Interdisciplinary Journal of Linguistics
Volume [11] 2018, Pp.1-28

Verb Morphology in Yemeni Arabic Speakers with Agrammatic Aphasia

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Abstract

The present study examines the nature of verb morphology deficits in Yemeni Arabic (YA) speakers with agrammatic aphasia with a view to finding out to what extent the emerging patterns could be explained within theoretical accounts proposed to explain verb morphology deficit in agrammatic aphasia. For this objective, we present data from YA verb inflection collected from five subjects with Broca's aphasia in three experimental tasks: repetition, completion, and grammaticality judgment. Two major findings emerge from our study. First, the performance of the agrammatic subjects in the sentence repetition task have revealed that YA agrammatic aphasics maintain sensitivity to the word-structure properties of their native language manifested in preservation of the verb inflections of both the perfective and imperfective with the absence of uninflected bare stems. Second, agrammatic subjects examined in this study show impaired knowledge of tense as compared to subject-verb agreement. These findings are discussed in view of existing theoretical accounts of verb morphology deficit in agrammatic aphasia.

Key Words: Verb, Morpheme, Agrammatic, Aphasia, Inflection, Tense, Agreement

Introduction

The study of agrammatism in Broca's aphasia, a language deficit generally associated with serendipitous damage to a specific area of the left cerebral hemisphere, is one of the significant interdisciplinary research pursuits and relates to the broad domain of brain-language relationship in general and of language impairment in particular. It has received much attention in the current neurolinguistics owing to its relevance for the study of the relationship between modern linguistics and neurology (Weisler and Milekic 2000). The correlation between linguistic symptoms and a specific lesion site has been used as evidence of the localizationist view which holds mind/brain as organized into a set of dedicated modules, each devoted to a particular cognitive domain. Grammatical deficits therefore have been mentioned as evidence to argue in favor of the existence of a mental organ for grammar. Further, research in language disorders has also demonstrated the value of these data in informing theories of the normal cognitive system underlying language comprehension and production. More specifically, language deficits observed in agrammatic patients have been investigated in order to validate existing linguistic theories about the nature of the normal grammar.Grodzinsky (2000: 18) writes:

"If language knowledge and use are taken to be biologically supported, then a theory of linguistic representation and use must be compatible with patterns of language reakdown."

Although several researches have emphasized the need for linguistic principles for the analysis of aphasic impairments (Goldstein 1948; Jackson, 1958; Luria1970), the early accounts of agrammatism were largely based on clinical descriptions rather than theory-based interpretations. Over the last few decades, as research in linguistic aphasiology advanced, an

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increasing amount of research in linguistics, psycholinguistics, and neurolinguistics has been conducted in order in order to provide theory-based descriptions of aphasic speech. one of the fundamental issue that is often raised is the question that does language deficit associated with aphasia reflect selective impairments to the various components of grammar such as phonology, morphology, syntax and semantics, and to their representations or to the processes involved in accessing these components? More specifically, the language deficit observed in brain-damaged patients has been studied from two different perspectives.According to one perspective, the linguistic difficulties encountered by agrammatic aphasics reflect a selective syntactic deficit in the functional categories of grammar and their projections. Such an explanation of structural deficit in agrammatism is offered by Hagiwara (1995) and Friedmann and Grodzinsky (1997). They point out that the impairment in agrammatic production is highly selective and can be accounted for in terms of a deficit in the syntactic tree, that is, agrammatic patients produce syntactic trees that are intact up to the Tense node and pruned from this node and up.
The other perspective relies on an assumption that agrammatic deficit is primarily due to processing limitations rather than loss of syntactic competence (e.g., Linebarger, Schwartz, and Saffran 1983; Bates, Friederici and Wulfeck 1987; Friederici and Kilborn 1989; Haarmann and Kolk 1994). It is suggested that agrammatic patients encounter difficulties in producing particular grammatical structures, because they suffer from a computational deficit which does not allow them to implement their grammatical knowledge fully (Friederici and Frazier 1992; Haarmann and Kolk 1994). In other words, the grammatical representations are supposed to be intact in agrammatism, but the process of accessing and using grammatical knowledge is severely impaired.

As far as language breakdown in agrammatic aphasia is concerned, the study of verb morphology in the speech of agrammatic aphasics has been an issue at the heart of linguistic research on agrammatic aphasia. It has been extensively worked on data obtained from different languages in order to understand the mechanisms underlying lexical representation and processing of inflected words as well as the nature of the underlying disorder in patients with agrammatic aphasia. An important issue that has attracted a growing interest among researchers is related to omission and/or substitution of inflectional affixes in agrammatic aphasia.For instance, in the English language, agrammatic spontaneous speech has been characterized by omission of grammatical inflections (Geschwind 1970; Goldstein 1948; Goodglass and Berko 1960). This motivated an interest in crosslinguistic analyses of aphasia in order to formulate a more consistent description of agrammatism (e.g. Grodzinsky, 1984; Bates, Friederici, and Wulfeck, 1987). These studies have shown thatthe extent of omission or retention of inflectional morphology in agrammatic aphasia varies from one language to another depending on the word-structure properties of the premorbid language (Bates *et al.,* 1987).

As pointed out by Grodzinsky (2000: 15), “Broca’s aphasics tend to omit inflections if they speak a language with a zero-inflectional morpheme; otherwise, they tend to substitute”. In languages with poor inflectional system, like English, where bare verb stems can exist as full-fledged words, omission of the inflectional affixes has been widely reported. However, in languages with rich morphology like Hebrew (Grodzinsky 1984, 2000) and Italian (Miceli, Silveri, Romani & Caramazza 1989), where lexical items are always attached with grammatical formatives, agrammatic performance is tended to be characterized with morphological substitution rather than omission errors. As the pattern of omissions or substitutions of inflectional morphemes is seen to be largely influenced by the nature of morphology in a particular language, agrammatic aphasic speakers of languages with rich inflectional system

have been noted to show a tendency to cling to inflectional markers that play an important role in the interpretation of sentences.

A related important issue that has been debated is whether inflectional errors relate to all inflectional categories in the linguistic behavior of agrammatics. Some scholars assume that the deficit caused by agrammatic aphasia results in a complete loss of syntactic abilities (e.g., Bradley, Garrett and Zurif 1980; Caramazza and Zurif 1976; Berndt and Caramazza 1980; Ouhalla 1993). Some studies rule out the possibility of such a complete loss and provide evidence that such impairment is selective, and that not all inflectional morphemes are selectively affected. For instance, the study conducted by Friedmann and Grodzinsky (1997) has shown that Hebrew-speaking agrammatic patients make numerous tense substitution errors while subject-verb agreement is intact, with error rates of less than 10%. By contrast, in a grammaticality judgment task with one of their Hebrew-speaking patients, Friedmann and Grodzinsky (1997) obtained virtually perfect performance on both tense and agreement. To account for the dissociation between agreement and tense, they proposed that the linguistic difficulties experienced by agrammatic aphasics are basically attributed to deficit in the functional categories and their projections.

Recent studieson other languages have reported a similar dissociation between tense and agreement. For example, Wenzlaff and Clahsen (2004) presented data from seven German-speaking agrammatics who, based on their performance in sentence completion and grammaticality judgment tasks, attained high correctness scores for subject-verb agreement, whereas tense marking was severely impaired. These findings provide further support for the cross-linguistic dissociation in tense-agreement use by agrammatic aphasics, and show that the dissociation in tense-agreement is not production-specific phenomenon, but also holds for other modalities, as revealed by the grammaticality judgment task.

In the light of recent findings and assumptions, the major objective of the present study is to investigate sensitivity to verb inflection in agrammatic data of Arabic as they have emerged in a neurolinguistic study carried out on five YA speakers with agrammatic aphasia, and to see how findings of this inquiry interact with the recent theoretical approaches to the deficit in agrammatic aphasia. The study also attempts to specify the role of language-specific properties in the patterns observed, and proposes explanations of the major findings in the perspective of the current linguistic theories of verb inflection deficit in agrammatic aphasia. The YA verb inflection paradigm has been chosen for this purpose where agreement features (person, number, and gender) are overtly marked on verb forms of both the perfective and imperfective paradigms, and tense contrasts (past vs. present) are realized by using the perfective and imperfective forms respectively.

Verb Morphology in YA

Arabic is a Semitic language with rich inflectional system. Like other Semitic languages, Arabic is typologically characterized as a synthetic language in which both inflection and word formation are mainly realized by means of affixation (Bulos 1965). The morphological system of Arabic is also often described as exhibiting non-concatenative morphology (McCarthy & Prince, 1988), where morphological meaning is expressed through internal modificationsof the lexical item. For example,the root/*k-t-b*/together with the vocalic vowels /*a-a-a*/ forms the perfective form *kataba* "he wrote."

In the Yemeni dialect, particularly the Taizzian dialect spoken by the subjects selected for investigation in this study, the root-and-pattern system of Arabic verb morphology has been maintained, though the internal vocalic vowels are not always identical. Most of the perfective forms have the pattern CaCaC or CiCiC (e.g. *katab* 'he wrote/has written', *širib* 'he drank/has drunk'). The most common forms of imperfective are yiCCaC, yaCCuC, yaCuuC as in *yišrab* 'he drinks/is drinking', *yaktub* 'he writes/is writing', *yaʃuum* 'he swims/is swimming' respectively. Both perfective and imperfective forms, except the third singular masculine perfective form, are overtly marked by affixes on the verb, which encode agreement features of Person (first, second, third), Number (singular, plural), and Gender (masculine and feminine). The perfective describes a completed action and contrasts with the imperfective, which denotes an incomplete action, that is, present, progressive, or habitual. The perfective roughly corresponds to the "past tense" and the imperfective corresponds to the "present tense."The inflectional paradigms of perfective and imperfective are presented in Tables 1 & 2.

TABLE 1: Yemeni Arabic Perfective Affixes for Person, Number, and Gender

Person/Gender	Singular	Plural
1.m/f	katab-tu	katab-na
2.m	katab-t	katab-tum
f	katab-ti	katab-tiin
3.m	katab	katab-uu
f	katab-at	katab-iin

TABLE 2: Yemeni Arabic Imperfective Affixes for Person, Number, and Gender

Person/Gender	Singular	Plural
1.m/f	ʔa-ktub	na-ktub
2.m	ta-ktub	ta-ktub-uu
f	ta-ktub-i	ta-ktub-iin
3.m	ya-ktub	ya-ktub-uu
f	ta-ktub	ya-ktub-iin

It is noted in Tables 1&2 that in YA perfective and imperfective verbs, except the third singular masculine perfective form, are overtly marked by affixes on the verb, which encode the morphosyntactic features such as Person (first or second or third), Number (singular or plural), and Gender (masculine or feminine). Tense contrasts, i.e. past tense vs. present, are primarily realized by using the perfective and imperfective forms respectively. The idiosyncrasies of the YA verb inflection system, particularly its rich bound morphology and its obligatory inflectional marking, make it particularly valuable for determining universal versus language-specific aspects of agrammatism in Broca's aphasia.

Method

Subjects

Collection of agrammatic data of Arabic from Broca's aphasia was done from five Yemeni subjects during the period between 2005 and 2006 over a span of seven months of observation. The five agrammatic subjects with Broca's aphasia were all monolingual native speakers of YA. All were right-handed and had left brain damage resulting from a single cerebrovascular accident (CVA). The brain scan reports of all five patients also confirmed such damage as relatively confined to the Broca's area in the left hemisphere. All the subjects had been aphasics at least three months post-onset, and had had no history of neurological disease, developmental language disorders, or history of significant brain disorder or dysfunction (e.g. Alzheimer,

senility, mental retardation), or any history of psychiatric disorders. Their age ranged between 28 and 52 and level of education varied from 6 to 12 years. In addition to these five aphasic subjects, five non-brain-damaged normal speakers of YA were selected to serve as control subjects of the study. They roughly matched the aphasic patients on the parameters of sex, age and educational background. Table 3 gives a summary statement of the relevant information. Each subject was assigned a numeric code for protecting the confidentiality of the person.

TABLE 3
Demographic Profile of Selected Aphasic Subjects

	P1	P2	P3	P4	P5
Age	38	28	52	33	29
Sex	M	F	M	M	F
Years of education	9	8	6	12	8
Hemiplegia	Right Hemiplegia	Right Hemiplegia	Right Hemiplegia	Right Hemiplegia	Recovered
Etiology	CVA (Infract)	CVA (Infract)	CVA (Haemorrhage)	CVA (Aneurism)	CVA
Handedness	R	R	R	R	R

(CVA: Cerebrovascular Accident; M: male; F: female; R: Right)

Experimental Tasks
Three experimental tasks were carried out in this study to examine aphasic patients' knowledge of verb morphology, namely sentence repetition, sentence completion, and grammaticality judgments for grammatical and ungrammatical sentences. The stimuli used in the different tasks were sentences including finite verbs. Each sentence was in the active voice and included only one verb. The repetition task intended to examine patients' ability to retain the various verb inflections of the perfective and imperfective paradigms in a sentence context. In the other two tasks, a distinction was made between tense and other agreement features.In the agreement context, the patients were tested on tasks requiring knowledge of the distinction between the different agreement features (person, number, and gender) of either the perfective or imperfective paradigm. In the tense context, a distinction was made between the past and present tense forms on tasks requiring attention to the distinction between verb forms inflected for either the present or the past tense. A description of the tasks is given below.

Task 1: Sentence Repetition
The study examined whether Yemeni persons with Broca's aphasia remained sensitive to verb morphology of their native language. The agrammatic aphasic's ability to retain verb morphology was examined in a repetition task where verbs inflected for perfective or imperfective were used in the context of a sentence. In constructing the sentences, we selected 10 finite verbs. The verbs were used to construct a single clause declarative sentence in two different inflectional contexts (perfective and imperfective). The task involved 20 different variables, including 10 conjugations for the perfective and 10 conjugations for the imperfective. Each variable was tested twice in simple SVO (Subject-Verb-Object) or SVPP (Subject-Verb-Prepositional-Phrase), making 40 sentences. Though both SVO and VSO word orders are possible in Modern Standard Arabic(MSA) and YA, the first was preferred as it is most commonly preferred and used. Sentences were presented orally in a delayed repetition task. Participants were asked to reproduce the given sentences. Repetition sessions were tape-recorded for further analysis.

TABLE 4
Examples of Stimuli Used in the Sentence Repetition Task

Perfective	**Imperfective**
huu širib?lħaliib	huu yišrab ?lħaliib
he drink-perf.3.s.m milk	*he 3.s.m-drink-imperf milk*
'He drank milk.'	'He drinks/is drinking milk.'

Task2: Sentence Completion
Based on the assumption that agrammatism could be regarded as a selective deficit in the production of tense and agreement morphology (Friedmann and Grodzinsky 1997), various verb inflections of the perfective and imperfective paradigms were examined in two different contexts, i.e. agreement and tense. In the context of agreement, the subjects were tested in tasks requiring knowledge of the distinctions between different agreement features (person, number, and gender) of either the perfective or imperfective paradigm. On the contrary, in the context of tense, the distinction was made between the present and past tense forms in tasks requiring attention to the distinction between verb forms inflected for either the present or the past tense. The two verbs were sought to be matched for all agreement features (person, number, and gender), but differed with respect to tense. Temporal expressions were used to determine whether the past or the present tense was appropriate. The aim was obviously to check the tense of the verb against that of the temporal expression.

The context of agreement involved each of the 20 perfective and imperfective forms to be tested for person (1st, 2nd, or 3rd), number (singular or plural), gender (masculine or feminine), thus resulting in a total of 60 sentences. One half of them was used to test perfective agreement inflections, and the other half was used to test imperfective agreement inflections. The context of tense involved the construction of 40 sentences, one-half in the present and the other half in the past tense. Participants were presented with incomplete sentences and asked to complete sentences by choosing from a set of two alternatives the correctly inflected verb form that would best complete the sentence.

TABLE 5
Examples of the Stimuli Used in the Sentence Completion Task

Agreement	**Tense**
*hum (raaħuu/ *raaħiin) l-ħadiqah* *they (m) go-perf.3.p.m/*go-perf..3.p.f def-park* *They (masculine)_____to the park..* *hum (yaruuħuu/ *yaruuħiin) l-ħadiiqah* *they(m) 3-go-imperf.p.m/3-go-imperf..p.f def-park* *They (masculine)_____to the park.*	ali (*yisaafir/saafar) san a??ams Ali *travels/traveled Sana'a yesterday Ali _____ to Sana'a yesterday. ali (yisaafir/*saafar) san a? kul šahr Ali travels/ *traveled Sana'a every month Ali_____to Sana'a every month.

Task3: Grammaticality Judgment

The task involving grammaticality judgment has been used to assess agrammatic aphasics' sensitivity to the grammaticality of sentential structure. Studies based on this paradigm have shown that Broca's aphasic patients, in spite of some comprehension deficit, are still able to recognize grammatical errors and correctly judge the grammaticality of sentences at above-chance levels (Linebarger, Schwartz, and Saffran 1983; Wulfeck,Bates, and Capasso 1991). This finding of preserved sensitivity to grammatical violations by agrammatic aphasics has already been cited as evidence that agrammatic performance may be due to performance limitations rather than due to a complete loss of morphological knowledge or syntactic knowledge.

The current task investigated sensitivity to tense and subject-verb agreement inflections in a comprehension task that required attention to the inflectional markers of agreement and tense on-line as they hear a sentence. The YA verbal morphological system, characterized by the obligatory occurrence of inflectional affixes which are frequent and salient, is ideal for examining the processing of verb inflections by individuals with agrammatic aphasia. Further, the typical properties of verb inflectional system were expected to facilitate agrammatics' ability to detect the overt inflectional violations of subject-verb agreement and tense inflections on stimuli that require processing of verb inflections.

In order to examine the subjects' comprehension ability on tools that required knowledge of subject-verb agreement, sentences taken from the sentence completion task were presented in the context of grammatical and ungrammatical sentence pairs. The grammatical sentences consisted of a subject pronoun and a verb, in perfective or imperfective form correctly inflected to agree with its subject pronoun in all grammatical features. The ungrammatical sentences contained violation of subject-verb agreement inflection (person, number or gender). The total number of sentences used for testing agreement was 60 pair of sentences, each with a grammatical and ungrammatical sentence. Examples of stimuli in the grammaticality judgment subtest of agreement are given in Table 6 below, where grammatical violations are given with asterisks.

TABLE 6

Examples of Stimuli in the Grammaticality Judgment Sub-Test Involving Agreement

Grammatical	**Ungrammatical**
hum raaħuu l-ħadiqah	hum *raaħiin l-ħadiqah
they (m) go-perf.3.p.m def-park	they (m) *go-perf..3.p.f def-park
They (masculine) went (masculine) to the park.	They (masculine) went (feminine) to the park.
hum yaruuħuu l-ħadiiqah	hum *yaruuħiin l-ħadiiqah
they(m) 3-go-imperf.p.m def-park	they(m) *3-go-imperf..p.f def-park
They (masculine) go (masculine) to the park.	They (masculine) go (feminine) to the park.

In the context of tense, the grammatical sentences consisted of a subject noun or pronoun, a verb correctly inflected in either past or present, and either a past temporal expression or a present temporal expression. The ungrammatical sentences were of the same structure as their grammatical counterparts but contained violation of tense, i.e. past tense verb form was used for a present tense verb form or a present tense verb form was used for a past tense verb form. The grammaticality judgment thus required the subject to check the tense of the verb against that of

the temporal expression that followed it. The total number of sentences in the tense condition was 40 pair, each with a correct tense and another with incorrect tense.

TABLE 7

Examples of Stimuli in the Grammaticality Judgment Sub-Test Involving Tense

Grammatical	Ungrammatical
Past: ali saafar san{a??ams *Ali traveled Sana'a yesterday* *'Ali traveled to Sana'a yesterday.'* *Present: ali yisaafir san a kul šahr* *Ali travels Sana'a every month* *'Ali travels to Sana'a every month.'*	ali *yisaafir san a ams Ali *travels Sana'a yesterday '*Ali travels to Sana'a yesterday.' ali *saafar san a kul šahr Ali *traveled Sana'a every month '*Ali traveled to Sana'a every month.'

Results

Perfective vs. Imperfective in Sentence Repetition

It has been already pointed out that verbs in Arabic are always obligatorily inflected to show overtly rich agreement marking first, second, and third person in the perfective and imperfective forms. Unlike Arabic, the verb in English, a language most examined for agrammatism, is not so heavily inflected, and the subject-verb agreement is not often morphologically realized.This entails that the difference between Arabic and English is taken to be a matter of providing a zero option in verb marking. Arabic tends to provide an overt morpheme in circumstances in which English tends to provide zero marking, i.e. no inflection at all. Based on such properties, it can be reasonably predicted that verb inflection happens to be one of the most preserved elements in the language abilities of the aphasic patients under investigation. The scores and percentages of correct responses in the sentence repetition task are given in Table 8.

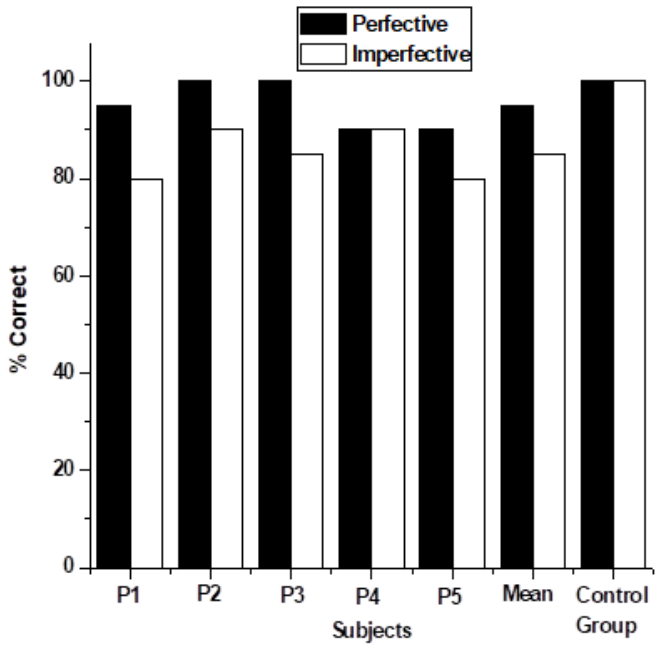
TABLE 8

Correct Responses in the Sentence Repetition Task

Aphasic Patients	**Perfective (N = 20)**		**Imperfective (N = 20)**	
	Correct	**%**	**Correct**	**%**
P1	19	95.0	16	80.0
P2	20	100	18	90.0
P3	20	100	17	85.0
P4	18	90.0	18	90.0
P5	18	90.0	16	80.0
Mean	19	95.0	17	85.0
Range	18-20	90-100	16-18	80-90
Controls (mean)	*100*	*100*	*100*	*100*

An examination of the data presented in Table 8 makes an interesting comparison concerning the performance of the aphasic subjects and the control group under study. As evident in Table 8, the scores and percentages of correct responses in the sentence repetition task lend a considerable support to the claim of preserved sensitivity to verb inflections by aphasic patients with agrammatic aphasia. It is further evident in Table 11 that only a mild deficit is exhibited by the aphasics in producing the correct verb forms used under the verb repetition task. Their performance on perfective forms was noted to range from 90% to 100% and 80 % to 90% with the mean performance of 95% and 85% on the perfective and imperfective forms respectively. As the sentences used in the task were very simple, the control subjects' performance was fairly high in terms of the correct responses. The results obtained with the two groups are given in Figure 1.

Figure 1
Performance of the Aphasic Patients on Perfective vs. Imperfective Forms in the Sentence Repetition Task



Examination of the data in Figure 1 illustrates that the control group encountered no difficulty at all with any of the verb forms. The aphasic subjects also performed well on the perfective forms: the mean performance being 95% correct with SD = 5. Aphasic subjects, however, performed relatively worse on imperfective forms: the mean 85% correct, SD = 5%. These differences appear to be statistically significant for the aphasic group as the t-value on t-test =

3.651, p=0.022 for perfective vs. imperfective. These results show that the aphasic subjects encountered more difficulty with imperfective than with perfective inflections.

Task 2: Tense vs. Agreement in Sentence Completion

A survey of data pertaining to observations of tense vs. agreement completion task offers good insights into verb morphology in Broca's aphasia. A comparison was made for the data of correct responses involving tense forms in comparison to the number of correct responses involving agreement forms. Such correct responses were then used to compute percentage of correct responses. Table 9 gives the results of the aphasic patients as well as the control group observed in different scoring conditions for agreement vs. tense performance noted in the sentence completion task. It is observed that the patients' performance as a whole reveals a marked dissociation between tense and agreement.

TABLE 9

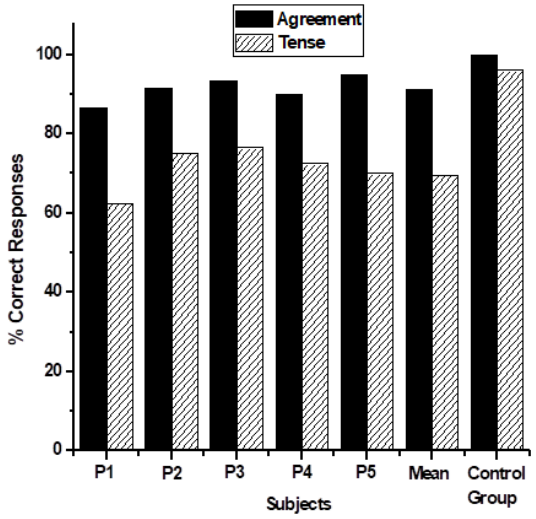
Correct Responses on Agreement vs. Tense in the Sentence Completion Task

Aphasic Patients	**Agreement (N = 60) Correct**	**%**	**Tense (N = 40) Correct**	**%**
P1	52	86.6	25	62.5
P2	55	91.6	30	75.0
P3	56	93.3	27	67.5
P4	54	90.0	29	72.5
P5	57	95.0	28	70.0
Mean	54.8	91.3	27.8	69.5
Range	52-57	86.6-95.0	25-29	62.5-75.0
Controls (mean)	*300*	*100.0*	*192*	*96.0*

It would seem appropriate to first consider the correct use of agreement by the normal controls. As Table 9 shows, the normal YA speakers taken in the control group encountered no or little difficulty with either of the two conditions. They scored 100% correct in agreement performance and 96% correct in the task involving tense. For the aphasic patients, the performance in regard to agreement was generally high with a range of 86.6% for P1 and 95.0% for P5, and a mean percentage of correct responses of 91.3%, SD = 3.22%. Even though their performance was slightly subnormal as compared to that of the control group (with 100%), the difference was significant on a t-test with 6.035, p = 0.001.

FIGURE 2

Performance of the Aphasic Patients and the Control Group in the Sentence Completion Task



Data shown in the bar diagram in Figure 2 point out that the aphasic subjects' performance suddenly dropped with regards to tense, with a range of only 62.5 % for P1 and 75 % for P2 and a mean score of 69.5 % correct responses, SD = 4.80.Their performance is certainly worse than that of the control subjects concerning the use of tense on t-test giving t= 10.600, p = 0.001. This obviously means impairment of tense. Within the aphasic group, results revealed that tense was considerably more impaired than agreement, mean = 69.5 % vs. 91.3 %. This difference is also significant in comparison of the means on a t-test with t= 11.106, p = 0.001). Similar difference between tense and agreement was also noted in the performance of the control group 100% vs. 96 % respectively, with t-test giving t= 3.138, p = 0.035.

To summarize, two interesting findings emerge from the results involving the sentence completion task. First, results of the sentence completion task show that the performance of aphasic patients under investigation in contexts requiring attention to the different verb inflections marking subject-verb agreement is mildly disturbed thus indicating some impairment. Second, the performance in contexts requiring attention to the distinction between past tense and present tense verb forms has shown that it was more susceptible to breakdown in Broca's aphasia.

Task 3: Tense vs. Agreement in Grammaticality Judgment

The motivation behind this task was twofold. Firstly, to explore subjects' sensitivity to the verb inflectional system of YA which is both salient and frequent with a heavy semantic load. Secondly, to find out whether the pattern of impairment observed in the sentence completion, i.e. impaired knowledge of tense vs. intact agreement, could be observed in tasks where linguistic knowledge was employed to decide the grammaticality of the structure. Grodzinsky (2000) has argued that the dissociation between tense and agreement in agrammatic aphasia can be regarded as a potential production-specific phenomenon and not necessarily holding for other modalities. However, the results of the present study on the grammaticality judgment task revealed that the dissociation between tense and agreement was also seen in aphasic patients' performance on the grammaticality judgment task. Table 10 shows the correct responses of individual aphasic patients as well as the control group in the tense and agreement tests of the

grammaticality judgment task. Chance performance is 50% correct. It can be noted that aphasic patients performed well concerning agreement though they performed considerably worse concerning tense.

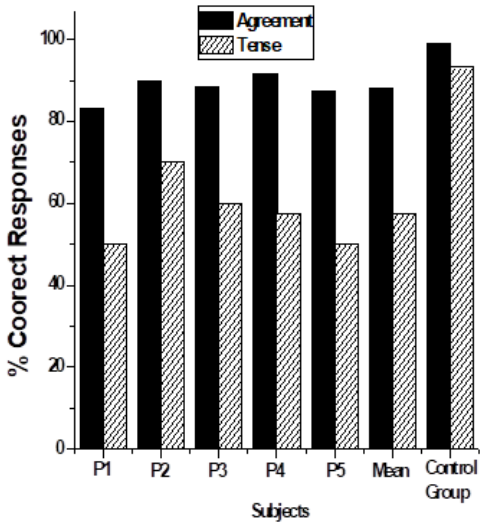
TABLE 10
Correct Responses to Items Involving Agreement vs. Tense in the Grammaticality Judgment Task

Aphasic Patients	**Agreement (N = 120)**		**Tense (N = 80)**	
	Correct	**%**	**Correct**	**%**
P1	100	83.3	40	50.0
P2	108	90.0	58	70.0
P3	106	88.3	48	60.0
P4	110	91.6	46	57.5
P5	105	87.5	40	50.0
Mean	105.8	88.1	46.4	57.5
Range	100-110	83.3-91.6	40-58	50-70
Controls (mean)	*595*	*99.1*	*373*	*93.3*

An examination of the correct responses on agreement and tense reveals that the performance of the normal speakers of YA examined under the performance of control group is above chance level in the agreement as well as the tense condition with mean percentages of correct responses = 99.1 vs. 93.3 % respectively. Among the YA subjects with Broca's aphasia taken up under the study, the aphasic subjects P2, P3 and P4 performed slightly better than chance, i.e. 70 %, 60 %, and 57.5 % respectively, while two others, P1 and P5, performed at chance(50 % each). Generally speaking, the aphasic patients as a group demonstrated near chance performance on tense with a mean 57.5 %. In contrast, their performance on agreement was considerably higher and hence close to normal, in a range from 83.3% to 91.6% with mean percentage of correct responses of 88.1%. Such near-normal performance in the agreement test shows that no aphasic patient resorted to a yes or no strategy in their answers, and that their performance was, no doubt, above the chance level. In all, the observations revealed that the scores of all aphasic patients in the tense test were considerably lower than that on the test of agreement. These data are similar to those obtained in the test of sentence completion task.

Observations on the performance of both the aphasic and control groups were also statistically compared by using t-test. Results of the t-tests showed that the aphasic patients' performance was significantly different from the control group owing to evident impairment in the tense condition with means as 57.5% for the aphasic group compared to 93.3 % for the control group, t-value = 9.294, p = 0.001, and means of 88.1 % vs. 99.1 % in the agreement condition, t value = 7.735, p = 0.001. The control group showed high accuracy scores for agreement and tense (99.1 % vs. 93.3 % respectively). Although their performance on tense was relatively lower than their performance on agreement, the difference was significant when the means were compared on t-test which gave t-value as 5.538, p = 0.005. The aphasic patient group, on the other hand, performed notably worse on tense than on agreement (57.5% versus 88.1%, t-test = 10.080, p = 0.001). The t-test as well as comparison of the data revealed that the aphasic group had impairment of tense rather than of agreement. Comparing the aphasic patients' performance to that of the control's, the aphasic patients' performance on tense displayed more impairment than that of the control group. Their performance on agreement also showed a relative impairment than the control group (Figure 3).

FIGURE 3
Performance of the Aphasic Patients and Control Group in the Grammaticality Judgment Task



These results demonstrate that in examination of the knowledge of tense and agreement on the grammaticality judgment test, YA speakers with Broca's aphasia, like the normal group of YA speakers, exhibited a relatively intact ability to detect subject-verb agreement violations. On the contrary, performance on the test of tense displayed difference between the control group and the aphasic patients. Unlike the control group of normal speakers, the aphasic subjects exhibited impaired ability to detect tense violations, and most of the tense errors could not be detected. Preserved sensitivity to agreement was seen in the subjects' quick response in comparison to their slow response in absence of any such violation. This is consistent with several other studies which have reported that in spite of expressive agrammatism, Broca's aphasics are still able to recognize grammatical errors in someone else's speech (e.g. Linebarger, Schwartz, and Saffran 1983; Lukatela, Shankweiler, and Crain 1995; Wulfeck, Bates, and Capasso 1991).

Agrammatic subjects' Performance across the Different Tasks
A comparison of individual aphasic performance in the two tasks (sentence completion vs. grammaticality judgment) was done, and it was found that the performance of all the agrammatic cases of Broca's aphasia was better for agreement than for tense in each of the two tasks. In addition, all the aphasic subjects were found to perform relatively less accurately in grammaticality judgment than in sentence completion, as shown in Table 11.

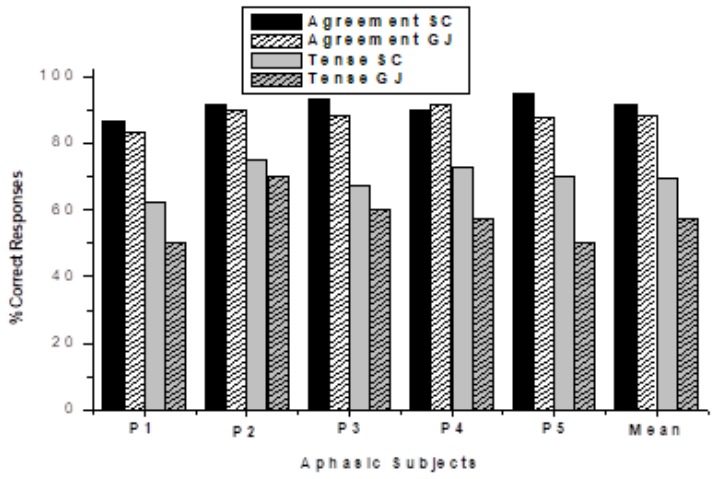
TABLE 11
Correct responses to Agreement vs. Tense in the Sentence Completion and Grammaticality Judgment Tasks

Aphasic	**Sentence Completion**		**Grammaticality Judgment**	
Subjects	**Agreement**	**Tense**	**Agreement**	**Tense**

	(%)	(%)	(%)	(%)
P1	*86.6*	*62.5*	*83.3*	*50.0*
P2	*91.6*	*75.0*	*90.0*	*70.0*
P3	*93.3*	*67.5*	*88.3*	*60.0*
P4	*90.0*	*72.5*	*91.6*	*57.5*
P5	*95.0*	*70.0*	*87.5*	*50.0*
Mean	*91.3*	*69.5*	*88.1*	*57.5*
Range	*86.6-95*	*62.5-75*	*83.3-91.6*	*50-70*
Control group	*100*	*96.0*	*99.1*	*93.25*

An examination of Table 11 shows that performance on both agreement and tense appeared to be affected by the nature of task. Thus, while the control group performed at ceiling for agreement and tense in the completion task, mean 100 % vs. 96 %, they performed relatively less accurately in the grammaticality judgment task, scoring only 93.25 % for tense, though the performance was fairly good for agreement with a score of 99.1%. Similarly, while aphasic subjects performed relatively high for agreement and tense in the sentence completion task, with mean 91.3% and 69.5 % respectively, they displayed impairment of performance as they performed worse on the two conditions in the grammaticality judgment task, with mean 88.1 % vs. 57.5 %. However, even though the performance was slightly affected by the nature of the task, the difference was crucial as it was statistically significant(t-value = 10.080, p = 0.001). Figure 4 depicts the aphasic patients' performance on agreement versus tense as seen across the different tasks.

Figure 4
Performance of Aphasic Patients on Tense vs. Agreement in the Sentence Completion and Grammaticality Judgment Tasks



The results obtained from the sentence completion and grammaticality judgment tasks of the present study reflect tense to be more prone to impairment than subject-verb agreement. Although the aphasic patients of this study demonstrated an understanding of words denoting temporal information, the low performance in the tense condition suggests that these subjects failed to utilize temporal information to select the syntactically and semantically appropriate

tense form during sentence planning. It may be argued that the erroneous selections of verbs in the tense condition is triggered by a deficit in selection from among the verb forms that tend to occur under two verbal paradigms pertaining to the imperfective present tense and the perfective past tense, rather than by any loss of verb inflection perse. It would not be out of context to mention that no such difficulty was observed in the agreement condition, where selection was found to be limited to verb forms occurring under the same paradigm with the same verb stem but different verb morphology. It would be reasonable to suggest that the process of selecting the exact tense form appears to obviously necessitate a degree of precision and specificity that may be problematic for the subjects with Broca's aphasia examined in this study.

Moreover, much evidence for tense randomization errors was seen to accompany the aphasic subjects' performance on the sentence completion task also comes from the grammaticality judgment where aphasic subjects' performance displayed relative impairment on sentences requiring sensitivity to tense contrasts in contexts where tense was a focal point (i.e. past tense versus present tense). Such an impairment, though, was not observed with regards to subject-verb agreement as the aphasic subjects did well on sentences requiring knowledge of subject-verb agreement in agreement-conveying contexts. This points out that the problems encountered in agrammatism due to Broca's aphasia among YA speakers was largely restricted to tense. This further suggests that sensitivity to verb inflection in agrammatic data from Broca's aphasia, particularly for tense, is related to the features conveyed by a particular inflectional marker in the morphosyntactic structure of the verb.

ANALYSIS OF IMPAIRMENT IN THE DATA

In order to facilitate explanation of the factors contributing to influence the performance of the aphasic subjects in our study, we will first consider the issue of verb form, and see whether it has an impact on the subjects' error rates. The purpose obviously is to examine if the errors produced by the aphasics in agreement and tense contexts are directly consequential to the influence of the morphological differences between the perfective and imperfective forms, and whether there is any remarkable preference for either the perfective or the imperfective forms.

Agreement in Perfective and Imperfective

To investigate the effect of verb form on the aphasic patients' performance involving agreement, the number of perfective and imperfective error scores in each task was computed along with the group mean. Table 12 shows distribution of the number and percentage of perfective and imperfective errors encountered in the aphasic data with regard to agreement in both tasks.

TABLE 12

Agreement Errors in the Context of Perfective and Imperfective

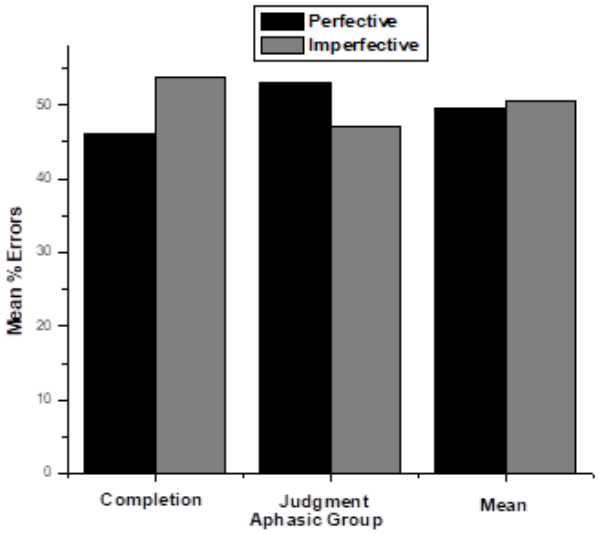
	Sentence Completion (N = 61)					**Grammaticality Judgment (N = 158)**				
Aphasic	**Number**	**Perfective**		**Imperfective**		**Number**	**Perfective**		**Imperfective**	
Patients	**Of errors**	**N**	**%**	**N**	**%**	**Of errors**	**N**	**%**	**N**	**%**
P1	8	3	37.5	5	62.5	24	13	54.2	11	45.8
P2	5	3	60.0	2	40.0	12	6	50.0	6	50.0
P3	4	2	50.0	2	50.0	14	8	57.1	6	42.9
P4	6	3	50.0	3	50.0	10	5	50.0	5	50.0
P5	3	1	33.3	2	66.7	15	8	53.3	7	46.7
Mean		2.4	46.16	2.8	53.84		8	52.92	7	47.08

An examination of data for perfective and imperfective errors in the context of agreement shows that the aphasic performance across the two tasks was quite consistent, with almost similar

number of errors made on the perfective and imperfective in both tasks. In the completion task, the aphasic subjects under study tended to make very few errors on both the perfective (mean = 46.16 %) and imperfective forms (mean = 46.16 %). The same pattern of performance can be also noted in the grammaticality judgment task, with similar errors seen in perfective and imperfective contexts with mean 52.92 % and 47.08 % respectively. Results also indicate that the score errors for both perfective and imperfective forms were affected by the nature of task, i.e. sentence completion vs. grammaticality judgment. Thus while agrammatic subjects made more errors with regard to imperfective than to perfective in the completion task, mean 46.16 % and 53.84 % respectively, they made more errors with perfective (mean = 52.92 %) than with imperfective (mean = 47.08 %) in the grammaticality judgment task. . However, none of these differences are statistically significant t= 1.265, p= 0.275. Overall results establish that the mean error percentage in perfective contexts in the two tasks was similar to that in imperfective contexts, with mean = 49.54 % for perfective as opposed to 50.46 % for imperfective. Figure 5 illustrates the mean percentage of agreement errors for perfective and imperfective in the completion and judgment tasks.

FIGURE 5

Mean Percentage of Agreement Errors for Perfective vs. Imperfective



Tense Errors in Perfective Past and Imperfective Present

We looked at the tense errors by comparing aphasic patients' performance on perfective past vs. imperfective present. The purpose was to find out whether the errors produced by the aphasic patients in the tense-conveying contexts were influenced by the morphological differences between the perfective and imperfective forms, and whether there was a manifest tendency to going for either the past tense or the present tense. Modern Standard Arabic distinguishes past from present tenses through the differences in the stem vocalic patterns and inflectional affixes of the verb (e.g. *katab-a* 'he wrote/has written' vs. *ya-ktub-u* 'he writes/is writing'). From the point of view of morphology, present tense verb forms, in Modern Standard Arabic as well as in the dialect under investigation, have been traditionally alleged to be paradigmatically specified for tense features, whereas past tense is considered to be left unspecified in the inflectional

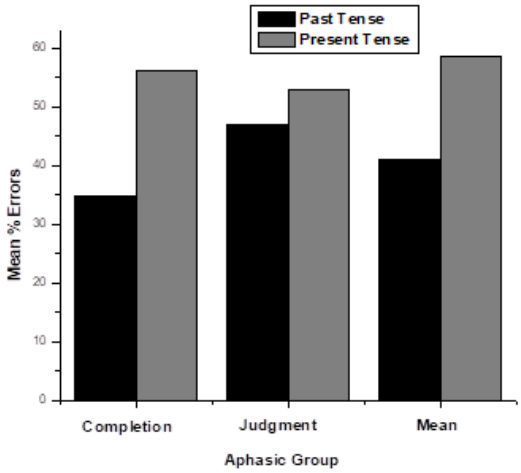
paradigm. For instance, the prefixal affix *ya-* in the data given above indicates the present tense. However, there is no specific morpheme that can be employed to mark the past tense. Of course, there is the suffix, but the suffix expresses agreement features only. This captures the fact that the past tense features are not specified by overt inflectional morphemes in the inflectional paradigm. Considering this morphological distinction between the past tense and the present tense, it would be necessary to examine whether the observed tense deficit in YA speakers with agrammatic aphasia can be explained at the morphological level, namely the presence or absence of overt affixes marking tense features. That is to say, if the subjects had difficulties in the tense condition due to the manner in which tense was coded in the surface structure of the Arabic verb, it would expect them to rely on past tense forms. For this purpose, the study sought to analyze the number of errors made when a particular verb form was used in a context where tense was significant, i.e. in the present tense or in the past tense, in both the completion and grammaticality judgment tasks. Table 13 displays the number and percentage of tense errors made by each aphasic subject in the sentence completion and grammaticality judgment tasks. Errors are sorted out in terms of past tense versus present tense errors.

TABLE 13
Tense Errors in the Context of Perfective Past Tense vs. Imperfective Present Tense

	Sentence Completion (N = 61)					**Grammaticality Judgment (N = 158)**				
Aphasic	**Number**	**Past**		**Present**		**Number**	**Past**		**Present**	
Patients	**of Errors**	**N**	**%**	**N**	**%**	**of Errors**	**N**	**%**	**N**	**%**
P1	15	4	26.7	11	73.3	40	18	45.0	22	55.0
P2	10	4	40.0	6	60.0	22	10	45.5	12	54.5
P3	13	6	46.2	7	53.8	32	13	40.6	19	59.4
P4	11	4	36.4	7	63.6	24	13	54.2	11	45.8
P5	12	3	25.0	9	75.0	40	20	50.0	20	50.0
Total	61	21		40			74		84	
Mean		4.2	34.86	8	65.14		14.8	47.06	16.8	52.94

Looking at the distribution of data of error scores in the sentence completion, given in Table 13, it can be noted that more errors were observed in the context of present tense forms, and hence the subjects' performance in the context of the present tense was relatively impaired than their performance in the context of the past tense. However, similar mean error rates for the past and present were observed in the grammaticality judgment task. In general, results of the sentence completion show that the agrammatic subjects made more erroneous responses in the context of the present tense than in the context of the past tense, with mean 65.14 % vs. 34.86 %. On the contrary, the subjects under study made similar mean error rates for the past and present tense in the task involving grammaticality judgment, with mean 47.06 % and 52.94 % respectively. Results also indicate that the score of errors for both past and present forms appeared to be affected by the nature of task, i.e. sentence completion vs. grammaticality judgment. Thus while agrammatic subjects made similar mean error rates for past (mean 47.06 %) and present (mean 52.94 %) in the grammaticality judgment task, they made more errors with the present tense (mean 65.14 %) than with the past tense (mean 34.86 %) in the completion task. Figure 6 illustrates the mean error proportions for the past and present tense for the aphasic patients' group in both tasks.

FIGURE 6
Mean Percentage of Errors in the Context of the Past and Present Tense



A look at the figure in sentence completion reveals that the mean percentages of errors involving tense were 34.86% and 65.14% in the context of past and present tenses respectively. It indicates that there is major difference in terms of error scores between past and present tense in the task involving sentence completion. Interestingly, patients had similar mean error rates for past and present tense in the grammaticality judgment task (mean 47.06% and 52.94% respectively). These results thus validate that the mean error percentage in the context of the present tense in the two tasks was higher than in the context of the past tense (mean percentages of errors = 59.04 % and 40.96 % respectively). These results clearly show that there does not appear to be any absolute preference of a particular tense form. There were substitution errors in both directions, with past tense forms produced instead of the present tense forms and vice versa. Thus, there is no firm evidence in our data to support that the aphasic patients preferred one of the two tenses as a default option; thus, suggesting that their tense deficit cannot be primarily attributed to the nature of the verbal system which marks tense distinctions.

Discussion

The study has attempted to define the verb morphology deficits likelyto be encountered by YA speakers with agrammatic aphasia.We began by positing some assumptions and hypothesis on morphological deficit in agrammatic aphasia: (1) intact linguistic abilities with regard to the verb morphological structure, (2) preserved sensitivity to verb inflections marking perfective and imperfective verbs, and (3) the relative impairment of two syntactic phenomena (tense and agreement inflection). These have been validated by our results. The major findings can be briefly summed up as follows:

First, the performance of the aphasics in the sentence repetition task conducted to examine verb morphology has revealed that YA agrammatic aphasics maintain sensitivity to the word-structure properties of their native language. It is manifest in retention of the different verb inflections of both the perfective and imperfective with the absence of uninflected bare stems.

Second, as far as large-scale relative impairment of tense vs. agreement is concerned, the analysis largely supports that such dissociation is also operative in Arabic agrammatic aphasia. Specifically, the aphasic patients studied here reflect impaired knowledge of tense contrasts as compared to subject-verb agreement, which is manifest in the production of more tense errors

than agreement errors, most often in the present tense. Despite the occurrence of some agreement errors, the system of finite verb agreement is seen to be relatively spared. Plausible explanations regarding the nature of the dissociation observed can be offered a little later in this section.

Impairment of Verb Morphology: Omission and Substitution

Though the language under investigation offers limited opportunities for omission and/or substitution of verbal affixes of the perfective and imperfective forms, the subjects under study showed remarkable ability to cling to inflections and produce complete inflected words. Our data indeed confirm the prediction concerning the absence of uninflected verbs. Despite occurrences of some infrequent morphological errors, they reflected impairments of substitution rather than omission. The majority of these errors observed in the repetition task affected the imperfective, and thus led to substitutions by perfective forms, which are also morphologically less marked whereas agreement was always preserved. For instance, e.g. *tismaʕuu* (listen-imperf.2.p.m) was produced as *simiʕtum* (listen-perf-2.p.m). Though other forms such as *tismaʕ* (lisen-pres.2.s.m/f), *smaʕuu* (listen-imperative-2.p.m), and *smaʕ* (listen-imperative-2.s.m) are possible occurrences in the dialect, they were not found in our data. It is reasonable to say that switches to such forms would lead to violations of agreement, and hence the subjects avoided such forms as a way out to avoid the problem of shifting reference. In general, the pattern of substitutions appears to largely reflect the subjects' preserved sensitivity to agreement inflections. Thus contrary to the so-called agrammatic omission errors, our agrammatic aphasic subjects predominantly manifest impairments of substitution rather than omission.

A number of factors can be proposed to account for the good performance of our subjects in the present study. One factor is the specific nature of the verb-internal structure in the language spoken by the subjects. The majority of Arabic verbs consist of a tri-consonantal root which always needs to be combined with a word pattern in order to form a phonologically pronounceable word. This results in the formation of verb stems which can then be affixed with an appropriate inflection. Consequently, many inflections cannot be stripped without violating word-structure properties. It can be noted here that the typical structure of the stem, primarily consisting of root and pattern, constitutes a single unit that can be easily stored for later derivations of various verb forms. We may argue that our subjects find it necessary to satisfy all of such structural properties for the formation of pronounceable units that can yield to well-formed lexical items in the language.

A second possible factor seems to be related to the characteristics of the verbal morphology that have various types of morphological markers, particularly regularity and obligatoriness of marking, frequency of occurrence and phonological saliency. It has also been already pointed out that YA perfective and imperfective forms are obligatorily inflected to show agreement marking in person, number, and gender. In order to correctly realize agreement features, a verb must be inflected to match its subject in terms of person, number, and gender. As a result, verb markers cannot be omitted or substituted without affecting grammatical relations. By way of contrast, the verb in English is not heavily inflected and subject-verb agreement is sometimes not realized morphologically. This entails that the difference between Arabic and English is taken to be a matter of providing a 'zero option' in verb marking. It is the obligatory occurrence of overtly morphological affixes which encode heavy morphosyntactic information that lies behind the retention of verb inflection as a way out to avoid the production of uninflected verb forms which may lead to violation of well-formedness of lexical items as well as violation of basic syntactic relations. Such an explanation, no doubt, highlights the importance of the

inflectional system as a major factor responsible for the preservation of the rich morphological system as was observed in YA.

It is clear that YA speakerswith agrammatic aphasia largely show preservation of inflectional morphology as an operation necessary for the structure of the verb as well as a source for providing crucial information about sentence meaning. This fact shows that the traditional description of agrammatic speech in terms of omission of morphological inflections is not appropriate for richly inflected languages such as Arabic. Thus, contrary to what has been claimed by Geschwind (1970), Goodglass and Berko (1960), and Kean (1980) that verbal morphology is vulnerable to omission in agrammatic speech, the performance of the aphasic subjects in this study shows that the verb inflections of the two morphological paradigms investigated were preserved, though there were some sporadic substitution errors. It can be concluded that Yemeni aphasic subjects tend to respect the word-structure properties of their native language when it comes to lexical well-formedness considerations.

Tense and Agreement in Agrammatism

One of the questions that was investigated in the present study concerned itself with the existence of a tense-agreement dissociation in agrammatic aphasia. Across most languages explored in other studies, difficulty with verb inflections in agrammatic aphasia is largely restricted to features of tense while subject verb agreement is relatively retained (e.g., Friedmann and Grodzinsky 1997; Benedet, Christiansen, and Goodglass 1998; Wenzlaff and Clahsen 2004). However, the underlying source of tense errors is still unclear. The results of this study tend to confirm the findings suggested by many of the previous studies. It has been seen that the patterns of performance in sentence completion and grammaticality judgment tasks have revealed that the aphasic patients have a high sensitivity to verb inflection in the contexts in which agreement features are highlighted. Surprisingly, they showed a different pattern of performance on tense contrasts in the same tasks. This suggests that the observed difficulties with verb inflections are primarily restricted to tense. In other words, not all functional categories are equally impaired in agrammatic aphasia; agreement inflection is relatively intact while tense is much more vulnerable to breakdown.

As already discussed, Arabic distinguishes between two major morphological forms: perfective and imperfective. In the perfective the agreement is exclusively suffixal, while in the imperfective it is suffixal and prefixal**.** Both the forms are assumed to involve a complex system of grammatical categories such as agreement (person, number, and gender), tense/aspect (perfective past tense, imperfective present tense), voice (active, passive) and mood (indicative, subjunctive and jussive imperfective). However, given the fusional character of Arabic verb structure, it is not always possible to specify a particular affixal morpheme to a particular inflectional category. A controversy that is still going on is whether the imperfective verb forms carry grammatical features about agreement as well as tense, i.e. present tense, or they are exclusively used to specify agreement features.

According to some analyses, tense in the imperfective forms is encoded in the prefixes (Wright 1896; Bolus 1965). This is the view generally held by the traditional Arab grammarians who consider the imperfective prefixes as markers of the present tense. Benmamoun (1999, 2000) argues that verbal morphology of both the perfective and imperfective forms, corresponding to the past tense and present tense respectively, is not specified for tense, and the distinction

between present and past tense verb is basically the same as is the distinction between imperfective and perfective. Thus, the perfective past tense verb in Arabic lacks the overt inflectional affixes marking tense, but it exhibits inflectional suffixes realizing only agreement morphology. Similarly, the imperfective present tense is identified by the presence of agreement morphology represented by the bound prefixes and suffixes on the verb. In this sense, the imperfective verb does not carry any tense information, and hence its verbal morphology is exclusively used to realize only agreement features. This conclusion was drawn by Benmamoun (2000:30) based on the facts that the imperfective form can occur in the context of the present tense, future tense, past tense, imperatives, and circumstantial adjuncts.However, unlike the imperfective, Benmamoun (*ibid*) argues that the perfective verb carries past tense features realized by an abstract morpheme similar to the present tense in English, which lacks specific phonological realization except for realizing agreement features in the third person singular.

If Benmamoun's claim is taken into consideration, one of the differences between tense and agreement in Arabic can be explained as related to the morphological properties of verb inflections that specify tense and agreement features. In other words, while agreement features are expressed by overt inflectional affixes, tense is marked by the absence of distinct temporal inflectional affixes. This suggests that verb morphology in Arabic is used mainly to express agreement features. As it does not intrinsically express anything specifically temporal, one can claim that a distinct temporal morpheme is lacking in the inflectional paradigms of both the perfective and imperfective forms.

Given the abovementioned analysis, the performance of the aphasic subjects in tasks requiring knowledge of tense distinctions could be attributed to the nature of the verb inflectional system, namely the absence of overt tense features in the inflectional system in Arabic. Unlike tense, agreement is always realized by the rich inflectional affixes on both the perfective and imperfective forms. These inflectional affixes thus carry heavy semantic load about essential elements in the sentence such as the identity of the subject. It means that categories with abstract morphological features can cause more constraints to patients with Broca's aphasia due to the extra processing load they impose on the aphasic speakers. This suggests that sensitivity to verb inflection is related to the function served by a particular inflectional marker in the morphosyntactic structure of the verb. Specifically, we propose that verbs in Arabic are primarily marked in the lexicon for agreement with the subjects while tense is largely a complementary feature that carries some information salience in the language.

Briefly, it seems reasonable to suggest that the problems encountered with inflectional morphology in the language abilities of YA speakers with Broca's aphasia do not reflect a complete loss of the principles and rules of inflectional morphology. Agrammatism rather reflects retrieval or access problems to certain grammatical processes; where representations are intact, but the mechanisms whereby they are retrieved are damaged. As Bates, Friederici, and Wulfeck (1987: 568) argue, "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." Such patterns are clearly reflected in Arabic aphasics as well. Thus there is no reason to suggest morphological breakdown of Arabic verb in terms of complete loss of grammatical categories in the language abilities of Broca's agrammatic aphasics as has been proposed earlier (Ouhalla 1993; Berndt and Caramazza 1980; Caplan 1985; Goodglass 1976). Functional categories are found in agrammatic speech, though access to some grammatical processes is impaired due to certain processing constraints. The view of morphological impairments as built by this study is

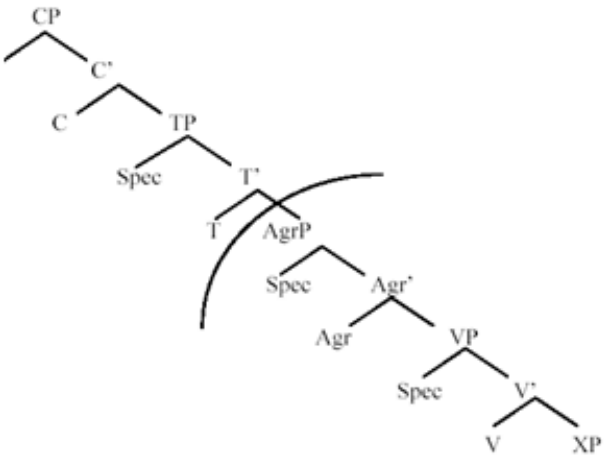
in agreement with these theories postulating that agrammatism is marked by a partial absence of grammatical abilities, and in particular the existence of a dissociation between agreement and tense (Friedmann and Grodzinsky (1997); Wenzlaff and Clahsen (2004); and many others).

Tense-Agreement Variability in Agrammatism: Two Accounts

In the literature, two main competing accounts have been proposed to explain the tense-agreement variability in agrammatic aphasia. One is the Tree-Pruning Hypothesis (Friedmann and Grodzinsky 1997; Friedmann and Grodzinsky 2000; Friedmann 2001), which ascribes the tense-agreement variability in the aphasic data of agrammatic patients to a structural deficit in the syntactic tree. Hagiwara (1995) attributes the difficulties with functional categories to their positions in the hierarchical structure. Another syntactic account, the Tense Underspecification Hypothesis of Wenzlaff and Clahsen (2004) does not assume a hierarchical order of separate tense and agreement projections, but predicts preserved agreement and impaired tense since the functional category of Tense remains underspecified in agrammatism. Contrary to Grodzinsky's (2000) assertion that the dissociation between tense and agreement is specific to production, Wenzlaff and Clahsen (2004) noted the dissociation between tense and agreement in both production and grammaticality judgment tasks, thus pointing to a central representational deficit.

Literature on agrammatic language impairment has highlighted Friedmann and Grodzinsky (1997) and Fridmann (2000, 2001) who explicitly argue that agreement errors are by and large not attested in agrammatic speech. This, they claim, is because both tense and agreement are represented as separate functional categories, and hence can be independently impaired in agrammatic aphasics' phrase-structure representation depending on their hierarchy in the syntactic representation. According to this view, agrammatics' difficulty with functional categories is a natural concomitant of their hierarchy in the syntactic tree. As a consequent, a syntactic tree structure that places tense higher than agreement predicts that tense would be harder for agrammatics to access than agreement (as in Figure 7).

FIGURE 7: The Tree-Pruning Hypothesis of Friedmann and Grodzinsky (1997)

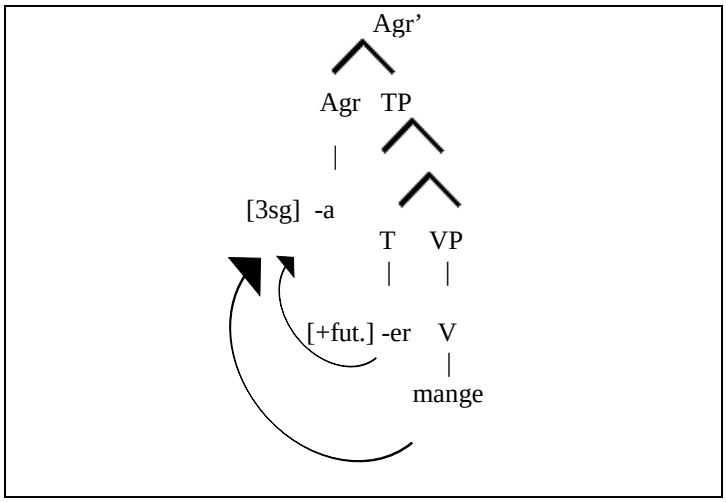


It is certainly true that the results obtained from agrammatic aphasics show good performance on agreement contrasts, but poor performance in tasks requiring knowledge of tense distinctions,

reflecting a clear variability between tense and agreement in agrammatic performance. However, if we attempt to explain these findings from a purely syntactic point of view, especially as implicated by the syntactic tree hypothesis (Friedmann and Grodzinsky 1997), which holds the breakdown of tense as mirrored by the relatively high position that tense inflections occupy in the syntactic representation, a number of problems may occur as discussed hereafter.

First, models based on the hierarchy hypothesis assume that inflected words are decomposed into stems and affixes, both of which have their own hierarchical representations in the syntactic derivation. This will be true of agglutinative languages only. Verbs would be represented at the deep-structure as stems, and then adjoined with their inflections by syntactic movement. Pollock (1989) has proposed that the verb, originally located in the Verb Phrase, moves from its original position to the functional heads Tense and Agreement, thereby becoming inflected for tense and agreement. A typical example of such movement has been mentioned by Borer (1998) for the French verb *mangera* 'eat-future-3sg' as in Figure **(8).**

FIGURE 8: **Partial Syntactic Tree of Verb Movement in French (Borer 1998: 172)**



In Figure (8), we see that segmentation of inflectional affixes of the verb is transparent to an extent that makes them appear as coherent phonological entities that can be represented in a hierarchical structure. Affixation process takes place sequentially via a syntactic movement, resulting in a structure which is a morphophonological word. Unlike in French, where inflectional categories are encoded directly to the verb stem, MSAas well as YA show greater difficulty of dividing the word into coherent and non-overlapping entities due to the fusional character of the word inflectional system. Thus, unlike in Figure (8), it is not always possible to represent inflectional categories by discrete morphemes that are sequentially concatenated at the right or the left of a verb stem. This can be illustrated with the following examples from YA:

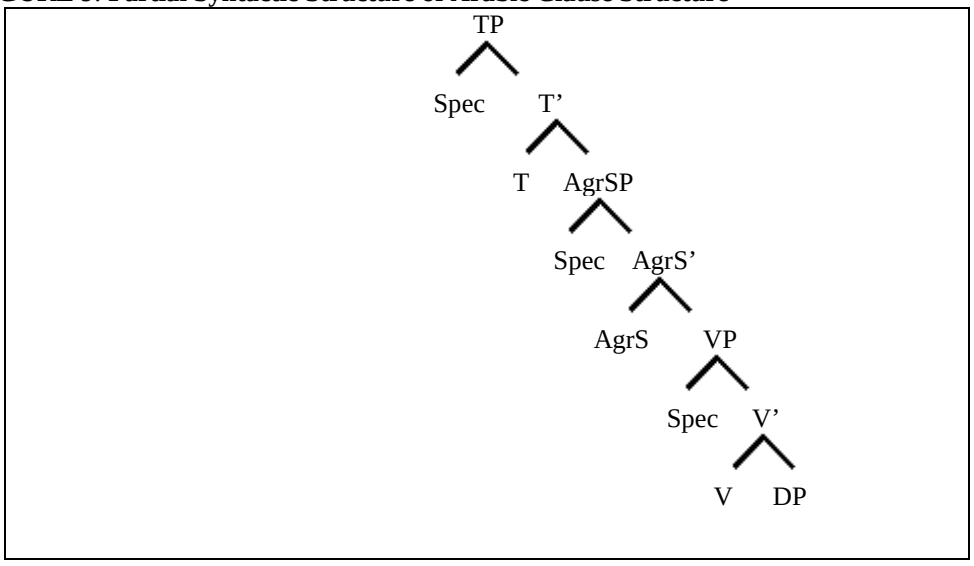
	Perfective Past Tense	Imperfective Present Tense
(1) a.	katab-tu	a-ktub

	wrote-1.s	1.s-write
	'I wrote'	'I write'
b.	katab-uu	ya-ktub-uu
	wrote-3.m.p	3.m-write-p
	'They wrote'	'They write'
c.	katab-na	na-ktub
	wrote-1.p	1.p-write
	'We wrote'	'We write'

It can be observed that agreement-marking in the past tense is always stem-final. Unlike in the past tense, the agreement making in the present tense in some cases is split between a post-stem and a pre-stem position (e.g. *ya-uu* in *yaktubuu*) while in others it is only prefixed (e.g. *na-* in *naktub*). Further, each tensed verb form appears with its own distinct stem due to the alternations in the vowels of the stems. In addition, complete extraction of inflection in Arabic is never permitted since doing so may result in production of the root consonants which is morphologically abstract, and hence cannot be spelt out unless it is inflected. Finally, the Arabic verb appears as an amalgamation of three morphological units, i.e. the discontinuous consonantal root, the vocalic pattern, and the inflectional categories of tense and agreement, so as to yield clear segmentation of morphemes. Thus, it is not possible to assign the same syntactic structure represented in **(8)** to amalgams in which the order of morphemes differs, and hence cannot be derived in a uniform manner.

Secondly, the view proposed by Hagiwara (1995), Friedmann and Grodzinsky (1997), &Friedmann (2001) attributes the disruption of functional categories to the position that they occupy in the syntactic representation. Thus, the verb forms that move to high positions in the syntactic representation are predicted to be more difficult for agrammatics to access and to correctly inflect them in comparison to forms that require relatively low positions. Following Ouhalla (1991), if it is assumed that the tense phrase is located in a node higher than the agreement phrase in the clause structure of Arabic, as illustrated in Figure 9.

FIGURE 9: **Partial Syntactic Structure of Arabic Clause Structure**



Given the clause structure of Arabic shown in (9), according to which tense is placed structurally higher than agreement, Friedmann and Grodzinsky's tree-pruning hypothesis predicts that tense would be more vulnerable to breakdown than subject-verb agreement, which is supported by the aphasic data obtained in this study. However, as mentioned above, the representation of tense by overt inflectional morphology is still a controversial issue in Arabic grammar. By adopting the view that only the verb in the present tense is marked by overt tense inflection represented by the inflectional prefixes, the verb in Arabic finite clauses is supposed to undergo movement into different hierarchical positions in the syntactic tree depending on its tense. In other words, it can be assumed that the verb in past tense sentences raises only up to AgrS to realize its agreement inflection while the verb in present tense sentences must raise up to AgrS and then Tense in order to collect its agreement and tense inflections. Holding the assumption to be true, one can further assume that agreement in Arabic will be the only functional head obligatorily projected in a simple clause while tense would be an additional head projected in the present tense. This would make the syntactic computation of past tense sentences less complex than the computation of the present tense. This assumption leads to an asymmetry in the production of tense and agreement morphology as well as in the production of past and present by agrammatic Broca's aphasics. However, the analysis also has to face a problem. It has been noted that tense errors were distributed in both past and present tense contexts with variability in performance across tasks.

Benmamoun (2000) argues that the verb in past or present tense in Arabic does not encode tense features by morphologically overt features, and the distinction between present and past is basically the distinction between imperfective and perfective aspect respectively. Thus tensed verbs (both in past and present) in Arabic lack overt inflectional affixes marking tense but they show inflectional suffixes realizing only the agreement morphology. Such a morphological perspective can claim that verb inflectional morphology in Arabic is specified for [+agreement], whereas tense features are left unspecified in the inflectional paradigms. Assuming this analysis to be correct, one can assume that agreement in Arabic would be the only functional category projected in simple clauses while tense would remain unspecified in the syntactic tree.

Based on these observations, the findings emerging from the study can be better explained within a model that does not assume the decomposition of inflected verbs into separate morphological units, i.e. bare stems and inflectional categories which need to be combined according to certain syntactic rules. In other words, we assume their existence as fully formed words with bundles of features which are syntactically relevant for functional reasons. Chomsky (1993, 1995) introduces the theory of checking as an alternative to the derivational approach to inflectional morphology where it is assumed that the interface between a verb's internal morphological structure and its syntactic requirement involves a system of feature checking. Thus, the formation of inflected forms of verbs has been removed from the domain of syntax. Instead, it is assumed that words emerge from the lexicon fully inflected for all features. The verb then moves to functional heads in the syntactic tree in order to match and check its inflectional features with corresponding features encoded under the functional categories. It would mean that syntactic movement is not a morphological process responsible for deriving inflected verbs, but a device to check the appropriateness of their inflected forms.

The theoretical proposal given above offers a different perspective to verb finiteness phenomena in agrammatic aphasia where primary agreement distinctions are maintained in agrammatic aphasia while secondary distinctions between [+past] and [-past] are lost. This has led to the Tense Underspecification hypothesis (TUH) in agrammatism. Originally used to

describe the status of tense and agreement in child language, Wenzlaff and Clahsen (2004, 2005) used it to account for the dissociation between tense and agreement observed in the speech of their German agrammatic aphasics. They have proposed that the underlying cause of the observed tense-agreement dissociation is that the syntactic category T (tense) is underspecified for tense, i.e. bearing no [±Past] value in agrammatic aphasia.

Our findings seem to fit quite well with Wenzlaff and Clahsen's (2004, 2005) tense underspecification theory. We propose that in agrammatism the functional category of Agreement is specified, whereas Tense is left unspecified. Due to the null-subject property of the Arabic language, agreement features are considered a core property of the Arabic grammar. Thus the primary agreement distinctions within perfective and imperfective forms are preserved while the secondary tense distinctions between past and present forms are lost. It may be noted that even for a normal speaker of Arabic, pronominal subjects are not important because one can easily recover the subject from the agreement inflection on the verb. As Jaeggli and Safir (1989: 29) have observed: "Null subjects are permitted in all and only languages with morphologically uniform inflectional paradigm". As far as agreement features are concerned, Arabic has morphological uniformity. Consequently, the null subject of a sentence is easily recoverable from the agreement markers. In other words, the agreement markers have a greater functional load in Arabic than tense markers which, in fact, are aspect markers (i.e. perfective vs. imperfective, rather than, past, present and future. The load of the agreement markers is so significant that they are equivalent to the pronominal subjects of sentences. We have already seen that lexical items, including subjects, are not lost in agrammatic aphasia. It is logical, therefore, that in languages with null subject property agreement features are not lost or impaired. If they are lost, the sentence will become uninterpretable or, at least, vague. On the other hand, if perfective and imperfective markers are confused, there may be temporal dimension for the sentence. While discussing inflection and null subject parameter Kenstowicz (1989: 272-274) observes that in Modern Arabic dialects, such as Levantine Arabic and Egyptian Arabic, whether the verb is tensed or not depends on whether the verb shows agreement with the subject. If the agreement marker exists, tense distinction exists in finite indicative clauses but not in subjunctive clauses. If agreement marker does not exit, tense features do not exist (e.g. in infinitival clauses). This distinction in the speech of normal speakers of these Arabic dialects lends support to our generalization that agreement is a more prominent feature than tense. It is, therefore, not surprising that agrammatic aphasics lose tense distinction, but not agreement distinction in finite clauses.

A significant point that favors the functional explanation given above can be made with the help of the child language acquisition. As has been noted by several researchers in Barlow and Ferguson (1988), acquisition of agreement features and tense/aspect features is distinguishable in child language acquisition. However, in pro-drop languages like Arabic, children use inflected form of the verb rather early, even when they use one word sentences. In comparison to it, the acquisition of tense/aspect is much later.

As reported by Jackendoff (1994: 151) precise analogous of Broca's and Wernicke's aphasias occur in brain-damage speakers of American Sign Language (ASL). An ASL Broca's aphasic signs slowly and leaves out all grammatical inflections of locations and style of movement, which means signs of verbal inflections involving tense/aspect are lost completely. Whether the agreement markers are lost cannot be concluded on the basis of a language like English for which data are available. To the best of my knowledge, no such work is available on the sign language of Arabic-speaking aphasics. A research project on the topic can provide additional

proof for or against our generalization that agreement markers are not lost in Arabic aphasics as much as tense/aspect markers because the former has more functional value than the latter.

Conclusion

This study is a modest endeavor to deal with the effect of brain damage on verbal morphology in speakers of YA from a neurolinguistic point of view. A further investigation on the phenomenon using different types of testing materials is needed to replicate and validate the pattern and nature of impairment that has been observed in this study. This study largely emphasizes the importance of conducting in-depth linguistic studies of aphasic performance in order to get a better understanding of not only the nature of linguistic impairment in agrammatism and language pathology in Arabic-speaking aphasic patients, but also of aspects of natural languages especially in relation to the relative significance of tense and aspect.

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