

## Inflectional Marking in Hungarian Aphasics

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How do aphasics deal with the rich inflectional marking available in agglutinative languages like Hungarian? For the Hungarian noun alone, aphasics have to deal with over 15 basic case markings and dozens of possible combinations of these basic markings. Using the picture description task of MacWhinney and Bates (1978), this study examined the use of inflectional markings in nine Broca's and five Wernicke's aphasic speakers of Hungarian. The analysis focused on subject, direct object, indirect object, and locative nominal arguments. Compared to normals, both groups had a much higher rate of omission of all argument types. Subject ellipsis was particularly strong, as it is in normal Hungarian. There was a tendency for Broca's to omit the indirect object and for Wernicke's to omit the direct object. Across argument types, Wernicke's had a much higher level of pronoun usage than did Broca's. Broca's also showed a very high level of article omission. Compared to similar data reported by Slobin (this issue) for Turkish, the Hungarian aphasics showed an elevated level of omission of case markings. Addition errors were quite rare, but there were 14 substitutions of one case marking for another. These errors all involved the substitution of some close semantic competitor. There were no errors in the basic rules for vowel harmony or morpheme order. Overall the results paint a picture of a group of individuals whose grammatical abilities are damaged and noisy, but still largely functional. Neither the view of Broca's as agrammatic nor the view of Wernicke's as paragrammatic was strongly supported. © 1991 Academic Press, Inc.

Languages vary markedly in their use of inflectional morphology for marking basic syntactic relations. Consider an English sentence such as

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“The dog on the chair is not ready to eat his dinner.” Not a single word in this sentence is inflected. There are no suffixes and no prefixes; each word is a bare monomorphemic stem. On the other hand, the translation of the sentence into Hungarian makes extensive use of inflection. The translation takes the form *A széken lévő kutya nem akarja az ebédjét megenni*. In the Hungarian sentence five of the nine words have grammatical inflections and two of them—*ebédjét* and *megenni*—have two inflections attached to a single stem. It is almost always the case that Hungarian sentences have many inflectional markers and that English sentences have only a few. Differences of this type have led linguists to refer to English as an “isolating” language and to Hungarian as an “agglutinating” language. Isolating languages have few inflections and those inflections are limited in the ways in which they can combine. In English, there are only six inflectional markings (past, third singular, plural, progressive, participle, and possessive). Three of these six markings are actually homophonous, since the third singular, the plural, and the possessive all take the shape /s/ ~ /z/ ~ /iz/. None of the six markings in English can be combined with any other marking. By way of contrast, there are approximately 70 inflectional suffixes in Hungarian and words can contain two, three, or even four suffixes at a time, much as in Turkish (Slobin, this issue). Although not all combinations of suffixes are semantically or syntactically possible in Hungarian, there are several hundred combinations that are common forms. When one compares the richness of marking in a language such as Hungarian with the frugality displayed by English, it is easy to see why Arnold Pick (1913) referred to English as “an essentially formless language of high standing.” Unfortunately, our current models of both normal and impaired language processing are based almost exclusively on data gathered from speakers of this singularly amorphous language, which just happens to be the native language of a powerful academic community.

Does the presence of rich morphological marking in a language have important empirical consequences for aphasia? Can we use our current theories to predict whether patients should have problems dealing with complex systems for inflectional marking? One theory that generates predictions in this case is the Agrammatism Model (Kean, 1979, 1985). If patients are behaving in accord with some pure version of this model, we should expect them to avoid any use of morphological markings, only producing bare stems. Another possibility is that, in accord with the more ecumenical views of Pick (1913), speakers of inflectional languages should tend to behave paragrammatically. If patients are behaving paragrammatically, we should expect frequent random substitutions within this large set of possible markings. Finally, if patients are behaving in accord with the model of normalcy through noise indicated by earlier work on the Competition Model (Bates & Wulfeck, 1989; MacWhinney & Bates,

1989; McDonald & MacWhinney, 1989), we would expect them to use their residual control of semantics and the lexicon and only show extreme agrammatism or paragrammatism in areas where the cues to marker selection strongly conflict. The current study attempts to find out which of these three views most accurately corresponds to the reality of aphasic sentence production in Hungarian.

The experimental literature on sentence production by aphasic speakers of richly inflected languages is fairly sparse. The most detailed work previously available was the study by Bates, Friederici, and Wulfeck (1987) on the preservation of morphological markings by Broca's and Wernicke's aphasic speakers of English, German, and Italian. Their analysis focused primarily on article omission and substitution errors in German and Italian. In both languages, article selection depends on gender and number. However, in German it also depends on case. Moreover, Italian has only two genders, whereas German has three. Not surprisingly, the greater number of options in the German system led to more errors in the study by Bates et al. However, these errors were extremely restricted in scope. There were errors in case, errors in number, and errors in gender. There were very few errors along more than one of these three dimensions. Within case errors, substitutions of the unmarked nominative case for one of the other three marked cases occurred 50% of the time for Broca's and only 4% of the time for Wernicke's. Omission errors in German were much more frequent in Broca's (60%) than in Wernicke's (27%). In general, German Broca's tend to avoid difficult case forms by substituting a simpler, less-marked morphosyntactic frame. Wernicke's aphasics try instead to produce a marked construction, resulting in a less conservative error pattern.

In order to select an article in either German or Italian, you must know the gender of the following noun. Of course, the gender of a noun cannot be determined until that noun has been selected. This means that there is no way to go directly from an underlying meaning to article selection without determining the shape of the noun. On the other hand, the categories of number and case do not depend upon the actual lexical realization of the noun. If most of the errors reported by Bates et al. had been gender errors, one could reasonably argue that case and number are mapped directly to the article and that only the indirectly mapped gender distinction is vulnerable in aphasia. However, errors of all three types occurred frequently in their data. Thus, it seems most likely that all three distinctions are indirectly mapped.

Hungarian, on the other hand, is structured in a way that maximizes possibilities for a direct mapping from meaning to morphological markings. Because there is no gender in Hungarian, there is no need to record or retrieve formal class information about the noun. Because most of the important markings are suffixes, the shape of the noun in the underlying

cognitive representation is entirely determined once the speaker reaches the point in sentence processing when it is necessary to produce the inflection. Plurality is marked independently of case, so there can be a fairly direct mapping back to semantics. Case is marked quite clearly and regularly and is based on real cognitive distinctions, rather than arbitrary syntactic subcategorization. As MacWhinney (1976) noted, Hungarian constitutes a good test case for the relative contribution of semantic mapping problems in language learning and disorders. Whatever problems aphasics have with suffix selection in Hungarian can be attributed more clearly to the process that maps directly from semantics to lexical items.

Although Hungarian allows for a kind of direct mapping not possible in German or Italian, the actual shape of that mapping is fairly complex. In this current issue, Slobin presents new data from Turkish that are directly comparable with the present study for Hungarian. Like Hungarian, Turkish also has no gender and the mappings from meanings to case forms are extremely direct. When comparing the results for these two languages, it is important to remember that the mapping in Hungarian is more complex than that involved in Turkish. Turkish has only one locative inflection, although the ablative and the dative also serve locative functions. Hungarian, on the other hand, has nine locative cases and several other case-like markings not found in Turkish. In addition, Hungarian has semantically complex mappings between particular case markings and particular verbs. Finally, as Slobin (this issue) notes, the inflectional paradigms of Turkish are much more regular than those of Hungarian on a phonological level. It could be that complexities involved in phonological processing lead to confusions not only on the phonological level, but also in terms of selection of the correct inflectional marking. Together, these additional complexities found in Hungarian may lead to more omissions and substitutions than we would expect to find in a more regular language like Turkish.

### THE HUNGARIAN SYSTEM

In the current study, we used the elicited production task of MacWhinney and Bates (1978). This is the same task that has been used with aphasics by Bates, Hamby, and Zurif (1983), Stan Smith (personal communication, 1990), and Slobin (this issue). Our analysis of the data produced in this task will focus on the ways in which Hungarian patients marked nominal case and verbal conjugation. Although there are hundreds of possible options for marking nouns and verbs, only a few of the many possible options play an important role in this study. Let us examine just those noun-marking and verb-marking options that actually are involved in our data. Of particular interest is the way in which certain grammatical markings compete with others in semantic terms.

The first set of four competing markings are the four “central” case markings—those which are most tightly specified by the case frame of the verb.

1. **Nominative:** The nominative is the uninflected and unmarked form of the noun. There is no nominative suffix. Because the unmarked form of the noun is also the uninflected form, any substitution of the unmarked nominative case for another marked case could also be viewed as an omission of a nominal inflection. The use of the unmarked form of the bare noun as the nominative is also found in Turkish. Both of these languages contrast with German which marks case primarily through the article and which requires that some form of the article be used even in the nominative. Competitions between the nominative and the other cases arise primarily through perspective switches. For example, instead of viewing a scene as “the boy gave the girl an apple,” one could say “the girl got an apple from the boy.” In such perspective switches (MacWhinney, 1975, 1977; MacWhinney & Pléh, 1988), the nominative is replaced by a locative and the dative is promoted to nominative status.

2. **Accusative:** The accusative case suffix has the form *-t*, sometimes preceded by a vowel. The direct object is almost always marked with the accusative. As Zsilka (1967) has pointed out, the Hungarian accusative often competes rather directly with the instrumental. One can describe an action as “spreading the bread with butter” or as “spreading butter onto the bread.” In the former phrase, Hungarian places “the butter” into the instrumental, in the latter phrase, it places “the butter” into the accusative. Thus the same semantic role can be described with either case, depending on one’s point of view. Similarly, the accusative often competes with a locative case. In the same example sentences, “the bread” can be either in the accusative or the locative, again depending on one’s focus or point of view.

3. **Dative:** This case is marked by placing the suffix *-nak* after the noun. On the one hand, the dative tends to compete with some of the locative suffixes. This reflects the fact that the dative was originally directional in meaning, like the English dative marker “to.” As Zsilka (1967) points out, the dative also often competes with the accusative in pairs such as “give the ball to John” and “present John with the ball.” Competitions of this sort are stronger in Hungarian than they are in English.

4. **Instrumental or Comitative:** This suffix takes the form *-val* and corresponds closely to the English word “with.” As we noted above, the instrumental competes tightly with the accusative and the dative in many semantic frames.

5. **Locatives:** In addition to the four central cases, subjects in our study made use of several locative suffixes and postpositions. The full set of 9 locative case suffixes and the full set of 12 locative postpositions compete

with each other within the set of contrasts that mark position and directional movement. Five locative suffixes were involved in substitutions in the current study.

- a. Sublative: This suffix takes the form *-ra* and corresponds to the English preposition "onto."
- b. Superessive: This suffix takes the form *-on* and corresponds to the English preposition "on."
- c. Inessive: This suffix takes the form *-ban* and corresponds to the English preposition "in."
- d. Ablative: This suffix takes the form *-tól* and corresponds to the English preposition "from."
- e. Under: This postposition takes the form *alatt* and corresponds to the English preposition "under."

Of the dozens of verb markings in Hungarian, only a few play an important role in the current study. They are the following seven suffixes.

1. 3Sing\_Definite: This suffix takes the form *-ja* and is used in the present declarative when the subject is in the third person singular and the direct object is definite.

2. 3Sing\_Indef: This is the unmarked form of the verb. It is used in the present declarative when the subject is in the third person singular and the direct object is indefinite or when the verb is intransitive. A small group of irregular verbs take the suffix *-ik* to mark this.

3. 1Sing\_Definite: This suffix takes the form *-om* and is used in the present declarative when the subject is in the first person singular and the direct object is definite.

4. 1Sing\_Indefinite: This suffix takes the form *-ok* and is used in the present declarative when the subject is in the first person singular and the direct object is indefinite or when the verb is intransitive.

5. Infinitive: This suffix takes the form *-ni* and corresponds to the English infinitive.

6. Conditional: This suffix takes the form *-na* and corresponds to the English word "could."

7. 3Plur\_Indefinite: This suffix takes the form *-nak* and is used in the present declarative when the subject is in the third person plural and the direct object is indefinite or when the verb is intransitive.

The competition between the definite and the indefinite conjugation in Hungarian is a complicated matter discussed in some detail in MacWhinney (1989). The competition between the first and the third persons within the verbal paradigm is one found in many languages (Bybee, 1985).

## METHOD

*Subjects.* Our subjects included nine Broca's aphasics and five Wernicke's aphasics who were tested at the Rehabilitation Institute in Budapest where they were recovering. All subjects were right-handed with left lateral lesions. All were monolingual Hungarian speak-

ers. All patients were studied at least 2 months after their initial insult at a point when their aphasic symptoms had stabilized. Our control subjects were 15 normals individually matched in age and educational level to the aphasic subjects. Our criteria for subject selection followed point by point the description given in Bates et al. (1987). We eliminated all patients with one or more of the following conditions:

1. a history of multiple strokes,
2. significant hearing and/or visual difficulties,
3. severe gross motor difficulties,
4. severe motor–speech involvement such that less than 50% of subject's speech attempts were intelligible, or
5. evidence that the subject was neurologically or physically unstable and/or less than 3 months postonset.

We defined our two groups according to their fit to a prototype used by neurologists and speech pathologists in Hungary and their scores on a Hungarian variant of the Western Aphasia Battery (WAB). A prototypic Broca's showed reduced fluency and phase length and a tendency toward omission of functors—relative to Hungarian normals. A prototypic Wernicke's aphasic displayed fluent or hyperfluent expressive language, with an apparently normal melodic line. This fluency is accompanied by marked word-finding difficulties, semantic paraphasias, and perhaps paramatrasms.

Table 1 presents data for the 14 subjects across 12 dimensions. The subjects with codes beginning with the letter "B" are classified as Broca's aphasics and those with the letter "W" are classified as Wernicke's aphasics. The first three dimensions are etiology, laterality of lesion, and locus of lesion. Then follow three scores from the Hungarian version of the WAB. These are the overall AQ score and the fluency and comprehension measures. The second part of the table gives the age of onset of aphasia and the delay between the age of onset and the time of testing, along with the subject's sex, handedness, occupation, and grades of schooling completed.

*Procedure.* Subjects were seated at a table individually and shown triplets of pictures. The nine triplets are given in Table 2.

The order of presentation of individual triplets was varied, as was the order within triplets. Patients were tested individually by the second author who is a native speaker of Hungarian and a trained aphasiologist. After an initial warm-up period, the picture stimuli were introduced with the simple instructions "I am going to show you some pictures. I would like you to describe what you see in each picture." If a patient experienced difficulty getting started in describing one or more of the items, we provided very general prompts, such as "Can you tell me anything more?," "What else do you see?," or "What else is happening here?" In cases of word-finding difficulty, the experimenter would occasionally ask the subject to point to the object for which a name was needed. In such cases, the experimenter would provide the word and then continue with the trial.

All responses were tape recorded and transcribed by native speakers, using standard Hungarian orthography. False starts, repetitions, and extraneous comments were all included in the transcription, to give a faithful picture of the problems that the patient experiences in the task.

*Morphological and syntactic coding.* In addition to the material which actually describes the activity in the picture, the protocols contain a large number of false starts, repetitions, fillers, expletives, metalinguistic comments, and simple object naming. These various picture-irrelevant aspects of the protocols were filtered out from the analysis by selecting the portion of the response that included the best match to the script. A stretch of speech was located that contained in sequence as many matches to the elements in the script as possible. We will call this the "core response." For example, in the SVO series, the subject might have a long response with retracings and interjections. However, within that overall response, there might be a core sequence that contained the verb and the object with no agent. This

TABLE 1  
SUBJECT CHARACTERISTICS

Subject	Etiology	Locus	WAB-AQ	WAB fluency	WAB comp.
B1	Trauma	Centroparietal	73	4	9.0
B2	CVA	MCA	50.2	4	6.4
B5	Thrombosis	MCA	33.6	3	6.7
B7	Thrombosis	MCA	70.8	4	8.2
B9	Trauma	Frontotemporal	59.8	2	8.1
B10	CVA	MCA	45.4	5	6.9
B11	Trauma	Frontotemporal	43.4	5	7.4
B12	Thrombosis	Frontotemporal	65.4	6	8.6
B13	CVA	Frontotemporal	67.0	4	9.2
B14	Aneurism	Frontotemporal	66.6	4	6.4
W2	Abcess	Centroparietal	33	6	6.6
W4	Meningioma	Occipital	58	7	5.6
W5	Tumor	Ant-temporal	56	8	5.6
W9	Thrombosis	MCA	51.2	8	5.5
W11	Ischemia	MCA	49.4	6	6.7

  

Subject	Onset Age	Testing Lag	Sex	Occupation	Grades
B1	37	4 years	Female	Worker	6
B2	36	7 months	Male	Ironworker	8
B5	44	7.5 months	Male	Engineer	University
B7	55	25 months	Female	Accountant	8
B9	18	8 months	Male	Student	8
B10	53	2 years	Male	Ironworker	8
B11	26	4 years	Male	Fireman	8
B12	55	7.5 years	Male	Engineer	University
B13	34	4 months	Female	Telex	8
B14	41	5 months	Male	Mechanic	8
W2	51	4 months	Female	Teacher	12
W4	55	2 months	Female	Clerk	12
W5	37	2 months	Male	Engineer	University
W9	76	3 months	Male	Accountant	12
W11	63	3 months	Female	Xeroxer	6

core response would be the material that we would use as the basis for our analysis. Within a core response, a single element would only be counted once. If there were two mentions of the object, only one would be counted. Within core responses, words were coded for syntactic category, part-of-speech, and morphological composition, using the CHAT coding scheme of the CHILDES system (MacWhinney, 1991). Omissions and substitutions were fully coded, and the resulting coding line was analyzed into frequency tables using the CLAN programs (MacWhinney, 1991). These analyses automated the process of frequency counting and allowed for cross-checking to guarantee the accuracy of the syntactic and morphological coding.

TABLE 2  
THE NINE SENTENCE TRIPLETS

Series	Structure	Sentence
1	SV	A (bear, mouse, bunny) is crying.
2	$\overline{SV}$	A boy is (running, swimming, skiing).
3	$\overline{SVO}$	A (monkey, squirrel, bunny) is eating a banana.
4	$\overline{SVO}$	A boy is (kissing, hugging, kicking) a dog.
5	$\overline{SVO}$	A girl is eating an (apple, doughnut, ice cream).
6	$\overline{SVL}$	A dog is (in, on, under) a car.
7	$\overline{SVL}$	A cat is on a (table, bed, chair).
8	$\overline{SVOD}$	A lady is giving a (present, truck, mouse) to a girl.
9	$\overline{SVOD}$	A cat is giving a flower to a (boy, bunny, dog).

*Note.* S, subject or actor in the nominative case; V, verb; O, direct object in the accusative case; D, indirect object in the dative case; L, locative phrase with a locative suffix or postposition.

## RESULTS

In this section we will present detailed results for each of the 14 aphasic subjects individually. We will look at correct uses, patterns of lexicalization, and case substitutions.

### *Patterns of Lexicalization*

First we will focus on correct uses for individual subjects on each of the four case types required by the script given in Table 2. Table 3 gives

TABLE 3  
NUMBER CORRECT FOR SCRIPTED ITEMS

Subject	Nominative (27)	Accusative (15)	Dative (6)	Locative (6)
B1	14	9	5	3
B2	16	6	0	0
B5	5	2	0	0
B7	26	10	4	5
B10	6	5	1	3
B11	8	8	3	2
B12	27	13	2	5
B13	14	16	1	6
B14	13	4	2	6
W2	21	2	0	0
W4	19	5	1	6
W5	13	7	1	2
W9	10	0	3	8
W11	6	4	1	1

TABLE 4  
FORMS OF LEXICALIZATION

	Omitted		Full		Pronominal	
	B	W	B	W	B	W
Nominative	47	42	51	49	2	9
Direct object	24	37	75	46	1	16
Indirect	41	17	57	70	2	13
Locative	19	17	81	53	0	30

the numbers of correctly marked uses of nouns for each subject. The total possible numbers of correct uses for each case are given in parentheses after each of the four headings, if a subject produced sentences that exactly corresponded to the script. For the purposes of Tables 3 and 4, both nominal and pronominal uses are included.

The divergences from the script in Table 3 were of two basic types. In some instances, the subject produced the correct noun, but with the wrong case marker. We will analyze such case substitution errors in detail below. More often, the subject either omitted the noun altogether or produced it as a pronoun, rather than as a noun. Table 4 shows the overall use of full nouns, pronouns, and omissions for the four basic case-marking types for both groups.

There are frequent omissions of all four case-marking types. Both groups have a high level of subject ellipsis. As Du Bois (1987) and others have noted, subject omission is a basic property of discourse and is generally more frequent than object omission. In Hungarian, subject ellipsis is a very common process that is extensively sanctioned by the grammar. The fact that aphasics delete subjects more than other elements suggests that they are still generally sensitive to the discourse basis of subject deletion (Bates et al., 1983; Wulfeck, Bates, Juarez, Opie, Friederici, MacWhinney, & Zurif, 1989).

There is a tendency for Broca's to omit the indirect object much more than Wernicke's. However, exactly the opposite pattern emerges for the direct object. For the direct object, Broca's show less omission than Wernicke's. Given the fact that the indirect object is more optional than the direct object, we can say that the pattern of omissions in Broca's is more in conformity with the grammar than the pattern of omissions found in Wernicke's. However, both groups use far more omission than the normal controls who averaged around 5% omission for these sentences.

The fact that Broca's has a higher omission rate than Wernicke's only for the indirect object matches up well with findings from Turkish (Slobin, this issue). However, the omissions for both aphasic groups are much higher than the comparable figures reported by Slobin for Turkish aphas-

TABLE 5  
 FAILURES TO SUPPLY FORMS AS REQUIRED BY THE INTENDED CONTEXT

Subject	Nominative	Accusative	Dative	Locative
B1	1	1	1	
B2		9	3	4
B5		2		1
B7		4	1	
B10		3	1	3
B11		3	1	1
B12		1		
B13		5	2	1
B14	1	4		
W2		2	2	
W4	1	3	1	1
W5		1	2	1
W9	2	2	1	2
W11		2	2	1

ics. It appears that Hungarian grammar licenses omissions more freely than does Turkish, since it is virtually impossible to say that a particular omission in Hungarian is ungrammatical. This is certainly true for all four case types—nominative, accusative, dative, and locative. It is also true that mere omission of a verb is not clearly an error, since it is reasonable in Hungarian to simply name the nouns in a picture in the nominative without including any verb. A response of this type does not really match the requirements of the experimental task, since the subject was asked to describe what was going on in the picture. However, one cannot say that a mere listing of the nominative form of the nouns in the picture involves any obvious grammatical error.

For the Broca's, 11% of the responses had bare nominative nouns and no verb; for Wernicke's, the figure was 8%. When one of the nouns was in a marked case, the omission of the verb was clearly a grammatical error. For both groups, this occurred in 8% of the total responses. Using these figures, we see that roughly half of the omissions of the verbs were ungrammatical in both groups. These figures correspond roughly to those reported by Slobin for Turkish.

### *Substitutions*

Table 3 looked at all possible matches between what the subject said and what the script required. In Table 5, we are looking at a somewhat smaller pie—picture descriptions for which it is clear that the subject intended a particular case, but failed to realize that intention. For example, the use of a verb and a noun in the nominative may indicate clearly that

TABLE 6  
DETAILED LISTING OF SUBSTITUTION ERRORS

	Marked to unmarked	Unmarked to marked	Marked to marked
B1	1acc, 1dat	acc	
B2	9acc, 3dat, 3loc		sub = super
B5	2acc, 1loc		
B7	2acc, 1dat		instr = acc, instr = acc
B10	2acc		super = acc, super = dat
			in = super, in = super, in = under
B11	3acc, 1dat, 1loc		abl = dat
B12	1acc		
B13	5acc, 2dat, 1loc		
B14	4acc	in	
W2	2acc, 1dat		acc = dat
W4	2acc, 1dat	acc	inst = acc, instr = elat
W5	1acc, 2dat, 1loc		sub = elat
W9	2acc, 1dat, 2loc	acc, com	
W11	2acc, 2dat, 1loc		all = elat

the subject intended to produce a form in the accusative, but failed to add the accusative suffix. Or the subject might have intended to produce a particular locative case but actually produced the wrong one. Instances of this type are counted in Table 5. If the subject did not produce a transitive verb, there is no context for an accusative and no entry would be made in Table 5. If the subject does not produce a noun describing a place, there is no context for a locative, and again no entry in Table 5. If the subject does not produce a transfer verb, there is no context for a dative noun. If no verb at all is produced, then there is no intended context for a nominative.

The errors listed in Table 5 are all various types of substitution errors. Table 6 divides the substitution errors into three basic types: marked to unmarked, unmarked to marked, and marked to marked. In this table, "acc" is accusative, "dat" is dative, "loc" is locative, "in" is inessive, and so on. The notation "acc = dat" indicates that a form which should have been a dative was incorrectly produced as an accusative.

Let us examine in further detail the three types of substitution errors.

*Marked to unmarked (omissions).* Because the nominative has no suffix, marked to unmarked substitutions are equivalent to case suffix omissions. These errors are given in the "marked to unmarked" column of Table 6. These omission errors seem to be roughly equally divided between Broca's and Wernicke's subjects, even taking into account the fact that there were more Broca's subjects. Table 7 summarizes the omissions for both nominal and pronominal forms in terms of percentages. Broca's tend to omit the

TABLE 7  
 PERCENTAGES OF CASE OMISSIONS IN REQUIRED CONTEXTS

Required Form	Broca's	Wernicke's
Accusative	22%	13%
Dative	18%	30%
Locative	7%	13%

accusative, whereas Wernicke's tend to omit the dative ( $\chi^2 = 5.15, p < .05$ ). This tendency is in accord with the overall tendency of Broca's to omit the complete dative noun phrase and Wernicke's to omit the complete accusative noun phrase that we discussed earlier. The figures for locative omissions are probably underestimates, since it is more difficult to judge when a locative is required than it is to judge when an accusative or dative is required.

These figures are much higher than similar figures reported by Slobin (this issue) for Turkish. The higher level of case omission in Hungarian is clearly a major difference between aphasic speech in the two languages. Slobin reports that Turkish aphasia has no telegraphic quality at all. It is clear that Hungarian aphasics come closer to producing what we would think of as telegraphic speech. The figures are also higher than similar figures reported by Bates et al. (1987) for German. However, it must be remembered that marked to unmarked substitutions of German articles do not involve omissions, whereas marked to unmarked substitutions in Hungarian involve the omission of any case marking.

Table 6 does not include verb omissions. Reductions of marked verb forms to unmarked forms are difficult to demonstrate, since the choice between the definite and the indefinite conjugations often depends on the conceptual status of words which have been omitted or for which the article is missing. It is difficult to know when there have been omissions of the third person singular definite suffix (*-i ~ -e ~ -ja ~ -je*) that is required on the verb in these sentences. One can only be sure that the third person singular definite has been omitted if there is an article on the direct object. If the article is missing, the direct object can be regarded as indefinite and there is no marking required on the verb with a third person singular subject. Subject B14 did clearly reduce an infinitive and a first-person form to the unmarked third person. However, no other clear marked to unmarked verb substitutions occurred.

*Unmarked to marked (additions)*. Addition errors are given in the "unmarked to marked" column of Table 6. They are quite rare and mostly involve uses of the accusative when the nominative is required. It is interesting that the high-frequency accusative case is the only one which is sufficiently strong to occasionally replace the nominative. This is exactly

the same effect as Slobin reports for Turkish. In Turkish, addition errors are also rare and only occur with substitutions of accusatives for nominatives.

*Marked to Marked (substitutions).* There was a total of 14 substitutions in the entire given–new corpus. Five of these were produced by a single subject (B10). As we will see, one could reasonably argue that at least some of the substitutions involve alternative ways of describing the picture. However, even if we grant this, the fact that any substitutions occurred at all contrasts with Slobin's report of no marked–marked substitutions at all for the corresponding body of given–new data in Turkish. Let us take a detailed look at each of the 14 marked to marked case substitutions.

1. Patient B2 produced one substitution. For picture 7a, he gave a description in which the sublative “down onto” is used instead of the superessive “onto.” The sentence is *székre macska lobonci*. The word *lobonci* is a neologism or nonce form that probably corresponds to the verb “to sit.” With this added, the sentence would read “chair-onto cat sits.”

2. Patient B7 produced two substitutions. She described picture 3b saying, *ez is banánnal* “this also banana-INST” with the word for “banana” in the instrumental, rather than in the accusative. Because she had described picture 3a as a “monkey eating a banana,” one would expect 3b to have an accusative also and the use of the instrumental seems to be a substitution error. The second substitution error occurred with picture 6a which she described with the sentence *ja, hogy egy kutya nézi illetve autóval vezet* “yes, a dog sees, or rather, car-INST drives.” In this sentence the instrumental *autóval* is clearly a substitution for what should have been an accusative.

3. Patient B10 produced five substitutions. For picture 3b, he produced *mókus, igen, banánon eszik* “squirrel, yes, banana-on eats.” This is quite undeniably a substitution of the locative superessive case for the required accusative. For picture 9c, the patient said *kutyán nem tudom kimondani ku-* “dog-on not can-I say dog.” For pictures 9a and 9b, the patient had used the dative correctly. Here, he appears to be having trouble activating the actual phonological shape of the dative and accidentally ends up with the superessive as a result. He himself comments on his inability to produce the intended form. Thus, this second substitution could probably be better described as a phonological access problem. The last three substitutions all involved overuses of the inessive locative case for other locative cases. For pictures 6b and 7b, the inessive substitutes for the superessive. For picture 6c, it substitutes for the postposition “under.”

4. Patient B11 produced one substitution that seems to arise from a perspective switch or conflict for picture 8b. Instead of saying that the mother is giving a present to her daughter, the patient said that the mother is giving a present *from* her daughter. Of course, the ablative “from”

would make sense if what the patient was trying to say was that the patient was “getting a present from her daughter.” For further analysis of perspective switches of this type see MacWhinney (1977).

5. Patient W2 produced one substitution. For picture 9a, she said *ez a kis fi-fiát ez ez megy megy a ő odamegy érte* “this the little b-boy-ACC this this goes goes the he goes-over for-her.” In this sentence, the accusative *fiát* clearly should have been the dative form *fiúnak*.

6. Patient W4 produced two possible substitution errors. Both occurred in the description of picture 8a *eperrel van # gyerek játék mamáva* “mouse-INST is # child game mama-INST.” In this utterance, the word *eper* “raspberry” is substituted for *egér* “mouse” and the noun *játék* “game” is substituted for the verb “play.” Then the nouns that should have been in the accusative and the dative are both placed in the instrumental. However, it seems that the patient may have been trying to say something like “the child plays with the mouse with the mother.” If this is true, then these would actually be correct uses of the instrumental, rather than substitutions.

7. Patient W11 produced one substitution error. For picture 9b, she said *hát akkor a kislány ezt viszi ahhoz a na-nagyobb (hoz)* “well then the girl this-ACC takes this-ALL the bigger-(ALL).” The choice of the allative here is partially influenced by the fact that a verb was chosen that takes the allative. Instead, a verb should have been selected that would take the ablative. The patient realizes that the allative is not correct in this utterance and says “I don’t know, this is very difficult for me.”

There were only a few verb substitution errors. There were four substitutions of first-person verb forms for the unmarked third person. However, such forms may well have been attempts by the subject to describe the picture from the first-person viewpoint, rather than true substitution errors. There were three substitutions of infinitives for full transitive verb markings. Such substitutions are also occasionally heard in Hungarian speech produced by little children and foreigners. Finally, subject W11 twice used a marked third person plural when the unmarked third singular would have been required. These last two errors seem to have been the only true verb substitution errors.

### *Pronoun Usage*

Table 4 showed a far greater use of pronouns by Wernicke’s than by Broca’s. One possible interpretation of this pattern is that Wernicke’s may be having greater problems with word finding than Broca’s. However, the high rate of omission in Broca’s would seem to indicate that both groups have some word-finding problems. The difference appears to be that when they are unable to retrieve a noun Broca’s subjects simply omit it altogether. Wernicke’s, on the other hand, are confronted with a number of active options, including both nouns and pronouns. Their task is to

TABLE 8  
ARTICLE USAGE

	Erroneous omission		Permissible omission		Article correct	
	B	W	B	W	B	W
Subject	24	22	51	51	25	27
Direct Object	22	10	57	62	21	28
Indirect Object	22	13	47	31	31	56
Locative	44	23	42	54	14	23

select from this active group, and often what they choose is the pronoun. This interpretation is further supported by the fact that none of the uses of pronouns by Broca's were incorrect, whereas the pronouns used by the Wernicke's included two with erroneous omission of the accusative and one with a number-marking error.

### Articles

Table 8 presents the pattern of erroneous omissions, permissible omissions, and correct article use for the nouns in the script. Hungarian allows extensive use of article omission for subjects, when they are treated generically, and for objects, when they precede the verb. However, the omission of articles in these two groups goes far beyond what is grammatically permissible, particularly in the Broca's subjects. Unlike the German article (Bates et al., 1987), the Hungarian article is not marked for case, number, or gender. Thus it plays a fairly minimal role in sentence interpretation. Given the fact that omission is sanctioned in many cases and given the fact that the article does not mark grammatical relations, it is not surprising to see that both groups of subjects tend to omit this marker.

### Vowel Harmony and Morpheme Order Errors

Two types of errors are particularly conspicuous in their absence. Nowhere in any of the protocols within either the basic task used for sentence elicitation or the wider interview and ancillary picture description tasks was there a single violation of the most basic morphophonological rules of suffix formation in Hungarian. There were complex words with two and sometimes even three suffixes, such as "lányának" with a possessive followed by a dative or "tetejére" with a possessive followed by a sublative and a complex stem alternation. However, there was not a single case of misordering of affixes or a single violation of the basic rules of vowel harmony. The absence of vowel harmony errors and morpheme order errors in these data closely matches what MacWhinney (1976) has reported

for Hungarian child language acquisition data. It also matches what Slobin reports for Turkish aphasia. In both cases, despite the large number of possibilities for error, subjects produce virtually errorless performance.

### SUMMARY

This study of elicited sentence production in Hungarian aphasics paints a picture of a group of individuals whose grammatical abilities are damaged and noisy, but still largely functional. Despite the bewildering number of possible choices of grammatical markers, both groups made paragrammatic substitutions from within a fairly narrow range of competing alternatives. Often the substitutions that did occur could be viewed as simply uses of less-preferred or more primitive discourse alternatives. Wernicke's patients had a higher overall rate of substitution errors and a much higher level of pronoun use. However, the large number of substitution errors in the Broca's subjects indicates that they also suffer from some paragrammatic symptoms. The finding that Broca's aphasics produce many substitutions as well as omissions is in conformity with the work discussed in the final chapter of Menn and Obler (1990).

Both groups omitted content words and articles much more than normals. These omissions were particularly frequent in those areas, such as article use, where the grammar permits omission in a variety of circumstances. In areas where omission is not permitted, such as the attachment of case suffixes and verb markings, levels of omission were lower, but still far above those found in normals. In this sense, both Broca's and Wernicke's subjects had a tendency toward telegraphic production. The strong difference between Wernicke's and Broca's article omission levels found by Bates et al. (1987) for German did not appear in Hungarian. Because the Hungarian article does not have the same grammatical load as the German article, the high levels of article omission in both Hungarian groups are not surprising. What is more surprising is the fact that both Broca's and Wernicke's omitted nominal case-marking suffixes at a roughly similar level. One possible way of understanding these differences between the findings for German and those for Hungarian is to hold that the German Broca's patients were experiencing particularly intense difficulty with the complexities of the indirect nature of the mapping of case, number, and gender onto the definite article (MacWhinney, Leinbach, Taraban, & McDonald, 1989). In Hungarian, the mapping is more direct in semantic terms and possibly easier for Broca's subjects to control.

In general, the view of Broca's as agrammatic and Wernicke's as paragrammatic provides a fairly poor characterization of the speech production of these patients—at least as it is viewed through the particular measures we used to study optimal performance in this experiment. Our measures tended to place a great deal of focus on those aspects of the subjects' picture descriptions that came closest to the actual script target.

A more informal analysis suggests a number of differences between Broca's and Wernicke's in the ways in which they attempted to reach this target. Our current structured analyses do not speak to such differences. Instead, they depict a group of individuals who are suffering from a variety of problems related to the selection and activation of grammatical morphemes and content words during the on-line process of sentence formulation.

In general, the results seem to match most closely with the model of normalcy through noise supported by earlier work on the Competition Model (Bates and Wulfeck, 1989; MacWhinney and Bates, 1989; McDonald and MacWhinney, 1989). According to this model, patients should use their residual control of semantics and the lexicon to produce generally correct simple sentences. They should only show agrammatisms or paragrammatisms in areas where the cues to marker selection strongly conflict. In particular case substitutions should be between closely competing cases, such as locatives with other locatives or central cases with other central cases. Comparisons of the performances of the Hungarian subjects with those of the German subjects of Bates et al. (1987) indicate that the speakers of both languages retain sensitivity to the patterns of omission permitted by their native languages. In addition, the comparison of the results for Turkish (Slobin, this issue) with those for Hungarian indicates that the phonological and selectional complexity of the Hungarian system leads to a much higher level of case omissions and substitutions, although the overall pattern of substitutions in these two languages is remarkably similar.

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