation of the extracted NP when the post-verbal NP is definite.

In order to confirm the intuition, noted above, that goal interpretations of the filler NP are more prevalent than theme interpretations when the post-verbal NP in a double object extraction is indefinite, a second questionnaire study was conducted. In Study 2, the subjects were 10 adult native speakers of American English (some of whom were linguists). The extraction sentences from Study 1 were used in Study 2, but with the post-verbal NP changed from definite to indefinite, as shown in (28) below.¹⁰ Both an initial and a secondary interpretation were sought, as in the first study.

- (28) Which patient did the nurse bring a doctor?
 a. The nurse brought a doctor some patient; which patient was it?
 b. The nurse brought some patient a doctor; which patient was it?

In Study 2, as before, the non-subject NPs were tested in both filler and object position. The results are presented in TABLE 3.

TABLE 3. Study 2 Filler Interpretation: Percent Goal vs. Percent Theme

<i>Initial Response</i>		<i>Secondary Response</i>	
% Goal	% Theme	% Goal	% Theme
63.3	36.7	57.1	42.9

Unlike Study 1, in which the extractions contained definite post-verbal NPs, goal interpretations were preferred with indefinites, although the preference appears to be weaker in Study 2.

Following their responses to the questionnaire items, the subjects in Study 2 were asked to provide a grammaticality judgment for the following double object extraction.

¹⁰The full set of materials is given in Appendix C.

(29) Who did the woman bring a cake?

The extraction structure used for this task is heavily biased for treatment as a goal extraction, in that the filler is human and the post-verbal NP is inanimate and indefinite (making it a highly implausible goal). Speakers were classified according to their response on the grammaticality task; 50% of the subjects judged (29) to be grammatical, while 50% found it to be either ungrammatical or questionable. The interpretation data reported in TABLE 3 are broken down by speaker dialect in TABLE 4.

TABLE 4. Study 2 Interpretation Responses by Dialect: Percent Goal vs. Percent Theme

<i>Dialect</i>	<i>Initial Response</i>		<i>Secondary Response</i>	
	% Goal	% Theme	% Goal	% Theme
Goal Extraction in (29) Grammatical	80.0	20.0	60.0	40.0
Goal Extraction in (29) Ungrammatical	46.7	53.3	50.0	50.0

As TABLE 4 shows, there are clear dialect differences in the off-line interpretation of ambiguous double object extractions. Speakers who accept unambiguous goal extractions (such as (29)) prefer to interpret the filler as a goal when the post-verbal NP is indefinite; the degree of goal preference for these speakers is comparable to the strength of the theme preference identified in Study 1 above. Even for speakers who rejected goal extractions on the grammaticality task, however, there is a surprising tendency to choose goal interpretations when the post-verbal NP is indefinite. Definiteness is clearly playing a role in the final interpretation assigned to the extracted NP in structures of this sort. However, the data reported thus far are insufficient evidence for drawing strong conclusions about processing for at least two reasons: 1) the subject population is quite small, and 2) the data are drawn from speaker intuitions and introspection, which may not reflect actual parsing behavior. In order to determine more directly the role of definiteness in on-line parsing and interpretation, the experiment reported in §3.1.2 was designed and executed.

3.1.2 On-line Interpretation

The studies reported above provide clear evidence that NP definiteness plays a role in determining the final interpretation of an extracted object in the double object construction. When the post-verbal NP in such a construction is indefinite, a goal interpretation of the extracted NP is strongly preferred by subjects who find goal extractions to be grammatical. What the questionnaire studies do not show is the extent to which definiteness plays a role in on-line parsing and interpretation. There are two basic hypotheses to be considered. The first is that speakers make use of definiteness in the process of constructing a syntactic parse on-line. If this is the case, one would predict the existence of definiteness effects, similar to those found in Studies 1 and 2, in on-line tasks. Conversely, speakers may call on definiteness information only as an off-line means of alleviating semantic or pragmatic anomaly resulting from the on-line syntactic parse. No evidence of definiteness effects on-line is predicted in such a scenario.

3.1.2.1 Design

In an attempt to distinguish between these hypotheses, an on-line experiment which measured both processing difficulty and filler interpretation for double object extractions was conducted. The subjects, 60 University of Massachusetts undergraduates, read 16 double object extraction sentences which were presented on a computer terminal. Each sentence was presented one word at a time, with each word appearing in the center of the screen for 300 msec. The final word in each experimental item included the sentence-final punctuation, in order to signal the end of the item to the subjects. Following each sentence, subjects indicated whether they understood the sentence ("got-it") or not by pulling the appropriate switch on an experiment response panel.¹¹ Following a "got-it" response, subjects saw a "What happened?" question, along with two declarative paraphrases of the experimental item; they were asked to choose the paraphrase which correctly matched the experimental item.¹² All responses and response times were recorded by a computer. Each of the 16 sentences had four different versions; fillers and post-verbal NPs were alternated in an attempt to balance for any lexical biases present in the materials. A sample sentence set (30a-d) and corresponding follow-up questions (31a,c) are shown below.¹³

- (30) a. Which dean did the professor show the new administrator?
 b. Which new administrator did the professor show the dean?
 c. Which dean did the professor show a new administrator?
 d. Which new administrator did the professor show a dean ?

- (31) a. What happened?
 The professor showed the dean the new administrator.
 The professor showed the new administrator the dean .
 c. What happened?
 The professor showed a dean a new administrator.
 The professor showed a new administrator a dean .

The experimental materials were randomly intermixed with 84 filler items (some of which were materials for Experiment 2, reported in §3.2 below.)

3.1.2.2 Dialect differentiation

Following the on-line portion of the experiment, subjects were given a short grammaticality questionnaire (Appendix E). Of crucial interest on the questionnaire were three double object extraction sentences which were strongly biased toward a goal interpretation of the filler NP; subjects were asked to indicate whether each of the sentences was acceptable in colloquial English, and to provide confidence ratings for their judgments. The relevant items and the rating scale are given in (32) and (33) below.

¹¹The right-hand lever was used for an affirmative response, and the left-hand lever for a negative response.

¹²In all cases, either paraphrase was correct, as the double object extraction examples are ambiguous between the theme and goal interpretations of the filler. This method relies on the assumption that a strong preference for one of a set of possible resolutions of structural ambiguity is correlated with the greater accessibility of that choice.

¹³The full set of materials appears in Appendix D.

- (32) a. Which friend did the chef bring a cake?
 b. Which teacher did the pupil take the apple?
 c. Which customer did the clerk show a dog?¹⁴
- (33) 5 = I would use this sentence easily in everyday speech.
 4 = I would probably use this sentence.
 3 = I don't know whether I would use this sentence myself, but it sounds like something I've heard others use.
 2 = I wouldn't use this sentence, and it doesn't seem like something I've heard anyone else say.
 1 = No one I know would ever say this--it sounds quite strange.

Using this rating scale, an average grammaticality score was calculated for each subject; subjects were classified, on the basis of their (un)willingness to accept goal extractions, as either Goal, Theme or Borderline dialect speakers.¹⁵ The Borderline dialect group included all subjects whose average grammaticality score for the items in (32) was higher than 2.0 (therefore including some speakers for whom goal extraction is somewhat marginal). The Theme group included all subjects with a score of 2.0 or lower; goal extractions are clearly unacceptable for this group, even in passive terms. Finally, the Goal dialect group is composed of all speakers whose average score was 2.67 or higher. (Note the overlap between the Borderline and Goal dialects; the Goal dialect is a subset of the Borderline group.) Of the total subject population, 39 fell into the Borderline dialect group; the remaining 21 subjects were classified in the Theme dialect group. Within the Borderline population, 25 subjects could be further classified as Goal speakers. The mean average grammaticality scores for relevant subsets of the subject population are given in TABLE 5 below.

TABLE 5. Mean Grammaticality Averages for Questionnaire Items

<i>Subset</i>	<i>Mean Average</i>
All Subjects (n = 60)	2.41
Theme (n = 21)	1.65
Borderline (n = 39)	2.81
Goal (n = 25)	3.08

In light of the results from Study 2, which demonstrated that filler interpretation varies from speaker to speaker according to the acceptability of goal extraction, it is reasonable to expect that on-line behavior will vary similarly. Accordingly, the data from Experiment 1 were analyzed with reference to the subjects' dialect affiliation.

¹⁴Unfortunately, item *c* is not biased as strongly toward a goal interpretation of the filler as are *a* and *b*, since "a dog", being animate, is a possible (though perhaps not plausible) goal.

¹⁵No reliable regional or social correlates of these divisions have been identified.

3.1.2.3 Results

Two types of data, response time data and interpretation data, were collected in Experiment 1. As the focus of this section is the impact of definiteness on interpretation, only the interpretation data will be reported here. Discussion of the got-it response times is postponed until §4.

Interpretation results are presented in TABLE 6 and TABLE 7 below, contrasting the percent of theme and goal interpretations of the extracted NP according to the definiteness of the post-verbal NP. Study 1 and Study 2 established that NP definiteness influences subjects' preferred off-line interpretation for the extracted NP. Here, because subjects were instructed to provide the paraphrase corresponding to their first intuition as quickly as possible, the data more closely reflect on-line, rather than introspective, behavior. TABLE 6 gives the data for the subject population as a whole.

TABLE 6. All Speakers, Interpretation Responses: Percent Goal vs. Percent Theme

Condition ¹⁶		% Goal	% Theme
A	Post-verbal Definite NP	43.2	56.6
B		45.9	54.1
C	Post-verbal Indefinite NP	70.6	29.4
D		74.9	25.1

There is a strong main effect of post-verbal NP definiteness, both for goal interpretations [$F(1, 59) = 39.72, p < 0.00$; $F(1, 15) = 41.07, p < 0.00$] and for theme interpretations [$F(1, 59) = 37.43, p < 0.00$; $F(1, 15) = 44.45, p < 0.00$]. The definiteness of the lexical NP following the verb is closely correlated with the interpretation of the filler. No other significant effects are found. The choice of filler NP (i.e. "which dean" vs. "which new administrator") is not significant [Goals: $F(1, 59) = 0.28, p < 0.61$; $F(1, 15) = 0.32, p < 0.59$; Themes: $F(1, 59) = 0.32, p < 0.58$; $F(1, 15) = 0.72, p < 0.59$]. There is no interaction between NP definiteness and choice of filler. The results for conditions A and B are markedly different from those reported for Study 1, where theme interpretations were preferred to goals, 80% to 20%. However, the results for indefinite post-verbal NPs (conditions C and D) are strikingly similar to those reported in Study 2, where goal interpretations exceeded theme readings by a four-to-one margin.

¹⁶Conditions correspond to the labeling given in (30a-d).

In TABLE 7, the interpretation data are displayed according to subject dialect.

TABLE 7. Interpretation Responses by Dialect: Percent Goal vs. Percent Theme

Condition	Theme	Dialect	Borderline	Dialect	Goal	Dialect
	% Goal	% Theme	% Goal	% Theme	% Goal	% Theme
A Post-verbal Definite NP	38.4	61.5	45.6	54.3	47.7	52.3
B	43.1	56.9	46.3	53.5	49.4	50.6
C Post-verbal Indefinite NP	70.5	29.5	70.5	29.5	64.5	35.7
D	75.0	24.8	74.6	25.4	74.6	25.4

For each of the dialects reported in TABLE 7, there is a significant main effect of definiteness. This is true for the Theme dialect [% Goal: $F(1, 20) = 7.17$, $P < 0.01$; $F(1, 15) = 22.05$, $p < 0.00$; % Theme: $F(1, 20) = 26.88$, $p < 0.00$; $F(2, 15) = 23.95$, $p < 0.00$], as well as for the Borderline dialect [% Goal: $F(1, 38) = 35.92$, $p < 0.00$; $F(2, 15) = 22.21$, $p < 0.00$; % Theme: $F(1, 38) = 17.44$, $p < 0.00$; $F(2, 15) = 30.57$, $p < 0.00$] and the Goal dialect [% Goal: $F(1, 24) = 21.98$, $p < 0.00$; $F(2, 15) = 12.68$, $p < 0.00$; % Theme: $F(1, 24) = 7.71$, $p < 0.01$; $F(2, 15) = 12.92$, $p < 0.00$]. There was no main effect of filler choice in any of the dialects, and no interaction between filler choice and definiteness.

As in the off-line Study 2 (TABLE 4), there is a very strong preference for goal interpretations when the post-verbal NP is indefinite (conditions C and D). Interestingly, however, this preference is found for all speakers, regardless of their dialect affiliation; even Theme dialect members choose goal interpretations by a three-to-one margin on-line. Interestingly, the on-line results from TABLE 6 and TABLE 7 are at variance with the findings from Study 1 (TABLE 1 and TABLE 2). While the off-line study showed a very clear preference for theme interpretations with a definite post-verbal NP (80% of all responses being theme responses), here there is only a slight margin of preference. Furthermore, although there is relatively little variation from dialect to dialect in terms of interpretation percents, the percent of goal responses chosen in conditions A and B increases slightly as the acceptability of goal extraction increases. Thus, while theme interpretations of the filler enjoy a slight advantage in conditions A and B for the entire population, the Goal dialect speakers show a nearly even split between goal and theme interpretations. The contrast between on- and off-line findings is suggestive of a parsing preference for goal interpretations, with subsequent restructuring resulting in an off-line theme preference.

The results of Studies 1 and 2, as well as the findings from Experiment 1, demonstrate that definiteness does indeed play a role in the interpretation of an NP extracted from a double object construction. When the noun phrase remaining in situ after the verb is indefinite, goal interpretations of extracted NPs are strongly preferred by all speakers. However, when the post-verbal NP is definite, theme and goal interpretations are chosen with nearly equal frequency on-line. The off-line data for definites (Study 1) display a much stronger theme interpretation preference, suggesting that the NP definiteness does not direct structure assignment (and concomitant NP interpretation), but instead is used to refine or restructure the initial syntactic parse.

Why should definiteness have such a marked impact on the gap site assignments given to extracted NPs? By examining restrictions on object

definiteness in declarative double object structures, the answer to this question will emerge.

3.2 Declarative Data

Declarative double object structures have some rather interesting properties in their own right, distinct from the behavior of double object extractions. In particular, the two objects in a double object declarative seem to be subject to certain restrictions on definiteness. Consider the sentences in (34) below.

- (34) a. The nurse brought a doctor a patient.
 b. The nurse brought the doctor the patient.
 c. The nurse brought the doctor a patient.
 d. ?The nurse brought a doctor the patient.

Example (34d), while not clearly ungrammatical, seems to strike most native English speakers as somewhat odd or problematic. Crucially (34d), unlike (34a-c), is a case in which the goal NP is less definite than the theme NP.¹⁷ The contrast given in (34) suggests some type of restriction on the two objects of a double object construction, requiring that goals be at least as definite as following themes.

The impression of marginality associated with (34d) is an effect which might reflect on-line processing difficulty, rather than merely indicating that sentences of this sort "sound funny". If the oddness of sentences such as (34d) does reflect actual parsing difficulties, then some measure of this difficulty should surface in on-line tasks. For example, a sentence such as (35b), in which the goal is indefinite and the theme is definite, should induce more processing difficulty than the corresponding sentence in (35a).

- (35) a. The pitcher threw the umpire a ball.
 b. The pitcher threw an umpire the ball.

In Experiment 2, such measures of processing difficulty were sought by means of the speeded "got-it" task employed in Experiment 1. In Experiment 2, subjects read eight sentences such as (35a-b) on a computer screen; the manner of presentation and subject response were identical to that in Experiment 1. Four of the eight double object declaratives presented had the definite-indefinite order of (35a) and four had the indefinite-definite order of (35b). The eight experimental items¹⁸ were embedded among 92 filler sentences, including the 16 sentences used in Experiment 1. The same subject population was used for both Experiment 1 and Experiment 2; accordingly, the dialect divisions which applied for the extraction data will be employed here. However, the data reported here will consist of response times for got-it judgments (i.e. the interval between the onset of the last presentation region of the declarative sentence and subjects' got-it response) and the percent of got-it responses provided. The results for all subjects are presented in TABLE 8 below.

¹⁷Example *a* can, in theory, have a reading in which the goal is indefinite and the theme is presuppositional, since weak determiners (Milsark 1974) are ambiguous between indefinite and presuppositional readings. If this reading is available for *a*, it is certainly not the preferred one. According to my judgments, the goal is more likely to be given the presuppositional reading, if either indefinite NP is to be.

¹⁸Appendix F.

TABLE 8. Experiment 2 Got-It Judgments: Mean Response Times (msec) and Percent Got-It

Condition		Response Times	Percent Got-It
A	Definite, Indefinite	1051	97.6
B	Indefinite, Definite	1152	89.0

Subjects took longer to provide a got-it response to the indefinite-definite ordering of double objects (35b) than they did when presented with the definite-indefinite ordering (35a) [$F(1, 59) = 5.67, p < 0.05$; $F(2, 17) = 3.70, p < 0.1$]. Thus, the marginal ordering of definite and indefinite objects was met with on-line processing difficulty, although the effect was marginally significant at best in the item analysis. The percent got-it data also support the claim that the combination of an indefinite goal and a definite theme poses a processing load [$F(1, 59) = 11.13, p < 0.01$; $F(2, 17) = 14.19, p < 0.01$]. Here the effect is significant for both subjects and items. When confronted with the indefinite, definite ordering, subjects take longer to reach a decision concerning the comprehensibility of double object sentences and are more likely to reject the sentences as confusing or incomprehensible than when given an asymmetry in the opposite direction.

As in Experiment 1, the results from Experiment 2 were analyzed according to the subjects' dialect affiliation. The results for the three dialects are presented in TABLE 9 below.

TABLE 9. DECLARATIVE Data by Dialect: Mean Response Times (msec) and Percent Got-It

Condition	Theme	Dialect	Borderline	Dialect	Goal	Dialect	
	RT	% Got-it	RT	% Got-it	RT	% Got-it	
A	Definite, Indefinite	1139	100	994	95.9	1033	97.0
B	Indefinite, Definite	1162	88.4	1134	90.1	1143	95.0

In the Theme dialect, there was no main effect of ordering on the got-it response times [$F(1, 20) = 0.82, p < 0.62$; $F(2, 17) = 0.06, p < 0.80$]. An effect is found, however, in the percent got-it data [$F(1, 20) = 7.19, p < 0.01$; $F(2, 17) = 18.80, p < 0.00$]. For the Borderline dialect, a main effect of ordering on got-it response time did occur [$F(1, 38) = 7.21, p < 0.01$; $F(2, 17) = 14.1, p < 0.00$]. This effect is also found, somewhat less strongly, in the percent got-it data [$F(1, 38) = 4.55, p < 0.04$; $F(2, 17) = 4.73, p < 0.06$]. The response time data for the Goal dialect show a tendency toward significance for both subjects and items [$F(1, 24) = 2.40, p < 0.13$; $F(2, 17) = 2.62, p < 0.15$]. While the percent got-it data for condition A are numerically greater than the figures for condition B, this difference is not statistically significant [$F(1, 24) = 0.39, p < 0.55$; $F(2, 17) = 0.79, p < 0.59$].¹⁹ On the whole, the results indicate a processing disadvantage associated with the indefinite-definite ordering of objects in double object declaratives. In other words, there is a parsing constraint of the following form:

¹⁹While the data for the Theme and Goal dialects do not provide statistically robust confirmation of the results found for the subject population as a whole and for the Borderline dialect, it should be kept in mind that relatively few data points are involved in each case. With more subjects (and more than four tokens of each condition per subject), it is quite possible that these data would be more in line with the other sets.

(36) DEFINITENESS ASYMMETRY CONSTRAINT

The definiteness of NP₂ in a double object construction of the form V-NP₁-NP₂ must not exceed that of NP₁.

By considering the extraction data reported above in light of the requirements imposed by the Definiteness Asymmetry Constraint, the interpretation preferences found receive a principled explanation, as detailed in §3.3.

3.3 *Extraction and Definiteness Effects*

The four studies reported to this point have yielded intriguing results. In particular, Studies 1 and 2 and Experiment 1 have demonstrated that the interpretation of a noun phrase extracted from a double object construction is influenced by the definiteness of the object which remains in situ. When the post-verbal NP is definite, subjects show a preference (ranging from slight on-line to very marked off-line) to interpret the extracted NP as a theme. However, when the post-verbal NP is indefinite, a goal interpretation of the filler NP is strongly preferred, both off- and on-line. Further, Experiment 2 demonstrated that subjects experience difficulty in processing when the first object in a double object construction is less definite than the second. What remains at this point is the integration of the extraction and declarative findings. Specifically, how do the declarative data shed light on the results of the extraction studies?

Given the Definiteness Asymmetry Constraint, which clearly holds for declarative structures, it is reasonable to hypothesize that subjects will avoid violating this constraint whenever possible. That is, if the combination of an indefinite goal and a definite theme is difficult or dispreferred, speakers will eschew this configuration when parsing double object extractions. This means that subjects will avoid assigning an extracted NP to the goal position in a sentence if that extracted NP is less definite than the post-verbal NP, preferring instead to assign the filler NP to the NP₂ position. If the extracted NP is more definite than the post-verbal NP, however, the extracted NP will make a good goal, and should be assigned to the immediately post-verbal NP₁ position. In the event that the extracted NP and the post-verbal NP are equally definite, either the NP₁ or NP₂ position should be equally available for the filler (all else being equal).

With these predictions in hand, the extraction data can be easily understood, provided that *which*-NPs are indefinite with respect to definite *the*-NPs. That such a definiteness asymmetry holds between *which* and *the* is borne out by several aspects of the current research. Consider the off-line interpretation preferences found in Study 1 and Study 2; these are summarized in (37) below.²⁰

²⁰The figures reported for Study 2 represent only the Goal dialect. The situation for Theme speakers, who reject goal extractions as ungrammatical, is more complex. See §5 for additional discussion.

(37) Off-line NP interpretations, Studies 1 and 2

SENTENCE TYPE	GOAL?	THEME?
Post-Verbal Definite NP	20%	80%
Post-Verbal Indefinite NP	80%	20%

Eight times out of ten, speakers assign the extracted NP to the NP₂ position when the post-verbal NP is definite:

(38) Which patient_i did the nurse bring the doctor e_i?

This strong preference is accounted for tidily if *the* is more definite than *which*; the data remain mysterious if this relation does not hold.

Interestingly, the pattern sketched in (37) suggests that *which* is more definite than *a*. The preponderance of NP₁ assignments when the post-verbal object is indefinite is exactly what is predicted if the extracted NP is definite; a goal assignment respects the Definiteness Asymmetry Constraint, while a theme assignment would violate it. It is conceivable that *which* actually falls between *the* and *a* on some scale of definiteness: *the* » *which* » *a*. An alternative account should also be considered, however. The discussion to this point has assumed that only the Definiteness Asymmetry Constraint is relevant to the assignment of object positions. This is unlikely to be the case, though, as there is considerable evidence that strictly syntactic principles such as the Active Filler Strategy guide initial parsing efforts in handling other constructions. Thus, while the Definiteness Asymmetry Constraint is clearly involved in parsing double object extractions, syntactic strategies should be assumed to be active as well.

Consider the predictions which emerge if both the Definiteness Asymmetry Constraint and the Active Filler Strategy are factored into the object gap assignment process. The Active Filler Strategy requires that the first available gap site be posited when a filler is encountered in the input string. In a double object construction, the Active Filler Strategy gap will be in NP₁ position, a goal. Therefore, the Active Filler Strategy predicts a goal preference for all double object extractions, as noted in §2, regardless of definiteness. When both the extracted NP and the post-verbal NP are indefinite, as is the case with *which* and *a*, only the Active Filler Strategy yields a prediction for preferred gap site. The Definiteness Asymmetry Constraint imposes no positional requirements on an extracted indefinite NP, as neither a theme nor a goal assignment will result in a violation of the constraint. With an initial goal assignment derived on strictly syntactic grounds there is no reason to abandon this parse for one in which the filler is given a theme interpretation; the Definiteness Asymmetry Constraint is not violated by the initial gap assignment. A goal preference is therefore predicted when the in situ object is indefinite. Such a preference is found both on- and off-line for Goal dialect speakers.

Given the combination of an indefinite *which*-NP and a definite *the*-NP, the Active Filler Strategy and the Definiteness Asymmetry Constraint impose conflicting requirements on gap assignment. If sentence processing is modular, beginning with a parse determined by strictly syntactic principles such as the Active Filler Strategy and only later taking into account semantic and pragmatic information for possible structural revision, the picture of the post-verbal definite

NP cases which emerges is one which is strikingly familiar: An initial Active Filler Strategy assignment of the filler to the goal position is supplanted by the analysis required by the Definiteness Asymmetry Constraint. The shift in interpretation preferences from roughly 55% themes on-line (TABLE 6 and TABLE 7) to 80% themes off-line (TABLE 1 and TABLE 2) fits tidily with this model.

Consider momentarily the opposing hypothesis that *which*-NPs are definite. If this were true, the Definiteness Asymmetry Constraint would yield no positional preference for conditions A and B of Experiment 1, where the post-verbal NP is a definite *the*-NP; both the extracted NP and the in situ object would be equally definite. Assuming only the Definiteness Asymmetry Constraint, the strong theme preference for these cases off-line (80%) is unexplained, since either a goal or a theme assignment would respect the definiteness requirements imposed by the Definiteness Asymmetry Constraint. Invoking the Active Filler Strategy does not help either, as this would predict a pattern in which the only positional preference motivated in parsing is a goal preference; thus, the off-line findings from Study 1 cannot be accounted for.

Further evidence that *which*-NPs are indefinite comes from a third questionnaire study involving the extraction of unambiguously indefinite NPs. In Study 3, eight native American English speakers read 16 double object extraction sentences, embedded among 84 filler items. Each of the sixteen sentences had two versions, one with a definite NP post-verbally and one with an indefinite. Subjects saw eight sentences including a definite NP and eight including an indefinite. As in Study 1 and Study 2, two paraphrases (representing the goal and theme interpretations of the extracted noun phrase) were given for each extraction. Unlike the first two studies, however, the extracted NP was *who*, rather than *which*-NP. Two versions of a sample sentence are given below; the full set of materials appears in Appendix G.

- (39) Who did the coach take the trainer?
- a. The coach took someone to the trainer.
 - b. The coach took the trainer to someone.
- (40) Who did the coach take a trainer?
- a. The coach took someone to a trainer.
 - b. The coach took a trainer to someone.

The interpretation results are presented in TABLE 10 below.

TABLE 10. Study 3 Interpretation Responses: Percent Goal vs. Percent Theme

Condition	% Goal	% Theme
Post-verbal Definite NP	42.9	57.1
Post-verbal Indefinite NP	81.3	18.7

The data in TABLE 10 are strikingly similar to the on-line data from Experiment 1. The degree of preference here is nearly identical to that reported in

TABLE 6 above for on-line *which*-NP extractions.²¹ Given this degree of similarity, it is reasonable to conclude that both *who* and *which*-NPs are of the same type with respect to the Definiteness Asymmetry Constraint: they are both indefinite.

Thus, while the data are somewhat inconclusive with respect to the relative definiteness of *which* and *a*, there is clear evidence that *which*-NPs are less definite than *the*-NPs. Only under this assumption can the pattern of interpretation responses found in the off- and on-line studies reported above be accounted for. The Definiteness Asymmetry Constraint requires that an indefinite *which*-NP which is extracted be assigned to the object position following a definite *the*-NP. Furthermore, the shift in theme preferences with a post-verbal definite NP from roughly 55% on-line to 80% off-line, suggests that a parsing strategy such as the Active Filler Strategy is playing a role in processing. Other data which bear on the nature of gap location in double object extractions are discussed in §4.

3.4 *The Nature of the Definiteness Asymmetry Constraint*

It seems likely that the Definiteness Asymmetry Constraint is a derived restriction, resulting from the interaction of structure and interpretation in the syntactic and semantic components of the grammar, rather than an autonomous parsing principle. For example, this constraint on definiteness may be related to a correlation between NP position (either at S-Structure or at LF) and NP interpretation, of the sort noted by Diesing (1990, 1992a,b). In Diesing's theory, true indefinites are mapped onto the nuclear scope of a tripartite semantic representation (Heim 1982, Kamp 1981), while presuppositional or "strong" (Milsark 1974) indefinites are mapped onto the restrictor clause of such a representation. Diesing proposes that material which is inside VP corresponds to material in the nuclear scope; structure outside of VP is mapped onto the restrictor clause. Thus, weak indefinites must be located inside the VP at some relevant level of representation. (For English, Diesing argues that the correct level of representation is LF.) Strong indefinites and definite NPs must be located outside the VP at the appropriate level.

One approach to the declarative double object data given in (34) above would be to hypothesize that movement of a definite theme to the proper position outside the scope of existential closure is blocked by the presence of an indefinite goal remaining within the domain of existential closure.²² That is, movement of the theme to a position outside of VP would be blocked by the presence of the goal

²¹One potentially troubling point is that the data for the post-verbal definite case do not show the 20%-80% split one would expect for an off-line study involving the extraction of an indefinite NP, based on the findings in Experiment 1 and the claim that *which*-NPs are indefinite. Determining the relative timing of syntactic revision driven by definiteness considerations is a difficult and inexact process within the limitations of the current project; it is conceivable that the data reported in Study 3 are simply "more on-line" than those reported in Study 1. One must also consider that a *which*-NPs and *who* are not identical in their properties, even if both are indefinites. Further investigations along this line may demonstrate that "definiteness" is not precisely the correct parameter for characterizing the effects discussed in this paper, as noted in fn. 1.

²²There are a variety of alternative directions which a syntactic/semantic analysis of the definiteness restrictions on double object constructions might take. Many of these possibilities focus on the idea that the verb and the goal form a unit to the exclusion of the theme, possibly by means of noun incorporation (or functional application, in a categorial framework. (See Bach, 1980, for some discussion of such an approach, and Diesing and Jelinek, to appear, for a very recent approach to object location, couched in terms of type theory and conditions on LF representations.)

inside VP. The situation is complicated by the question of how and when case assignment and the movement of objects to the relevant case positions occurs. Runner (in preparation) argues that object movement for case checking occurs at S-Structure (contra Chomsky, 1991, 1992, who argues for LF movement). Either proposal appears to be problematic for an account of the definiteness asymmetry noted above. If objects move to VP-external Agr positions at S-Structure in order to get case, then indefinites must be returned to the VP at LF, where the mapping onto the semantic representation takes place. If case assignment takes place at LF, though, then it is unclear how to derive a VP-internal position for either object, raising the question of how to get any weak object interpretations at all. (See Runner, 1993, for a discussion of this issue with regard to simple transitive verbs.) While this topic is a fascinating one which deserves further exploration, it goes beyond the scope of the current research and will not be pursued further here.²³ (The reader is referred to Beckman, 1994, for additional discussion of these issues.)

4. Response Time Data and Gap Location

Thus far, only interpretation data have been reported from the on-line findings in Experiment 1. However, other data were collected in the hopes of provided conclusive evidence for the role of the Active Filler Strategy in double object extraction parsing. In particular, both got-it response times and got-it percentages for the initial double object extraction sentences were recorded. Because the Active Filler Strategy predicts that goal assignments will be posited for all double object extractions, cases which are biased strongly for a final theme interpretation should be problematic for the parser, resulting in on-line measures of difficulty. In particular, given the strong theme preference with post-verbal definite NPs established in Study 1, longer got-it response times and fewer got-it responses are predicted for sentences such as (41a) (where a theme interpretation is preferred), compared to those like (41b) (where a goal interpretation is preferred).

- (41) a. Which patient did the nurse bring the doctor?
- b. Which patient did the nurse bring a doctor?

With respect to Experiment 1, evidence for the Active Filler Strategy would be provided by longer got-it response times and/or by fewer got-it responses on conditions A and B than on C and D. The data are presented in TABLE 11.

TABLE 11. Response Times (msec) and Percent Got-It, by Dialect

Condition	Theme Dialect		Borderline Dialect		Goal Dialect	
	RT	% Got-It	RT	% Got-It	RT	% Got-It
A Post-verbal Definite NP	1574	58.9	1560	67.9	1528	70.5
B	1360	65.9	1222	71.2	1428	79.4
C Post-verbal Indefinite NP	1386	65.4	1363	72.4	1595	78.8
D	1162	52.9	1397	76.3	1561	84.9

²³A more thorough investigation of this topic might shed some light on the proper syntactic structure to be assigned to double object constructions, an issue sidestepped here. Also, the question of how case is to be assigned to both objects in the double object construction (a long-standing concern) is not addressed.

There is no significant main effect of either definiteness or choice of extracted NP for any of the dialects. This is true both for the response times and the percentage of got-it responses. However, while there is no interaction between filler choice and definiteness in the Borderline dialect [RT: $F(1,38) = 0.01$, $p < 0.87$; $F(1,15) = 0.03$, $p < 0.84$; %: $F(1,38) = 5.98$, $p < 0.02$; $F(1,15) = 1.86$, $p < 0.19$] or the Goal dialect [RT: $F(1,24) = 1.21$, $p < 0.28$; $F(1,15) = 0.04$, $p < 0.83$; %: $F(1,24) = 0.11$, $p < 0.74$; $F(1,15) = 0.18$, $p < 0.68$] there is an interaction in got-it percentage for the Theme [%: $F(1,20) = 6.12$, $p < 0.02$; $F(1,15) = 4.15$, $p < 0.06$]. The absence of any effect in the response time data, as well as the small number of subjects involved, suggests that this finding may not be a very reliable one.²⁴

Returning to the predictions of the Active Filler Strategy, recall that a main effect of definiteness on response times and/or the percentage of got-it responses is expected if the Active Filler Strategy is playing a role in parsing. In particular, conditions A and B (where a theme interpretation preference holds) are predicted to take longer and have fewer got-it responses than conditions C and D (where the preference is for goal interpretations). No such main effect is found, and a simple inspection of the data in TABLE 11 shows that there are no clear-cut numerical tendencies in the appropriate direction. Consider the Goal dialect findings. Here the response times are longer for the cases in which the Active Filler Strategy assignment (which-NP = goal) is preferred than for the conditions in which it is not, a result which runs counter to the predictions set out above. Further, in the other two dialects, where the response times for condition A are quite a bit longer than those for conditions C and D, the RT for condition B is inexplicably fast. These data provide no support for the Active Filler Strategy.

Unfortunately, the data in TABLE 11 fail to support any well-established models of parsing. Consider an obvious alternative, the XX Extraction Principle. The predictions here are the opposite of the predictions for the Active Filler Strategy: conditions in which a theme extraction is favored (A&B) should be fastest, and those in which a goal interpretation predominates (C&D) should be slow. Numerically, this is found in the Goal dialect, which is quite odd, as these are the speakers who accept violations of the XX Extraction Principle as grammatical. Nowhere else in the data does this pattern surface. Furthermore, as demonstrated at length in §3, the interpretation data run counter to the predictions of this principle.

These findings also cannot be accounted for under models which assume that there is no preference for either gap position in the initial parse. Suppose that the parser delays making a syntactic assignment for the filler NP until relevant definiteness information is encountered. With such parser, one would expect either longer response times when definiteness information is inclusive (i.e. if there is no preference imposed by the definiteness of the post-verbal NP), as in conditions

²⁴Interestingly, a post-hoc study of lexical biases in the experimental materials demonstrated that conditions A and C were strongly theme-biased. Given only the filler NP, the subject and the verb, subjects rated more of the fillers in these conditions as preferred themes than as preferred goals; the filler NPs for conditions B and D were rated as preferred themes less often. However, while the existence of a theme bias in conditions A and C does provoke speculation about the role of thematic biases in Experiment 1, no systematic influence of these biases can be identified; therefore, these findings will not be discussed further in this work.

C&D, or no difference in response times.²⁵ Neither of these predictions is borne out by the data in TABLE 11.

As shown above, the on-line RT and got-it data from Experiment 1 fail to provide information about the nature of the gap location process in double object extractions. Rather, the results raise more problems than they address. Without additional experimental evidence, perhaps gleaned with the use of different on-line tasks, the character of filler-gap processing in double object constructions must remain an open question.

5. Dialect Differences and Parsing

A key theme which runs through this research is the relevance of idiolectal variation to the question of parsing behavior.²⁶ Little, if any, research has addressed the role of linguistic variation in sentence processing. The default assumption seems to be that of Idiolect-Driven Parsing:

(42) IDIOLECT-DRIVEN PARSING

In parsing, a speaker initially makes use of only the rules and constraints available in his/her own idiolect.

To the extent that it is possible to characterize the linguistic behavior of a speaker or speakers in terms of a grammar, that grammar can reasonably be expected to underlie on-line parsing behavior.

One of the most interesting, and perhaps most surprising, aspects of the research reported here is the on-line behavior of subjects from the Theme dialect, which convincingly discredits the idiolect-driven parsing hypothesis. Recall from the discussion of Experiment 1 that Theme dialect speakers are classified as such on the basis of the grammaticality ratings assigned to goal extractions on a post-experiment questionnaire. In order to fall into the Theme dialect, subjects had to achieve an average grammaticality rating of 2 or lower, where 2 was coded as "I wouldn't use this sentence, and it doesn't seem like something I've heard anyone else say". If such grammaticality ratings correspond in any reliable way to a speaker's capacity to produce utterances of the type rated, then it seems fairly clear that Theme speakers are not producing goal extractions in their normal usage.²⁷ (The same is true for those Borderline dialect speakers who are not included in the Goal dialect subset; these speakers had average ratings of 2.33, which is conceivably also within the range corresponding to non-production of goal extractions.)

²⁵For example, there might be no difference in response time if *which* actually falls between *the* and *a* on the definiteness scale, or if having a filler and a post-verbal NP of equivalent definiteness results in no processing cost. In order to implement the latter, one might call upon some sort of default gap-placement strategy. Note, however, that any reasonable strategy of this sort will essentially introduce either the Active Filler Strategy or the XX Extraction Principle into the parsing model.

²⁶Although the discussion in this section is not concerned with variation which can reliably be attributed to geographical or social factors, the general issues are clearly relevant to dialect distinctions of these sorts as well.

²⁷It should be noted, however, that grammaticality judgments can be influenced by a variety of subjective factors, making such judgments an imprecise indicator of "normal usage".

The respect in which these speakers are surprising is the following: Although their introspective assessment of goal extractions indicate that Theme speakers do not produce goal extractions with double object constructions, their on-line interpretation data demonstrate that they are quite capable of comprehending and utilizing goal interpretations when faced with externally generated data. In other words, a Theme speaker apparently does not rely solely on his/her own grammar to parse double object constructions. The on-line behavior of Theme speakers is very similar to that of Goal dialect subjects; strong differences emerge only in the off-line interpretation data from Study 2 (TABLE 4). This suggests that speakers' initial approach to incoming data may be to implement some sort of grammar which is more general than their production grammar, in that it is capable of coping with more variation than is permitted in the native dialect. Subsequently, the idiolectal grammar takes over to yield a final parse (or to ultimately reject an utterance or sentence as ungrammatical).

Upon further reflection, this notion of variation-sensitive parsing makes intuitive sense. Consider the sort of phonological variation that one encounters in the various dialects of American and non-American English. One sometimes experiences a fair degree of difficulty in comprehension when initially encountering a speaker whose phonology diverges considerably from one's own system, but upon repeated exposure to the dialect features, these difficulties are often minimized or entirely eradicated. Speakers apparently develop the ability to accommodate phonological divergence. Why should syntactic diversity be strikingly different, particularly if there is a set of basic parsing strategies which is shared by native speakers of the same language?

The disparity between idiolect and parsing behavior identified here raises some serious questions for a particular class of parsing models, namely those which rely on frequency considerations in syntactic processing. In one such model, that of MacDonald, Pearlmutter and Seidenberg (1993), the relative frequencies of different argument structures associated with a given verb play an important role in determining the syntactic structure to be assigned by the parser. The more frequent a particular argument structure for some verb is, the higher the activation level of that argument structure, and the more it will inhibit the activation of other possible structures. Thus, more frequent structural options are the most accessible choices for the parser (modulo other influencing factors such as context). In light of the current findings, however, a basic question arises: With respect to what is frequency determined? Assuming Idiolect-Driven Parsing, the obvious answer would be frequency within the idiolect of the speaker whose parser is active. However, as Idiolect-Driven Parsing has been shown not to obtain, the challenge for a frequency-based model will be to provide a principled metric by which to evaluate structural frequency and its role in parsing.

The experiments reported above provide strong evidence that definiteness is a factor in parsing and interpreting double object extractions on-line. Further, the Active Filler Strategy is arguably involved. What the data additionally suggest is that all speakers begin the parsing process with the same tools; Theme speakers, however, overlay an additional component somewhere between the initial parse and the final off-line assessment. While the nature of this additional constraint is not clear, the preference for theme interpretations (coupled with the rejection of unambiguous goal extractions) suggests one possibility, namely that these speakers do not accept configurations in which lexical complements are separated from their

licensors by non-lexical constituents. This suggestion is highly speculative, and must unfortunately remain so in the context of the current research.

6. Conclusions

While there are still many open questions to be addressed in the domain of double object extractions, a number of clear conclusions have arisen from the current research. First, the existence of the Definiteness Asymmetry Constraint, prohibiting the combination of an indefinite goal and a definite theme, has been demonstrated. This constraint not only holds of declarative double object structures, but is also a determining factor in the assignment of gap positions to extracted NPs; contrary to the standard assumptions in the syntactic literature, the extraction of goals is not globally prohibited for native American English speakers. In fact, goal extraction is the preferred parse when the object which remains in situ is indefinite. An additional finding, attendant on the demonstrated role of the Definiteness Asymmetry Constraint, is the patterning of English *which*-NPs with indefinites, relative to definite *the*-NPs. Finally, the dialect data from Experiment 1, discrediting the notion that parsing is driven by a speaker's idiolect or native dialect, set the stage for further work in the domain of variation and processing.

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Department of Linguistics
South College
University of Massachusetts
Amherst, MA 01003
jbeckman@linguist.umass.edu

Appendix A: Questionnaire for Study 1A

Instructions: Read each sentence carefully. Once you have finished it, circle the letter of the paraphrase below it which best matches your first intuition about the meaning of the sentence. Our concern here is with everyday, colloquial English, and not with facts or rules you may have learned in an English grammar class.

Practice:

0. As you may know, visiting in-laws can be difficult.
 - a. Challenging situations may arise when in-laws come to visit, as you may know.
 - b. Going to visit one's in-laws can be a difficult time, as you may know.

Test Sentences:

1. Did John buy the old books and albums?
 - a. Did John buy the old books, and the old albums, too?
 - b. Did John buy the albums, and some old books, too?
2. The park ranger saw the tourist with binoculars.
 - a. The park ranger saw a tourist who was carrying binoculars.
 - b. The tourist used the binoculars to look at a park ranger.
3. Which patient did the nurse bring the doctor?
 - a. The nurse brought the doctor a patient; which patient was it?
 - b. The nurse brought a patient the doctor; which patient was it?
4. I told the woman that Bill liked the story.
 - a. I told the story to the woman that Bill liked.
 - b. I let the woman know that Bill liked the story.
5. Which child kissed the girl in the hallway?
 - a. There's a girl standing in the hallway. Which one of the children kissed her?
 - b. One of the children was in the hallway when he kissed a girl. Which child was it?
6. Mary said that her brother went to the store this morning.
 - a. Earlier today, Mary's brother went to the store.
 - b. Mary went to the store this morning, according to her brother.

7. Which dean did the professor show the student?
 - a. The professor showed some dean the student; which dean was it?
 - b. The professor showed the student some dean; which dean was it?

8. Leslie shot the burglar with the gun.
 - a. The burglar, who had a gun, killed Leslie.
 - b. Leslie used a gun to shoot the burglar.

9. Stewart ate the ripe pears and apples with a spoon.
 - a. Stewart used a spoon to eat ripe pears and ripe apples.
 - b. Stewart used a spoon to eat some ripe pears, and he used it to eat some apples, too.

10. Which assistant did the shift manager assign the receptionist?
 - a. The shift manager assigned the receptionist an assistant. Which assistant was it?
 - b. The shift manager assigned an assistant the receptionist. Which assistant was it?

Now that you have read each of the sentences above, consider them again. Is the paraphrase that you *didn't* circle above also a possible paraphrase of the sentence? If it is, put a box around the letter of the paraphrase. If not, leave it blank.

Name: _____

Hometown: _____

Appendix B: Questionnaire for Study 1B

Part I.

Instructions: Read each sentence carefully. Once you have finished it, circle the letter of the paraphrase below it which best matches your first intuition about the meaning of the sentence. Our concern here is with everyday, colloquial English, and not with facts or rules you may have learned in an English grammar class.

1. As you may know, visiting in-laws can be difficult.
 - a. Challenging situations may arise when in-laws come to visit, as you may know.
 - b. Going to visit one's in-laws can be a difficult time, as you may know.
2. Did John buy the old books and albums?
 - a. Did John buy the old books, and the old albums, too?
 - b. Did John buy the albums, and some old books, too?
3. The park ranger saw the tourist with binoculars.
 - a. The park ranger saw a tourist who was carrying binoculars.
 - b. The tourist used the binoculars to look at a park ranger.
4. Which patient did the nurse bring the doctor?
 - a. The nurse brought the patient the doctor.
 - b. The nurse brought the doctor the patient.
5. The secret agent found a bug under her bed.
 - a. The agent found an insect under her bed.
 - b. The agent found a listening device under her bed.
6. Which child kissed the girl in the hallway?
 - a. One of the children kissed the girl who was standing in the hall.
 - b. One of the children who was standing in the hall kissed the girl.
7. Mary said that her brother went to the store this morning.
 - a. Earlier today, Mary's brother went to the store.
 - b. Mary went to the store this morning, according to her brother.
8. Which dean did the professor show the student?
 - a. The professor showed the student the dean.
 - b. The professor showed the dean the student.
9. Leslie shot the burglar with the gun.
 - a. The burglar, who had a gun, killed Leslie.
 - b. Leslie used a gun to shoot the burglar.
10. Did Stewart eat the ripe pears and apples with a spoon?
 - a. Stewart used a spoon to eat ripe pears and ripe apples.
 - b. Stewart used a spoon to eat some ripe pears, and he used it to eat some apples, too.

11. Which assistant did the shift manager assign the receptionist?
 - a. The shift manager assigned the receptionist the assistant.
 - b. The shift manager assigned the assistant the receptionist.
12. The bewildered traveler sat on a bench near the bank.
 - a. The traveler sat near a river.
 - b. The traveler sat near a financial institution.
13. I told the woman that Bill liked the story.
 - a. I told the story to the woman that Bill liked.
 - b. I let the woman know that Bill liked the story.
14. Which prisoner did the warden leave the guard?
 - a. The warden left the prisoner the guard.
 - b. The warden left the guard the prisoner.

Part II.

Imagine that a foreign friend who is learning English asks you whether the following sentences are okay to say in colloquial English:

- a. The girls is here.
- b. Who is here?.

You would tell him or her that sentence *a* is not an okay English sentence, but that sentence *b* is fine. What would you tell this friend if he/she asked about sentences 1-6 below? If the sentence is okay, answer "yes". If it's not okay to use in colloquial English, answer "no".

1. Which friend did the chef bring a cake?
2. The landlord showed the applicant the neighbor.
3. Which teacher did the pupil take an apple?
4. Which customer did the clerk show a sweater?
5. The babysitter brought the mother the baby.
6. Who did the librarian mail a letter?

Now that you've read all of the sentences, consider them again. For each one, please provide a rating from the scale given below which reflects your confidence about the answer you gave in the first part. Feel free to add any comments that seem relevant about the sentences in the spaces below them.

- 5 = I would use this sentence easily in everyday speech.
- 4 = I would probably use this sentence.
- 3 = I don't know whether I would use this sentence myself, but it sounds like something I've heard others use.
- 2 = I wouldn't use this sentence, and it doesn't seem like something I've heard anyone else say.
- 1 = No one I know would ever say this--it sounds quite strange.

Appendix C: Questionnaire for Study 2

1. Which patient did the nurse bring a doctor?

- a. The nurse brought a doctor some patient; which patient was it?
- b. The nurse brought some patient a doctor; which patient was it?

2. Which dean did the professor show a student?

- a. The professor showed some dean a student; which dean was it?
- b. The professor showed a student some dean; which dean was it?

3. Which assistant did the shift manager assign a receptionist?

- a. The shift manager assigned a receptionist some assistant. Which assistant was it?
- b. The shift manager assigned some assistant a receptionist. Which assistant was it?

Now that you have read each of the sentences above, consider them again. Is the paraphrase that you *didn't* circle above also a possible paraphrase of the sentence? If it is, put a box around the letter of the paraphrase. If not, leave it blank.

Finally, consider the following sentence. Is it grammatical? (Would you say it? Does it sound okay?)

Who did the woman bring a cake?

Appendix D: Experimental Materials for Experiment 1

- (1) a. Which patient did the nurse bring the doctor?
b. Which doctor did the nurse bring the patient ?
c. Which patient did the nurse bring a doctor?
d. Which doctor did the nurse bring a patient ?
- a,b. What happened?
The nurse brought the patient the doctor.
The nurse brought the doctor the patient .
- c,d. What happened?
The nurse brought a patient a doctor.
The nurse brought a doctor a patient .
- (2) a. Which part-time employee did the landowner hire the housekeeper?
b. Which housekeeper did the landowner hire the part-time employee?
c. Which part-time employee did the landowner hire a housekeeper?
d. Which housekeeper did the landowner hire a part-time employee?
- a,b. What happened?
The landowner hired the part-time employee the housekeeper.
The landowner hired the housekeeper the part-time employee.
- c,d. What happened?
The landowner hired a part-time employee a housekeeper.
The landowner hired a housekeeper a part-time employee.
- (3) a. Which player did the coach take the trainer?
b. Which trainer did the coach take the player?
c. Which player did the coach take a trainer?
d. Which trainer did the coach take a player?
- a,b. What happened?
The coach took the player the trainer.
The coach took the trainer the player.
- c,d. What happened?
The coach took a player a trainer.
The coach took a trainer a player.

- (4) a. Which dean did the professor show the new administrator?
b. Which new administrator did the professor show the dean?
c. Which dean did the professor show a new administrator?
d. Which new administrator did the professor show a dean?

a,b. What happened?

The professor showed the dean the new administrator.

The professor showed the new administrator the dean .

c,d. What happened?

The professor showed a dean a new administrator.

The professor showed a new administrator a dean .

- (5) a. Which assistant did the shift supervisor assign the receptionist?
b. Which receptionist did the shift supervisor assign the assistant?
c. Which assistant did the shift supervisor assign a receptionist?
d. Which receptionist did the shift supervisor assign an assistant?

a,b. What happened?

The shift supervisor assigned the assistant the receptionist.

The shift supervisor assigned the receptionist the assistant .

c,d. What happened?

The shift supervisor assigned an assistant a receptionist.

The shift supervisor assigned a receptionist an assistant.

- (6) a. Which agent did the director send the actor?
b. Which actor did the director send the agent ?
c. Which agent did the director send an actor?
d. Which actor did the director send an agent ?

a,b. What happened?

The director sent the agent the actor.

The director sent the actor the agent.

c,d. What happened?

The director sent an agent an actor.

The director sent an actor an agent.

- (7) a. Which lawyer did the senior partner offer the client?
b. Which client did the senior partner offer the lawyer?
c. Which lawyer did the senior partner offer a client?
d. Which client did the senior partner offer a lawyer?

a,b. What happened?

The senior partner offered the lawyer the client.

The senior partner offered the client the lawyer.

c,d. What happened?

The senior partner offered a lawyer a client.

The senior partner offered a client a lawyer.

- (8) a. Which child did the teacher assign the student aide?
b. Which student aide did the teacher assign the child?
c. Which child did the teacher assign a student aide?
d. Which student aide did the teacher assign a child?
- a,b. What happened?
The teacher assigned the child the student aide.
The teacher assigned the student aide the child.
- c,d. What happened?
The teacher assigned a child a student aide.
The teacher assigned a student aide a child.
- (9) a. Which realtor did the neighbor find the buyer?
b. Which buyer did the neighbor find the realtor?
c. Which realtor did the neighbor find a buyer?
d. Which buyer did the neighbor find a realtor?
- a,b. What happened?
The neighbor found the realtor the buyer.
The neighbor found the buyer the realtor.
- c,d. What happened?
The neighbor found a realtor a buyer.
The neighbor found a buyer a realtor.
- (10) a. Which prodigy did the guide show the famous author?
b. Which famous author did the guide show the prodigy?
c. Which prodigy did the guide show a famous author?
d. Which famous author did the guide show a prodigy?
- a,b. What happened?
The guide showed the prodigy the famous author.
The guide showed the famous author the prodigy.
- c,d. What happened?
The guide showed a prodigy a famous author.
The guide showed a famous author a prodigy.

- (11) a. Which driver did the millionaire loan the cleaning lady?
b. Which cleaning lady did the millionaire loan the driver?
c. Which driver did the millionaire loan a cleaning lady?
d. Which cleaning lady did the millionaire loan a driver?

a,b. What happened?

The millionaire loaned the driver the cleaning lady.

The millionaire loaned the cleaning lady the driver.

c,d. What happened?

The millionaire loaned a driver a cleaning lady.

The millionaire loaned a cleaning lady a driver.

- (12) a. Which plumber did the contractor bring the architect?
b. Which architect did the contractor bring the plumber?
c. Which plumber did the contractor bring an architect?
d. Which architect did the contractor bring a plumber?

a,b. What happened?

The contractor brought the plumber the architect.

The contractor brought the architect the plumber.

c,d. What happened?

The contractor brought a plumber an architect.

The contractor brought an architect a plumber.

- (13) a. Which delinquent did the cop take the attorney?
b. Which attorney did the cop take the delinquent?
c. Which delinquent did the cop take an attorney?
d. Which attorney did the cop take a delinquent?

a,b. What happened?

The cop took the delinquent the attorney.

The cop took the attorney the delinquent.

c,d. What happened?

The cop took a delinquent an attorney.

The cop took an attorney a delinquent.

- (14) a. Which bishop did the Pope send the priest?
b. Which priest did the Pope send the bishop?
c. Which bishop did the Pope send a priest?
d. Which priest did the Pope send a bishop?

a,b. What happened?

The Pope sent the bishop the priest.

The Pope sent the priest the bishop.

c,d. What happened?

The Pope sent a bishop a priest.

The Pope sent a priest a bishop.

- (15) a. Which prisoner did the warden leave the guard?
b. Which guard did the warden leave the prisoner?
c. Which prisoner did the warden leave a guard?
d. Which guard did the warden leave a prisoner?

a,b. What happened?

The warden left the prisoner the guard.

The warden left the guard the prisoner.

c,d. What happened?

The warden left a prisoner a guard.

The warden left a guard a prisoner.

- (16) a. Which model did the shop manager offer the stylist?
b. Which stylist did the shop manager offer the model?
c. Which model did the shop manager offer a stylist?
d. Which stylist did the shop manager offer a model ?

a,b. What happened?

The shop manager offered the model the stylist.

The shop manager offered the stylist the model .

c,d. What happened?

The shop manager offered a model a stylist.

The shop manager offered a stylist a model .

Appendix E: Grammaticality Questionnaire Following Experiment 1

Imagine that a foreign friend who is learning English asks you whether the following sentences are okay to say in colloquial English:

- a. The girls is here.
- b. Who is here?

You would tell him or her that sentence *a* is not an okay English sentence, but that sentence *b* is fine. What would you tell this friend if he/she asked about sentences 1-6 below? If the sentence is okay, answer "yes". If it's not okay to use in colloquial English, answer "no".

1. Which friend did the chef bring a cake?
2. The landlord showed the applicant the neighbor.
3. Which teacher did the pupil take the apple?
4. Which customer did the clerk show a dog?
5. The babysitter brought the mother the baby.
6. Who did the librarian mail the letter?

Now that you've read all of the sentences, consider them again. For each one, please provide a rating from the scale given below which reflects your confidence about the answer you gave in the first part. Feel free to add any comments that seem relevant about the sentences in the spaces below them.

5 = I would use this sentence easily in everyday speech.

4 = I would probably use this sentence.

3 = I don't know whether I would use this sentence myself, but it sounds like something I've heard others use.

2 = I wouldn't use this sentence, and it doesn't seem like something I've heard anyone else say.

1 = No one I know would ever say this--it sounds quite strange.

Were there any of the sentences used in the experiment that you participated in which were particularly difficult or unusual? If yes, what were the sentences like? Whatever you can remember will be helpful.

Please supply the following information about yourself:

Hometown:

Any other information which you consider crucial in determining what dialect you speak (for example, places that you have lived for long periods of time, dialects of parents):

Are you right-handed or left-handed?

Is anyone in your immediate family (parents or siblings) left-handed? (If yes, please list their relationship to you.)

Appendix F: Experimental Materials for Experiment 2

- (1) a. The pitcher threw the umpire a ball.
b. The pitcher threw an umpire the ball.
- (2) a. The senator mailed the woman a report.
b. The senator mailed a woman the report.
- (3) a. The student sold the man a car.
b. The student sold a man the car.
- (4) a. The new teacher gave the pupil an assignment.
b. The new teacher gave a pupil the assignment.
- (5) a. The babysitter bought the baby a present.
b. The babysitter bought a baby the present.
- (6) a. The sergeant promised the recruit a vacation.
b. The sergeant promised a recruit the vacation.
- (7) a. The activist wrote the politician a letter.
b. The activist wrote a politician the letter.
- (8) a. The judge assessed the homeowner a fine.
b. The judge assessed a homeowner the fine.

Appendix G: Experimental Items for Study 3

- (1) a. Who did the nurse bring the doctor?
The nurse brought someone to the doctor.
The nurse brought the doctor to someone.
- b. Who did the nurse bring a doctor?
The nurse brought someone to a doctor.
The nurse brought a doctor to someone.
- (2) a. Who did the landowner hire the housekeeper?
The landowner hired the housekeeper for someone.
The landowner hired someone for the housekeeper.
- c. Who did the landowner hire a housekeeper?
The landowner hired a housekeeper for someone.
The landowner hired someone for a housekeeper.
- (3) a. Who did the coach take the trainer?
The coach took someone to the trainer.
The coach took the trainer to someone.
- b. Who did the coach take a trainer?
The coach took someone to a trainer.
The coach took a trainer to someone.
- (4) a. Who did the professor show the dean?
The professor showed the dean to someone.
The professor showed someone to the dean.
- b. Who did the professor show a dean?
The professor showed a dean to someone.
The professor showed someone to a dean.
- (5) a. Who did the shift supervisor assign the receptionist?
The shift supervisor assigned someone to the receptionist.
The shift supervisor assigned the receptionist to someone.
- b. Who did the shift supervisor assign a receptionist?
The shift supervisor assigned someone to a receptionist.
The shift supervisor assigned a receptionist to someone.

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- (6) a. Who did the director send the producer?
The director sent the producer to someone.
The director sent someone to the producer.
- b. Who did the director send a producer?
The director sent a producer to someone.
The director sent someone to a producer.
- (7) a. Who did the senior partner offer the client?
The senior partner offered someone to the client.
The senior partner offered the client to someone.
- b. Who did the senior partner offer a client?
The senior partner offered someone to a client.
The senior partner offered a client to someone.
- (8) a. Who did the teacher assign the student aide?
The teacher assigned the student aide to someone.
The teacher assigned someone to the student aide.
- b. Who did the teacher assign a student aide?
The teacher assigned a student aide to someone.
The teacher assigned someone to a student aide.
- (9) a. Who did the realtor find the buyer?
The realtor found someone for the buyer.
The realtor found the buyer for someone.
- b. Who did the realtor find a buyer?
The realtor found someone for the buyer.
The realtor found the buyer for someone.
- (10) a. Who did the guide show the prodigy?
The guide showed the prodigy to someone.
The guide showed someone to the prodigy.
- b. Who did the guide show a prodigy?
The guide showed a prodigy to someone.
The guide showed someone to a prodigy.
- (11) a. Who did the millionaire loan the driver?
The millionaire loaned someone to the driver.
The millionaire loaned the driver to someone.
- b. Who did the millionaire loan a driver?
The millionaire loaned someone to a driver.
The millionaire loaned a driver to someone.

- (12) a. Who did the contractor bring the plumber?
The contractor brought the plumber to someone.
The contractor brought someone to the plumber.
- b. Who did the contractor bring a plumber?
The contractor brought a plumber to someone.
The contractor brought someone to a plumber.
- (13) a. Who did the cop take the delinquent?
The cop took someone to the delinquent.
The cop took the delinquent to someone.
- b. Who did the cop take a delinquent?
The cop took someone to a delinquent.
The cop took a delinquent to someone.
- (14) a. Who did the Pope send the priest?
The Pope sent the priest to someone.
The Pope sent someone to the priest.
- b. Who did the Pope send a priest?
The Pope sent a priest to someone.
The Pope sent someone to a priest.
- (15) a. Who did the warden leave the guard?
The warden left someone for the guard.
The warden left the guard for someone.
- b. Who did the warden leave a guard?
The warden left someone for a guard.
The warden left a guard for someone.
- (16) a. Who did the shop manager offer the stylist?
The shop manager offered the stylist to someone.
The shop manager offered someone to the stylist.
- b. Who did the shop manager offer a stylist?
The shop manager offered a stylist to someone.
The shop manager offered someone to a stylist.