# Agrammatism and functional categories*

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ABSTRACT. The loss of function words and grammatical morphemes in agrammatism has been investigated by a number of researchers. Different theories have been put forth by Goodglass (1968), Kean (1977), and Grodzinsky (1984), as well as several others. One of the problems they faced was that these function words and morphemes did not form a natural class in syntactic theory. The three theories mentioned will be reviewed. The implications of a new theory of syntax (Fukui 1986) for the study of agrammatic speech will then be examined in the hopes that they will encourage further research in this particular area.

## 1.0 INTRODUCTION

Broca's aphasia is a syndrome resulting from damage to the anterior portion of the brain's left hemisphere. The accompanying speech deficits include poor articulation, substitution and deletion of sounds, and impairment in the formation of syntactic patterns. The latter symptom is known as agrammatism.

One of the most striking characteristics of agrammatism is the omission of function words (such as English *the*) and grammatical morphemes (for example, *-ed*) causing speech to sound *telegraphic*. There have been several popular theories regarding the deficit or deficits causing this type of speech. In this paper I will first describe the condition known as agrammatism in more detail. Function words will be defined and I will discuss the problems in deciding which items to include under that definition. I will then review three theories concerning the underlying nature of agrammatism. Finally, a recent theory of syntax within the GB framework, which promises to resolve some of the problems regarding function words and grammatical morphemes, will be briefly outlined. The implications of this theory for agrammatism will also be discussed.

### 1.1 Agrammatism

Agrammatism is the term used for the syndrome in which there is omission of function words and certain grammatical morphemes, and a tendency to use more nouns than other grammatical categories. In reality there is much variation amongst patients.

Although agrammatism is primarily associated with Broca's aphasia, it can also be present in other types of aphasias. In English speaking patients, omission of grammatical morphemes includes loss of verb inflection and agreement in person, number and gender, as well as genitive and plural omissions on nouns. Verbs, when they are used, are often in the infinitival form (e.g. *to like*). Speech may consist of *serial naming* when only nouns, or nouns plus a few other grammatical categories are used.

Two examples of agrammatic speech from English speaking patients are included below to illustrate both the omission of elements and how variation can be manifested:

(1) Yes..ah..Monday..ah..Dad and Peter Hogan [the pseudonym of the patient] and Dad...ah...hospital...and ah Wednesday...Wednesday, nine o'clock...and Thursday...ten o'clock ah doctors...two...two and doctors and ah...teeth. And a doctor...an girl...and gums, and I. (from Goodglass 1968)

(2) Cinderella...poor...um'dopted her...scrubbed floor, um, tidy...poor, um...'dopted...si-sisters and mother...ball. Ball, prince um, shoe...(from Schwartz, Linebargar, and Saffran 1985)

The lack of function words is more evident in the second speech than in the first where there are a number of *and*'s, *an* and *a*, but no *the*'s. The first patient may be using *and* as a time filler rather than as a function, much as the second patient uses *um*. The lack of verbs and the presence of nouns can be clearly seen in both examples but is more marked in the first where no verbs have been used. An obvious example of a missing pronoun is when the patient refers to himself by name rather than using *I*.

## 1.2 Function words and grammatical morphemes

There has been some disagreement as to what vocabulary items should be included in the classification of function words and this naturally influences both the definition of 'function words' and the theories which have been generated to explain their omission. The categories which have been included are determiners (e.g. *the*, *a*), auxiliary verbs (e.g. *have*, *was*), conjunctions (e.g. *and*, *or*), and complementizers (*if*, *that*, and *whether*). An example of *that* used as a complementizer is in (3).

(3) He heard *that* Calgary had a lot of snow.

Function words have traditionally been defined as words which are relatively abstract, have little or no semantic content, do not have referents, do not enter into morphological transactions, and are in a closed system. They are also not usually stressed in a sentence.

Function words are abstract when compared to content words, such as nouns, particularly concrete nouns. However, while it could be said that *the* has little content, prepositions such as *under* have more content, whereas pronouns can, and usually do, refer to something or someone in the real world. This is, however, by virtue of an interpretive dependency on an antecedent, not inherent lexical content. Instead of only two distinct categories, words could be considered as being on a continuum such as the following:

## Figure 1: Word category abstractness

| More Abstract | | | | | | Least Abstract | |
|---|---|---|---|---|---|---|---|
| Det | Prep | Pronoun | Adjectives | Exist. | Action | Abstract | Concrete |
| Comp | Aux | Adverbs | | verbs | verbs | nouns | nouns |
| Conj. | | | | | | | |

Besides being more abstract, function words do not normally undergo morphological changes that other words do. They are not usually pluralized or associated with possessiveness, except for pronouns which do have plural and genitive forms (e.g. *he*, *they*, and *his*).

Function words are considered to belong to a closed class of words. New determiners, auxiliaries, or pronouns are not being added to the vocabulary, whereas new nouns and verbs and even adjectives are always being added (e.g. *jog*, *microwave*, and *microwaveable*).

Another feature of function words is that they are not stressed in normal speech unless the speaker wishes to emphasize a function word for a special reason.

Most researchers (e.g. Kean 1977, 1980, 1985; Goodglass 1973) when discussing agrammatism are concerned not only with free standing morphemes, such as the function words we have been discussing, but also with bound or grammatical morphemes. These researchers have found that it is inflectional morphemes (such as the genitive -'s and the past -ed ) that are more likely to be omitted by agrammatics than derivational affixes (such as -ity in *divinity* ). (Kean 1977).

I will be looking at Kean (1977), Grodzinsky (1984), and Goodglass (1973) as examples of those who have investigated the problem of why some morphemes are omitted by agrammatics more consistently than other morphemes.

## 2.0 THEORIES

Two main streams of thought have developed regarding the cause of agrammatism. One is that agrammatism is a result of a grammatical deficit; the other is that agrammatics simplify their speech as a coping strategy. The first claims that agrammatism has a linguistic explanation, whereas the second suggests that the explanation is psychological in nature.

Those in the "grammatical deficit school of thought" are further divided in their suggestions of the cause of the grammatical deficit. Kean (1977, 1980, 1985), for example, feels that a phonological deficit leads to the omission of function words and grammatical morphemes as well as phonological errors, thereby explaining the co-occurence of phonological paraphasias (saying *pun* for *fun,* for example) and agrammatism in Broca's aphasics. Grodzinsky (1984) feels that it is primarily a loss of syntax or syntactic ability which causes **agrammatism**. As pointed out by Goodglass (1968), the term *agrammatism* us biased towards this viewpoint. Goodglass claims instead that the problems are more psycholinguistic in nature than purely linguistic. Although he has investigated agrammatics' use of linguistic structures (e.g. plural vs. genitive -'s), he introduces constructs which are not linguistic terms. I will discuss the findings of these three researchers in more detail in the following sections.

### 2.1 Phonological deficit

Kean (1977, 1980, 1985) discusses both free standing function words and grammatical morphemes in her articles. Her argument is that a phonological deficit is responsible not only for phonemic paraphasias in Broca's aphasics, but also for the omission of function words and grammatical morphemes.

Her first claim is that many of the morphological omissions have to do with the *sonorance hierarchy,* a ranking of segments first done in Sanskrit by the ancient grammarian, Panini. The sonorance hierarchy places vowels as the most sonorant. These are followed by glides, liquids, nasals, and fricatives. Stops, at the end of the scale, are the least sonorant.

## Figure 2: Sonorance hierarchy

| Most Sonorant | | | | Least Sonorant | |
|---|---|---|---|---|---|
| vowels | glides | liquids | nasals | fricatives | stops |

Accordingly, the -s of the English plural will most likely be deleted after fricatives and stops and least likely deleted after vowels. Kean gives the example of a patient, reported by Goodglass et al. (1972), who could say *kills* and *shoes* (-s after a liquid and a vowel respectively) but omitted the -s in *laughs* (after a fricative).

Kean's second major claim is that agrammatics are more likely to omit word boundary affixes (such as -*ing* in *dancing* ) than formative boundary affixes (such as -*tion* in *destruction* ). In English, inflectional affixes (and some derivational affixes) are word boundary morphemes. Word boundary morphemes do not affect the stress pattern of words (again in English). Note that the following words have different stress patterns after adding formative boundary affixes:

(4) définite           defínitive

(5) légal           legálity

Compare word boundary affixes in the following words in which stress is not affected by the affix:

(6) róse           róses

(7) définite           définitely

Similarly, function words do not affect the stress pattern of sentences:

(8) Close the dóor.

(9) Clóse the door.

Kean concludes that a Broca's aphasic will "...reduce the structure of a sentence to a minimal string of elements which can be lexically construed as phonological words [words with semantic content found in the patient's mental lexicon] in his language" (Kean 1977:25). So the agrammatic may omit the -*ly* in *definitely* leaving a pronounceable word and one which will be in his lexicon, but would not omit *ob* in *object* as *ject* is not a phonological word. Moreover, without the -*ive* the word *defínite*, with the stress on the second syllable, is not a word either and this affix would not be omitted. In English, the phonological words carry or affect the stress pattern, but function words and inflectional affixes do not. Kean also claims that this fact explains why Broca's aphasics do not produce jargon words such as *blick,* as other types of

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aphasics do. Broca's aphasics only produce what is in their lexicon as phonological words.

Kean maintains that since her conclusion is not based on stress alone as a factor but on "...whatever is construed as a phonological word" the explanation is applicable to languages other than English. She gives an example from Russian in which polysyllabic prepositions are phonological words and monosyllabic prepositions are not and are therefore more likely to be omitted by agrammatics (Kean 1980). She claims that Russian agrammatics do tend to omit the monosyllabic prepositions rather than the polysyllabic ones (Kean 1980).

## 2.2 Syntactic deficit

Grodzinsky (1984) argues against Kean's hypothesis by claiming that if it were correct, Hebrew speaking agrammatics would have to be mute. The roots of Hebrew words consist only of consonants. Because affixes are added by the addition of intervening vowels (and perhaps an extra consonant), a Hebrew word without the affix would be unpronounceable. For example, the verb *keep* consists of the consonants *šmr* and has the following infixes:

> (10)  šamœr    'he kept'
>
> šamrah    'she kept'
>
> nišmœr    'he has been kept'
>
> səmor    'keep thou (masc.)'

Grodzinsky found, that in reality, Hebrew speaking agrammatics tend to substitute the incorrect form of a word for the correct form rather than omit it. An example would be using the masculine form of the word when the feminine form is required or using the wrong tense of the verb as the following patient did:

> (11)  šaloš milim...lo...šloša milim ve 'arba'a ne 'elam.
>
> three (F) words (F)...no...three (M) words (F) and four (M) disappear (M sing.) (from Grodzinsky 1984).

Therefore, Grodzinsky suggests that agrammatism is the incorrect selection from a number of possible items. In some languages (English, but not Hebrew) this may include a null (or uninflected) item. In English, *walk* (the null item) may be substituted

for *walking* (the inflected item). In Hebrew and similar languages, as there is no null item, the patient will substitute another inflected item instead.


2.3 Psycholinguistic deficit

Goodglass (1973) tested patients' repetition abilities using sentences or phrases with function words in various stress patterns, such as the following (˘ indicates weak stress; ´ indicates strong stress):


(12)  ˘ ˘ ´ in the house          ´ ˘ ´ Close the door.

   ˘ ˘ ´ Is he home?           ´ ˘ ´ Where is Jack?

          ´ ´ ´ Cows eat grass.


He found that function words were more likely to be omitted when they were in initial position than when the function word was between stressed words. Goodglass interprets this to mean that the agrammatic needs a stressed word to begin an utterance. He found that the position of the function word in the stress pattern was more significant than the complexity level of the sentence (simple interrogative being considered as simpler than negative interrogative, for example).

Sentences which had the stress pattern of ´ ´ ´ with N - V - N, such as *cows eat grass* were all perfectly reproduced. There are no function words in this sentence and all words are equally stressed in normal speech (i.e. when stress is not used for emphasis).

Goodglass and Hunt (1958, quoted in Goodglass 1973) also tested the patient's ability to handle inflectional endings using a question and answer task. They found that patients were more likely to omit the genitive -'s and the 3rd person verb agreement -s than they were the plural -s. This is surprising as all three affixes have the same phonological forms, [s], [z], and [əz], depending on the environment in which they are found (see table 13):


| (13) |  | [s] | [z] | [əz] |
|---|---|---|---|---|
| | plural: | cats | dogs | roses |
| | third person agreement: | walks | jogs | blushes |
| | genitive: | cat's | dog's | judge's |


Goodglass attributes all of these results to a concept he calls saliency although he realises this involves defining a new construct. He says that saliency is the

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"...psychological result of stress [pattern], of the informational significance, of the phonological prominence and of the affective value of a word" (Goodglass 1973:204).

Other studies offer evidence that the idea of saliency may be a valid one. For example, Healy (1980) gave normal subjects a printed passage and instructed them to cross out all instances of the letter *t*. Subjects typically missed out an average of 6.9 out of a total of 40 *t*'s in the passage. What was significant was that 62% of the *t*'s missed were in the word *the*. One explanation for this result is that this particular function word, in reading at least, is not as salient as other words. There were other words in which the *t* was part of the digraph *th* (e.g. *they*) and the *t*'s in these words were not missed as frequently as in *the*. Healy's hypothesis was that the *the* is read as a complete unit (because it is a frequent word) and so the individual *t* is missed in it more easily.

Another study was done by Nespoulous et al (1985, quoted in Caplan 1987:285) on a patient who had problems with pronouns and auxiliary verbs when they occurred in sentences. When these words were in isolation he had no trouble reading them aloud. Nespoulous presented sentences in which some of the function words were highlighted with a magic marker. Function words which had previously been omitted were not omitted when they were highlighted but the patient omitted other function words which were not highlighted instead. It appears that making the function words more salient by highlighting them improved this patient's ability to read them. Though both of these examples involve reading, they do illustrate the concept of saliency and how it can affect people's awareness of certain words. Goodglass' idea of saliency is reminiscent of Kean's claim that in English, words and morphemes not affected by stress would be more likely to be omitted. However, it includes other qualities of the words as well, such as abstractness and the affective or emotional quality of the word. Obviously, function words would have little emotional content.
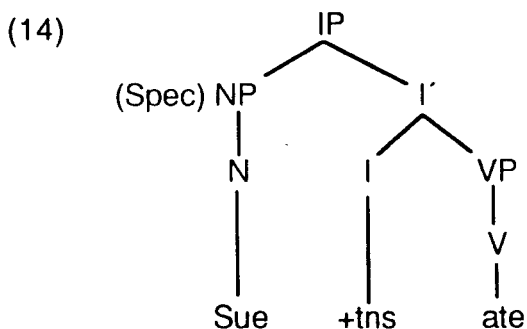
## 3.0   FUNCTIONAL CATEGORIES

We have examined three hypotheses which attempt to explain why function words and certain grammatical morphemes are omitted in the speech of agrammatics. One of the problems investigators noted was that function words did not seem to belong to a *natural class*. For example, Grodzinsky says, "[t]he problem is that prepositions, determiners, auxiliaries, complementizers, and the like do not constitute a natural class within the theory of syntax" (Grodzinsky 1984). Kean felt that there was no way, syntactically, that these words could be grouped together and came to the conclusion that only phonology provided a rationale for their being omitted as a group. She says, "if it is not possible to distinguish between the major categories and the function words on the basis of some general property of syntactic representation, then such analyses will fail to be empirically adequate" (Kean 1980:246).
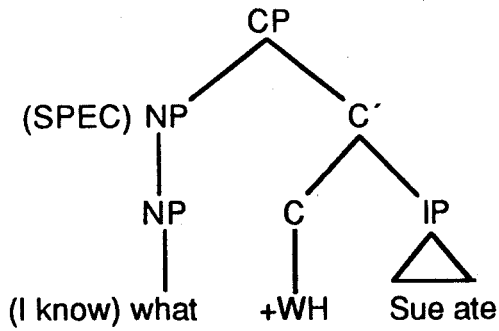
Goodglass' comment is similar: "...the boundaries of psychological components of language, as marked by aphasic symptoms, usually cut across the preconceived categories that we have inferred from a logical analysis of normal speech" (Goodglass 1973:184). A statement by Caplan is even more explicit: the function words and function word categories themselves specify a wide variety of syntactic structures, which makes it hard to capture what they have in common syntactically" (Caplan 1987:266). Recent work in Government and Binding (GB) Theory of syntax, however, appears to provide a solution to this dilemma.

Chomsky (1986) has recently suggested extending the X-bar schema so that CP (COMP phrase) and IP (INFL phrase) both have specifier positions. Fukui (1986), in his dissertation, takes the position of Abney (1987) that in addition to COMP and INFL, determiners (DET) are heads of phrases as well so that we have DP (determiner phrases). According to Fukui, these three (C, I, and D) make up the category *Functional Heads* or *Categories*. Abney (1987) defines Functional Heads as closed class items, elements that lack the semantic value of lexical categories and items that select a unique (that is, non-iterable) specifier.
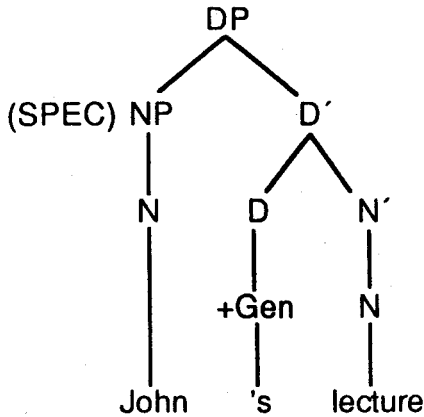
The following phrase structures are built around these Functional Categories (INFL, COMP, and DET):

(14)

```
                    IP
                 ╱      ╲
        (Spec) NP        I´
               │        ╱  ╲
               N       I    VP
               │       │    │
               │       │    V
               │       │    │
              Sue     +tns  ate
```

(15)

```
                    CP
                  /    \
        (SPEC) NP        C´
              |         /   \
             NP        C     IP
              |        |     /\
      (I know) what   +WH   Sue ate
```

(16)

```
                    DP
                  /    \
        (SPEC) NP        D´
              |         /  \
              N        D    N´
              |        |    |
              |      +Gen   N
              |        |    |
            John      's  lecture
```

Note that in examples (14), (15), and (16), only one prehead element is allowed, so that the following sentences would be ungrammatical:

(17) *Sue Mary ate (cf. 14)

(18) *what that Sue ate (cf. 15)

(19) *yesterday John's lecture (cf. 16)

Fukui (1986) observes that traditional X´ theory did not explain why sometimes two or more prehead elements are permitted (as in 20 and 21 below) whereas sometimes only one is allowed.

(20) the *very very old* lady

(21) Boris *has been* eating garlic


Fukui maintains that specifiers of Functional Categories are defined by the fact that their specifiers close off their projections and therefore do not allow anything to be added outside the phrase. For example, in (17), *Mary* (the subject which is the specifier of IP) closes off the projection of the functional head INFL so that adding *Sue* outside the phrase makes the sentence ungrammatical.

The fact that *the* is not iterable suggests that it could be a specifier but as mentioned above Fukui is assuming determiners to be heads of phrases in agreement with Abney (1987). To summarize, Fukui says "[t]he proposal that DET, COMP, and INFL [and prepositions in Abney's view] constitute a natural class of Functional Categories allows parallel structures to be assigned to DP (determiner phrase), IP, and CP" (Fukui and Speas 1986:133). This suggests that there is an answer to the issues raised by others that function words do not constitute a unified category or natural class and makes syntactic explanation of agrammatism more plausible.

Included in Fukui's theory is the idea of F-features or Function-features which includes nominative Case, assigned by tense/agreement, genitive Case, assigned by -'s, and +Wh, assigned by Wh-COMP. The term *Kase* is introduced to include Case in the usual sense (e.g. objective case assigned by transitive verbs) and F-features assigned by Functional Categories. Fukui (1986) gives the following paradigm of English functional categories and their Function features:


## Table 3: F-Features

| | Functional Categories | | |
| --- | --- | --- | --- |
| | **C** | **I** | **D** |
| **Kase assigner** | +Wh | Tns/Agr | 's |
| **non-Kase assigner** | that | to | the,a |
| | if, whether | | that,those |

## 4.0   FUNCTIONAL CATEGORIES AND AGRAMMATIC ERRORS
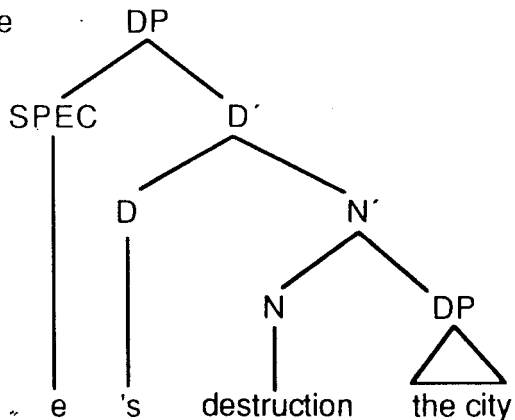
### 4.1  Discussion

The words and grammatical morphemes which are included in the Functional Categories in Fukui's system (in English) are: determiners, the genitive marker (-'s ), tense affixes, verb agreement affixes, and COMP (*that, if,* and *whether* ).  Abney (1987) also includes prepositions and pronouns.  Goodglass (1985) claims that conjunctions, such as *and* and *or,* are not deleted as much by agrammatics as other function words.  It appears that Fukui's list of Functional Categories resembles the list of categories that agrammatics tend to omit the most frequently.
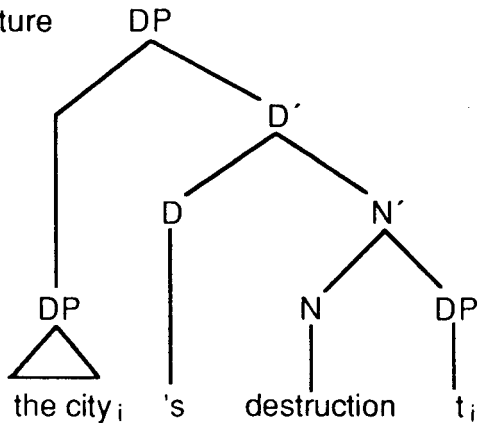
Kean mentioned the distinction between heads of phrases and their specifiers in her discussion of the problem of finding a unified category in order to base agrammatism on a syntactic problem.  But she rejected this discussion as a solution to the problem since "...some function words can act as the heads of phrases.  Prepositions, which are generally classed as function words, are the heads of prepositional phrases" (Kean 1980:246).  If Fukui is correct and DET, COMP, and INFL are also heads of phrases, then they are a unified category in that they are Functional Heads as opposed to Lexical Heads (Noun, Verb, etc.).  Prepositions remain a problem as they are often included in the set of function words and at other times are included in the set of lexical categories.

Kean raised a problem regarding affixes, "...some of the elements typically omitted in agrammatism are inflectional affixes on the heads of phrases and not distinguished in the syntax from their heads under the proposed algorithm" (Kean 1980:246).  Since genitive -'s  and Tns/Agreement are included in Fukui's theory as Functional Categories (DET and INFL, respectively) and thus as heads of phrases this problem is also solved.  The following illustrates the genitive -'s  as head of a phrase (DP) and movement of the noun's argument  into the specifier position:

(22) D-structure

```
                    DP
                 /      \
              SPEC       D'
               |       /    \
               |      D       N'
               |      |      /  \
               |      |     N    DP
               |      |     |    /\
               e     's  destruction  the city
```

(23) S-structure

```
                    DP
                 /      \
               /          D'
              /          /    \
            DP          D       N'
            /\          |      /  \
   the city i          's     N    DP
                         destruction  t i
```

As mentioned in 2.3, Goodglass found that the possessive *-'s* and the 3rd person verbal agreement *-s* were more likely to be omitted in agrammatic speech than the plural *-s*.    Again, we see that the words/morphemes omitted seem to belong to Fukui's Functional Categories.

Grodzinsky (1984) reports that agrammatics retain prepositions which are heads of phrases adjoined to S (in 24a) or when when they are used as particles (in 24b) better than when they are the heads of prepositional phrases contained in an NP (in 24c) or VP (24d).

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(24) a. John plays tennis on Sundays.

b. John ran up a large bill.

c. a rose for Emily

d. John put the cookie on the table


A possible explanation for this selective omission of certain prepositions is that prepositions which are the heads of complements (as in 25 c and d) are the ones which agrammatics will tend to omit rather than prepositions which are not heads of complements (25 a and b).


(25) a. John plays tennis *on Sundays*. (temporal modifier)

b. John *ran up* a large bill. (verb and particle)

c. a rose *for Emily* (argument-benefactive q-role)

d. John put the cookie *on the table*. (argument-locative q-role)


In the above sections we have seen that the words and grammatical morphemes which may be classified under Fukui's (1986) and Abney's (1987) Functional Categories are the ones which agrammatics seem to find problematic.


## 4.2 Implications

Recall that Fukui claimed there are languages which lack some or all Functional Categories and he has given arguments that Japanese lacks all three categories[1]. If this is true, and agrammatics omit or substitute only Functional Category words, then Japanese agrammatics should not omit any words. Agrammatism, however, does exist in Japanese.

Tonoike (1988) disagrees with Fukui's analysis of Japanese and suggests that inflectional endings, case markers, etc. are INFL, COMP, and DET in Japanese. A few examples are given in (26).


(26) a.     INFL=*ta* (past tense marker)

Tabe-ta

eat-Past

'I ate it'

b. COMP=*ga* (subordinate clause marker)

Tabe-ta-ga

eat-Past-though

'though I ate it'


c. DET=*wa* (topic marker)

John-wa kawa-nakat-ta hon

'book John did not buy' (others may have bought it)


If this is so, are these the elements which are consistently missing in the speech of Japanese agrammatics? A case study of a Japanese agrammatic was done by Panse and Shimoyana (1955) in which the patient omitted or substituted words. Some of the omitted elements were case markers but, as other words were omitted or substituted as well, it is not conclusive evidence. More data from other patients are needed.

Lamontagne and Travis (1986), in their discussion of the Case Filter and the Empty Category Principle, suggest that Case be represented by the functional category K and be accorded categorial status. Their theory would also predict that Case markers would be the elements most likely to be omitted by aphasics speaking languages which have overt Case marking, such as Japanese and Turkish.

Chinese, Korean, and Thai may lack some or all of Fukui's Functional Categories and the study of agrammatic speech in these languages may open many interesting avenues for research. Chinese and Thai differ from Japanese and Korean in that they do not use case marking or inflectional endings. Are there other elements which are consistently omitted in the agrammatic speech of these languages? Analyses of these languages, using Fukui's framework, may shed light on why agrammatics omit the words they do.


## 5.0 Summary

Fukui's theory seems to have solved the problem that words systematically omitted in agrammatic speech do not form a natural class. As yet, no solution has been offered to explain what categories are omitted in the speech of agrammatics whose language does not have Functional Categories. At any rate, it does seem to be the case that Functional Category words tend to be the elements omitted in agrammatic speech in English. It is hoped that this paper will encourage future research in the areas of Functional Categories and agrammatic speech across languages in order that we may understand language and how it is organized in the human brain.

## Notes

\*       I would like to thank Gary Libben, William O'Grady, Joyce Hildebrand, and Andrew Roy for their helpful comments, suggestions, and encouragement. Any errors, of course, remain my own.

1       Fukui claimed in his dissertation that Japanese had a defective INFL without F-features. However, in a later work with Speas (1986) he claims that Japanese lacks all three Functional Categories.

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