APHASIA IN TURKISH: SPEECH PRODUCTION IN BROCA'S AND WERNICKE'S PATIENTS†

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APHASIA IN TURKISH: SPEECH PRODUCTION IN BROCA'S AND WERNICKE'S PATIENTS[1]

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Abstract

Turkish speech production was studied in seven Broca's and ten Wernicke's aphasics. Turkish is an agglutinative language, with few free-standing closed-class morphemes. The speech of Broca's patients was not telegraphic; although nonfluent, noun and verb suffixes were used appropriately. The speech of Wernicke's aphasics was fluent, using a wide range of often inappropriate forms. Both groups used appropriate nominal morphology. Broca's patients used a limited set of verb forms in contextually appropriate fashion. Wernicke's patients used a wide range of verb forms, all morphosyntactically correct, but often semantically anomalous. Both groups retained canonical subject-object-verb word order, and controlled various types of pragmatically appropriate word-order variation. It is proposed that aphasic speech patterns reflect retrieval problems rather than impairment of a portion of the language system.

INTRODUCTION

The grammatical structure of Turkish allows for significant crosslinguistic comparisons in the study of aphasia. Like Japanese, Korean, Hungarian, and Finnish, Turkish is an agglutinating inflectional language. The neutral word order is subject-object-verb (SOV), and Turkish adheres rigorously to the typological features of such languages: all derivational and inflectional morphemes are suffixed; postpositions are used rather than prepositions; and the noun is preceded by demonstratives, numerals, possesives, adjectives, and relative clauses. Suffixes are syllabic and words are enunciated with syllable-timing rather than stress-timing—that is, unstressed syllables are not reduced. Stress is generally word-final, and almost always occurs on grammatical morphemes. There is almost no homophony among grammatical morphemes, and there is virtually no irregularity (by contrast, for example, with Hungarian). Turkish children acquire the basic morphological components of nouns and verbs before the age of 2, and there are hardly any errors throughout the entire course of grammatical acquisition (Aksu-Koç & Slobin, 1985). As a consequence, the system of grammatical morphology is remarkably well preserved in aphasia, with hardly a trace of "telegraphic speech."

In strings of agglutinated morphemes, each element retains its phonological and semantic identity as well as its relative position in the string. The following portion of the paradigm for noun inflection is illustrative. Consider the order of noun suffixes: STEM + (PLURAL) + (POSSESSIVE) + (CASE), as in *el* 'hand', *-ler* 'plural', *-im* 'first person possessive', *-de* 'locative'. The following combinations are possible:

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el 'hand'	*el-ler* 'hands'
el-im 'my hand'	*el-ler-im* 'my hands'
el-de 'in hand'	*el-ler-de* 'in hands'
el-im-de 'in my hand'	*el-ler-im-de* 'in my hands'

The verb allows for a long series of intermediate and final affixes, with markers such as valence, voice, modality, and tense/aspect intervening between the stem and person/number markers. The full series (within the bounds of semantic plausibility in any given instance) includes:

stem-reflexive-reciprocal-causative-passive-potential-negative-
necessitative-tense-conditional-question-person-number

Consider, for example:

ver	'give'
-il-	'passive'
-me-	'negative'
-d-	'past'
-im	'first person'
ver-d-im	'I gave'
ver-me-d-im	'I didn't give'
ver-il-d-im	'I was given'
ver-il-me-d-im	'I wasn't given'

Note that stems can stand alone as full words: *el* 'hand', *ver* 'give' (imperative). Derivational affixes freely convert stems into other form classes; e.g., *el-le* 'to touch', *el-le-ş* 'to shake hands'; and *ver-im* 'output, production', *ver-im-li* 'productive', *ver-im-li-lik* 'productivity'. Note, also, that the possible array of stem-affix strings is so vast that it would be uneconomical to represent each Turkish word as a unique lexical entry. Rather, Turkish words appear to be productive linguistic entities, similar to phrases in Indo-European languages.

Given these exceptionally transparent devices for inflection and word formation in Turkish, it is of special interest to study the patterns of neurological disturbance of a language of this type.

SUBJECTS AND PROCEDURES

Our subjects are seven Broca's and ten Wernicke's aphasics, studied at the Hospital of the Çapa Medical School, Istanbul University.[2] Patients were identified on the basis of CT scans, an aphasia severity rating scale, and clinical evaluation. All were monolingual Turkish speakers.[3] As has been

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[3] We excluded all patients with one or more of the following conditions: (1) history of multiple strokes, (2) significant hearing and/or visual disabilities, (3) severe gross motor abilities, (4) severe motor-speech involvement such that less than 50% of subject's speech attempts are intelligible, (5) evidence of being neurologically or physically unstable and/or (6) less than three months post onset. A summary of patient characteristics can be found in the appendix.

noted in a wide range of languages, the speech of Broca's patients was nonfluent and dysprosodic, with reduced utterance length and sentence complexity, while that of Wernicke's patients was fluent but often semantically empty. However, as will be demonstrated below, the grammatical features of aphasic speech in Turkish do not conform well to the standard textbook descriptions of these two patient groups.

Patients were given a battery of measures, including: biographical interview, naming test, lexical comprehension test, word order/inflection/animacy sentence comprehension test, "cookie theft" picture description test, and "given/new" picture description task. The current report is based on all speech recorded in the biographical interview and the two picture description tasks. The cookie theft task presents a single picture, with the aim of eliciting description and narrative. The given/new task presents nine series of three pictures each, with constant and changing elements across the three pictures (originally used by MacWhinney & Bates, 1978; described below).

RESULTS

Briefly, both Broca's and Wernicke's patients show good retention of basic noun and verb inflections and standard word order. The speech of Broca's aphasics is generally nonfluent, with appropriate use of a restricted set of grammatical morphemes; while the speech of Wernicke's aphasics is fluent, using a wide range of often inappropriate forms.

As an initial orientation to the data, consider the patterns of omissions and substitutions in the given/new task. Subjects were shown nine triplets of pictures, with instructions to "describe what you see" in each series of three pictures. (The order of presentation of individual triplets was varied, as was the order within triplets. Buffer pictures depicting individual, static situations were interspersed between each triplet.) The picture contents are summarized below (S = subject, V = verb, O = direct object, L = locative, D = dative):

Table 1
Given/New Task: The Nine Picture Triplets

STRUCTURE	PICTURES
SV	A (bear, mouse, bunny) is crying.
SV	A boy is (running, swimming, skiing).
SVO	A (monkey, squirrel, bunny) is eating a banana.
SVO	A boy is (kissing, hugging, kicking) a dog.
SVO	A girl is eating an (apple, doughnut, ice cream).
SVL	A dog is (in, on, under) a car.
SVL	A cat is on a (table, bed, chair).
SVOD	A lady is giving a (present, truck, mouse) to a girl.
SVOD	A cat is giving a flower to a (boy, bunny, dog).

Responses were taperecorded and transcribed by a native speaker (Dr. Öget Öktem-Tanör) in standard Turkish orthography, including false starts, repetitions, and extraneous comments. For each picture, a stretch of speech was located that contained in sequence as many matches to the elements of the pictured situation as possible. For example, in response to an SVO picture a patient may have given a long response with retracings and interjections; however, within that overall response, there was a sequence that contained the verb and the object with no subject. In this instance, the patient would be credited with VO and omission of S. The following table presents percentages of **omitted** elements for Broca's (N=6), Wernicke's (N=9),[4] and normal control (N=10) subjects (hospital staff).

All three groups are quite similar with regard to subject omission (about one-fifth of the time) and locative omission (very rare). However, Wernicke's omit both direct and indirect objects more

frequently than normal controls, while Broca's omit verbs more frequently than Wernicke's and normals. (Overall, omissions for both aphasic groups are much lower than comparable figures reported by MacWhinney, Osmán-Sági, and Slobin, in press, for Hungarian Broca's and Wernicke's aphasics.)

These figures are misleading, however, since many omissions are both grammatical and pragmatically normal in Turkish. In a subsequent analysis, we consider only those aphasic omissions that are **not** also made by normal controls to the same pictures. To begin with, it is of interest that Wernicke's make far more ungrammatical omissions than do Broca's: 41% of Wernicke's omissions are not the sort made by controls, while only 26% of Broca's omissions are non-normal. The following figures present percentages of omisions made by aphasic patients that are unacceptable with regard to the normal comparison. (The Locative can be disregarded, since there was only one omission in each of the aphasic groups, and none in the control group.)

Table 3
Percentages of Omissions that were Grammatically Unacceptable in Given/New Picture Descriptions

ELEMENT OF STRUCTURE	BROCA'S	WERNICKE'S
subject (S)	8%	31%
direct object (O)	25%	63%
indirect object (D)	67%	29%
verb (V)	50%	69%

Across these four structural elements, the rate of ungrammatical omissions tends to be higher for Wernicke's aphasics; Broca's have a higher omission rate only for indirect objects. Structures with indirect objects are the longest (SVOD), and may therefore put a strain on processing capacities for Broca's patients. Otherwise, Broca's show a better approximation to normals than to Wernicke's. (A similar pattern is shown in Hungarian, where Broca's have fewer omissions of direct objects and greater omissions of indirect objects, in comparison with Wernicke's.) Remember that these figures represent patients' **best attempts** at encoding each of the structural elements of a picture. The Broca's patients seem to have retained a somewhat better sense of what is called for in the picture-description task.

We can also examine nominals for presence or absence of correct casemarking. (Verbs were never given as bare stems or infinitives.) Overall, as discussed in detail below, the Turkish case system is remarkably well-preserved in both types of aphasia. Unlike Hungarian (MacWhinney et al., in press), there were almost no instances of substitution of one case for another (only three instances of accusative inflection where nominative was required, in Wernicke's patients—probably under short-term control of a following verb, as discussed below). Both patient groups showed some instances of omission of required casemarking, using the nominative (citation form) instead. Such omissions were more frequent for Broca's, especially with regard to the locative, which is the most peripheral in the system of casemarking considered here. The following figures show percentages of case omissions (=nominative) in required contexts.

Table 4
Percentages of Case Omissions in Required Contexts
in Given/New Picture Descriptions

REQUIRED FORM	NOMINATIVES: BROCA'S	NOMINATIVES: WERNICKE'S
accusative (O)	6%	1.5%
dative (D)	11%	5.5%
locative (L)	25%	5.5%

Overall, then, Turkish aphasics tend to describe the Given-New pictures with appropriate nouns and verbs, with a high retention of inflectional marking. A more detailed analysis follows, based on all available transcribed speech (biographical interview, cookie theft picture, Given-New pictures). Speech patterns are discussed with regard to: (1) preservation of nominal morphology, (2) use of verbal morphology, and (3) use of word-order patterns.[5]

NOMINAL MORPHOLOGY

Broca's Aphasics

In Turkish, the stem-form of the noun is the citation form or nominative case. All six patients appropriately use this form for isolated naming and for sentence subjects. However, as noted above, it is almost never used where a casemarked form is required. In most instances, nouns are correctly marked with suffixes for the six grammatical cases: accusative, genitive, dative, locative, ablative, and instrumental/comitative. The following chart shows the range of possibilities for nouns and pronouns:

CASE	NOUN	PRONOUN
NOMINATIVE	*muz* 'banana'	*o* 'it'
ACCUSATIVE	*muz-u* [eat] 'the-banana'	*on-u* 'it'
GENITIVE	*muz-un* 'banana's'	*on-un* 'its'
DATIVE	*muz-a* 'to banana'	*on-a* 'to it'
LOCATIVE	*muz-da* 'on/in banana'	*on-da* 'on/in it'
ABLATIVE	*muz-dan* 'from banana'	*on-dan* 'from it'
INSTR/COMIT	*muz-la* 'with banana'	*on-la* 'with it'

Even the most nonfluent patient provided single words with appropriate casemarking. For example, in describing a picture of a woman giving a gift to a child, he named *kadın* 'woman' in the nominative (*kadın*) and *çocuk* 'child' in the dative (*çocuḡ-a*).

It is noteworthy that in instances of word-finding difficulty, patients often provide pronouns with appropriate casemarking. For example, another patient described the same picture saying: *O ona verdi* 'she to-her gave'. Evidently, nominal elements carry with them their thematic roles, based on a grasp of underlying semantic relations even if a complete proposition fails to be lexicalized.

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[4] One Wernicke's patient did not produce enough propositional speech to be analyzed with regard to patterns of omissions.

Repairs also indicate monitoring for grammatical morphology. Sometimes a participant in a picture will be named in the nominative, with the appropriate case inflection substituted in a self-correction. For example: *Çocuk...çocuǧ-a verdi* ‘child...to-child gave’. In other instances, a patient provides an inflected noun which is syntactically, but not semantically appropriate, followed by substitution of the correct form in the given picture context. For example, the verb *ver* ‘give’ takes both accusative (for direct object) and dative (for recipient). One patient offered an accusative, replacing it with a dative: *çocuǧ-u...kız-a veriyor* ‘child-ACC...girl-DAT gives’ (=gives the child...to the girl). Both forms are syntactically compatible with the verb, but only the latter corresponds to the pictured situation.

If "agrammatism" is defined as the absence of closed-class elements, it is clear that these patients cannot be classified as agrammatic. Turkish, by and large, does not have free-standing closed-class morphemes that could be deleted to produce telegraphic speech. There are no articles, and hardly any conjunctions or subordinating particles. Casemarking, as discussed above, is carried out by suffixes rather than prepositions. Locative postpositions are inflected nouns (corresponding, roughly, to such English expressions as *on top of, in back of*), and are used by all six Broca’s aphasics. Indeed, Turkish 2-year-olds do not produce telegraphic speech either; and, in fact, actual Turkish telegrams do not require this economy.

Wernicke’s Aphasics

Although the speech of Wernicke’s patients tends to be characterized by rambling and groping fragments, casemarking tends to be appropriate—either with regard to the immediate syntactic context, or with regard to the semantic relations in the pictured situation. Since Turkish is verb-final, case inflection on a noun or pronoun depends on the **following** verb. Thus the choice of suffix cannot be determined on a left-to-right basis, but must be made on the basis of an anticipated verb. For example, the verb *hazır* ‘prepare’ requires an accusative object, while the verb *başla* ‘begin’ requires a dative object. Casemarked pronouns are correctly produced by a Wernicke’s patient: *onu hazırlıyorduk* ‘it-ACC we-were-preparing’ (=we were preparing it) and *onlara başlıyorduk* ‘it-PL-DAT we-were-beginning’ (=we were beginning them). Sometimes the "pull" for casemarking exerted by a verb can lead to a semantically anomalous utterance, as when a patient attempted to describe a picture of a monkey eating a banana. He omitted the word for banana, and ended up with *hayvan-ı yiyor* ‘animal-ACC is-eating’—literally ‘(Someone) is eating the animal’. Apparently the noun and verb are accessed together, and the noun inflection is drawn into an object-verb phrase on syntactic grounds. (This phenomenon is reflected in the three instances of accusative substitutions in nominative contexts, reported above.)

In other instances, nouns bear appropriate casemarking with relation to the pictured semantic relations, although they seem to be lost in a long stream of groping and often uninterpretable talk. For example, a patient attempts to describe a picture of a boy kicking a dog. In the course of hesitations, elaborations, and false starts, the words for ‘boy’, ‘dog’, and ‘kick’ appear in the standard subject-object-verb order, with the agent in the nominative and the patient in the accusative, as shown in the capitalized words: *Burada bir...ÇOCUK genç bir erkek...ee bu bir...kiz kendisinden ee çocuǧu ş pardon ee ç ç töp KÖPEǦ-‘İ arka ayaǧına baya bacakla ee BACAK-LA VURUYOR* ‘Here one...CHILD young one male...um this one...girl herself um boy-ACC sh pardon um ch ch tog DOG-ACC hind leg-

[5] Findings from the word-order comprehension test, comparing Turkish and Hungarian aphasics, are summarized in MacWhinney, Osmán-Sági, and Slobin (in press).

DAT lug leg-INSTR um LEG-INSTR HITS'. (Note also the lexical substitution of 'boy' for 'dog' with 'boy' appropriately casemarked for accusative, replaced by 'dog-ACC' after a self-correction.)

A common picture-description strategy consists in naming the participants in the nominative, followed by placement of the nouns in a semantically and syntactically correct sentence frame with appropriate casemarking. For example, in describing a picture in which a cat gives a flower to a rabbit, one patient said: *Kedi tavşan. ... Kedi...tavşan-a...çiçek...veriyor.* 'Cat rabbit. ... Cat...rabbit-DAT...flower...gives.' (Indefinite direct objects are given in the nominative in Turkish.)

In sum, nominal morphology in Wernicke's aphasics is almost always correct—either with regard to the syntax of a fragment, or with regard to the semantics of the referent situation. These patients contrast with Broca's aphasics in that they produce much extraneous elaboration, with fragments that don't always add up to sentences, while Broca's patients produce either well-formed simple sentences or contextually appropriate fragments. But, in both patient populations, nominal grammatical morphology is relatively intact. (These findings contrast with the Hungarian results reported by MacWhinney et al., in press. Although the two languages would appear to be formally similar, the total, exceptionless regularity of the Turkish system must play an important role in facilitating the access of appropriate forms.)

VERBAL MORPHOLOGY

All patients in our sample—both Broca's and Wernicke's—use verbs with inflections for tense, aspect, modality, negation, person, and number. Morphemes are always produced in the correct order, following the stem. The most fluent Broca's patient produced as many as four postverbal suffixes: *Hatırlı-ya-mı-yacağ̄-ım* 'remember-ABILITY-NEGATIVE-FUTURE-1SG' (=I won't be able to remember).

However, the two patient samples differ markedly in the diversity of verbal inflections. We counted the number of distinct suffixes and suffix combinations used at least once in each patient group. A separate tally was made for each tense/aspect form, noting occurrences with a range of suffixes for person, number, negation, valence, voice, and modality, as well as a range of nonfinite verb forms. A conservative estimate of the number of syntactically possible combinations is 500 (ignoring combintions of voice and modality), although it would be hard to find plausible contexts for many possibilities (e.g. a third person, plural, negative, causative). The difference between the two populations is dramatic: Broca's patients use 46 different forms at least once, while Wernicke's use 98.

A detailed examination of the actual forms used is instructive. Broca's aphasics, by and large, limit themselves to a basic core of verb forms, expressing simple past, present, and future tenses, negation, and the single modality of ability (almost always first-person negative—i.e., 'I can't do X'). These uses are contextually appropriate. Wernicke's aphasics use a wide range of forms, all morphosyntactically correct, but often semantically anomalous.

For each verb form, we tabulated the number of patients who used that form at least once. We then isolated the the most frequent forms, using a criterion that a form had to be produced by at least 67% of the patients in each of the two aphasic groups to be considered a "dominant verb form." These forms are shown in the following two charts.

Tense/Aspect. There are four dominant forms for Broca's patients: PRESENT PROGRESSIVE, SIMPLE PAST, NONWITNESSED PAST, and FUTURE.[6] These forms are acquired by

[6] Turkish makes an obligatory distinction in the past tense between reports of direct experience and reports based on inference or hearsay. Aphasics correctly describe pictured actions and autobiographical events in the witnessed past tense, and

Turkish children by age 3. The same forms are also dominant for Wernicke’s patients. In addition, Wernickes use PAST PROGRESSIVE, AORIST (timeless, habitual), and the INFINITIVE. These latter forms are more advanced in child development, being acquired by age 4. Thus, the common core of verb forms for both patient groups includes those forms with the longest developmental history. These forms are probably also the most frequent, although the necessary frequency counts have not yet been carried out.

Table 5
Verb Forms Used by Turkish Aphasics

TENSE/ASPECT FORM	BROCA’S	WERNICKE’S
present progressive (-Iyor)	100%	100%
simple past (-DI)	83%	83%
nonwitnessed past (-mIş)	67%	90%
future (-EcEk)	67%	80%
past progressive (-Iyordu)	50%	70%
aorist (-Ir)	33%	80%
infinitive (-mEk)	50%	80%

Modulations. We have categorized together all those particles that are placed between the verb stem and the tense/aspect inflections as "modulations" of basic verb meaning. These forms include markers of negation, valence, voice, and modality. The dominant forms for Broca’s aphasics include only two categories of modulation: negation and the modality of ability (abilitative); while Wernicke’s aphasics, in addition, have dominant markers for passive, causative, and conditional. All of these forms are present in child speech by age 3, but negation is certainly the earliest to develop.

Table 6
Modulations of the Verb Used by Turkish Aphasics

MODULATION	BROCA’S	WERNICKE’S
negative	100%	100%
abilitative	83%	90%
passive	33%	80%
causative	33%	70%
conditional	0%	70%

With regard to modulation, then, Wernicke’s aphasics tend to express a greater range of **perspectives** on events in their use of verbal morphology. However, even Broca’s patients can have recourse to some less frequent forms under the pressure to impose syntactic coherence on adjacent words. For example, one patient, in describing a picture of a woman giving a truck to a child,

completed actions inferred from pictured situations in the nonwitnessed past tense.

appropriately produced ‘woman’ in the nominative (*kadın*) and ‘child’ in the dative (*çocuğa*), and then, after some hesitation, retrieved ‘truck’ (*kamyon*) in the nominative. At this point he had apparently lost track of the previous sentence frame, and produced a passive verb form, compatible with the last noun: *kamyon ver-il-ecek* ‘truck give-PASSIVE-FUTURE’ (=truck will be given). This was a nonfluent patient, yet he had access to the passive in an appropriate context.

Interclausal verb forms. The equivalents of conjunctions and subordinators are formed in Turkish by nonfinite verb suffixes. Broca’s patients rarely produce utterances of more than one clause, therefore these forms hardly ever occur in their speech. However, forty percent or more of Wernicke’s patients produced such forms to conjoin two clauses or to produce relative clauses. For example, the Turkish equivalent of *she shows a mouse and gives it* is: *fare-yi göster-ip ver-iyor* ‘mouse-ACC show-CONJUNCTION give-PRESENT.PROGRESSIVE’. This construction was among those used by Wernicke’s patients. The following chart lists the nonfinite verb forms used by at least forty percent of Wernicke’s patients, along with comparable figures for Broca’s. All of these forms are used by children by the age of 4.

Table 7
Nonfinite Verb Forms Used by Turkish Aphasics

NONFINITE FORM	BROCA’S	WERNICKE’S
-*ip* ‘and (then)’	17%	60%
-*ken* ‘while’	17%	60%
-*ince* ‘when’	0%	40%
-*dik* RELATIVE CLAUSE	17%	50%
-*deki* LOCATIVE RELATIVE CLAUSE	17%	40%

MORPHEME AND WORD ORDER

As noted earlier, all grammatical morphemes occur in the correct order following noun or verb stems. The word plus its grammatical morphemes is a phonological entity, bound by vowel harmony, and accessed and pronounced as a unit. Pauses occur between, rather than within inflected words, and repairs replace the entire word, rather than the inflections alone. As in child language, errors of vowel harmony do not occur in aphasic patients.[7] For example, the dative is appropriately produced as *çocuğ-A* ‘child-DAT’ and *köpeğ-E* ‘dog-DAT’. Vowel harmony is maintained across strings of agglutinated morphemes. For example, patients correctly produce a series of front unrounded vowels in pronouncing a word such as *el-ler-in-de* ‘hand-PLURAL-POSSESSIVE-LOCATIVE’ (=in her hands), and a series of front rounded vowels in pronouncing a word such as *dök-ül-müş* ‘spill-PASSIVE-NONWITNESSED PAST’ (=was spilled).

[7] Suffixes harmonize with the vowel of the last syllable of the stem in features of height, fronting, and rounding. There are two alternation classes for grammatical morphemes: (1) a front-back alternation of unrounded low vowels, *e/a*, and (2) a front-back, rounded-unrounded alternation of high vowels, *i/ı/ü/u*. Compare, for example, the locative suffix, realized as *İzmir-DE* ‘in Izmir’ and *İstanbul-DA* ‘in Istanbul’, and the genitive suffix, realized as *İzmir-İN*, *Tahran-IN*, *İstanbul-UN*, and *Atatürk-ÜN*. Uninterrupted vowel sequences are avoided by the use of buffer consonants for vowel-initial suffixes, each such inflection carrying its own buffer, as, for example, the intercalated *n* of the genitive, resulting in such forms as *Ankara-nın* (rather than **Ankara-ın*).

Sentences follow canonical word order in both patient groups, and correspond to the word orders used by a group of ten normal controls in describing the same pictures. The dominant orders for all three groups are: SUBJECT-VERB, SUBJECT-OBJECT-VERB, and SUBJECT-DATIVE-OBJECT-VERB. Normal controls show no more flexibility in word order than do aphasic patients in the picture description tasks. Even Broca's aphasics, in their short sentences, occasionally use pragmatically appropriate word order variation. For example, in one series of three pictures a woman gives three different objects to a girl. The girl, being the constant—or "old" information—across the series, is appropriately backgrounded by one Broca's patient, being right-dislocated to postverbal position in the third picture: *Annesi hediye paketini veriyor kızına* 'mother-POSSESSIVE gift package-ACC gives girl-POSSESSIVE-DATIVE' (=her-mother gift-package gives to-her-daughter). This order of SUBJECT-OBJECT-VERB-DATIVE is perfectly normal in context.

There is even suggestive evidence that Broca's patients monitor for appropriateness of word order. One patient, being displeased with an awkward sentence she had produced, said: "I shouldn't have made such an 'inverted sentence'!"

Overall, then, there is no evidence of impairment of grammatical order—for either morphemes or words—in Turkish aphasics.

CONCLUSIONS

These findings with regard to aphasia in Turkish are consistent with suggestions made by Bates, Friederici, and Wulfeck (1987) in a recent analysis of preservation of grammatical morphology in Italian and German aphasics. They report relative preservation of inflected articles in those languages, suggesting that "the way that grammar breaks down in a richly inflected language" (p. 550) differs strikingly from familiar patterns exhibited by English-speaking aphasics. Similar to our findings of preservation of Turkish noun and pronoun inflections, Bates et al. found that aphasics—both fluent and nonfluent—provided the correct article more than 85% of the time when an article was provided, and that patients often corrected themselves after providing an incorrect article. They refer back to Arnold Pick's (1913) observation that omission of function words and inflections was only **occasional** in his agrammatic German and Czech patients. In such "richly inflected languages" grammatical morphemes carry a heavier functional load than in English. Bates et al. note (p. 560): "Patients struggle to provide the article, in keeping with a lifetime habit of furnishing this important piece of information." The phrase "lifetime habit" is significant in the light of our observation that the best-preserved grammatical morphemes in Turkish aphasia are those that are first mastered by children. Turkish makes use of a wide variety of word-order patterns, along with frequent ellipsis of nominal arguments. The only reliable cue to grammatical relations is provided by case inflections. Slobin and Bever (1982) have found that Turkish 2-year-olds understand sentences in all possible orders if case inflections are provided. Thus, following Bates and MacWhinney's (1987) theory of the role of cue validity, one would expect that these morphemes—having high information value in Turkish—should be better preserved in aphasia than function words in languages like English.

Thus it seems reasonable to propose that, for Turkish aphasics, difficulties with grammatical morphology do not reflect impairment of a portion of the language system, but, rather, reflect retrieval problems. As Bates et al. put it (p. 568): "Clearly morphology is not *lost*; rather, focal brain damage seems to affect the patients' ability to *access* these morphemes." They propose that nonfluent patients "are impaired in their ability to access grammatical forms in a rapid, automatic fashion" (p. 570), while fluent patients automatically access inflections, but have lost the ability to monitor their speech. These patterns are clearly reflected in Turkish aphasia as well.

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APPENDIX: PATIENT CHARACTERISTICS

Broca's Patients

FA: male, age 45, right hemiplegia and motor aphasia (occlusive type CVA), left infarct of medial artery, including anterior cerebral artery

MB: male, age 36, hematoma in left hemisphere, aneurysm located in left frontal temporo-parietal area in neurosurgery, postoperative lesion in left temporo-parietal area

HP: male, age 67, left partial infarct of sylvan fissure and left parietal-frontal area, right hemiplegia

YS: female, age 37, pervasive hemhorraging following CVA, right hemiplegia

NS: female, age 39, right hemiparesis and dysphasia following occlusive cerebrovascular accident, infarct in left fronto-temporal area in region of left cerebremedial artery

HT: male, age 41, left hemisphere CVA, infarct in left cerebremedial artery leading to right hemiparesis

Wernicke's Patients

SA: male, age 45, right hemiparesis, aneurism on left temporo-parietal area

RD: male, age 35, occlusive type CVA, temporo-parietal occlusion, right hemiplegia

EG: female, age 64, right hemiparesis, pervasive infarct of frontal-parietal lobe

DG: male, age 45, right hemiparesis, left cerebremedial artery infarct

YK: male, age 59, right hemiparesis, infarct of left temporal lobe

CS: male, age 78, left temporo-parietal infarct of cerebremedial artery, right hemiparesis
MS: male, age 48, occlusive CVA, infarct in left temporo-parietal cortical area
SU: male, age 24, occlusive CVA, infarct in left temporo-parietal cortical area
MY: male, age 65, right hemiparesis, acute cortical and subcortical infarcts in left parietal lobe
FY: male, age 49, infarct of cerebremedial artery in left temporo-parietal area, right hemiparesis