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Tense and Agreement in Agrammatic Production: Pruning the Syntactic Tree

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This paper discusses the description of agrammatic production focusing on the verbal inflectional morphology. Agrammatism in Hebrew is investigated through an experiment with a patient who displays a highly selective impairment: agreement inflection is completely intact, but tense inflection, use of copula, and embedded structures are severely impaired. A retrospective examination of the literature shows that our findings are corroborated by others. A selective account of the agrammatic production deficiency is proposed, according to which only a subclass of the functional syntactic categories is impaired in this syndrome. The consequence of this deficit is the pruning of the syntactic phrase marker of agrammatic patients, which impairs performance from the impaired node and higher. These findings also bear upon central issues in linguistic theories, particularly that of Pollock (1989), regarding split inflection.

INTRODUCTION

Agrammatism is usually viewed as a language deficit implicating all functional morphemes equally. Is it truly so? We present new evidence that it is not, focusing on a special type of functional elements: Inflectional morphemes. These are not disturbed to the same degree in this syndrome: agreement inflection is relatively intact, while tense is severely impaired. Since

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these two elements are distinguished syntactically, the line drawn between the intact and impaired morphemes is relegated to the syntax, namely, the apparent morphological deficiency is actually related to the cluster of syntactic deficits in production.

The available proposals for the description of agrammatic production are varied. Though differing in the exact explanation for the origin of the impairment and the estimated extent of the phenomenon, virtually all current views of agrammatism—whether morphological, syntactic or lexical—agree on one point: patients tend to omit or substitute grammatical morphemes in an unselective fashion.[1] For instance, Marshall (1986), in a review of the literature, has argued that ''Free standing function words and bound morphemes (both inflectional and derivational) often fail to be produced in obligatory contexts.'' In this statement no distinction is made between types of grammatical morphemes. Other descriptions share the same view, and predict the same pattern of breakdown for every grammatical morpheme (e.g., Berndt & Caramazza, 1980; Caplan, 1985; Gavarró 1993; Goodglass, 1976; Goodglass & Berko 1960; Grodzinsky, 1984, 1986, 1990, 1995; Kean, 1977; Lapointe, 1983; Saffran, Schwartz & Marin, 1980).

We believe that such an across-the-board account of morphological deficits is too strong. In this paper we use inflectional morphology to examine this claim and try to find out whether all inflectional morphemes are equally disturbed. Inflectional morphology is a good place to start because it contains two dissociable types of morphemes: tense and agreement (person, number and gender), which are close morphological relatives. All studies of agrammatism posit deficient verbal inflection, and since inflection consists of tense and agreement marking, it follows that the deficit implicates both.[2]

The literature, however, contains evidence to the contrary. Several studies present indications of intact agreement. Some even provide direct evidence for relatively intact production of some of the inflectional morphemes; others provide indirect evidence, namely, they allow for such an inference because of the existence of phenomena in agrammatic speech that presuppose inflection. De Bleser and Luzzatti (1994), for instance, show relatively preserved verbal agreement production in Italian agrammatics. Similarly, De Bleser and Bayer (1985) indicate that nominal and adjectival agreement (number and gender) in German is spared in production. Further, Nadeau and Rothi (1992) report only 2% person agreement violations in spontaneous speech of an English-speaking ''morphologic agrammatic'' patient. Finally, Lonzi and Luzzatti (1993) offer indirect evidence for spared Infl by documenting

[1] Some studies do distinguish between different morphemes in terms of their impairment, yet none offers a theoretical motivation for the described hierarchy. Nor does any previous account distinguish impaired functional elements in terms of their position in the phrase marker, as we do below.

[2] Hagiwara (1995) is a recent exception. She argues for preserved inflection, yet still her account predicts the same pattern of impairment for tense and agreement, both being intact.

preserved word order (which necessitates specified inflectional categories) in Italian and French agrammatics. Yet even though such data do exist, the phenomenon of spared agreement in a certain subgroup of patients has gone mostly unnoticed up till now.

We are left with a puzzle: on the one hand, descriptive accounts treat agrammatism as a global impairment of inflectional elements; on the other, data have accumulated, suggesting that this picture is incorrect, and that it must actually be finer-grained. This is the question we address in this paper.

We investigated inflectional morphology in agrammatic production experimentally, via an examination of a Hebrew speaking patient. Since Hebrew has rich and distinct inflectional morphology, it is a good testing ground for claims about inflection in agrammatism. We found a clear dissociation between tense and agreement. While our agrammatic patient experiences extreme difficulty in producing tense inflection, she nevertheless has an intact agreement system. The tense deficit correlates with several other morphological and structural deficits such as impaired copula, loss of the ability to embed sentences and to use complementizers and Wh-words properly. Going through the literature on other patients' inflectional systems in other languages, we found similar cases. This pattern of results has three implications: first, a view of agrammatism as a deficit to *all* grammatical morphemes must be abandoned; second, the move to narrow the scope of the impairment is best done through a syntactic formulation; and finally, theoretical linguistic ramifications follow, since these results provide support from a surprising angle to a recent syntactic theory which claims that Tense and Agreement must be split in the syntactic tree (Pollock, 1989).

EXPERIMENT

Subject

RS is a 70-year-old right-handed woman, with 14 years of education. She is a native speaker of Hebrew, who has been suffering from aphasia for the past 4 years. Diagnosed as a Broca's aphasic, her speech output is markedly non-fluent, consisting of very short phrases. She expresses herself agrammatically, with phonemic paraphasias and flat prosody but no dysarthria. Her intact comprehension is manifested in sentence-picture matching (passive constructions) and grammaticality judgment. Her naming and single-word reading are normal. A CT scan done in November 1991 revealed asymmetry in the size of the lateral ventricles: the left body of the lateral ventricle is larger than the right, and the left frontal horn is larger than the right. There is a vague, patchy low density area in the left hemisphere, specifically in the left anterior inferior temporal lobe.[3]

General Methods

The experimental study included a battery of tests specifically devised to assess RS's grammatical abilities in inflectional morphology and syntactic structures. These tests were con-

[3] We thank Margaret Naeser and Carole Palumbo from the Aphasia Research Center, Boston, for their help in reading RS's CT scan.

TABLE 1
An Example of Hebrew Inflectional Paradigm

	Past	Present	Future
1st			
mas			
Singular	KaTaVti	KoTeV	eKToV
Plural	KaTaVnu	KoTVim	niKToV
fem			
Singular	KaTaVti	KoTeVet	eKToV
Plural	KaTaVnu	KoTVot	niKToV
2nd			
mas			
Singular	KaTaVta	KoTeV	tiKToV
Plural	KaTaVtem	KoTVim	tiKTeVu
fem			
Singular	KaTaVt	KoTeVet	tiKTeVi
Plural	KaTaVten[a]	KoTVot	tiKToVna[a]
3rd			
mas			
Singular	KaTaV	KoTeV	iKToV
Plural	KaTVu	KoTVim	iKTeVu
fem			
Singular	KaTVa	KoTeVet	tiKToV
Plural	KaTVu	KoTVot	tiKToVna[a]

Note. KTV, write.

[a] These forms are scarcely used in colloquial Hebrew, and are usually substituted for their masculine counterpart. This substitution does not count as an error.

ducted over 15 sessions by the same experimenter. A corpus of spontaneous speech containing 440 utterances (1673 words) was gathered in addition to the structured tests. (Utterance counting according to Berman & Slobin, 1994). All sessions were tape-recorded and transcribed fully, including false starts, repetitions and extraneous comments by the subject (as well as the experimenter). A control subject (a native speaker of Hebrew, matched in age, gender, and education), scored 100% correct in all subtests.

The report of the tests and results is arranged in the following way: in the first section, we present tests and related results concerning tense and agreement inflection production. The second section will focus on tests and results concerning judgment and comprehension of inflectional morphology. The third section briefly describes word order, questions and embedding impairments in production.

Tense and Agreement: General

A variety of tasks were used to assess RS's inflectional morphology in input and output tasks. Tense and agreement (person, number and gender) were examined on both verbs and copulas.

In Hebrew, every verb is inflected for one of three tenses and one of 10 agreement forms. There are no bare forms, so the patient cannot just omit the inflections, only substitute for a wrong one. (see Table 1 for an example.)

Since verbal inflection in Hebrew contains a different morpheme for every combination of

tense and agreement, it was very easy to determine the type of every error. Errors were analyzed in the following way:[4]

Every error of verbal inflection was counted as either a tense or agreement error (or a combined error). A *tense* error is a mismatch between the temporal adverb and the verbal inflection. An *agreement* error is a mismatch between the grammatical subject and the agreement features of the verb.

For example, for the target sentence in (1), response (2) is a tense error, and (3) an agreement error.

(1) Yesterday the boy **wrote** (etmol ha-yeled *KaTaV*)
(2) Yesterday the boy **writes/will write** (etmol ha-yeled *KoTeV/yiKToV*)
(3) Yesterday the boy **wrote-PL/wrote-F/wrote-1st** (etmol ha-yeled *KaTVu/KaTVa/KaTaVti*)[5]

We compared the production of tense and agreement errors in repetition and completion tasks, and assessed RS's receptive inflectional abilities through comprehension and grammaticality judgment of tense and agreement inflections in various tasks.

TENSE AND AGREEMENT IN PRODUCTION

The Tasks

Repetition

Sentences were short and simple, three to four words in length, and included verbs and copulas inflected for tense and agreement (number, gender, and person), and adjectives inflected for number and gender (116 sentences).

Single words included verbs and copulas in all inflectional options, as well as nouns and adjectives inflected for gender and number (43 words).

The target (word or sentence) was read aloud by the experimenter, at a normal reading speed. When asked, the target was read again.

Since regular repetition yielded a ceiling effect, manifested in a low error rate, we delayed the repetition by using articulatory suppression (see Baddeley 1986, 1990). This condition was devised to elicit more errors, and block phonological ''echoing.'' The subject heard the target once, then articulated three or four words (reciting from the Hebrew alphabet) and only then repeated the target as accurately as possible.

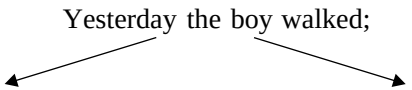
[4] In counting errors, recoverable phonemic paraphasias, errors resulting from phonemic paraphasias were ignored, and counted as correct or wrong responses according to the assumed intended target. Unrecoverable or questionable phonemic sequences were excluded from the result count (subtracted from the number of test sentences). Errors that were immediately and spontaneously corrected by the patient were counted as correct responses.

[5] A similar typology was used for errors in the inflection of copulas: Target: Etmol Dan HAYA Ha'aluf (yesterday Dan was the-champion); Tense error: Etmol Dan HU ha'aluf (yesterday Dan is the-champion); Copula omission: Etmol Dan ha'aluf (Yesterday Dan the-champion); Agreement error: Etmol dan hayta ha'aluf (yesterday Dan was-fem the-champion).

Sentence Completion

Completion tasks were aimed to test RS's ability to inflect for an agreement or tense feature. Again, the inflections were examined on both regular main verbs and copulas. The verb or copula had to agree in tense with a temporal term (such as ''yesterday'') and to agree in φ-features (person, gender and number) to the subject NP. Every trial included two clauses: A source clause with verb/copula inflected correctly for tense and agreement, and a target clause in which the verb or copula was missing. The latter was similar to the source clause in all but one feature: the grammatical subject or the temporal term. Given this procedure, the subject only had to change one feature of the source verb: either tense or agreement but not both. (The verb in the source clause was appropriate in one dimension only, and had to be changed in the other.)

For example,



Tomorrow the boy ____.
Tense condition

Yesterday the **boys** ____.
Agreement condition

Another type of sentence completion task included sentences without temporal expressions (similar to Nespoulous et al.'s [1988] ''story completion test''). These sentences too were composed of two clauses, but here the source clause included the infinitival form of the verb (i.e. no feature appropriate for the target clause). The target clause included two conjoined VPs, one headed by a verb inflected for the required tense and agreement and the other by the verb to be inserted by the subject. In order to give an appropriate response, the subject had to copy the features of the given conjoined verb to the missing verb. An example of this kind of completion is the following:

The cats wanted to eat, so they opened the can and _____.

There were 191 sentences for completion of the first type and 26 of the second. The sentences were presented auditorily or visually, and completion was either oral or written, respectively.

Results

The main result of both sentence repetition and completion tasks is that agreement remained completely intact, while tense was markedly impaired.

Repetition

A problem at the morphological–lexical level was ruled out decisively through word repetition results, which yielded an error rate of only 3/43. Sentence repetition results are summarized in Table 2.

TABLE 2
Percentage (and Number) of Errors in Delayed Repetition

	Agreement	Tense
Verb	0% (0/56)	23% (13/56)
Copula	0% (0/60)	50% (15/60 substitution, and 15/60 omission)
Total	0%	37%

Copular tense errors were tense substitutions or copula omissions.[6] Again, there was no copular agreement error. There was also no agreement error (number or gender substitutions) for the nouns and adjectives that appeared in the target sentences.

Sentence Completion

Sentence completion tasks also showed a dissociation between tense and agreement: Tense was poor while agreement was good. Table 3 shows the number of errors made in oral and written completion tasks. The overall level of errors was 63.2% (86/136) in tense items and 4.7% (5/107) in agreement items.[7] Across tasks, the written tasks were harder than the oral ones, the former yielding 43.9% errors and the latter 31.8%.[8]

Of 49 verbal tense completion errors, 24 were tense substitutions (with no preferred or default form) and 25 were ''don't know'' responses. Of 37 copular tense completion errors, 12 were tense substitutions, 17 were copula omissions, and 8 were ''don't know'' responses.[9]

TABLE 3
Percentage (and Number) of Errors in Sentence Completion Tasks

	Agreement		Tense	
	Oral completion	Written completion	Oral completion	Written completion
Verb	3.2% (1/31)	10.0% (4/40)	38.0% (19/50)	75.0% (30/40)
Copula	0% (0/18)	0% (0/18)	70.0% (21/30)	100.0% (16/16)
Total	2.0%	6.9%	50.0%	82.1%

[6] In present tense, two forms are accepted in most structures: zero-copula and present-tense copula (''Pron'' in terms of Doron, 1983). Only overt present tense copula occurs in identity sentences and permanent property predicates.

[7] The 26 sentences that required both tense and agreement inflections, were counted as tense and as agreement completion tasks.

[8] There were a few cross-task errors: Eight tense substitution errors occurred in the copula agreement completion, five tense substitution errors in the verbal agreement completion, and two agreement substitution errors in the verbal tense completion.

[9] Omissions and ''don't know'' responses were scored as errors according to the task type: if it was an agreement sentence completion task, it was regarded as an agreement error; if it was a tense inflection task, it was regarded as a tense error.

Noticeably, among all of RS's errors, there were only four infinitival substitutions for finite verbs, a finding that may indicate an intact sensitivity to verb finiteness. Moreover, RS never created a non-word in her inflectional errors: she always chose one of the members of an inflectional paradigm, and never invented a nonexistent form.

Tense and Agreement in Spontaneous Speech

We believe that structured tests are a more effective means of characterizing inflectional competence than spontaneous speech, in particular tense inflection. (see also Bates, Friederici, & Wulfeck 1987, Kolk & Heeschen 1992).[10] Agreement violations are relatively easy to detect, since the target is usually easy to approximate, but tense violations are much harder to detect. Hearing a sentence like ''Dan went to school,'' it is hard to determine what the target tense was supposed to be: was it past, in which case no violation occurred, or was it present or future, and hence a tense violation?[11]

With these considerations in mind, we looked at the spontaneous speech corpus and found only one agreement violation in 440 utterances, even though these errors are easy to detect. We nevertheless found occasional tense violations through inconsistent tenses in a sequence. Errors also showed up in copula omissions creating ungrammatical sentences or a change in sentence tense.

Interim Summary: Tense versus Agreement Production

Summarizing the production part of the results, RS's performance on tasks requiring tense inflection production is poor, while her performance on agreement tasks is almost normal. Copular tense is more impaired than verbal tense. In some tasks RS even performed worse than chance level, considering the fact that there are only three tenses in Hebrew. The results for the repetition and completion tests show a similar pattern in these two respects, as demonstrated in Fig. 1.

TENSE AND AGREEMENT IN JUDGMENT AND COMPREHENSION

The results in Fig. 1 indicate a selective impairment in production, manifested in defective tense and copula and intact agreement. Now we turn to the question of whether a parallel pattern of impairment exists also in com-

[10] A large proportion of morphological studies on agrammatism in fact work exclusively with spontaneous speech data; this may be one of the reasons for the tense impairment being relatively unnoticed up to now.

[11] The only cases in which tense violations can be detected are: (1) Sentences containing a mismatch between a time term and verbal tense. (2) Sequences of connected sentences with inconsistent tense across adjacent clauses. (3) Context mismatch (using extra linguistic information).

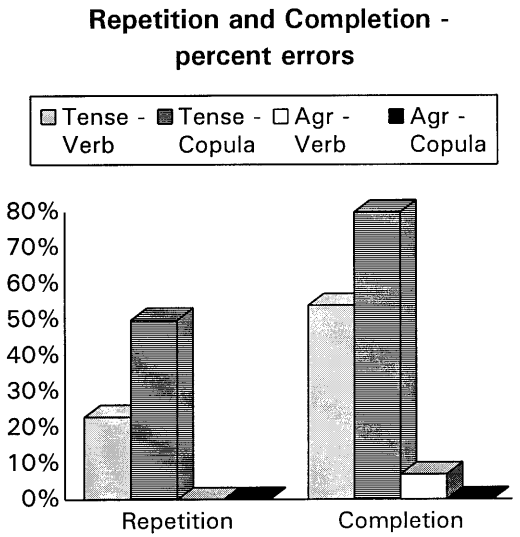


FIG. 1. Repetition and completion errors grouped by inflectional feature, and verb/copula.

prehension and grammaticality judgment (a ''central'' impairment in Caramazza and Zurif, 1976, terms). Comprehension and grammaticality judgments of tense and agreement were assessed in an extensive study of 291 sentences. Comprehension and production tasks contained the same structures and morphemes. Several more complicated structures were examined only for the comprehension tasks. Every session included both comprehension and production tests, randomly ordered. The general finding was that RS's input route is almost normal.

The Tasks

Grammaticality Judgment

The grammaticality judgment competence of RS was assessed by three methods: free judgment, contrastive judgment, and forced-choice completion.

Free and contrastive judgment. Free judgment tasks included lists of sentences ($N = 159$), presented orally or visually (written). The subject was instructed to say or to mark every sentence according to whether it is ''good or bad.'' The answers were scored as correct (correct acceptance or rejection), incorrect acceptance of ungrammatical sentences (misdetection) sorted by error type—the type of violation misdetected and incorrect rejections of grammatical ones (false alarms).

Contrastive judgment included 84 sentence pairs. Every pair included one grammatical and one ungrammatical sentence. The subject was instructed to

mark the better sentence in each pair. Contrastive judgment was presented only visually.

The grammaticality violations were agreement and tense violations on verbs and copulas. In addition to the regular tense violation (past/present/future substitutions), we administered two other special kinds of **tense** violations: finiteness and Benoni.

We tested **finiteness** knowledge in the following way: in certain environments (main matrix verb) only a +Fin verb is acceptable. In other environments (after a modal or a verb that selects IP) only the infinitive is acceptable. Bearing this in mind, we created two types of finiteness violations: infinitival as a main verb in the matrix clause, and a finite verb as a complement of an IP-selecting verb. (*Dan to eat an orange, *Dan wants eats an orange.)

We used **Benoni** constructions, (the Hebrew participle), in which the Benoni heads a small clause complement of a perception verb (I saw the girl dance-Benoni) (Shlonsky, 1995). The perception verb appeared in past or future tense. Benoni violations included substituting the Benoni for past or future tense (*I saw the girl danced).

We used a more subtle **agreement** judgment task after we realized RS had no problem with regular agreement. We used construct-state nominals (Borer, 1986) such as ''ce'if hayalda''—the girl's scarf, in which the gender of the N head is different from the NP complement gender. In this way we tried to check whether RS retained the knowledge of agreement to the head of construct-state nominal. The ungrammatical sentence in this condition contained a predicate (AP or VP) agreeing in gender to the complement NP and not to the head of the construct-state nominal.

Contrastive judgment proved afterward to be better than free judgment for our needs, because it provided us the exact locus of the error, if there was one. (Since the two sentences constitute a minimal pair, the dissimilarity between them is supposed to be the source of the error).

Forced choice completion. Twenty-nine sentences were presented with one missing word (verb or copula) replaced by an underline. Below every sentence three or four choices appeared. The instructions were to choose the best alternative suggested. The foils were: (1) correct, (2) correct agreement wrong tense, (3) correct tense wrong agreement, (4) correct verb inflection, inappropriate stem.

The reason for the forced-choice completion appearing in this judgment section is that the subject always used a judgment heuristic in these tasks: trying every alternative, judging it, and then choosing (this was obvious both from the patient's behavior during the test and from her own report about the method she used).

Tense Comprehension: Elicitation of an Event Time from Tense Inflection

In order to further determine whether RS has tense inflection problems in comprehension, we administered a task of elicitation of an event time from

tense inflection. The experimenter read to the patient 19 short sentences inflected for tense. The patient was asked to determine when the action described in each sentence took place. For example: the correct answer for ''The boy walked'' is ''past.''

Results

Grammaticality Judgment

Grammaticality judgment was generally good. Contrastive judgment was better than free judgment, and in free judgment, judgment from oral presentation was better than judgment from written text. Overall, grammaticality judgment of inflection tasks was 91% correct.

Free judgment. In general, inflectional judgment yielded 89% correct responses. *Tense and agreement* (both copula and verbs) yielded 3/62 tense errors in auditory presentation and 4/48 in visual presentation (2 tense, 2 agreement). *Benoni* yielded 0/27 errors auditorily and 3/16 visually. There were also false alarms, in which grammatical sentences were rejected: 2 in auditory presentation and 6 in visual presentation.

Contrastive judgment. In general, inflectional judgment yielded 92% correct responses. *Tense and agreement* yielded 5/55 errors (2 tense and 2 agreement in copular test, and 1 tense in verbal test). *Finiteness* yielded 2/24 errors (which she herself corrected after she asked the experimenter to read the sentences aloud). Agreement of *Construct state nominals* was perfect: 0/11 errors.

Forced-choice completion. In these tests, the subject demonstrated perfect performance. RS made *no* errors in this task, both in choosing verbal inflection (tense and agreement) and in choosing copular tense. (0/11 and 0/18 errors, respectively).

Time Comprehension

The patient performed the task of time comprehension from tense inflection without any problem (100% correct responses). She answered rapidly and accurately to every item, reporting after the test that it was very easy for her.

Interim Summary: Judgment and Comprehension of Tense and Agreement

All of the judgment and comprehension results demonstrate RS's preserved input route, even in those structures and morphemes that are impaired in the output route. Judgment of tense morphemes is much better than production thereof. This pattern is presented in Fig. 2. Thus, this study provides another evidence against the necessity of input and output routes damaged together, at least in the morphosyntactic level. Other agrammatic patients who show a similar pattern of impaired output and intact input route have

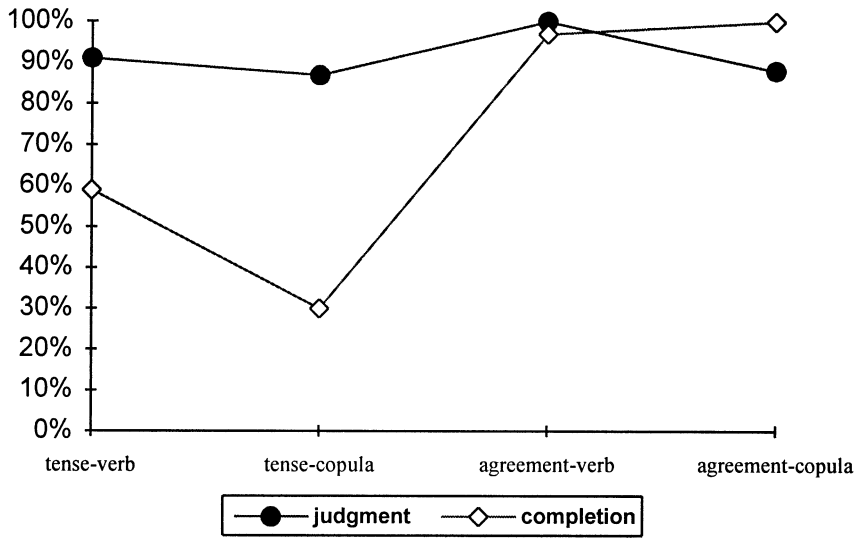


FIG. 2. Judgment vs. Production (contrastive judgment vs. oral completion).

already been documented in studies by Miceli, Mazzucchi, Menn, and Goodglass (1983); Nespoulus, Dordain, Perron, Ska, Bub, Caplan, Mehler, and Lecours (1984, 1988); Kolk, Van Grunsven, and Keyser (1985); and Caramazza and Hillis (1989) (although as Goodglass, Christiansen, & Gallagher [1993] note, none of these studies compared the same grammatical morphemes in comprehension and production).

The input route of RS seems to be relatively spared as she was able to detect very easily the same errors she herself had made, once read aloud to her (in addition to her good results in the tests). In this respect, many agrammatics are similar to jigsaw puzzle players: when asked to fill in a blank without a well-defined set of alternatives (or with too many possible parts), they are lost, unable to make the right choice. Yet once a piece is in their hands, they know exactly whether or not it fits.

SENTENCE STRUCTURE TASKS

It thus seems that there is a syntactic problem in the subject's tense inflection production, probably in the Tense node in the phrase marker. This led us to investigate two further topics that might be influenced from a structural deficit relegated to Tense node:

1. Some researchers both in theoretical linguistics (Grimshaw, 1991) and in language acquisition (Rizzi, 1994) assert that ''If any higher projection is present, all those which intervene between the higher projection and the lowest projection must be present also'' (Grimshaw, 1991). This raises the

question of whether the nodes higher than the impaired Tense node are present or are they defective as well. For that matter we examined the nodes higher than Tense that include wh-question words, (e.g. what, who etc.) and complementizers (that, which etc.)

2. Are other syntactic aspects that require the Tense node, such as word order impaired as well?

We examined these two issues and found both higher nodes and other structural aspects damaged.

Complementizers and wh-words

Wh-questions. RS, like many other reported agrammatics, (cf. Thompson & Shapiro [1995]; Thompson, Shapiro, Jacobs, & Schneider, in press) finds it extremely difficult to construct Wh-questions, although she succeeds in constructing yes/no questions that differ from declarative sentences in Hebrew only in prosody. We tried various tasks to elicit Wh-questions, and none of them was successful (0/20). RS's repetition of sentences including wh-questions as main and embedded clauses was also very poor (2/23 and 5/23 in a second try). Preliminary results show that RS's performance in reading Wh-questions was somewhat better, but still very disturbed (3/8). In 440 utterances of spontaneous speech, there were only three well-formed Wh-questions, each appearing in a two-word long utterance. The corpus includes 11 yes/no questions.

Embedded structures. Since embedding involves using the nodes higher than T (specifically the C node), the patient's ability to embed is an important indicator of the state of the higher nodes. Data from repetition (4/23), spontaneous speech, and reading all indicate the same result: RS definitely cannot embed normally. She either omits most of the embedded sentence (4), omits the complementizer (as in (5)), or avoids these structures altogether in spontaneous speech.

(4) Dorit ba'aa . . . etmol . . . tilpena la-rofe **she**. . . . . tor.
Dorit came . . . yesterday . . . called to-the-Doctor **that** . . . appointment.

(5) Siparti la Nir xayal. Lo hevina oti.
(I)-Told her [**that**] Nir a-soldier. [she] didn't understand me.

Subject Omission and Word Order

If the deficit depicted above is indeed structural in nature, it should have structural ramifications: this we examined next. Two main structural factors were examined: subject omission and relative word order of copula and negation.

Subject pronoun omission. Hebrew allows pro-drop only in a limited number of cases, that is, in first or second person in the past or future tense. Omission is not allowed in third person in all tenses, and in present tense

for all persons. RS, nevertheless, omits pronoun subjects in every context, especially in the presence of another verb argument (object). In a repetition task with sentences containing a subject–verb–object sequence, RS omitted 36% of the subject pronouns, and no object pronouns. In spontaneous speech she also omitted most of the expected subject pronouns.

Copula-negation word order. Hebrew requires a different relative order between the negation and copulas in different tenses: negation comes before past and future copulas, but after the present tense copula. A patient whose tense is defective should have trouble with ordering of copulas and negations. We investigated RS's ordering ability through anagram tests ($n = 28$), copula insertion into negative sentences ($n = 17$), negation insertion into copular sentences ($n = 32$), and oral negation of given sentences ($n = 38$). All copular sentences (including present tense) contained an overt copula. Her performance level in all these tasks was similar and very poor: she failed in the copula-negation ordering tasks, producing an overall chance performance of 76% erroneous orders, compared to only 4% errors in main verb-negation ordering.[12]

A STRUCTURAL ACCOUNT

Summary of Our Findings

The findings described above reveal a rather complex pattern of errors: receptive abilities, as reflected in sentence interpretation and grammaticality judgment of inflectional features are almost normal. The deficit, manifesting itself in production, is as follows:

1. Verbal tense is severely impaired, resulting mostly in tense substitutions. Verbal, adjectival and nominal agreement (gender, person, number) is not affected.
2. The copula is impaired, generating tense substitution and omission errors.
3. Wh-question words and complementizers are omitted, and there is an inability to handle embedded structures and wh-questions.
4. Word order impairment is detected in a limited set of constructions, such as negative copular sentences, and in subject pronoun omissions.

In the following sections, we propose a syntactic account for this highly selective impairment.

Why a Syntactic Account?

These findings appear to call for a grammatical account. The one we seek would capture all the aspects of the deficit while deviating minimally from the normal assumptions regarding grammatical abilities. Hence, we attempt

[12] When we taught R.S. to use a judgment technique in the copula insertion task, that is to try every one of the four possible places and to judge whether it makes a grammatical sentence, her performance jumped from her very poor performance earlier to 100%.

to assume minimal impairment. The most self-evident way to account for the cluster of empirical findings is to locate the deficit at some syntactic level. Nonsyntactic alternatives are easily excluded: Most notably, a *morphological deficit*, restricted to the structure of words and their inflections, that could be hypothesized given the findings, cannot work. First, the observed deficit includes failure in tasks that are clearly structural, such as embedded sentences and questions. Second, RS performed almost at a normal level (95% correct) in word repetition and reading tasks, and her inflectional errors were produced only in sentential contexts. Another untenable account is a *lexical-semantic account*, which would claim that the apparent inflectional deficit in tense is actually semantic, and that the only problem our patient has involves the understanding of temporal terms such as ''yesterday.'' This account is also inappropriate, since it predicts a failure that is not restricted to production, but extends to judgment and comprehension as well, contrary to fact. Further, the second type of completion test (conjoined VPs) did not include temporal adverbs at all but yielded just as many tense errors. Every other account that would claim that the problem in tense is semantic rather than syntactic, would have to make further assumptions in order to account for the host of syntactic phenomena relegated to the tense node and the higher nodes that were found in this study.

It seems, then, that a syntactic account is most suitable. In order to consider what exactly in the syntax is impaired, we outline a sketch of the theoretical tools relevant for the description of the agrammatic production impairment.

Tense and Agreement in Current Syntactic Theory

The general framework which is relevant to our findings is that of *split inflection* (Pollock, 1989) and *checking theory* within the minimalist program (Chomsky, 1992). These two theoretical approaches are concerned, among other things, with representing inflection and its mechanisms. The central issue for us is the syntax of verbal inflection, which includes tense features, as well as agreement features, which ensure that the verb agrees with an NP in the sentence in person, gender, and number. Generative theories have traditionally assumed that inflection is not only a morphological entity: it is represented syntactically in the phrase marker, occupying a node of its own—the I(nfl) node which projects into an Inflectional Phrase (IP) and dominates the verb phrase (see Fig. 3). Tense and agreement features are contained in the IP, and the process of affixation (where the verb attaches to its inflectional affixes) is done by the movement of either the verb into I or the inflection into V.

Yet this representation of inflectional features turned out to be insufficient. In order to account for syntactic phenomena that are related to inflection (among them many cross-linguistic facts), Pollock (1989) proposed that the I node of earlier analyses be split into two separate projections—*Tense and Agreement* (person, gender and number). As shown in Fig. 4, Tense and

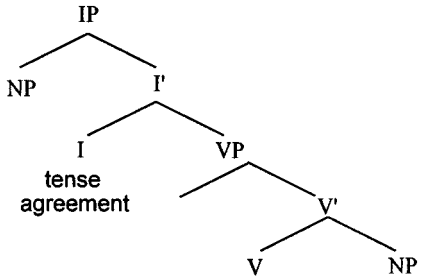


FIG. 3. Infection represented in the phrase marker.

Agreement (plus a node for the representation of negation) are now represented separately in the phrase marker. The inventory of functional categories is now richer than before, and these categories all behave exactly like lexical ones: every functional node is fully projected, in accordance with the X-bar scheme, and each has a specifier and a complement: T(ense) takes Agr(eement)P (or NegP) as its complement; Agr takes VP as its complement.

Chomsky (1992), in his Minimalist Program, further develops the idea of split inflection. In his account inflection and verb movement are also connected, but in a way different from Pollock's analysis: the issue is what motivates the movement of the verb into the inflectional node. For Pollock, the verb comes from the lexicon uninflected, and is inflected through a process of affixation that takes place in the syntax (this view goes back to Chomsky [1957]). For him, the need for affixation is the reason for verb movement. In Chomsky's theory, at the stage of lexical insertion into the phrase marker

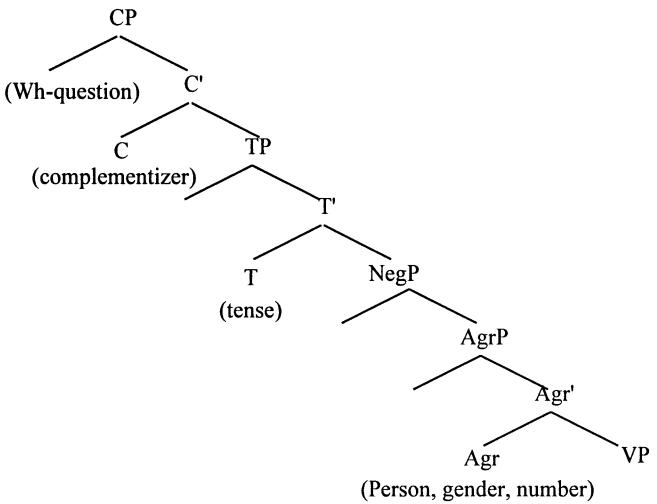


FIG. 4. Pollock's phrase marker—split inflection.

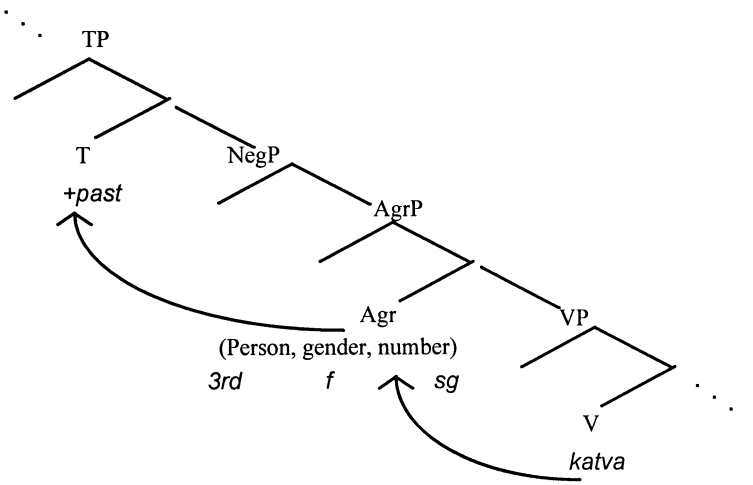


FIG. 5. An example of a verb moving to agr and T for checking its inflectional features.

the verb is already inflected for tense and agreement—all inflectional affixes are there. Movement of the verb is not motivated by affixation, but rather, by checking requirements. Namely, the inflectional nodes serve only as checkpoints in which the features of the verb are required to match the inflectional features. The inflected verb (and other constituents of the sentence) move to these checkpoints: if there are no mismatches between the moved constituent and the features, the derivation converges—i.e., the sentence is well formed. Thus in Chomsky's theory the mechanism of inflection is a checking mechanism.

So, for instance, the inflected verb *katva* (write-3sgFpast) is inserted from the lexicon into V in its position inside VP. It then moves twice for checking purposes. It first moves to Agr to check its agreement features (Fig. 5). If the Agr node contains the specification *3sgF*, it moves on to the next checking point: the T node. If T contains the feature +*past*, it is then certified for articulation. On the other hand, if T node includes the feature +*future*, a mismatch is detected, and the sentence is ruled out.

The Syntactic Locus of the Impairment

Taking these theories as a point of departure, we now return to the neuropsychological findings. Recall that we have documented errors in tense, but not agreement. As we have seen, current theories provide us with a means for this distinction, namely, unlike previous accounts of agrammatism, we have a formal device for picking out tense, but not agreement. In contemporary terms, the most obvious candidate for a deficit implicating tense and

copula is the T(ense) node. If this node is defective, then the pattern of results we have reported is explained, both by a theory that assumes a checking mechanism, and one that takes affixation as its central tennet.

Consider checking first. An (intact) checking mechanism cannot carry out its task for lack of feature specification in T. As a consequence, it is no longer able to detect mismatches between the intended tense (the feature specified in T node) and the tense inflection of the verb, and therefore, inflection errors may result. As for affixation, since T and its features are crucially involved in this operation, then, problems in tense features would imply impaired affixation, hence errors of tense inflection. For both theoretical approaches, every other aspect of the representation is assumed to be intact, hence, no other error type is allowed. A first approximation to the nature of the deficit is formulated in (6):

(6) The syntactic tree of agrammatic aphasics is impaired in the T(ense) node.

There are still some open questions: What is the meaning of ''impaired'' in (6)? What exactly are the consequences of such an impairment? Is the tree left intact, other than this node, or rather, does the impairment to the Tense node affect the rest of the phrase marker?

We thus proceed to the next point, and examine the state of nodes higher than the T node to see whether or not they are implicated (we know that lower ones, e.g., Agr, are intact). One possibility is that the nodes above T are intact, and the moving verb may skip over the damaged T node and reach a higher node. Another possibility is that since T is impaired, the rest of the tree cannot project higher, and the tree is thus ''pruned'' upward. In this case, the verb cannot cross over the impaired node.

The way to distinguish these possibilities is empirical in nature. Spared higher nodes imply the former possibility and impaired higher nodes the latter. The functional head higher than T is C, namely the functional head of the phrasal projection CP. C is where complementizers (i.e., embedding morphemes) reside; Wh-words reside in the SpecCP node (cf. Fig. 4).

Our data suggest that all the constituents and categories that are contained in CP (i.e., complementizers and Wh-words) are severely impaired in RS's production. RS systematically omits complementizers in repetition, reading, and spontaneous speech and is unable to produce fully embedded sentences. The only questions she produces are yes–no questions; she cannot utter, repeat, or read Wh-questions at all. The empirical findings thus support the claim that a defective node implicates all the nodes above it (in this case the nodes of CP). This leads to the following generalization, stated in (7):

(7) The tree-pruning hypothesis:
(a) T is underspecified in agrammatic production.
(b) An underspecified node cannot project any higher.

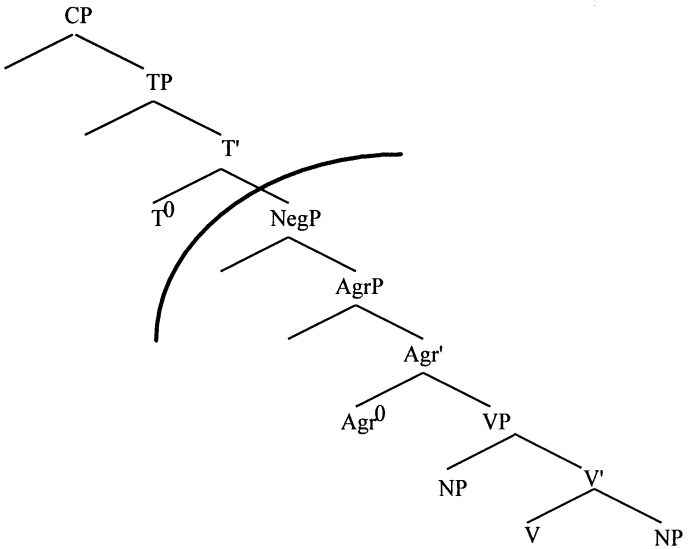


FIG. 6. Agrammatic phrase marker. Arch represents site of deficit.

The conclusion is that the syntactic tree of agrammatic aphasics is pruned in T node, and that the deficit impairs every node above T (specifically CP).[13]

From a certain node up, agrammatics are no longer able to construct the phrase marker, or alternatively, it is not possible for them to move constituents higher than a certain node. In the case presented in this study, the relevant node is the Tense node (Fig. 6). Agrammatics, on this account, have pruned structures (somewhat reminiscent of Rizzi's (1994) idea for children in the ''root infinitive'' stage having truncated structures). This is the reason why tense, as well as copula, complementizers, and Wh-words, are impaired in RS's production. As we will see, this is also the explanation of another empirical fact, namely, the impairment of word order that was found. Next, we go over the error types and see how they are accounted for in light of the tree pruning hypothesis.

The Account and the Spectrum of Errors

Tense vs. Agreement

Consider the errors RS made in sentence repetition and completion (exemplified in (8) and (9)):

[13] The data indicate a preserved output route. What does it tell about the relation between input and output in language representation and processing? One possibility is that the impairment is representational in nature, so there should be two separate phrase markers: one for input which is intact, and the other one for output, which is pruned. The other possibility is that the deficit is in output processing. In this case the processing deficit must be syntactically constrained. We note this point, although our account is currently not designed to handle it, since it restricts itself to production disturbances in agrammatism.

(8) ha'ish roce levashel, az hu lokeax sir ve **bishel.**
the-man wants to-cook, so he takes(3sg-M-pr.) pot and cooked(3sg-M-past)

(9) axshav ata holex. etmol ata **telex.**
Now you(2sg-M) go(2sg-M-pr.). Yesterday you will-go(2sg-M-fut.)

RS's errors are only substitutions of tense but not agreement. The tree pruning hypothesis readily explains this phenomenon: T node is defective, so the verbal tense is impaired (either because the checking mechanism is inaccessible to the tense features or because affixation fails due to underspecified tense features). At the same time, the Agr node is intact and hence keeps the verb correctly inflected for person, number, and gender.

If this account is correct, it has some possible implications to the agreement system in the context of the *Minimalist Program.* Chomsky (1992) adds another Agr node and changes the relative order of Agr and T nodes—his relative order is Agr_s, T, Agr_o. The data we have just presented lead to one of two possible analyses:(a) Agr (Agr_s) is below T in the Hebrew phrase marker (as suggested by Pollock [1989, 1993] and by Ouhalla [1994] and Demirdache [1988] for Arabic); (b) a lower Agr projection (if one assumes Agr_o) suffices in most cases to check the agreement of the subject.

Copula Omissions and Substitutions

The copula is located in the T node in the phrase marker. It is either base-generated in this position or moves there before the phonology spells out the syntactic representation. (Guasti, 1993; Rizzi, 1994; Shlonsky, 1995). If T is underspecified, and copulas live in T, it follows that they are liable to be impaired, just like tense inflection. Copulas are indeed impaired as we have seen and are involved in both omissions and substitutions of the tense morphology. Crucially, there are no agreement errors in the production of copulas. We now see why copulas are involved; what remains is to clarify why in this case there are both omissions and substitutions, whereas in the case of verbs, only substitution errors are recorded. Substitutions of tense in copular constructions are explained in the same way as similar tense errors in main verbs, but why also omissions? In Hebrew, one possibility for the present tense copula marker is a zero morpheme. Omission, then, could be interpreted as substitution for another tense of the copula (without agreement violation). Omission could also be ''true'' omission, because it is marked by a free standing morpheme which is not represented in the tree. Thus, its omission would not violate rules of lexical well-formedness.[14]

If this account is valid also for auxiliaries (this depends on the location of auxiliaries in the phrase marker—whether they are located in the impaired

[14] This idea, apart from being well motivated, is also intuitively appealing, for copulas have no lexical content (Rizzi 1994), and denote only tense and agreement.

zone or not), it should also explain the prominent omissions of auxiliaries in languages in which compound tenses are comprised of aux + participle or aux + infinitive, for example. This question is hard to examine in Hebrew, because auxiliaries are not often used in compound tenses.[15]

Complementizers and Wh-Words

Agrammatic patients hardly ever produce complex constructions. In particular, they fail to produce well-formed embedded structures. RS's typical errors when trying to produce an embedded sentence were of the following types: ((4), (5) repeated here as (10), (11)):

(10) Dorit ba'aa. . .etmol. . . tilpena la-rofe **she**. . . . . tor.
Dorit came. . . yesterday. . . called to-the-Doctor **that** . . . appointment.

(11) Siparti la Nir xayal. Lo hevina oti.
(I)-Told her [**that**] Nir a-soldier. [she] didn't understand me.

Complementizers are located higher than T in the tree, and hence are inaccessible for production as well. This inaccessibility is manifested in one of two ways in RS's speech: either she intends to produce an embedded structure, yet the embedding word is completely absent from the sentence, and the result is two sentences which appear disconnected (11), or the matrix sentence appears, followed by a complementizer, yet the embedded clause is either absent or incomplete (10). In both cases, complementizers cannot be integrated into the phrase marker, which is precisely what the tree-pruning hypothesis predicts. The fate of Wh-questions is similar. Wh-words are located in Spec-CP, that is, in the impaired zone. Therefore Wh-questions are impossible to produce, and hard to read and repeat.

Word Order

Word order is determined by the phrase marker and the movement of elements within it. A defect in part of the tree above the T node hampers elements from being integrated into the impaired zone, making it impossible for an agrammatic patient to order correctly the constituents in this part of the tree. Copula and negation are in this zone, and this is why RS fails in placing correctly copula and negation relative to one another.

Subject omissions are probably the result of the defective T not being able to assign (or check) nominative case to the subject. We do not know why this tendency is much more evident in pronominal than lexical subjects.

[15] There are, however, some data from Japanese, indicating that copulas and auxiliaries are not equally impaired in agrammatic production: the two Japanese patients described in Sasanuma, Kamio, and Kubota (1990) omitted very few auxiliaries (7/37 and 1/31) but about half of the copulas (3/7 and 6/10). Unaware of the syntactic details in these respects, we can only propose that at least in Japanese, auxiliaries and copulas are located in different nodes.

Independent Evidence—A Selective Review of the Literature

Having discovered this fine impairment pattern, we proceeded to inquire whether it is true of this particular patient only, or rather, generalizes to others who belong to the familiar diagnostic category. We found compelling evidence that indicates the generality of our result. There are documented cases of French-, Italian-, and English-speaking agrammatics who perform with the same pattern—a pattern that has simply gone unnoticed up to now. Since no direct comparisons between tense and agreement are available, we extract this information from several studies that contain detailed analyses of the agrammatic morphological production, and include, among other morphemes, tense and agreement.

1. Nespoulous et al. (1984, 1988, 1990). This is a case study of a French-speaking agrammatic aphasic, who bears a striking resemblance to RS. The patient had difficulty in producing copulas and auxiliaries, had never used ''complex verbal tenses'' (probably due to omission of auxiliaries), used no relative clauses and no subordinate clauses attached to the verb.[16] He sometimes produced inconsistent tenses while telling a story. The authors nevertheless report ''no morphological errors on verbal inflections,'' that is, he produced no error of verbal agreement.[17] Like RS, he also had good grammaticality judgment (on the tests the authors used which are obviously different from ours), and preserved single-word level production. This patient, then, shows exactly the same syntactic problem as ours—a deficit to the Tense node that causes disruption to the representation of the copula, auxiliaries, and verbal tense inflection, while leaving verbal agreement intact. In addition, there is a deficit in nodes above T (complementizers for instance),[18] from which the embedding problems follow.

2. Miceli, Silvery, Romani, and Caramazza (1989). This is a survey of production errors of 20 Italian agrammatic patients. A dissociation between tense and agreement is observed, but only in one direction: a deficit in tense occurs with intact agreement, but not vice versa. Namely, 4 of their patients show poor tense and auxiliary in the presence of spared agreement, although there are some who are impaired in neither, and others who have trouble with both (we return to the issue of variation below).

3. Nadeau and Rothi (1992). This is a case study of an English-speaking agrammatic whose spontaneous speech also reveals a pattern similar to our

[16] Infinitival subordination is intact in his speech. This is explained by the fact that infinitives do not require the C and T nodes.

[17] Although he did make errors in the number and gender agreement of determiners to nouns.

[18] Mr. Clermont produced a type of error predicted from the interaction between the special properties of French and the pattern of the agrammatic impairment: object clitics are in Agro, above VPAux (Siloni & Friedemann, 1994). If we assume that the deficit is in Agro and higher, the object clitic deficit comes for free. ''. . . va chercher le mais pour [**le**] porter en ville.''

patient with 2% person agreement errors, but 17% tense violations, 40% complementizer omissions, 22% auxiliary, and 36% omissions of copulas.

4. Hagiwara (1995) presents evidence from Japanese in favor of a selective impairment in respect to functional categories and projections. She argues ''that not all the functional projections are equally disturbed in agrammatic language.'' According to Hagiwara, Projections within IP tend to be retained while those outside of it, like CP, are easily susceptible to disruption. In ''projections within IP,'' she includes tense, negation and agreement, (but she studies empirically only tense and negation in comprehension, and negation in production).

5. de Roo (1995). The second part of the tree pruning hypothesis, which claims that if a node is not represented, no higher node could project, is borne out by a recent study by de Roo (1995). She found that in 40 out of 41 sentences which included tense violation (finiteness omission) the elements in CP were omitted as well.

Degrees of Agrammatic Severity

The results of both our study and the literature survey indicate the existence of a substantial group of agrammatic patients whose impairment pattern is more selective than previously supposed, yet it is clear that this characterization covers only a subgroup of agrammatics. This conclusion, naturally, raises important diagnostic questions. Are these patients truly agrammatic? Is agrammatism a unitary phenomenon, or is it rather a mere abstraction, devoid of empirical content, as some authors believe? We believe that these patients are agrammatic, and that they belong in a category that is a true clinical and theoretical entity. Our findings, in fact, strengthen this view, and the theory we propose provides us with the appropriate means to handle the important aspects of the variation observed.

Variation in agrammatism goes along two dimensions: first, there are subgroups of agrammatics with deficits whose descriptions are structurally distinct. Second, patients differ in the overall amount of errors they produce. The latter aspect, we believe, is relevant neither to diagnostic issues, nor to theory (see Grodzinsky, 1991 for detailed discussion of Miceli et al.'s findings). The former, however, is of great significance for a theory of brain/language relations as we understand it. The variety of structural deficits ranges over a highly constrained spectrum, which we delineate below in precise terms. This fact is a clear indication that the variability among agrammatics is not random, but rather, is a result of some principled reason. Our conclusion, then, is that with respect to structure, there are (at least two or three identifiable) subgroups of agrammatics, that present structurally distinct clusters of symptoms which bear a principled relation to one another. This relation we call a *severity metric*. We propose that one and the same relation holds among the different manifestations of agrammatism, and that this relation is not only principled formally, but also reflects what we intu-

itively perceive as degrees of severity in this pathology. We thus propose an approach to intra-syndrome variation, that allows for *constrained variation* within each clinical category. For agrammatism we propose a syntactic account. Such an approach, if successful, advances our understanding of the nature of aphasic syndromes, in contrast to calls to dispense with the concept of a neuropsychological syndrome altogether. We develop this idea directly.

Consider, first of all, the empirical facts that are at issue. It appears that agrammatic symptoms feature two varieties: some patients are impaired in Tense while Agreement is intact. Yet clearly, there are others for whom both functional categories—T and Agr—are impaired. There are claims for the existence of a third variant, in which T and Agr are intact, and only the higher functional category, namely C, is impaired (Hagiwara, 1995).

The question immediately arises: are these variants of the same phenomenon, or rather, distinct clinical entities? If we find a strong common line, and a principled reason for variation, we can conclude that the same syndrome is at issue.

Notice that in every other respect, except the functional categories C, T, and Agr, these patients are similar in speech production. Namely, they all share the standard clinical signs, except those pertinent to these categories. So, they all have similar types of lesions, they are all non-fluent, and impaired in aspects of their grammar—they have short phrase length, and in particular, they cannot embed or ask questions.

A possible account is that these are different degrees of severity of the same clinical phenomenon, and that there is a single principle that distinguishes them from one another, namely the level in the syntactic tree at which the deficit (pruning) occurs. The severity metric is the syntactic location of the defective node in the phrase marker: the lower it is, the greater the number of impaired functional categories, and hence the more severe the impairment. Thus, ''mild'' agrammatism impairs high nodes only (i.e., CP). A more severe form will implicate T, (and hence also C) while a very severe form will include functional heads all the way down—C, T, and Agr. Each of these forms may implicate one node or more; yet what is important is that due to the tree-pruning hypothesis, whenever a node is impaired, the tree cannot be constructed any higher, as can be seen in Fig. 7.

Degrees of severity, then, may be accounted for in structural terms: the lower the impairmed node, the more severe will be the clinical manifestation of agrammatism. This is how the tree pruning hypothesis provides a flexible, yet highly constrained, conception of a neuropsychological syndrome, that may have more than a single manifestation. Formally, a relation we call *more severe than* is defined in (13) and holds between variants.

(12) The tree-pruning hypothesis (revised):
a) C, T, or Agr is underspecified in agrammatism.
b) An underspecified node cannot project any higher.

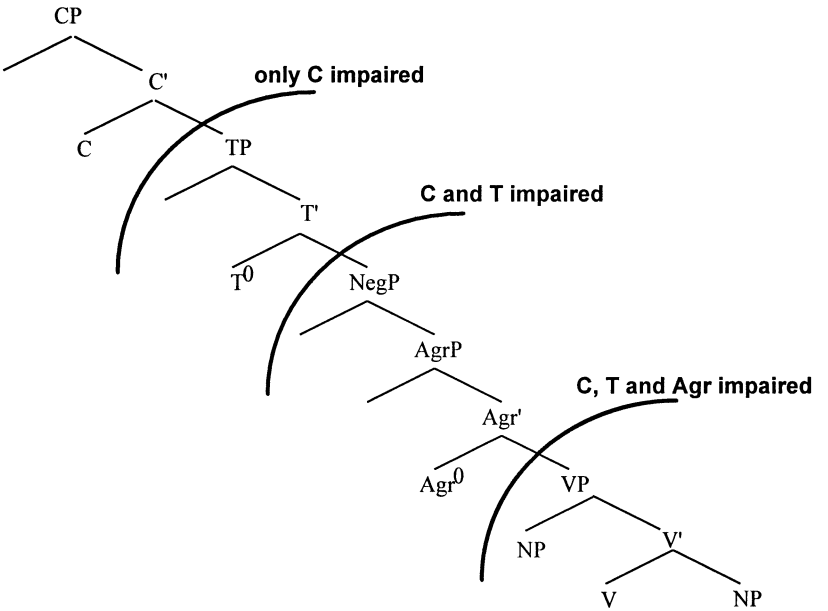


FIG. 7. Degrees of severity, determined by pruning location.

(13) Severity metric for agrammatism
For P_1, P_2 . . . P_n, different variants of the syndrome, P_i is *more severe than* P_{i-1} iff N_i, the node impaired in P_i, is contained in the c-command domain of N_{i-1}, the node impaired in P_{i-1}.

We propose this sketch to demonstrate the availability of conceptual tools for handling intra-syndrome variation in a useful manner. Still, a lot remains to be investigated empirically in patients in different languages and degrees of severity; the advantage of this proposal is that it has clear, testable predictions that, we hope, will be tested in the near future.

Non-finite verbs: An empirical consequence

Agrammatics are known to overuse infinitives and participles instead of a requested finite verb. This is true for English, where gerunds are used (cf. for instance, Goodglass & Geschwind, 1976 for an attempted explanation), and for French, Italian, Dutch and German, in which infinitival forms are prominent (cf. Tissot, Mounin, & Lhermitte, 1973, for a discussion of French; Miceli et al., 1983, for Italian; Kolk & Heeschen, 1992 for German and Dutch; and Grodzinsky, 1990, for a review).

The reason for this use of infinitival forms follows from our account. If verbs move up to T and Agr in order to incorporate to inflection, then, when both T and Agr nodes are impaired the verb cannot incorporate, and hence

remains uninfected, i.e., in its non-finite form. This, we believe, is the reason why many agrammatic aphasics are reported to use these forms excessively—it is the only way for them to construct a sentence in the absence of inflectional nodes. Yet notice that there is an interesting contrast here: the less impaired agrammatics, namely those who have at least the Agreement node preserved, will refrain from overusing infinitives, which would not satisfy the preserved-Agreement node requirements. The verb raises to Agr and gets its agreement inflection, but as the Tense node is impaired, it cannot get a proper tense inflection. Now, the use of the infinitive is no longer possible because the verb is inflected for agreement, and the result is that the milder patients will use a finite verb inflected correctly for agreement, but sometimes wrongly for tense.

The process is somewhat different when rather than incorporation, a checking theory is assumed. The results are nevertheless the same: assume that all kinds of verb forms raise to Agr and T for checking. If a nonfinite form raises to an intact (finite) Agr checkpoint, the checking mechanism detects its inappropriateness (for it is not specified for the required agreement inflection), and prevents the use of a nonfinite form. If, on the other hand, it raises to an impaired Agr (and hence impaired Tense) nothing will prevent a non finite form from substituting a finite form. The result is the same: a patient with impaired Agr and T will use nonfinite forms instead of finites, while milder patients, having a spared checking for Agr, will not use nonfinites erroneously. More specifically, the milder patients will use finite forms inflected correctly for agreement, and sometimes wrong tense.[19] This is exactly what was found in the present study and in Nespoulous et al.'s (1988, 1990): both RS and Mr. Clermont, for whom a mild impairment (only T but not Agr impaired) is hypothesized, almost never used infinitives incorrectly (four and two infinitives, respectively).

This correlation between different degrees of severity of agrammatism and use of infinitival forms is a prediction of the tree pruning hypothesis, which has yet to be examined empirically.

CONCLUSION

An agrammatic patient whose production shows a dissociation between inflectional morphemes is presented. Agreement inflection is preserved, and tense inflection is severely impaired. The selectivity of the impairment and

[19] Note that some of what seems to be finite for infinitive substitution might in fact be a result of auxiliary omission (occurring also in the ''milder'' patients). In Hebrew, in which almost no auxiliaries are in use, Aux omission cannot be the reason for overuse of infinitives. In addition, if one assumes that the abundance of nonfinite forms in agrammatic speech is a consequence of Aux omission, then one is left with an unsolved problem: why do agrammatics tend to use such forms five times more than normals (cf. Kolk & Heeschen, 1992, for an examination of this issue).

the spared agreement prove that not all grammatical morphemes are impaired in agrammatism. The impaired tense is accounted for by a syntactic account, according to which the deficit in production lies in the Tense node. This deficit causes incorrect tense inflections, as well as copula omissions (since copulas reside in the Tense node), and word order errors. Since tense is defective, no other node above it can project, and the tree is pruned. As a result complementizers and wh-words are not represented, and embedded structures and wh-questions are absent or ill-formed.

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