

PRAGMATICS IN APHASIA: CROSSLINGUISTIC EVIDENCE*

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Previous research suggests that English Broca's and Wernicke's aphasics retain sensitivity to pragmatic factors governing forms of reference, in particular the ability to choose lexical expressions that convey givenness and newness of information. The present study investigates the generality of this phenomenon across patients and language types. Normal and aphasic speakers of English, German, and Italian described nine picture triplets in which one element varied while the others remained constant. Dependent variables included lexicalization versus ellipsis, pronominalization, and definite and indefinite article use. For a subset of German and Italian patients, data were compared to performance in a biographical interview. Results indicate that (a) the pragmatics of reference are preserved in both Broca's and Wernicke's aphasics, despite syndrome-specific problems in retrieving content words and/or closed-class grammatical elements, and (b) certain language-specific patterns of reference are also preserved, including crosslinguistic differences in subject omission. Differences between picture description and the biographical interview reinforce this conclusion. Evidence for the preservation of pragmatics in aphasia is not surprising in its own right, but evidence for the sparing of language-specific relations among pragmatic, lexical, and morpho-syntactic patterns can be used to argue against any strong view of grammatical impairment as a disconnection syndrome and/or a loss of grammatical competence. Instead, these data support theories in which grammatical impairment is viewed as a performance deficit.

Key words: aphasia, pragmatics, reference, Italian, German

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INTRODUCTION

In earlier papers (Bates, Friederici, and Wulfeck, 1987a, b; Bates, Friederici, Wulfeck, and Juarez, 1988), we have explored the interacting effects of fluency and language type on patterns of sentence comprehension and production by aphasic patients. In these and other papers (e.g., Bates and Wulfeck, 1989) we argue that the processing profiles observed in aphasic patients reflect the converging effects of (1) syndrome differences (e.g., the fluent/non-fluent dimension) and (2) structural and statistical differences between language types. Effects of syndrome and/or lesion type are, of course, not new in aphasia research, but systematic crosslinguistic comparisons are relatively new and offer important information about the proper interpretation of aphasic symptoms. We have found similarities across languages (including English, Italian, German, Serbo-Croatian, Hungarian, and Turkish) and patient groups (Broca's and Wernicke's aphasics) in the grammatical elements that are most vulnerable to focal brain damage (in particular, inflections and function words). This finding is compatible with some version of the closed class theory of agrammatism (see Bates *et al.*, 1987a, for a detailed discussion). At the same time, we have also found interesting crosslinguistic differences in the syntactic and morphological error patterns displayed by patients across these language groups, suggesting that a great deal of language-specific knowledge is retained.¹ This finding argues against any strong view of agrammatism as a disconnection syndrome, requiring us to consider some alternative accounts in which grammatical impairments are treated as a limitation on real-time processing across a preserved knowledge base.

To illustrate, in a sentence comprehension study with English, German, and Italian patients (Bates *et al.*, 1987a), we reported that language-specific processing patterns observed with control subjects were also present (although degraded) in all the aphasic subjects. For example, all English-speaking subjects relied on word order cues, not only when interpreting sentences with a grammatical word order but also when interpreting sentences which were not grammatical with respect to word order, while Italian subjects showed greater reliance on agreement cues. However, *within* each language, use of word order cues showed less evidence of impairment than use of grammatical morphemes — a pattern that held for both fluent and nonfluent patients.

In a study of grammatical morphology in sentence production within the same three languages (Bates *et al.*, 1987b), English-speaking nonfluent aphasics showed the expected telegraphic pattern: omission of free-standing grammatical morphemes and bound inflections. By contrast, nonfluent aphasic speakers of German and Italian (two richly inflected languages) made fewer omission errors but more substitution errors in the production of free-standing grammatical morphemes. Furthermore, these substitution

¹ It is important to note that this particular line of research has focussed on post-sentence performance and not on the real-time properties of natural language processing. Hence, we are charting endpoints in language processing which may not reveal a full array of symptom-specific processing patterns that may be present (cf. Friederici, 1985; Swinney, Zurif, and Nicol, 1989; Wulfeck, 1987).

errors were found in both fluent and nonfluent patients. Finally, in a study of word order regularities in the same crosslinguistic corpus (Bates *et al.* 1988), we observed that aphasic subjects (both fluent and nonfluent) in all three languages showed little or no impairment in the use of basic word order, relative to language-matched controls.

These results for production mirror our earlier results for sentence comprehension: (1) Grammatical morphology appears to be more vulnerable to the consequences of brain damage, compared with basic word order, but (2) Specific patterns of sparing and impairment differ across languages. These findings lead to some important (albeit tentative) conclusions about the relationship between form and function in aphasia. Universal linguistic functions (e.g., thematic role assignment) appear to be preserved; whether or not we see a deficit in the way those functions are expressed depends upon the particular forms that are employed for this purpose in a given language. For example, if thematic roles are signalled through word order, we will see relatively little evidence of grammatical impairment; if the same roles are signalled through case and/or agreement morphology, there appears to be more evidence for some kind of grammatical deficit.

In the present study we focus on a different functional domain: the pragmatics of reference, with a particular emphasis on the lexical and grammatical devices used to convey givenness and newness of information. Although this is only one small sector within the broad domain referred to as "pragmatics", it is an important one that cuts across several different aspects of language use. In line with our findings on the forms that are used to express thematic roles, we suggest that the universal contrast between given and new information will be preserved in aphasic patients, and that we will also find evidence for preservation of language-specific means for encoding this pragmatic function. Any evidence for impairment that we do uncover should be a matter of degree (as opposed to an absolute disconnection), and should revolve primarily around the use of grammatical function words to convey the given/new contrast.

We use a paradigm first developed by MacWhinney and Bates (1978) in a cross-linguistic study of normal language development. In their *given-new task*, subjects are presented with three-picture sequences in which one nominal or verbal element is varied across each picture triplet (e.g., a little girl is pictured eating three distinct foods). Subjects are asked to describe what they see in each triplet set, and their production attempts are analyzed in terms of the effects of the "givenness" and "newness" of information on several dependent variables including lexicalization, pronominalization, and the contrastive use of definite and indefinite articles. MacWhinney and Bates (1978) found this task to be an excellent vehicle for revealing marked differences between languages, the developmental acquisition of these pragmatic devices, and the nature of the devices themselves.

Bates, Hamby, and Zurif (1983) were the first to use the given-new task with aphasic subjects. They found that English-speaking Broca's and Wernicke's aphasics tend to lexicalize new information while omitting redundant or old information in pragmatically appropriate ways. Fluent aphasic subjects also retained pragmatic control over the use of definite articles (to signal old information) and indefinite articles (to signal new information). At the same time, they overused pronouns, usually as a substitute for content

words which were difficult for them to retrieve. Nonfluent subjects made such minimal use of articles and pronouns that it was not possible to judge whether or not they retained pragmatic control of these elements. However, there was evidence of attempts to use word order variation for pragmatic purposes. Hence Bates *et al.* (1983) found a combination of preserved linguistic knowledge, interacting with syndrome-specific profiles of impairment.

The present study is also concerned with expression of the given/new contrast in aphasia, but we use the given-new paradigm within a crosslinguistic framework. This approach permits us to assess *three* different aspects of the pragmatics of reference in aphasia: universal pragmatic tendencies (in all language and patient groups), patterns of reference that are symptomatic of fluent and/or nonfluent aphasia (i.e., syndrome effects), and patterns of reference that are specific to particular languages (i.e., language effects). Pragmatic universals include an overall tendency to omit and/or pronominalize elements that have already been introduced into the discourse, and a tendency to use full lexical items with indefinite reference when new elements are introduced for the first time. Following Bates *et al.* (1983), we expect these pragmatic universals to interact with the lexical and morphological access problems that are peculiar to Broca's and Wernicke's aphasia. For example, we may expect more omission overall in Broca's aphasics (particularly for main verbs), with relatively little use of pronouns or articles. Conversely, we may expect abnormally high use of pronouns in Wernicke's aphasia, reflecting the difficulty these patients experience in finding content words. In both patient groups, compared with normal controls, we may also find more use of definite articles (perhaps reflecting the greater frequency of definite forms in normal language use).

With regard to predicted language effects, there are some interesting differences among English, Italian, and German in the principles that govern pronominalization, ellipsis, and definiteness. One such difference revolves around pragmatic and syntactic constraints on production of an overt subject. Italian is a "null subject" language, that is, a language in which subjects can be omitted in free standing declarative sentences. For example, an Italian speaker can say, "Sono andato al negozio" instead of, "Io sono andato al negozio" ("I went to the store"), when it is obvious from the discourse that the speaker is the intended subject of the sentence. By contrast, subjects are obligatory in both English and German – including use of so-called lexical expletives or "dummy subjects", e.g., the pronoun "it" in the sentence "It is raining". The null subject distinction leads us to predict that subjects will be omitted more often by Italian patients, with relatively little use of subject pronouns. Subject omission will be less frequent in the speech of English and German patients, who will instead produce a larger number of pronouns in the subject role.

In addition, there are also subtle but interesting differences among the languages studied here in the use of definite and indefinite articles. In English, generic reference is usually conveyed by plural or mass noun forms that take no article at all, or by singular forms with an indefinite article (e.g., "Children need love and attention from a caring adult"). While article omission in English is especially common for plural (e.g., "I don't like dogs") and mass nouns (e.g., "Water tends to leak in around the door here"), it also

occurs with singular count nouns under certain discourse conditions, particularly in informal speech.

Within many of the discourse contexts in which English permits article omission, use of articles is obligatory in Italian (e.g., "I bambini" instead of "bambini" for "children" in the above example). Hence articles are more frequent overall than they are in English. Furthermore, definite articles are more common in Italian than they are in English, particularly for these generic forms of reference. The discourse conditions governing definiteness in German are more similar to English in some respects. However, because the article carries crucial information about case in German (i.e., who did what to whom), omission of the article in informal speech is much less common in German than it is in English.

We know from our other crosslinguistic studies (Bates *et al.*, 1987b) that Italian and German aphasics produce far more finite and indefinite articles than their English counterparts. In this paper, we will ask two additional questions: (1) Are these articles under control of the pragmatic dimension of givenness and newness?, and (2) Are crosslinguistic differences in the relative frequency of definite versus indefinite forms reflected in the speech of aphasic patients?

The English data are taken from the given-new transcripts originally used by Bates *et al.* (1983) in their study of pragmatic expression in aphasia. Comparable given-new data were collected for Italian and German patients. In addition, transcripts of biographical interviews were available for eleven of the German patients, and all of the Italians. The interview data will be used for some additional analyses of subject omission and pronominalization, discussed below.

METHOD

Subjects

The intention of our crosslinguistic aphasia project was to test five to ten monolingual speakers of English, Italian, or German, within each of three categories: nonfluent (Broca's) and fluent (Wernicke's) aphasic subjects, and neurologically intact age-matched control subjects. The English-speaking subjects in the present study had already participated in a previous study of pragmatics (Bates *et al.*, 1983); all the subjects in the present study were described in two other crosslinguistic studies of production (Bates *et al.*, 1987b; Bates *et al.*, 1988), and most were included in a crosslinguistic study of comprehension (Bates *et al.*, 1987a). We have addressed the complicated issues pertaining to subject matching in comparative studies across patient groups and languages in great detail in these earlier papers; we will therefore limit our discussion of these issues here.

Patients were referred for testing by neurologists and speech pathologists at the three respective research sites. Each candidate had a diagnosis of either Broca's or Wernicke's aphasia and had to meet rigid selection criteria for inclusion in the project. We eliminated all subjects with one or more of the following conditions: (1) history of multiple strokes, (2) significant hearing and/or visual disabilities, (3) severe gross motor disabilities, (4) severe motor-speech involvement such that less than 50% of subject's

speech attempts were intelligible, and (5) evidence that the subject was neurologically or physically unstable and/or less than three months post-onset.

Diagnosis was made on the basis of medical history (neurological examination, CT scans, when available) together with the results of the standard aphasia batteries used at the respective research sites: the Boston Diagnostic Aphasia Examination – BDAE (used at the Boston site with English-speaking patients, Goodglass and Kaplan, 1983), the Aachen Aphasia Test – AAT (used at the Berlin site with German-speaking patients, Huber, Poeck, Weniger, and Willmes, 1983), and an Italian analogue of the Boston Diagnostic Aphasia Examination (used at the Catholic University in Rome with the Italian-speaking patients). Patient groups were defined independently within each language, according to a predetermined set of behavioral and neurological criteria. That is, aphasic subjects were defined according to their fit to the behavioral and neurological profiles of Broca's and Wernicke's aphasia used by the neurologists and speech pathologists in that country.

The Broca's aphasic subjects were rated to be in the moderate to severe impairment range for fluency (articulation, prosody, and phrase length) and showed a tendency toward omission of functors, relative to their language-matched controls. The Wernicke's aphasic subjects displayed fluent expressive language that was accompanied by word-finding difficulties, paraphasias, and neologisms. Auditory comprehension for the Broca's patients was relatively intact (English-speaking aphasics: BDAE mean z-score = +0.8; Italian-speaking aphasics: Italian auditory comprehension mean score = 90%; German-speaking aphasics: AAT comprehension mean score = 90; light auditory impairment range). By contrast, the Wernicke's patients showed reduced auditory comprehension (English-speaking aphasics: BDAE mean z-score = -0.8; Italian-speaking aphasics: Italian auditory comprehension mean score = 73%; German-speaking aphasics: AAT comprehension mean score = 80; middle severity range).

The majority of patients inducted into the pool of aphasic subjects had suffered a single cerebrovascular accident. Exceptions included one English, three Italian, and three German patients. These patients with exceptional medical histories (e.g., trauma) did not show any striking deviations from the group patterns when their individual data were analyzed. Pre-morbid right-handedness was reported for all Italian and all but three of the German patients for whom handedness information was not available (one Broca's and two Wernicke's). All English-language aphasic subjects were right-handed pre-morbidly except for one Broca's aphasic subject who was left-handed. Similar educational and occupational levels were represented across languages for each patient and control group. Table 1 summarizes the mean number of years of aphasia as well as the numbers and ages of the control and aphasic subjects who participated in this study, in each of the three language groups.

Materials

The term "pragmatics" refers to the rules that govern the use of language in context (e.g., Bates, 1976), including the ways in which speakers shape their utterances to satisfy conventions of conversation. The task we chose centers around the pragmatics of reference. We manipulated one specific pragmatic influence on the speaker's choice of

TABLE 1
Summary of Subjects by Language and Group

	Broca's			Wernicke's			Controls	
	N	Mean age (range)	Mean years of aphasia	N	Mean age (range)	Mean years of aphasia	N	Mean age (range)
English	6	47 (32-60)	3.5	5	57 (47-71)	2	5	40 (25-50)
Italian	10	47 (22-77)	3	9	58 (30-73)	2	8	48 (32-59)
German	7	48 (31-61)	5	10	60 (44-74)	4.7	7	56 (36-74)

TABLE 2
English-language given/new stimuli

Series	Target structure	Picture triplets
1	Intransitive	(BEAR, MOUSE, BUNNY) crying.
2	Intransitive	Boy (RUNNING, SWIMMING, SKIING).
3	Transitive	(MONKEY, SQUIRREL, BUNNY) eating banana.
4	Transitive	Boy (KISSING, HUGGING, KICKING) dog.
5	Transitive	Girl eating (APPLE, DOUGHNUT, ICE CREAM).
6	Locative	Dog (IN, ON, UNDER) car.
7	Locative	Cat on (TABLE, BED, CHAIR).
8	Dative	Lady giving (PRESENT, TRUCK, MOUSE) to girl.
9	Dative	Cat giving flower to (BOY, BUNNY, DOG).

referring expressions: givenness versus newness of information. Subjects were presented with triplets of pictures, and asked to look at the three pictures in the set and describe each picture in sequence. There were nine picture triplets in all in the given-new task. Table 2 summarizes the content of the nine sets of pictorial stimuli in simple sentence form.

Because of the nature of the stimuli, we were able to study several pragmatic/linguistic variables. For example, the three picture frames in Series 1 could be described as "a

bear, a mouse, and a bunny crying". In this example, the agent varies (increases in newness), while the action remains constant (increases in givenness) across the three frames. In other words, by varying one element, while holding the remaining elements constant (Constancy Factor) across the three picture frames (Frame Factor), we hoped to observe subjects' ability to encode the changing focus of information in their productions. Further, since both nominal and verbal elements were controlled, we could observe similarities or differences in production patterns for these lexical items (Noun/Predicate Factor).

Procedure

Subjects were tested individually by experimenters who were native speakers of the subjects' languages. After an initial warm-up period, the given-new task was introduced with the following instructions: "I am going to show you some pictures. I would like you to describe what you see in each picture".

The nine picture triplets were presented to each subject in a randomized order. The order of presentation of individual pictures was also randomized within each triplet and all three pictures in the triplet were in view at the same time. After each series, a picture of a common object, such as a house, was inserted. This was done to minimize any set effects and reduce perseverative responses. Neutral prompts were used ("Can you tell me anything more?" or "What else is happening here?") if a patient experienced difficulty describing one or more of the items. No other prompts were used, to avoid changing the pragmatic focus conditions provided by the picture sets.

All responses were tape-recorded and transcribed by native speakers, using standard orthography for each language. False starts, repetitions, and extraneous comments were all included in the transcription to give a faithful picture of the problems that the patient experienced on the task, although these aspects of the corpus were excluded from most of our analysis, as noted below.

Data reduction

The intricate morphological and word order analyses of these subjects' performance on this task were discussed earlier, and are described in detail in other papers (Bates *et al.*, 1987b; Bates *et al.*, 1988). Preparation of data for the analysis of pragmatic expression was also a complicated process since we wished to examine lexicalization, pronominalization, and the pragmatic use of definite and indefinite articles. The coding procedures were as follows:

First we eliminated false starts, repetitions, extraneous remarks, and comments. In this way we could identify the "core description" for each picture in a series. Then, we conducted counts of noun and predicate lexicalization attempts. In informal discourse, there is a tendency for speakers to provide an explicit noun or predicate for varying information more often than for constant information. We were interested in the patients' sensitivity to this constraint, regardless of whether the appropriate or "best" content word was retrieved for this purpose. To this end, we coded all depicted elements that were described with an explicit noun or predicate (Noun/Predicate Factor), even

if the referent was incorrectly labelled. Since this study focussed primarily on pragmatic expression, the predicate category was loosely defined to include three kinds of predicate forms: main verbs (in the intransitive (Series 1 and 2), transitive (Series 3, 4, and 5), and dative items (Series 8 and 9); see Table 2) as well as both copular and preposition forms in the two locative items (Series 6 and 7). Specifically, we gave subjects credit for lexicalization if they produced one or more of the major parts of the VP on the locative items: a main verb (e.g., "cat sitting table"), a copula (e.g., "cat is table") or a preposition (e.g., "cat on table"). Separate counts were then made for constant and varying nouns and predicates (Constancy Factor) and for each of the three frames within a triplet (Frame Factor). If an element was not lexicalized, it was coded into one of several categories: (1) omission (when a subject clearly left out an element), (2) other (when an attempt to lexicalize was too general, for example, "this thing"), or (3) non-recoverable (verbalizations which were unrecognizable fragments, impossible to code in terms of the elements depicted in a given picture triplet).

We also wanted to observe whether nominal or pronominal forms of reference were used. Here we expected that pronoun use would be greatest with constant elements. For example, Series 2 (Table 2) might be described as "The *boy* is running and now *he's* swimming and skiing". Those constant or varying nominal elements, referred to with a pronoun, were also tallied for each frame. Occasionally a subject produced an explicit noun phrase followed by a pronoun (e.g., "The boy he is running . . ."). In those cases, the noun would be counted as a lexicalization, with no credit given for pronominalization.

These counts were converted to proportions or "rates" by dividing the number of opportunities provided in the picture sets. For constant and varying nominal elements, there were twelve and six opportunities, respectively, and for constant and varying predicate elements there were six and three opportunities, respectively, for Frame 1, 2, and 3 positions. For example, since there were twelve opportunities to lexicalize constant nominal elements in the Frame 1 position of the nine triplet sets, if a subject lexicalized seven nominals, pronominalized two, and omitted three, he would receive scores of 0.58 for lexicalization, 0.17 for pronominalization, and 0.25 for omission. These rates were then used instead of raw scores for all analyses to insure comparability over items. Rates for nonrecoverable reference were quite low, even among the Wernicke's patients (who tend to produce speech that is more difficult to interpret overall). The global rate of nonrecoverable references was 2%, which broke down as follows: 0% controls, 3% Broca's, 3% Wernicke's. Rates for overly general reference were also low: 0.9% overall, 0% for controls, 0.6% for Broca's and 2% for Wernicke's. This means that 99% of the forms of reference used by patients and controls in this study fell into the pragmatic categories of interest here (i.e., explicit lexicalization, pronominalization, omission). Therefore we will concentrate only on these categories in the analyses that follow.

Definite and indefinite articles offer another interesting marker for sensitivity of pragmatic expression. There is a tendency for speakers to use the definite article "the" with elements already established in discourse, while using indefinite articles "a" or "an" with new information. For example, Series 5 (Table 2) could be described as follows: "Here is a girl. *The* girl is eating *a* cookie, *an* ice cream, and *a* doughnut". All definite and

indefinite articles in the "core description" that were used with nominal elements were tallied for each triplet, by frame and constancy. The dependent variable for the present analysis of variance was a proportion score: definite articles/all articles produced. Overall article use and analyses of article error patterns for these subjects is reported in an earlier paper (Bates *et al.*, 1987b).

Additional analyses involved subject ellipsis and pronominalization contrasts between the given-new task and the biographical interview data collected as part of our experimental battery. These analyses will be described in the relevant sections below.

RESULTS

Lexicalization and ellipsis

Noun and verb lexicalization rates were entered into a $3 \times 3 \times 3 \times 2 \times 2$ analysis of variance. Language (English, Italian, and German) and Group (Controls, Broca's, and Wernicke's) served as between-subject factors; the linguistic/pragmatic variables (Frame, Constancy, and Noun/Predicate) were within subjects.

Significant main effects were obtained for Frame ($F(2, 116) = 19.4, p < 0.001$), Constancy ($F(1, 58) = 42.4, p < 0.001$) and Noun/Predicate ($F(1, 58) = 4.0, p < 0.05$). For Frame, overall lexicalization rates (collapsed over nouns and predicates) were greatest for picture frame 1 (mean proportion = 0.87), with rates decreasing across frames (frame 2, mean proportion = 0.82, frame 3, mean proportion = 0.79). This indicates that subjects lexicalized more information on the first frame of the triplet set than they did on the frames that followed. For Constancy, subjects lexicalized varying nominal and predicate elements more often (mean proportion = 0.89) than constant ones (mean proportion = 0.76). For Noun/Predicate, lexicalization of nominals (mean proportion = 0.84) was slightly higher than for predicates (mean proportion = 0.81).

A highly reliable Frame \times Constancy interaction was also observed ($F(2, 116) = 18.2, p < 0.001$), with lexicalization rates decreasing across frames for constant elements (Frame 1 = 0.85, Frame 2 = 0.73, Frame 3 = 0.70) while remaining stable for varying elements (Frame 1 = 0.89, Frame 2 = 0.90, Frame 3 = 0.88). Since no other language or group interactions with frame or constancy were observed, these data indicate that subjects in all languages, and in all groups, were sensitive to the changing focus of information and were able to encode these changes in their utterances.

Although there were no significant main effects involving Language or Group, small but reliable interactions involving these factors were observed. A Language \times Noun/Predicate interaction ($F(2, 58) = 4.8, p < 0.05$) revealed that lexicalization rates were higher for nominal than for predicate elements, for English and Italian subjects but not for German subjects. These language effects do not interact with patient group, and appear to reflect stylistic differences from language to language in the perspective form which some subjects choose to describe the pictures.

Although the Group \times Noun/Predicate interaction approached significant ($p = 0.08$), we were somewhat surprised that this effect was not stronger since there have been previous reports that verb lexicalization may be more difficult for Broca's aphasics.

However, since we had adopted a generous *pragmatic* coding of the locative items, this could have masked syndrome-specific *lexical* problems in the retrieval of verb forms. In a follow-up analysis to clarify this point, we removed prepositions from the lexicalization counts in the verb category. This analysis revealed a significant difference ($t(44) = 2.2$, $p < 0.05$) between the noun and verb lexicalization rates for Broca's aphasics across languages (mean proportion noun = 0.85, mean proportion verb = 0.72). This finding of greater verb omission overall is consistent with previous reports suggesting that verb access may be more difficult for agrammatic aphasics (Miceli, Mazzucchi, Menn, and Goodglass, 1983; Miceli, Silveri, Villa, and Caramazza, 1984). It is also consistent with reports (Friederici, 1982; Zurif and Caramazza, 1976) that prepositions with semantic content are relatively easy for Broca's aphasics to retrieve, compared with semantically empty closed-class elements (thereby reducing the Noun/Verb difference for Broca's aphasics when locative prepositions were included in the count).

To summarize so far, the lexicalization analyses demonstrate that Broca's and Wernicke's aphasics retain control over a universal pragmatic constraint on forms of reference: use of explicit lexical forms to convey new information. Small stylistic differences are observed from one language to another, but they do not override the larger effects of constancy and frame. Broca's aphasics also evidence a syndrome-specific difficulty with the lexicalization of verb forms, but this tendency is subordinate to universal pragmatic effects on lexicalization.

Definite and indefinite article use

In an earlier paper (Bates *et al.*, 1987b), we discussed language differences in the article system for German, Italian, and English, as well as article omission and error patterns associated with aphasia subgroups. We noted that German has the greatest number of forms to mark articles (28 possible gender/number/case combinations) followed by Italian (nine possible gender/number combinations) and finally English (three forms; *the*, *a*, and *an*). Crosslinguistic differences in the probability of article use followed the same scale (greatest use by German normals and patients, followed by Italians, with the lowest levels of article use observed in English), suggesting that preservation of the article in aphasia is a partial function of the importance and/or informativeness of the article within a given language. In this study, we examined a different aspect of those article data: the use of articles to mark given and new nominal elements. In particular, we looked for evidence that subjects could selectively access definite articles for old information and indefinite articles for new information. Rates of definite article use (definite articles/total number of articles) were entered into a $3 \times 3 \times 3 \times 2$ analysis of variance with Language (English, Italian, and German) and Group (Controls, Broca's, and Wernicke's) as between-subject factors, and the linguistic/pragmatic variables (Frame and Constancy) within subjects.

Significant main effects were obtained for Language ($F(2, 58) = 4.6$, $p < 0.05$), Group ($F(2, 58) = 11.8$, $p < 0.001$), Frame ($F(2, 116) = 16.5$, $p < 0.001$), and Constancy ($F(1, 58) = 37.3$, $p < 0.001$).

The main effect of Language revealed differences in the degree to which subjects used definite articles in different languages. Specifically, definiteness was greatest in the

two richly inflected languages: German (mean proportion = 0.62) and Italian (mean proportion = 0.51), compared to English (mean proportion = 0.40). This finding is in line with known differences among the three languages in the rules that govern definite reference, and confirms our earlier prediction of a crosslinguistic difference in the probability of definite reference among aphasic patients from different language groups.

Patient group differences in definite article use were also observed. Wernicke's aphasic subjects produced the largest proportion of definite articles (mean proportion = 0.64), followed by Broca's subjects (mean proportion = 0.56) and, finally, control subjects (mean proportion = 0.33). At least two explanations might account for these differences. First, definite articles are generally higher in frequency and may therefore be easier to access relative to indefinite articles. Hence control subjects, who have no disruption to language processing mechanisms, should, by definition, be better able to selectively access indefinite articles when it is pragmatically appropriate to do so, compared with aphasic subjects. Second, definite reference can sometimes reflect a relatively "concrete" approach to picture description, one in which speakers are influenced by the so-called "exophoric" or here-and-now status of the pictures themselves. In other words, the patient uses "the" to refer to a pictured element because that element is right there in front of him or her (regardless of other constraints in the pictured story). A similar tendency toward a concrete, exophoric use of definite reference has also been reported for small children in the same given-new task (MacWhinney and Bates, 1978). It is possible that such a "concrete" approach to picture description reflects limitations in the cognitive resources available to the speaker (i.e., memory, attention), a resource limitation that can be found (albeit for different reasons) in children and adult aphasics (Goldstein, 1948).

For Frame (collapsed over groups and languages), the definite article rate was lowest for picture frame 1 (mean proportion = 0.47), with rates increasing across frames (frame 2 mean proportion = 0.54, frame 3 mean proportion = 0.57). In other words, definite articles were applied in larger numbers as the *givenness* status of nominal elements increased across frames. For Constancy (collapsed over groups and languages), subjects used the definite article more with constant nominal elements (mean proportion = 0.62) than variable ones (mean proportion = 0.43). This, too, is the pragmatically correct usage for definite articles. No significant interactions with language or patient group were obtained. In other words, these pragmatic effects are not significantly different in any of the language or patient groups.

There are two main points to be extracted from the article use findings. Taken together, these results indicate once again that subjects from all languages and patient groups are sensitive to the pragmatic shift of information in the triplet pictures. Since the particles were not coded for grammatical correctness in the present analysis, the patient's *pragmatic* success with articles should not be taken to indicate that *morphological* processes are intact (e.g., correct agreement with the noun in number, gender, and/or case). Nevertheless, although patients may experience syndrome-specific problems in the retrieval of articles, those articles that they do retrieve tend to reflect both universal and language-specific constraints on definite and indefinite reference.

TABLE 3

Percent pronominalization by Languages and Groups

	Broca's	Wernicke's	Controls
English	0.5	3.9	1.1
Italian	1.0	3.6	2.4
German	1.6	11.3	6.9

Subject ellipsis and pronominalization in the given-new task and the biographical interviews

We had predicted crosslinguistic differences in the forms that normal and aphasic speakers use to refer to the subject of the sentence. In particular, subject ellipsis should be more common in Italian (a null subject language), while subject pronouns ought to be more common in English and German (languages in which subject omission is ungrammatical in free-standing declarative sentences). At the same time, these two variables may well reflect syndrome-specific patterns: more omission in Broca's aphasics, and more pronominalization in Wernicke's aphasics. However, the given-new task appears to elicit very little omission *or* pronominalization, of the subject or of any other nominal element, compared with the rate of omission that is normally observed in informal discourse. The pragmatics of picture description are such that most speakers (including brain-damaged patients) refer explicitly to most of the elements in the picture, even on the later cartoon frames.

A similar story can be told for rates of pronoun use in the given-new task. On the average, pronouns were used to express nominal elements only 3.9% of the time in this situation (collapsed over language and patient groups), although all of the trends are in the expected direction. With regard to the expected group differences, pronouns were used for 7% of the nominal elements by Wernicke's aphasics, 3.7% by normal speakers, and less than 2% by Broca's aphasics. Pragmatic effects were also in the expected direction: 5.4% pronominalization for constant elements, versus 2.4% for varying elements; 2.9% pronominalization in frame 1, 4.4% in frame 2, and 4.4% in frame 3. There were slight differences in pronoun use over languages: 7.2% in German, 2.3% in Italian and 1.7% in English. This difference may reflect the fact that German has a particularly large array of pronominal forms to choose from, including pronouns that are identical in form to the definite article. Because most of these forms are marked for case and gender, there is less potential for ambiguity in the German pronoun system. Hence Germans may use pronominal forms where English or Italian speakers would use another nonspecific form of reference (e.g., "This guy here . . ."). Table 3 summarizes descriptive statistics on overall percent pronoun use for each language and patient group.

TABLE 4

Percent subject omission (Group \times Frame \times Constancy interaction)

	Frame 1		Frame 2		Frame 3	
	Constant	Variable	Constant	Variable	Constant	Variable
Broca's	13.7	6.5	21.1	10.9	22.4	8.7
Wernicke's	4.2	2.1	14.3	0	18.5	0
Controls	0	0	25.7	0	26.4	0

Given all of these trends, it would be interesting to determine the extent to which pragmatic factors, syndrome effects, and language differences interact to influence pronoun choice. Unfortunately, because overall rates were so low (with many speakers producing no pronouns at all), these data could not be analyzed with analysis of variance or any other parametric technique. The same is also true for pronominalization of the subject role (averaging 5.1% overall).

Although subject omission rates were also very low (9.7% overall), they were high enough for us to attempt a $3 \times 3 \times 2 \times 3$ analysis of variance (with Patient Group and Language as between subject factors, Frame and Constancy as within-subject factors). This analysis revealed the expected pragmatic effects: a significant main effect of Frame ($F(2, 116) = 18.7, p < 0.001$) that reflects more subject omission in the later frames (4.6% in frame 1, 11.9% in frame 2, 12.6% in frame 3); a significant main effect of Constancy ($F(1, 58) = 28.5, p < 0.001$), with more omission of constant subjects (16.1%) than varying subjects (3.2%); and a Frame \times Constancy interaction showing that the increase in subject omission over frames occurs only for constant elements ($F(2, 116) = 15.8, p < 0.001$). In addition, there was also a small but reliable Group \times Frame \times Constancy interaction, illustrated in Table 4, ($F(4, 116) = 2.7, p < 0.05$). Table 4 shows that the Frame \times Constancy interaction described above for all subjects is weaker among the Broca's aphasics, due to a general tendency toward omission of constant subjects even on the first frame. Most important for our purposes here, no main effect of Language was observed — although results were in the expected direction: 11.7% subject omission in Italian, compared with 9.9% in English and 7.2% in German. There were also no interactions involving the Language factor.

Because English is not a language that permits subject omission in free-standing declarative sentences, it is worth examining how our English-speaking subjects (normals and aphasic patients) managed to attain a 9.9% rate of subject omission in the given-new task. We found two forms of subject omission in English given-new transcripts. First, some speakers (particularly normal controls) managed to describe two or more frames of a three-picture triplet in a single sentence, e.g., "The girl is eating an apple and then an

ice cream cone". In this situation, the speaker would receive credit for an overt subject, verb and object on frame 1 (the apple frame); on frame 2 (the ice cream frame), credit would be for one overt lexicalization (on the object), while the subject and the verb would both count as elliptical forms of reference (i.e., omissions). Obviously this kind of subject omission is not an "error", but, rather, a legal option within the English language. Second, some speakers (particularly – but not exclusively – aphasic patients) did leave the subject out of a simple free-standing sentence, e.g., "Eating an apple" produced to describe the first frame. Such cases of subject omission are not uncommon in informal speech – although they are much less common in English than they are in a language like Italian. This serves as a reminder that linguistic distinctions like the null-subject parameter are idealizations; informal speech often takes a much less precise form.

Despite the absence of crosslinguistic differences in subject omission within the given-new task, we remained convinced that a crosslinguistic difference might emerge in a more appropriate pragmatic context. Picture description is a mode of discourse in its own right, with its own pragmatic rules. The given-new task has a large and measurable effect on some pragmatic variables (e.g., explicit reference, definiteness), but relatively little effect on others (e.g., pronominalization, subject omission). All of our language and patient groups seem to be sensitive to these discourse facts, and perhaps for this reason we were unable to observe crosslinguistic differences in subjectivization that are known to exist in these languages. We encountered a similar problem in an earlier paper on word order and word order variation (Bates *et al.*, 1988). Specifically, normal and aphasic speakers in all three languages tended to cling to canonical word order in this picture description task – despite known differences among the three languages in the prevalence of non-canonical forms in a less formal discourse situation. In that paper, we supplemented the picture-description analyses by examining data from the biographical interview; this discourse situation did indeed reveal pragmatic word order variation among Italian speakers, including Italian Broca's aphasics. Transcribed interview data are available in the present study as well, for all of the Italian patients and for eleven of the German aphasics (five Broca's and six Wernicke's). The topics covered in the interviews were quite similar for each language, but there were no controls over length in these informal "warmup" sessions. The biographical interview was one in which patients were engaged in a conversation covering topics such as occupational history, family, hobbies, favorite radio and television shows. Since Italian and German differ along the null subject parameter, despite the fact that they are both richly inflected languages, these data provide a particularly interesting contrast set.

Before we turn to the pronoun and subject omission analyses, it is worthwhile considering how and why the pragmatics of reference differ in these two discourse situations. The given-new task is designed to elicit descriptions of objects and events that are separate from both the speaker and the listener. Extraneous comments aside, *all* the forms of reference observed in that context were in the third person. By contrast, the biographical interview elicits a high proportion of first-person reference, as the patient describes life before and after the unhappy events surrounding his or her illness. We documented this fact by counting instances of first, second, and third-person reference in the biographical interviews for each patient. Third-person reference averaged only

39% across the four groups; roughly half of these were explicit noun phrases, while the others were split between omissions and third-person pronouns (depending on the patient's language — see below). This means that explicit lexical forms were used in this discourse situation only about 14% of the time, compared with mean lexicalization rates of 80% or more in the given-new task! Second-person reference (to the interviewer) was relatively rare in our biographical interviews, accounting for fewer than 3% of sentence subjects. Most references were to the patient himself, in the first person singular. The identity of the speaker is, of course, the one element that can most easily be taken for granted in any informal discourse situation. Hence, on pragmatic grounds, the biographical interview is particularly likely to reveal crosslinguistic differences along the null subject parameter.

We first examined rates of subject pronoun use, in a 2×2 analysis of variance (with Language and Patient Group as between-subject variables). Notice that this analysis is restricted entirely to pure subject pronouns; demonstrative like "this one" or "those" were not included. There was a large and reliable main effect of Language ($F(1, 26) = 102.2, p < 0.001$). Neither the Group effect ($p < 0.09$) nor the Language \times Group interaction ($\bar{p} < 0.06$) reached significance. Examination of cell means makes the interpretation of these results quite clear. German patients produced subject pronouns at a very high rate (63.8% overall); this tendency held for the five Broca's (51.2%) and for the six Wernicke's (74.3%). Italians produced relatively few subject pronouns (8.5% overall); this was true both for the ten Broca's (7.8%) and for the nine Wernicke's (9.3%). It is quite clear that language has more influence on use of the subject pronoun than patient group, at least in this naturalistic situation.

The picture changes slightly when we expand the pronoun count to include demonstratives — pronouns that a patient is particularly likely to use for a third-person referent in place of an explicit proper noun or noun phrase. We repeated the analysis on this expanded count, and obtained main effects for both Language ($F(1, 26) = 73.5, p < 0.001$) and Group ($F(1, 26) = 7.4, p < 0.02$). The Language \times Group interaction again failed to reach significance. Cell means for this analysis are as follows: Italian Broca's 10.2%, Italian Wernicke's 19.8%, German Broca's 51.8% and German Wernicke's 76.8%. Adding demonstrative pronouns to the count has not changed the picture very much for German (a language that provides a wide array of subject pronouns, used in situations in which an English or Italian speaker would probably use a demonstrative). But the overall rates of pronoun production go up in Italian when all pronominal forms are included, especially among the Italian Wernicke's aphasics. This analysis points up once again how syndrome differences can interact with crosslinguistic effects, to different degrees depending on the dependent variable and the discourse situation.

Analyses of subject omission complement the above picture. Entering this variable into the same 2×2 analysis of variance, we obtained a large and reliable main effect of Language ($F(1, 26) = 55.4, p < 0.001$), with no main effect of Group and no interaction. Omission rates for the Italians averaged 68.6% (71.3% for Broca's and 65.6% for Wernicke's), while omission rates for Germans averaged only 23% (32% for Broca's and 15.5% for Wernicke's). The patient group trend is in the expected direction, but falls well short of significance ($p < 0.11$).

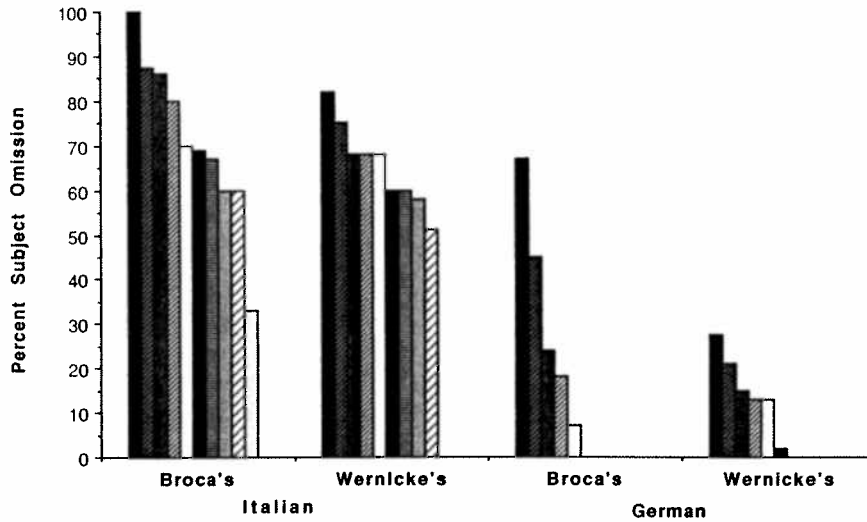


Fig. 1. Percent subject omission for individual subjects in the biographical interview.

We conclude that the null subject contrast between Italian and German is retained in Broca's and Wernicke's aphasia. But does it hold up consistently for individual subjects? Figure 1 presents the percentage of subject omission in the biographical interview for every subject, organized by language and patient group. This figure shows that the Italian/German contrast holds up even among the most severely impaired Broca's aphasics. For example, the least fluent German patient omits the subject 67% of the time; but the least fluent Italian patient omits the subject 100% of the time (and three other Italian Broca's omit the subject more than 80% of the time). This result is analogous to reports by Bates *et al.* (1987b) for rates of article omission in German and Italian compared with English: It is possible to find German and Italian patients who are so severely impaired that they omit articles at a rate that falls within the English range – but that rate is most comparable to an English patient who is only mildly or moderately impaired. Since there is to date no reliable metric for matching patients across languages on their *absolute* degree of severity, we must be satisfied with group studies like these, comparing patients according to their degree of severity *relative to other normal and aphasic speakers in their native language* (see also Paradis, 1987). Such comparisons clearly show that language-specific factors are still operating to shape pragmatic, lexical, and grammatical aspects of aphasic speech.

DISCUSSION

In earlier studies of comprehension and production (Bates *et al.*, 1987a, b; Bates *et*

al., 1988), we obtained evidence that syndrome differences and crosslinguistic differences both contribute to the processing profiles of our aphasic and control subjects. However, we found that some aspects of grammatical processing (i.e., grammatical morphology) appear more vulnerable to the effects of brain damage than others (i.e., basic word order), even though the relative importance of these grammatical structures varied between the languages of interest (English, German, and Italian). The purpose of the present study was to examine the interacting effects of focal brain damage, language-specific factors, and universal pragmatic principles on the forms of reference produced by fluent and non-fluent aphasic subjects relative to language-matched controls.

Evidence for sparing of pragmatic expression in aphasia

We found evidence for sparing of at least some universal pragmatic principles in aphasia. First, in all three languages and in all three patient groups there was a tendency toward lexicalization of new information and ellipsis of old or redundant information. Second, significant main effects of Frame and Constancy in the article analyses, *without* any statistically significant interactions with Language or Group, revealed that aphasic subjects are sensitive to the pragmatics of definite reference, insofar as they are able to produce articles at all. That is, subjects in all groups used indefinite articles for new information and definite articles for nominal elements already established in discourse. Finally, descriptive statistics suggest that subjects in all three groups and languages are more likely to pronominalize given information – an appropriate strategy on pragmatic grounds. Taken together, these results indicate that fluent and nonfluent aphasic subjects are sensitive to the changing focus of information, and are able to shape their utterances to reflect this change. In this regard, our crosslinguistic findings are consistent with the general findings reported by Bates *et al.* (1983) in their study of English-speaking aphasic subjects.

Evidence in support of syndrome differences

We found some evidence for syndrome differences in a subset of our data. For example, there were significant differences in rate of lexicalization for nominal versus verbal elements among nonfluent aphasic subjects; specifically, nonfluent patients lexicalized verbal elements less often than either fluent or control subjects (when prepositions were removed from the predicate count). These findings are consistent with other reports (Miceli *et al.*, 1983; Miceli *et al.*, 1984), suggesting that nonfluent aphasic subjects may have more difficulty accessing verbal elements compared with nouns. However, we did not observe the double dissociation (i.e., $V < N$ for nonfluents and $N < V$ for fluents) reported by other investigators.

Nonfluent and fluent aphasic subjects also differed in their processing profiles for article and pronoun use. Definite article use was greatest for the Wernicke's aphasic subjects, followed by the Broca's subjects. Control subjects used the lowest number of definite articles. Two facts may explain this between-group difference. First, definite articles are higher in frequency of occurrence across our target languages, which may make them somewhat easier for language-impaired subjects to retrieve. Second, brain-damaged patients may adopt a more "concrete" perspective on picture description,

using definite articles to describe the pictured elements because they are “right there”. These explanations are, of course, not mutually exclusive. However, the frequency factor should affect Broca’s and Wernicke’s aphasics equally, whereas the concreteness factor might have a selectively greater impact on posterior patients (since general intellectual deficits are more often postulated in descriptions of Wernicke’s aphasia).

The pronoun analyses also revealed differences in performance patterns between the aphasic groups, in line with previous findings (e.g., Wepman and Jones, 1966). Descriptive statistics in the given-new task showed that Wernicke’s aphasics use the highest proportion of pronouns, while the lowest proportions are observed in Broca’s aphasics. We also obtained a significant difference between patient groups in pronoun use within the biographical interview – although this effect reached significance only when all pronominal forms were considered together (including third-person demonstratives). The heavy use of pronouns by Wernicke’s aphasics may reflect the word-finding problems that are characteristic of this group. Avoidance of pronouns by Broca’s aphasics is usually interpreted as one symptom of a more general problem with closed-class morphology in Broca’s aphasia (Bates *et al.*, 1983). However, these conclusions must be tempered by the crosslinguistic differences in pronoun use that we obtained in the biographical interview – which brings us to the next point.

Evidence in support of crosslinguistic differences

We found evidence for crosslinguistic differences among our fluent and non-fluent aphasics in several aspects of the data. First, there were small stylistic differences in rate of lexicalization for nouns and verbs, language differences that did not interact with patient group. Second, we observed crosslinguistic differences in use of the definite article (greater in German and Italian than in English). This language difference held up in all three patient groups. However, the most striking crosslinguistic differences observed in this study revolve around a linguistic distinction called the “null subject parameter”.

In a null subject language like Italian, the subject can be omitted in free-standing declarative sentences, if its identity can be recovered on pragmatic grounds. By contrast, subject pronouns are obligatory in languages like English and German, even in situations in which the identity of the subject can be taken for granted (leaving aside for the moment the fact the subject omissions are occasionally produced in informal speech, even within a language in which subjects are supposedly obligatory). Within the given-new situation, there were trends in the predicted direction, even for Broca’s and Wernicke’s aphasics: slightly more subject omission in Italian, and slightly more use of pronouns in German and English. However, because rates of pronominalization and ellipsis were so low in this task, these language differences were marginal.

For this reason, we examined subject ellipsis and subject pronouns in a different discourse situation: a biographical interview in which the German and Italian patients described events before and after their illness. This situation elicits a very high proportion of first-person reference (averaging 60% or more); because the speaker is the one element that is most easily taken for granted in an informal conversation, this interview provides an ideal context for studying preservation of the null subject parameter. Results were quite clear: German patients (including Broca’s aphasics) are particularly likely

to use a subject pronoun, while Italian patients (fluent and nonfluent alike) are much more likely to omit the subject. Although we don't have baseline data from normal controls, these two patterns are consistent with the known crosslinguistic differences in healthy adults. This difference was apparent even among the most severely impaired patients in the two respective language groups. This finding makes clear the extent to which universal pragmatic tendencies and language-specific factors interact to shape the symptoms of Broca's and Wernicke's aphasia.

Conclusions

Our goal in the present study was to observe how the forms of reference used by aphasic patients are influenced by universal pragmatic principles, syndrome-specific symptom patterns, and language-specific constraints. We examined monolingual speakers of languages which differ from English in certain aspects of the pragmatics of reference. Two important pieces of information were obtained. First, we observed that the pragmatics of reference appear to be preserved in both Broca's and Wernicke's aphasics, despite syndrome-specific problems in retrieving content words and/or closed-class grammatical elements. Second, language-specific patterns of reference are also preserved although degraded relative to the language-matched controls for each language — including preservation of the “null subject parameter”, an aspect of language that has played a particularly important role in recent theories of generative grammar (Rizzi, 1980).

Comparisons between the given-new task and the biographical interview add a fourth factor to this interacting set of constraints: differences that are inherent in the discourse situation itself. The picture description task is a fairly rigid discourse context, one that encourages exhaustive lexicalization (with concomitantly low rates of pronominalization and ellipsis) even among nonfluent aphasic patients. The rules of discourse are quite different in a biographical interview. Even though the patient is conversing with an unfamiliar adult, the situation is still relatively informal. We learned in a previous study (Bates *et al.*, 1988) that Italian pragmatic word order variation is much more likely in a conversational setting, compared with a picture description task. In the present study, we learned that the biographical interview also encourages much more first-person reference, a fact that apparently results in much higher rates of omission and pronominalization. The omission/pronominalization differences in turn follow language-specific constraints on the form of reference that must be used when the subject of the sentence can be taken for granted. It is clear that pragmatic constraints on lexical and grammatical form can also vary *within* a given discourse situation — yet another aspect of the pragmatics of reference that appears to be preserved in aphasic speech.

To summarize, we have found evidence to suggest that aphasic patients retain knowledge of (1) universal pragmatic constraints on means for expressing the contrast between given and new information, (2) language-specific constraints on the expression of this pragmatic function, and (3) constraints on pragmatic expression that are peculiar to the discourse situation. The discovery that pragmatic *functions* are preserved in aphasia is not surprising in its own right, since no one has ever proposed that pragmatic functions are lateralized to the left hemisphere. However, we have also shown that aphasic patients

retain some pragmatic control over universal and language-specific lexical and morpho-syntactic forms. This finding is relevant to alternative characterizations of lexical and grammatical impairment, providing further evidence for the argument that linguistic knowledge is largely preserved in aphasia; the lexical and grammatical deficits that define the two major aphasic syndromes may have more to do with deficits in the processes by which linguistic knowledge is accessed and deployed.

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