

**LANGUAGE BREAKDOWN:
IMPLICATIONS FOR THE THEORY OF FUNCTIONAL CATEGORIES**

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1.0 AGRAMMATISM AND SYNTACTIC THEORY

Broca's aphasia results from damage to the anterior portion of the left hemisphere of the brain (Broca's area). Agrammatism is the linguistic syndrome that is usually associated with Broca's aphasia. The most striking characteristic of agrammatic speech is the omission, substitution and avoidance of 'function' words and grammatical morphemes, resulting in 'telegraphic' speech. Although the current consensus is that agrammatics have difficulties with functional categories in general (Caplan, 1987; Grodzinsky, 1984b, 1990), systematic studies of specific functional categories are scant (Grodzinsky, 1988, 1991; Hofstede & Kolk, 1994), with virtually no attention being paid to the functional categories within the noun phrase. The goal of this paper is to investigate agrammatic production of nominal functional categories, compare it to agrammatic production of verbal functional categories, and consider the theoretical implications of these findings.

Although agrammatism is characterized by omissions, substitutions and avoidance of specific morphemes, this paper will focus on the omission errors produced by agrammatics of various languages. The utterances in (1) illustrate omissions in the speech of an English agrammatic, where omissions are indicated by square brackets []. In (2) we have examples of omissions in French (a), Italian (b), Dutch (c).

- | | |
|--|-------------------------|
| (1) a. [he] is riding his kite
b. the man carries [a] suitcase
c. [the] witch [is] stirring the brew
d. [the] man feed[s] the dog
e. who [is] playing the violin
f. the woman calls [the] boy | Sanchez (1992) |
| (2) a. peu après [il] contemple [la] récolte
little after [he] gazes at [the] harvest | Nespoulous et al (1990) |
| b. Io [sono] stanco di stare qui
I [am] tired of being here | Miceli et al (1983) |
| c. de man geef[t] de bal aan de jongen
the man give[s] the ball to the boy | Kolk et al (1982) |

Grodzinsky (1990) argues that theoretical models of grammar are subject to 'external' constraints: they must be parsable, learnable, and breakdown-compatible. More specifically, a grammatical theory must be able to account for language breakdown. As stated above, agrammatics have difficulties with functional categories. In keeping with the breakdown-compatibility constraint, I argue that the theoretical distinction between functional and lexical categories is, therefore, a necessary one. Moreover, I provide evidence for the distinction between verbal and nominal categories, so that I may account for the greater difficulty that agrammatics have with verbal elements.

2.0 FUNCTIONAL VERSUS LEXICAL CATEGORIES

2.1 Two Models of Categorial Features

Chomsky (1970) observed a distinction between lexical and functional categories and captured this distinction with the use of features. He presented a model whereby syntactic categories are projections of features: it is the feature [+/- Functional] which results in the Functional-Lexical distinction. Although everyone agrees that syntactic categories are made up of features, the debate revolves around which features are relevant to syntactic categories.

Let us turn to the syntactic distinction between functional and lexical categories presented by Fukui (1986) and Abney (1987). For Fukui, every category has precise featural specifications, as shown in (3).

(3)		[-Functional]		[+Functional]	
		[-Kase]	[+Kase]	[-Kase]	[+Kase]
	[-Nominal]		P	C that	C +WH
[-Verbal]	[+Nominal]	N		D the	D 's
	[-Nominal]	V unacc	V trans/unerg	I to	I Tns/Agr
[+Verbal]	[+Nominal]	A			

Abney, on the other hand, proposes a much smaller set of features, as in (4).

(4)		[-Functional]	[+Functional]
	[-Nominal]	V, Aux, P	I, C
	[+Nominal]	N, A, Q, Adv	D, Deg

Following Chomsky (1970), both Fukui and Abney capture the lexical-functional distinction by having lexical categories defined as [-Functional] and functional categories defined as [+Functional]. However, several problems arise with respect to these models. First, the abundance of features proposed by Fukui leaves us with 'empty slots': we expect to find the [+Kase] counterparts to A and N, for example. With Abney's model, a problem opposite to Fukui's arises: too many distinctions are collapsed. For languages like English, A and N are different and need to be identified as such.

A second point of concern has to do with the bivalent nature of these features. Having both [+] and [-] values of each feature forces us to stipulate which value is to be selected for a given syntactic process. If, on the other hand, features are privative, then necessarily it is the feature that is present that is selected for a given syntactic process. No stipulation is required (the model of categorial features that is adopted below includes the notion of privative features)¹.

Despite these criticisms, the fundamental distinction between lexical and functional categories remains. It is this distinction that is consistent with the agrammatics' differential treatment of these categories.

2.2 Agrammatic Behavior

Let us consider the agrammatic production of lexical and functional categories. The table in (5) shows the omission and substitution rates of an English agrammatic speaker. This data from Menn (1990) reveals that 60% of functional categories are omitted whereas only 4% of lexical categories undergo such a loss. Functional categories suffer a much higher rate of omission.

(5)	Context	Omission - %	Substitution - %
	functional categories	115 - 60%	7 - 4%
	lexical categories	9 - 4%	9 - 4%

The table in (6) illustrates a different aspect of the lexical-functional distinction. In (6) we see that for the Chinese speakers in Packard (1990) 42.5% of morphemes produced by agrammatics are functional categories, whereas 51.9% of morphemes produced by the normal controls are functional categories. Functional categories are significantly underproduced by agrammatics as compared to the normal controls. This reveals an avoidance strategy adopted by agrammatics, which, once again, indicates a distinction between lexical and functional categories.

(6)	Agrammatic	Control	
	42.5%	51.9%	sig <

Any model of syntactic categories must be consistent with these facts. In order to account for the agrammatic treatment of functional categories, a syntactic distinction between lexical and functional categories is required. The models of categorial features presented in 2.1 are both consistent with the agrammatic data since they distinguish between lexical and functional categories: lexical categories are [- Functional]; functional categories are [+ Functional].

3.0 NOMINAL AND VERBAL PARALLEL

3.1 The Theory

As stated above, Chomsky (1970) captures categorial distinctions with the use of syntactic features. These features include [+/- Nominal], which distinguishes between nominal and verbal categories. Even Abney (1987: 60) states that "the noun-verb distinction [is] the most fundamental categorial distinction". Despite this division between nominal and verbal elements, the current trend has been to argue for a strong parallel between nominal and verbal structures (Abney, 1987; among many others).

Lees (1960) was among the first to discuss the parallel between sentences and noun phrases. He showed that sentences and noun phrases are similar in external distribution.

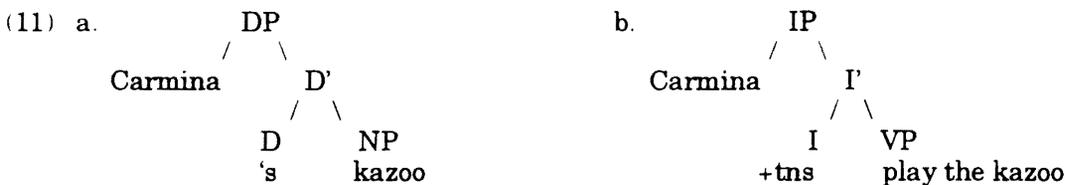
- (7) a. *Carmina* surprised me.
b. *That Carmina played the kazoo* surprised me.
- (8) a. I know *Carmina*.
b. I know *that Carmina played the kazoo*.
- (9) a. [*Carmina*]₁ was known t₁ by many
b. [*That Carmina played the kazoo*]₁ was known t₁ by many.

In (7), both a noun phrase, *Carmina*, and a sentence, *That Carmina played the kazoo*, serve as subject. In (8), these same elements are objects. And in (9), they both undergo movement to subject position of a passive.

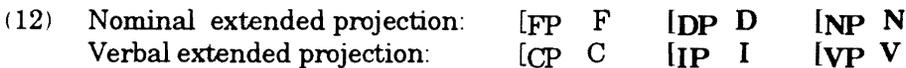
Following Lees, Abney (1987) draws a parallel between sentences and noun phrases and proposes that a functional element serves as head of the traditional noun phrase. In other words, *the dog* projects a DP headed by *the*, just as the tensed verb phrase projects an IP headed by the inflectional element Infl. More specifically, NP is the complement of the functional head D much in the same way as VP is the complement of the functional head I(nfl), as shown in (10).



If DPs and IPs do function in a similar fashion, then subject-predicate relationships will have a similar structure and ought to have matching properties. The most notable example is the English Genitive construction, where the 'subject' of the noun occupies the [Spec DP] position in the same way that the subject of a verb occupies the [Spec IP] position.



Abney's proposal matches nominal functional categories to verbal functional categories². Each of the dominating categories becomes the extension of the nominal or verbal phrases: IP (and CP) is the extended projection of VP; DP (and FP) is the extended projection of NP³. This is schematized in (12).



The extended projections of NP and VP, having parallel structures, are, therefore, expected to exhibit parallel behavior.

3.2 Agrammatic Behavior

It has been shown for a wide variety of languages that agrammatics display significantly greater difficulty with verbal functional categories than with nominal functional categories. Kolk et al. (1982) found that in a specific Dutch agrammatic speaker verb inflections are frequently omitted whereas nominal inflections are never omitted. For English, Jakobson (1964) found agrammatics to have greater difficulty with verbal inflection than with nominal inflection: 3rd person singular *-s* and past *-ed* showed more omissions than plural *-s*. For both Hebrew and Italian agrammatics, verbal inflections are more often wrong than nominal inflections (Hebrew - Grodzinsky, 1982; Italian - Miceli et al., 1983). This behavior is not predicted by extant theories, which all maintain a parallel between verbal and nominal functional categories.

Let us take a closer look at the specific data. The tables below show the percentage omission (and substitution) of each of the categories presented in the left-most column. In each of the tables, the nominal categories are better retained than the verbal elements⁴.

- (13) Nominal and Verbal Omission and Substitution Pattern: Dutch patient #1
Kolk et al. (1990)

	Context	Omission - %	Substitution - %
noun	104	2 - 1.9%	
article	45	36 - 80.0%	1 - 2.2%
lexical verb	91	17 - 18.7%	
auxiliary	57	52 - 91.2%	

- (14) Nominal and Verbal Omission and Substitution Pattern: Dutch patient #2
Kolk et al. (1990)

	Context	Omission - %	Substitution - %
noun	148	4 - 2.7%	
definite article	76	21 - 27.6%	2 - 2.6%
indefinite article	16	7 - 43.8%	
other determiner	20	1 - 5.0%	
lexical verb	81	31 - 38.3%	
auxiliary	34	23 - 67.6%	

Both Dutch patients have greater difficulties with verbal elements than with nominal elements. Dutch patient #1 omits 1.9% of nouns, and 18.7% of verbs. Dutch patient #2 omits 2.7% of nouns, and 38.3% of verbs. When we look at the functional categories within the nominal and verbal projections, we see that this trend is maintained. Whereas articles, which are nominal functional categories, have an 80% omission rate for Dutch patient #1, auxiliaries, which are verbal functional categories, have an omission rate of 91.2%. Dutch patient #2 shows a similar pattern, with determiners exhibiting a range of omission from 5 to 43.8%, and with 67.6% of auxiliaries being omitted.

- (15) Nominal and Verbal Omission and Substitution Pattern: German patient
Stark & Dressler (1990)

	Context	Omission - %	Substitution - %
noun	95	3 - 3%	
definite article	96	11 - 10%	19 - 19%
lexical verb	100	13 - 13%	6 - 6%
auxiliary have/be	14	7 - 50%	2 - 14%

The German patient has greater difficulties with verbal elements than with nominal elements. He omits 3% of nouns, and 13% of verbs. When we look at the functional categories within the nominal and verbal projections, we see that this trend is maintained. Whereas definite articles, which are nominal functional categories, have a 10% omission rate, auxiliaries, which are verbal functional categories, have an omission rate of 50%.

- (16) Nominal and Verbal Omission and Substitution Pattern: English patient #1
Menn (1990)

	Context	Omission - %	Substitution - %
noun	92	1 - 1%	1 - 1%
article	66	4 - 6%	
lexical verb	69	3 - 4%	6 - 12%
auxiliary	35	9 - 28%	1 - 2%

(17) Nominal and Verbal Omission and Substitution Pattern: English patient #2
Menn (1990)

	Context	Omission - %	Substitution - %
noun	139	3 - 2%	3 - 1%
definite article	47	22 - 47%	3 - 6%
indefinite article	16	9 - 56%	
lexical verb	51	6 - 12%	6 - 12%
auxiliary	5	5 - 100%	

Both English patients have greater difficulties with verbal elements than with nominal elements. English patient #1 omits 1% of nouns, and 4% of verbs. English patient #2 omits 2% of nouns, and 12% of verbs. When we look at the functional categories within the nominal and verbal projections, we see that this trend is maintained. Whereas articles, which are nominal functional categories, have an 6% omission rate for English patient #1, auxiliaries, which are verbal functional categories, have an omission rate of 28%. English patient #2 shows a similar pattern, with determiners exhibiting a range of omission from 47 to 56%, and with 100% of auxiliaries being omitted.

It was predicted that the extended projections of NP and VP exhibit parallel behavior. We would, therefore, expect nouns and determiners to show rates of omission similar to their respective verbal counterparts, verbs and auxiliaries. However, the reality is that agrammatics exhibit greater difficulty with verbal categories than with nominal categories.

4.0 NOMINAL AND VERBAL FUNCTIONAL CATEGORIES ARE DIFFERENT

4.1 The Theory

As stated above, the theoretical construct that is discussed in this paper is that of categorial features. The specific categorial model that is adopted is Déchaine (1993), presented in (18) below.

(18)	C	T	V	K ⁵	D	N	P	A
Nominal				+	+	+		+
Referential ⁶		+	+		+	+		
Functional	+	+		+	+			

Déchaine's (1993) feature system captures both the functional-lexical and the nominal-verbal distinctions: functional elements are [+Functional]; nominal elements are [+Nominal]; lexical and verbal elements are unspecified for [Functional] and [Nominal], respectively. Déchaine differs from Fukui (1986) and Abney (1987) in two ways. First, she adopts the features [Referential], [Functional], and [Nominal]. Déchaine has fewer features (and consequently distinctions) than Fukui, but more than Abney. The second way in which she differs from them is in her use of privative features, which, as was argued in section 2.1, is preferred to bivalent features.

4.2 Agrammatic Behavior Revisited

To begin, let us recall that agrammatics omit/substitute functional and verbal categories. Put differently, they retain lexical and nominal categories. For a unified featural account of agrammatic behavior we must have the features [Functional] and [Verbal] OR [Lexical] and [Nominal] (each of the two possibilities are considered below). (18) above has the features [Functional] and [Nominal]. These features do not account for the agrammatic deficit. A revised set of features is required: one feature must be changed.

Agrammatism can be characterized in one of two ways: either agrammatics have difficulty accessing specified categories, or agrammatics can better access specified categories. Let us consider the first option whereby agrammatics have difficulties accessing specified categories. The more

features a category has, the more specified it is. The more specified it is, the less well retained it is. Since functional and verbal elements are less well retained in agrammatic speech, the required features for this approach to the deficit are [Functional] and [Verbal]. Functional elements are [Functional], and lexical elements are unspecified for this feature. Verbal elements are [Verbal], and nominal elements are unspecified for this feature. The resulting categorial table is shown in (19).

(19) ⁷	C	T	V	K	D	N	P	A
Verbal	✓	✓	✓				✓	
Referential		✓	✓		✓	✓		
Functional	✓	✓		✓	✓			

This model predicts that the fewer features a category has the better retained it will be (by an agrammatic). If we compare nouns and verbs, we see that nouns have fewer features than verbs, and are, therefore, predicted to be better retained than verbs. As argued above, this is indeed the case. This model, in fact, predicts the following hierarchy of retention, where ">" means "better retained than".

(20) A > N, P, K > V, D, C > T

This hierarchy predicts that adjectives will show the best retention. This prediction is not borne out (Sanchez, 1994).

Let us now consider the second alternative, whereby agrammatics can better access specified categories. Once again, the more features a category has, the more specified it is. But now, the more specified a category is, the better retained it is. In other words, specified categories are more robust than unspecified categories. Since lexical and nominal elements are better retained in agrammatic speech, the required features for this approach to the deficit are [Lexical] and [Nominal]. Lexical elements are [Lexical], and functional elements are unspecified for this feature. Nominal elements are [Nominal], and verbal elements are unspecified for this feature. The resulting categorial table is shown in (21).

(21)	C	T	V	K	D	N	P	A
Nominal				✓	✓	✓		✓
Referential		✓	✓		✓	✓		
Lexical			✓			✓	✓	✓

This model predicts that the more features a category has (the more robust it is) the better retained it will be (by an agrammatic). If we compare nouns and verbs, we see that nouns have more features than verbs, and are, therefore, predicted to be better retained than verbs. As argued above, this is indeed the case. The hierarchy of retention that this particular model predicts is presented in (22).

(22)⁸ N > V, A, D > P, T, K > C

This hierarchy predicts that nouns are the most robust category and, therefore, will show the best retention. Nouns are indeed the category best retained in agrammatism. The fact that this most basic prediction is supported, whereas that of the hierarchy in (20) is not, argues in favor of the feature model in (21), where [Nominal], [Lexical], and [Referential] are the necessary features⁹.

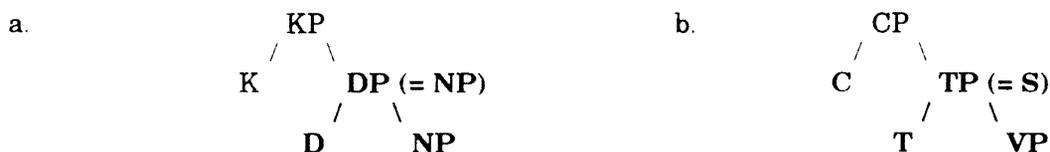
5.0 CONCLUSION AND FURTHER RESEARCH

This paper serves as a bridge between theoretical linguistics and the clinical disciplines. On the one hand, we used grammatical theory to account for certain aspects of the language deficit of agrammatism. On the other, we adopted agrammatic production as a data base with which to test and constrain the grammatical theory.

We saw that two distinctions are relevant to agrammatism: the lexical-functional and nominal-verbal distinctions. In order to provide a unified account of the two distinctions, I adopted the independently motivated theoretical construct of categorial features, whereby syntactic categories are projections of features (Chomsky, 1970). This paper turned to Déchaine's (1993) feature system, which captures the relevant distinctions using the privative features [Nominal], [Functional], and [Referential]. I argued that [Lexical] had to replace [Functional] if the feature system were to account for the agrammatic data. With this final model, I provided an account of agrammatism in which agrammatics better retain categories that have a more robust feature specification. This account produced a retention hierarchy which makes predictions about which categories will be better retained. Needless to say, further research on agrammatic production is necessary in order to test the retention hierarchy with respect to agrammatism, and possibly other language deficits.

NOTES

- 1 See Déchaine (1993) for a more thorough critique of Fukui's and Abney's featural models.
- 2 For a more detailed account of the evidence for the DP/IP parallel see Abney (1987) and Szabolcsi (1983, 1987).
- 3 For a thorough explanation of extended projections, see Grimshaw (1991).
- 4 The implication is that determiners are the nominal counterpart of auxiliaries. For a thorough look at this issue see Sanchez (in progress).
- 5 K = Kase, as in *of* in *Carmina is fond of kazoos*; where *of* has no semantic content, unlike prepositions. For more details see Déchaine (1993).
- 6 [Referential] is required to distinguish between categories that have privileged relationships and categories that do not. (For technical detail cf. the issue of extended projections in Grimshaw (1991)).



N and D have a privileged relationship, where the entire extended projection of DP represents what was traditionally labelled NP. V and T have a privileged relationship, where the entire extended projection of TP represents what was traditionally labelled S. K, C, P, and A, on the other hand, are not involved in privileged relationships.

- 7 Although both Det and Tense are independent categories, they are actually extensions of the nominal phrase and verbal phrase respectively. There is a correlation between the loss of verbs and the loss of verbal functional categories; thus, teasing apart the two types of omissions is quite difficult.
- 8 There seems to be tension between the number of features and the type of features that a category is specified for. This may indicate the need for a Feature Hierarchy, whereby some features are 'stronger' than others. The hierarchy that I wish to propose is the following: Lexical > Referential > Nominal. However, this paper focuses on the influence that robustness has on how agrammatics treat specific categories. The study of featural weight will have to be postponed to a later date.
- 9 For a detailed account of which features are relevant to agrammatism, see Sanchez (in progress).

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