

# EXTENDED PROJECTIONS IN AGRAMMATISM

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## ABSTRACT

*This paper is concerned with agrammatic production and the implications these data have for the theory of syntactic features. Agrammatism, a type of language breakdown, is usually characterized by a significantly higher rate of omission of functional categories than of lexical categories. Agrammatics also display significantly greater difficulty with verbal categories than with nominal categories. This behavior is consistent with Déchaine's (1993) functional/lexical and nominal/verbal syntactic distinctions: functional elements are [+Functional]; nominal elements are [+Nominal]; lexical and verbal elements are unspecified for [Functional] and [Nominal], respectively. However, these features do not provide a unified account of these two agrammatic characteristics. This paper argues that [Verbal] and [Functional] are the requisite features and that agrammatism is governed by a theory of robustness whereby the more feature specifications a category has, the more robust it is, and the easier it is to access. Thus, agrammatic behavior is characterized as better retention of robust categories. Lastly, this paper argues for a syntactic distinction between copulas and auxiliaries, whereby copulas have an independent theta-grid but auxiliaries do not, in order to explain the more frequent omission of auxiliaries as compared to copulas.*

## 1. AGRAMMATISM

Broca's aphasia results from damage to the left frontal lobe (Broca's area). Agrammatism is the linguistic syndrome that is usually associated with Broca's aphasia. Although the current consensus is that agrammatics tend to omit and substitute functional categories in general (Caplan 1987, Grodzinsky 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. This paper compares agrammatic production of verbal and nominal functional categories, addresses the distinction between copulas and auxiliaries, and considers the theoretical implications of these findings.

Agrammatism is characterized by omissions, substitutions and avoidance of specific morphemes. The utterances in (1) and (3) illustrate omission and substitution errors, respectively, in the speech of an English agrammatic. Omissions are indicated by square brackets '[]'; substitutions are indicated by italics, where the content of the following rounded brack-

ets presumably represents the speaker's target. In (2) and (4) we have examples of omissions and substitutions, respectively, for French (a), Italian (b), and Dutch (c) agrammatics.

- |     |    |  |                           |
|-----|----|--|---------------------------|
| (1) | a. | [he] hit[s] the house  | Sanchez (1992)            |
|     | b. | [the] witch [is] stirring the brew   |                           |
|     | c. | [the] man feed[s] the dog  |                           |
|     | d. | who [is] playing the violin  |                           |
| (2) | a. | peu après [il] contemple [la] récolte<br>little after [he] gazes at [the] harvest                        | Nespoulous et al. (1990)  |
|     | b. | Io [sonc:] stanco di stare qui<br>I [am] tired of being here   | Miceli & Mazzucchi (1990) |
|     | c. | de man geef[t] de bal aan de jongen<br>the man give[s] the ball to the boy                               | Kolk et al. (1990)        |
| (3) | a. | limes <i>is</i> (are) sour   | Sanchez (1992)            |
|     | b. | [the] bat is batting <i>the</i> (his) wing[s]  |                           |
|     | c. | the man carries <i>the</i> (a) suitcase  |                           |
| (4) | a. | les (mes) souvenirs [sont] flous<br><i>the</i> (my) memories [are] confused                              | Nespoulous et al. (1990)  |
|     | b. | io <i>dire</i> (dissi) al prof. C.<br>I <i>say</i> (sai I) to prof. C                                    | Miceli & Mazzucchi (1990) |
|     | c. | de dief kwan binnen door <i>de</i> (het) raam<br>the thief came in through <i>the:M/F</i> (the:N) window | Kolk et al. (1990)        |

Grodzinsky (1990) has argued that linguistic theory must be compatible with language breakdown. As stated above, agrammatics have difficulties with functional categories. In keeping with this breakdown-compatibility constraint, I maintain that the theoretical distinction between functional and lexical categories is 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. Lastly, I argue for a syntactic distinction between copulas and auxiliaries, whereby copulas have an independent theta-grid but auxiliaries do not, in order to explain the more frequent omission of auxiliaries as compared to copulas.

## 2. CATEGORIAL FEATURES

Accounting for the variety of syntactic categories that are available to languages, how they vary cross-linguistically, and how they are associated with syntactic structures number among the concerns of linguistics. In English, for example, the basic categories are those of N(oun), V(erb), A(djective), and I(reposition). However, Walpiri has N/A, V, and P.

Navaho differs from both English and Walpiri by combining the A and V categories. Breaking down categories into features allows us to explain the variation as well as predict possible and impossible combinations. Chomsky (1970) adopted such an approach when he observed a distinction between lexical and functional categories. He presented a model whereby syntactic categories are projections of features: the feature [+/-Functional] results in the Functional-Lexical distinction. Although there is agreement that syntactic categories are made up of features, the debate revolves around which features are relevant to syntactic categories. This paper considers agrammatic data to help us determine which are the relevant features.

Let us turn to the categorial features proposed by Fukui (1986), Abney (1987) and Déchaine (1993). For Fukui, every category has precise featural specifications, as shown in (5).

(5) <sup>1</sup>		[-Functional]		[+Functional]	
		[-Kase]	[+Kase]	[-Kase]	[+Kase]
[-Verbal]	[-Nominal]		P	C that	C +WH
	[+Nominal]	N		D the	D 's
[+Verbal]	[-Nominal]	V unacc	V trans/unerg	I to	I Tns/Agr
	[+Nominal]	A			

Abney, on the other hand, proposes a much smaller set of features, as in (6).

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

Lastly, we have the categorial model proposed by Déchaine (1993), presented in (7).

1 The following abbreviations are used: A for adjective/adverb; Aux for auxiliaries; C for complementizer; D for determiner; Deg for degree word; I for inflection; K for kase; N for noun; P for preposition; Q for quantifier; T for tense; V for verb.

(7) <sup>2</sup>	C	T	V	K	D	N	P	A
Nominal				+	+	+		+
Referential		+	+		+	+		
Functional	+	+		+	+			

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]. Their feature systems also distinguish between nominal and verbal categories. Fukui includes both [+/- Nominal] and [+/- Verbal] whereas Abney settles for [+/- Nominal]. However, several problems arise with respect to these models. 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. Further, this model makes a distinction between [-Kase] and [+Kase] C, D and I; agrammatic substitutions and omissions do not appear to distinguish between these two sets (Sanchez 1997)<sup>3</sup>. 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.

Déchaîne's (1993) feature system also captures both the lexical-functional and the nominal-verbal distinctions: functional elements are [+Functional]; nominal elements are [+Nominal]; lexical and verbal elements are unspecified for [Functional] and [Nominal], respectively. Déchaîne differs from Fukui and Abney in two ways. First, she adopts the features [Referential]<sup>4</sup>, [Functional], and [Nominal]. Déchaîne has fewer features (and consequently distinctions) than Fukui, but more than Abney. This makes her system more accurate and, consequently, more desirable.

The second way in which she differs from them is in her use of privative 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 re-

2 Although both D(eterminer) and T(ense) are independent categories, they are actually extensions of the nominal phrase and verbal phrase respectively. See Grimshaw (1991) for further details regarding extended projections.

3 Agrammatics appear to omit [-Kase] and [+Kase] D(eterminers) at the same rate, for example. However, production data comparing [-Kase] and [+Kase] categories is impoverished. As such, more detailed work on these categories is required.

quired. Once again, Déchaine's is the preferred model; as such, it is the model that I adopt in this paper.

3. AGRAMMATIC BEHAVIOR: FUNCTIONAL VERSUS LEXICAL

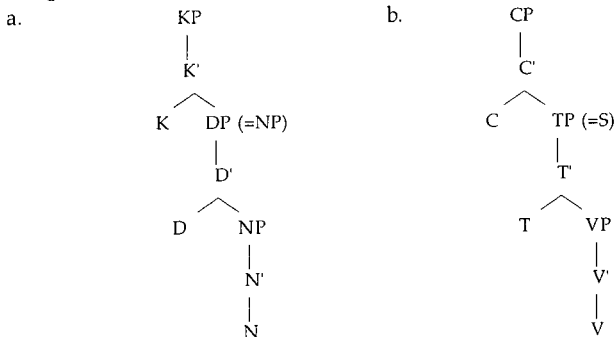
Let us consider the agrammatic production of lexical and functional categories. The table in (8) shows the omission and substitution rates of an English agrammatic speaker. These data from Menn (1990) reveal that 60% of functional categories are omitted whereas only 4% of lexical categories undergo such a loss. Functional categories suffer a much higher rate of omission than lexical categories.

(8) Function and content word omission and substitution pattern  
English (Menn 1990)

	Context	Omission	%	Substitution	%
functional categories	192	115	60%	7	4%
lexical categories	206	9	4%	9	4%

The table in (9) illustrates a different aspect of the lexical-functional distinction. In (9) 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. Once again, a distinction between lexical and functional categories is apparent.

4 Déchaine (1993) argues that [Referential] is required to distinguish between categories that have privileged relationships and categories that do not.



N and D have a privileged relationship. V and T have a privileged relationship. K, C, P, and A are not involved in privileged relationships.

(9) Agrammatic and normal production pattern of functional categories  
Chinese (Packard 1990)

	Agrammatic	Control	
functional categories	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. Déchaine's model of categorial features is consistent with the agrammatic data since it distinguishes between lexical and functional categories: functional categories are [+ Functional]; lexical categories are unspecified for this feature.

## 4. AGRAMMATIC BEHAVIOR: VERBAL VERSUS NOMINAL

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 Italian agrammatics, verbal inflections are more often wrong than nominal inflections (Miceli et al. 1983).

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 elements are better retained than the verbal elements.

(11) Nominal and verbal omission and substitution pattern:  
Dutch patient 1: Kolk et al. (1990)

	Context	Omission	%	Substitution	%
noun	104	2	1.9%		
definite article	45	36	80%	1	2.2%
lexical verb	91	17	18.7%		
auxiliary	57	52	91.2%		

(12) 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%
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 other categories within the nominal and verbal projections, we see that this trend is maintained. Whereas articles, which are nominal<sup>5</sup>, have an 80% omission rate for Dutch patient 1, auxiliaries, which are verbal<sup>6</sup>, have an omission rate of 91.2%. Dutch patient 2 shows a similar pattern, with the definite article exhibiting an omission rate of 27.6%, and auxiliaries an omission rate of 67.6%.

(13) 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	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 other categories within the nominal and verbal projections, we see that this trend is maintained. Whereas definite articles have a 10% omission rate, auxiliaries have an omission rate of 50%.

(14) Nominal and verbal omission and substitution pattern:  
English patient 1: Menn (1990)

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

5 See Sanchez (1997) for arguments concerning status of determiners.

6 See Sanchez (1997) for arguments concerning status of auxiliaries.

(15) 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 other categories within the nominal and verbal projections, we see that this trend is maintained. Whereas articles have an 6% omission rate for English patient 1, auxiliaries 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.

In order to account for the agrammatic treatment of verbal categories, a syntactic distinction between nominal and verbal categories is required. Déchaine's model of categorial features is consistent with the agrammatic data since it distinguishes between nominal and verbal categories: nominal categories are [+Nominal]; verbal categories are unspecified for this feature.

## 5. THEORY REVISITED

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]. Déchaine's model ((7) above) has the features [Functional] and [Nominal]. These features do not allow a unified 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.<sup>7</sup> 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 more difficulties it creates. Since functional and verbal elements are more problematic for the agrammatic speaker, the required features for this approach to the deficit are [Functional] and [Verbal]. Functional elements are [Functional], and lexical elements are unspecified for the feature [Functional]. Verbal elements are [Verbal], and nominal elements are unspecified for the feature [Verbal]. The resulting categorial table is shown in (16).

(16)	C	T	V	K	D	N	P	A
Functional	√	√		√	√			
Verbal	√	√	√				√	
Referential		√	√			√	√	

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'.

$$(17) \quad A > N, P, K > V, D, C > T^8$$

This hierarchy predicts that adjectives will show the best retention; more importantly, that adjectives will show a better retention rate than nouns. This prediction is not borne out (Sanchez 1997).

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 and 'easier' to access 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].

7 As pointed out by a reviewer, this positive characterization is consistent with Kolk et al. (1985).

8 T is predicted to suffer the most loss in agrammatic speech. However, there is a correlation between the loss of verbs and the loss of tense; thus, teasing apart the two types of omissions is quite difficult. For a more thorough discussion see Sanchez (1997).

Lexical elements are [Lexical], and functional elements are unspecified for the feature [Lexical]. Nominal elements are [Nominal], and verbal elements are unspecified for the feature [Nominal]. The resulting categorial table is shown in (13).

(18)	C	T	V	K	D	N	P	A
Lexical			√			√	√	√
Nominal				√	√	√		√
Referential		√	√		√	√		

This model predicts that the more features a category has (i.e., 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 (19).

$$(19) \quad N > V, A, D > P, T, K > C$$

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 (Sanchez 1997, among others). The fact that this most basic prediction is supported, whereas that of the hierarchy in (17) is not, argues in favor of the feature model in (18), where [Lexical], [Nominal], and [Referential] are the necessary features.

## 6. AUXILIARIES AND COPULAS IN AGRAMMATISM

As we saw in our discussion about verbal elements, auxiliaries are omitted more frequently than determiners. Let us now consider how auxiliaries compare to other categories within the verbal projection. In tables (20) through (24), we see that auxiliaries show a much higher rate of omission than verbs.

(20) Verbal and auxiliary omission and substitution pattern:  
Dutch patient 1: Kolk et al. (1990)

	Context	Omission	%	Substitution	%
lexical verb	91	17	18.7%		
auxiliary	57	52	91.2%		

- (21) Verbal and auxiliary omission and substitution pattern:  
Dutch patient 2: Kolk et al. (1990)

	Context	Omission	%	Substitution	%
lexical verb	81	31	38.3%		
auxiliary	34	23	67.6%		

- (22) Verbal and auxiliary omission and substitution pattern:  
German patient: Stark & Dressler (1990)

	Context	Omission	%	Substitution	%
lexical verb	100	13	13%	6	6%
auxiliary	14	7	50%	2	14%

- (23) Verbal and auxiliary omission and substitution pattern:  
English patient 1: Menn (1990)

	Context	Omission	%	Substitution	%
lexical verb	69	3	4%	6	12%
auxiliary	35	9	28%	1	2%

- (24) Verbal and auxiliary omission and substitution pattern:  
English patient 2: Menn (1990)

	Context	Omission	%	Substitution	%
lexical verb	51	6	12%	6	12%
auxiliary	5	5	100%		

Omission of verbs ranges from 4% to 38.3%. Omission of auxiliaries ranges from 28% to 100%. In no individual agrammatic do we find auxiliaries having a rate of omission lower than that of verbs. An explanation for such a difference is fairly straightforward. First, verbs are semantically fully specified whereas auxiliaries act as place holders for tense (among other syntactic attributes). Second, verbs are phonologically robust, whereas auxiliaries are phonologically weak (they can be reduced/contracted while verbs cannot). From these two differences alone, it is clear that verbs and auxiliaries should behave differently.

However, if we compare auxiliaries and copulas we find that auxiliaries are once more omitted more frequently (Sanchez 1997). Consider the following tables.

- (25) Copula and auxiliary omission and substitution pattern:  
English patient 1: (transcripts from Menn 1990)

	Context	Omission	%	Substitution	%	% Error
copula	16			1	6.25%	6.25%
auxiliary	31	6	19.35%	1	3.23%	22.58%

- (26) Copula and auxiliary omission and substitution pattern:  
English patient 2: (transcripts from Menn 1990)

	Context	Omission	%	Substitution	%	% Error
copula	11	7	63.64%			63.64%
auxiliary	6	6	100%			100%

- (27) Copula and auxiliary omission and substitution pattern:  
Dutch patient 1: (transcripts from Kolk et al. 1990)

	Context	Omission	%	Substitution	%	% Error
copula	28	20	71.43%			71.43%
auxiliary	16	15	93.75%			93.75%

- (28) Copula and Auxiliary Omission and Substitution Pattern:  
Dutch patient 2: (transcripts from Kolk et al. 1990)

	Context	Omission	%	Substitution	%	% Error
copula	26	16	61.54%			61.54%
auxiliary	10	8	80%			80%

- (29) Copula and auxiliary omission and substitution pattern:  
German patient 1: (transcripts from Stark & Dressler 1990)

	Context	Omission	%	Substitution	%	% Error
copula	15	2	13.33%			13.33%
auxiliary	25	3	12%	5	20%	32%

- (30) Copula and auxiliary omission and substitution pattern:  
German patient 2: (transcripts from Stark & Dressler 1990)

	Context	Omission	%	Substitution	%	% Error
copula	16	7	43.75%			43.75%
auxiliary	14	7	50%	2	14%	64%

- (31) Copula and auxiliary omission and substitution pattern:  
French patient 1: (transcripts from Nespoulous et al. 1990)

	Context	Omission	%	Substitution	%	% Error
copula	8	3	37.5%			37.5%
auxiliary	20	9	45%	1	5%	50%

- (32) Copula and auxiliary omission and substitution pattern:  
French patient 2: (transcripts from Nespoulous et al. (1990))

	Context	Omission	%	Substitution	%	% Error
copula	18	1	5.56%			5.56%
auxiliary	35	3	9%	5	14%	23%

The distinction between copulas and auxiliaries does not parallel the distinction between verbs and auxiliaries: copulas and auxiliaries are semantically similar; copulas and auxiliaries have the same phonological status. If the distinction is not phonological (or morphological, for that matter) or semantic, it must be syntactic. If the difference between copulas and auxiliaries is syntactic, it may be one of categorial features. However, agrammatism would be the sole motivation for introducing a new categorial feature to the model in (18)<sup>9</sup>. It is more likely that copulas and auxiliaries have the same featural specifications as verbs, namely [Referential] and [Lexical]. Instead, I propose that the distinction is that of theta-marking. Copulas have an independent theta-grid whereas auxiliaries do not.<sup>10</sup> Verbal elements with a theta-grid are syntactically more robust than those without a theta-grid. The more syntactically robust a category is, the better retained it is (in agrammatism).

## 7. CONCLUSION AND FURTHER RESEARCH

This paper serves as a bridge between theoretical linguistics and the clinical disciplines. On the one hand, I used grammatical theory to account for certain aspects of the language deficit of agrammatism. On the other, I

9 An additional categorial feature may be motivated if other types of external evidence provide similar support; i.e., if data from acquisition/learning, dementia, code-switching/mixing, and so forth reveal a distinction between copulas and auxiliaries.

10 Williams (1994) argues that copulas inherit a theta-grid from the (adjectival or nominal) predicate of the clause. What is at issue here is that a distinction between copulas and auxiliaries remain. If copulas inherit a theta-grid, and auxiliaries do not, the distinction is still present.

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 provide a unified account of 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, in accordance with Kolk et al. (1985).

This paper then focused on omission within the verbal projection. We saw that auxiliaries show a much higher rate of omission than both verbs and copulas. I proposed that the distinction is that of theta-marking, where copulas have an independent theta-grid and auxiliaries do not. Verbal elements with a theta-grid are syntactically more robust than those without a theta-grid. Once again I appealed to the notion of syntactic robustness. The more syntactically robust a category is, the better retained it is (in agrammatism).

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.

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