Tense and Agreement in German Agrammatism

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ABSTRACT

This study presents results from sentence-completion and grammaticality-judgment tasks with 7 German-speaking agrammatic aphasics and 7 age-matched control subjects examining tense and subject-verb agreement marking. For both experimental tasks, we found that the aphasics achieved high correctness scores for agreement, while tense marking was severely impaired. To account for the observed tense-agreement dissociation, we suggest that the functional category T/INFL is tense-defective in agrammatic aphasia, i.e. it is specified for [± Realis], but not for [±Past]. It will also be argued that other accounts, specifically the tree-pruning model, do not explain our findings.

Key words: agrammatism, tense, agreement, tree pruning, German, aphasia

INTRODUCTION

Agrammatism has traditionally been defined as a disorder of language production which is characterized by the simplification of syntactic structure and the omission and/or substitution of bound and free functional morphemes (e.g. Goodglass, 1968; Marshall, 1986; Leuninger, 1989; Jarema, 1998). Much research of the last decades has indicated, however, that not all functional elements are equally affected. For example, conjunctions are comparably well retained (e.g. Goodglass, 1976; Menn & Obler, 1990), and regular noun plurals yield less difficulty than possessive marking in English-speaking aphasics (Gleason, 1978). With respect to verbal morphology, recent studies of Hebrew and Arabic (Friedmann & Grodzinsky, 1997; 2000; Friedmann, 1998; 2000; Friedmann et al., 2000) showed that tense is more impaired than agreement in agrammatic production. While these findings have received some cross-linguistic support (Goodglass et al., 1993; Höhle, 1995; Benedet et al. 1998; Kolk, 2000), other studies have produced different results (de Villiers, 1978; Lehe□ková, 2001; Stavrakaki & Kouvava, in press). This raises the question of whether and to what extent the dissociation between tense and agreement is a language-specific phenomenon.

A related important question is whether agrammatic symptoms are specific to production or have corresponding manifestations in other modalities. Such parallelism, it has been argued (Weigl & Bierwisch, 1970; Berndt & Caramazza, 1981), would be a precondition for postulating any kind of central representational deficit. With respect to tense and agreement inflection, some researchers have examined agrammatic patients in tasks that tap different modalities (Goodglass et al., 1993; Friedmann & Grodzinsky, 1997; Bendet et al., 1998; Stavrakaki & Kouvava, in press). These studies found that grammaticality judgment as well as comprehension of verbal tense is well preserved, indicating that the dissociation between tense and agreement does not hold for modalities other than production.

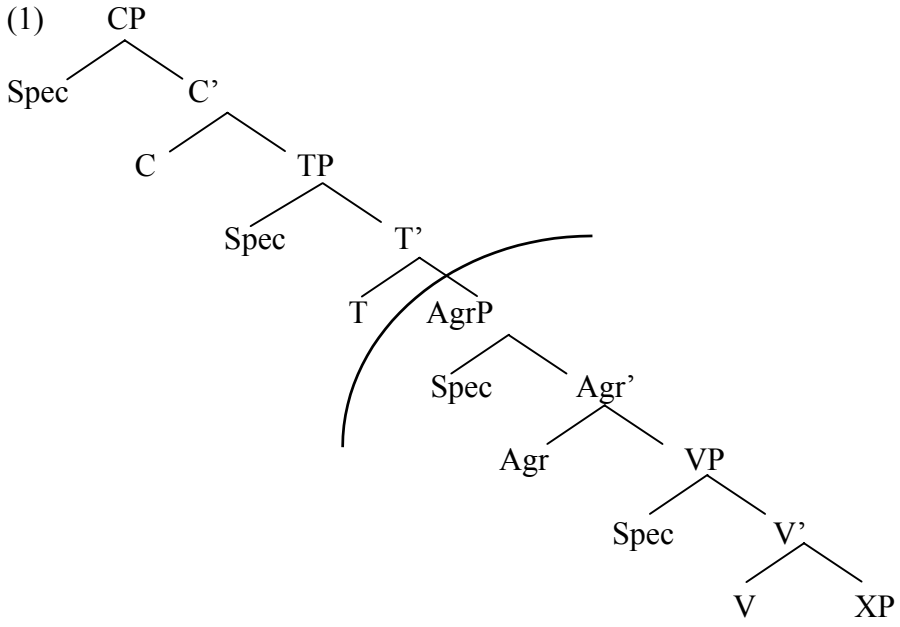
Yet, other studies (Parisi & Pizzamiglio, 1970; Pierce, 1981) found aphasics' interpretation of tense morphology to be impaired in sentence-picture matching tasks, suggesting that difficulties with tense might, at least in some patient groups, be modality-independent.

Clearly, more data and research are needed to determine whether tense and agreement are dissociated in agrammatism across different languages and across different modalities. To this end, the present study examines tense and agreement inflection in German-speaking agrammatics in two tasks, sentence completion and grammaticality judgment, using parallel materials. We will show that the tense-agreement dissociation can be replicated for German and that it holds for different modalities, suggesting that it is based on a central deficit.

PREVIOUS STUDIES OF TENSE AND AGREEMENT IN AGRAMMATISM

Attention to the existence of a dissociation between tense and agreement in agrammatic production has been drawn most prominently by Friedmann & Grodzinsky (1997; 2000) and Friedmann (2000; 2001). Testing Hebrew- and Arabic-speaking subjects on delayed sentence repetition and oral sentence completion tasks, these researchers discovered that subject-verb agreement was almost intact with error rates of less than 10%, whereas tense marking was severely impaired. By contrast, in a grammaticality judgment task with one of their Hebrew-speaking patients, Friedmann & Grodzinsky (1997) obtained virtually perfect performance on both tense and agreement; moreover, this patient did not produce any errors in an event time elicitation task which tested for the comprehension of tense morphemes. To account for these findings, Friedmann & Grodzinsky (1997, 2000) proposed the Tree Pruning Hypothesis (TPH) of agrammatic production. Assuming that AgrP is located below TP, the TPH claims that in agrammatic production higher layers of functional structure, i.e. TP and/or CP, are pruned, i.e. omitted from agrammatic phrase-structure representations, as illustrated in (1).

(1)



In addition to the dissociation between tense and agreement in agrammatic production, the TPH also predicts (due to the pruning of the CP-layer) impairments in the production of wh-questions, embedded clauses and other CP-related phenomena. Evidence suggests, however, that these additional predictions do not hold across languages. An important finding on German agrammatism comes from Penke (1998, 2000) who observed that verb-second placement of finite verbs in main clauses (which involves V-to-C movement) is largely preserved in German-speaking agrammatics, contrary to what one would expect from the TPH.

Cross-linguistic findings on tense and agreement in agrammatic production

Despite the controversy surrounding the TPH (see the *Discussion* section for further comments), Friedmann & Grodzinsky's empirical finding that tense and agreement are dissociated in agrammatic production has been confirmed in a number of studies on different languages (Goodglass et al., 1993 for English; Höhle, 1995 for German; Benedet et al., 1998 for Spanish; Kolk, 2000 for Dutch). Even though subject-verb agreement marking was not

found to be perfect, tense marking yielded considerably more errors in all these studies despite the fact that different methods and materials were used.

Other studies, however, did not find a clear dissociation between tense and agreement in agrammatic speech. Analyzing spontaneous speech data from 8 non-fluent English-speaking aphasics, de Villiers (1978) found similar mean omission rates for the 3rd singular -s (35.1%) and the past tense –ed (28.2%). In English, however, tense and agreement are difficult to tease apart; in particular, the 3rd singular –s encodes both agreement and (present) tense. It is therefore not clear whether the relatively high omission rates for this morpheme are due to difficulties with tense, agreement, or both. Two other studies examining spontaneous speech in agrammatics found similar and relatively low error rates of 10% to 15% for tense and agreement, Lehe□ková (2001) for Czech and Stavrakaki & Kouvava (in press) for Greek. Note, however, that Lehe□ková (2001) collapses subject-verb agreement and NP-internal concord into one mean error score for 'agreement'. The results of this study are therefore not directly comparable with the subject-verb agreement scores reported in the studies mentioned above. Moreover, as pointed out by Friedmann & Grodzinsky (1997), many tense errors may remain unnoticed in spontaneous speech samples, as it is often hard to identify the required target tense. Support for this comes from an elicitation study (Tsapkini et al., 2001) examining perfective past tense forms in Greek. The aphasic patient tested failed to produce the required tense forms in 41.9% of all cases resorting to present or imperfective past tense forms instead. This suggests that tense inflection is much more compromised in Greek than is apparent from the spontaneous speech data of Stavrakaki & Kouvava (in press).

With respect to *agrammatic production in German*, Höhle (1995) examined 10 agrammatic aphasics in an oral sentence completion task which required the production of present and past tense forms in the 3rd sg. or 3rd pl.. 48 auditorily as well as visually

presented sentences such as *Gestern morgen brach der Verkehr zusammen, weil alle Ampeln rot* ___ 'Yesterday morning the traffic collapsed, because all traffic lights ___ red' served as stimuli. The gap for the finite verb had to be filled with a form of the verbs *sein* 'to be' or *haben* 'to have'. Höhle found significantly more tense errors (29%) than agreement errors (9%). Substitution errors were observed for both present and past tense forms with no clear preference. These findings suggest that tense is more impaired than agreement in German agrammatism. Note, however, that Höhle tested only two irregular verbs (i.e. *haben* and *sein*) and that with respect to agreement she only tested the sing./plur. distinction, rather than person and number. Moreover, she did not examine tense and agreement in different modalities.

Tense and agreement in other modalities

According to Friedmann & Grodzinsky (1997), the dissociation between tense and agreement in agrammatism is a production-specific phenomenon. The findings of near-ceiling performance on both tense and agreement in grammaticality judgment (Stavrakaki & Kouvava, in press; see also Hagiwara (1995) for evidence of preserved grammaticality judgement of tense in Japanese) and intact tense comprehension (Tsapkini et al., 2001) support this claim. On the other hand, Parisi & Pizzamiglio (1970), using a sentence-picture-matching task with 28 Italian-speaking Broca's aphasics, found that the interpretation of present, past, and future tense morphology was more impaired than the interpretation of (number) agreement contrasts. Also using sentence-picture-matching tasks, Goodglass et al. (1993) and Bendet et al. (1998) obtained higher error scores for number agreement than for tense in both their English and their Spanish aphasics. The conclusions that can be drawn from these two studies are not clear, however. Recall first that the 3rd sg.–s in English encodes both agreement and tense, which makes it hard to interpret these error scores.

Moreover, Goodglass et al. (1993) and Bendet et al. (1998) did not examine tense marking proper, i.e. for example present vs. past tense forms. Instead, they presented periphrastic forms (e.g. *going-to*, progressive, present perfect). Comprehension of periphrastic forms in aphasics has independently been shown to be considerably better than comprehension of the present/past tense opposition (Pierce, 1981). Thus, questions remain as to how Goodglass et al.'s and Bendet et al.'s patients would have performed on present vs. past tense forms.

Summarizing, previous studies of tense and agreement in agrammatism have not yet produced conclusive results. There is evidence from a range of studies on different languages that tense is more impaired than agreement, particularly in production, but in other studies no such dissociation was found. Whether this dissociation is specific to agrammatic production is even more controversial. Clearly, more research is needed in this area.

The present study investigates a group of German agrammatics with respect to tense and agreement in tasks that tap different modalities. Our aims are to further assess the cross-linguistic validity of the hypothesized tense-agreement dissociation and the question of whether it holds for different modalities.

SUBJECT- VERB AGREEMENT AND TENSE IN GERMAN

In German, finite verbs encode the grammatical person and number of the subject as well as tense and mood. As illustrated in (2), person and number agreement in regular verbs is realized in the form of suffixes and in modal verbs in the form of additional stem changes. Besides, the verb *sein* 'to be' has a highly irregular suppletive agreement paradigm.

(2)	Regulars	Modals	Suppletive
Infinitive	hören = hear	können = can	sein = be
Present tense			
1.sg.	hör-e	kann-Ø	bin
2.sg.	hör-st	kann-st	bist
3.sg.	hör-t	kann-Ø	ist
1.pl.	hör-en	könn-en	sind
2.pl.	hör-t	könn-t	seid
3.pl.	hör-en	könn-en	sind
Past tense			
1.sg.	hör-te	konn-te	war
2.sg.	hör-te-st	konn-te-st	warst
3.sg.	hör-te	konn-te	war
1.pl.	hör-te-n	konn-te-n	waren
2.pl.	hör-te-t	konn-te-t	wart
3.pl.	hör-te-n	konn-te-n	waren

As illustrated in (2), the simple past tense (= preterite) of regular verbs is formed by -te affixation to the unmarked verb stem, with agreement suffixes following –te. The past-tense forms of so-called mixed verbs (e.g. modals) comprise stem vowel changes plus the –te suffix, while irregular (so-called strong) verbs have stem changes and no –te suffix in the past tense, e.g. *geben – gab* 'give- gave'. The verb *sein* has a highly irregular past tense paradigm as shown in (2). In contrast to the simple past, German does not have an overt present tense affix.

In German usage, the simple past is not very common, at least in the spoken language. Instead, past-time reference is mostly expressed by a periphrastic form, the so-called present perfect, which consists of an auxiliary (which is [-Past]) plus a non-finite participle. By contrast, the past tense forms of the verb *sein* and of modals are very common, also in the spoken language.

METHOD

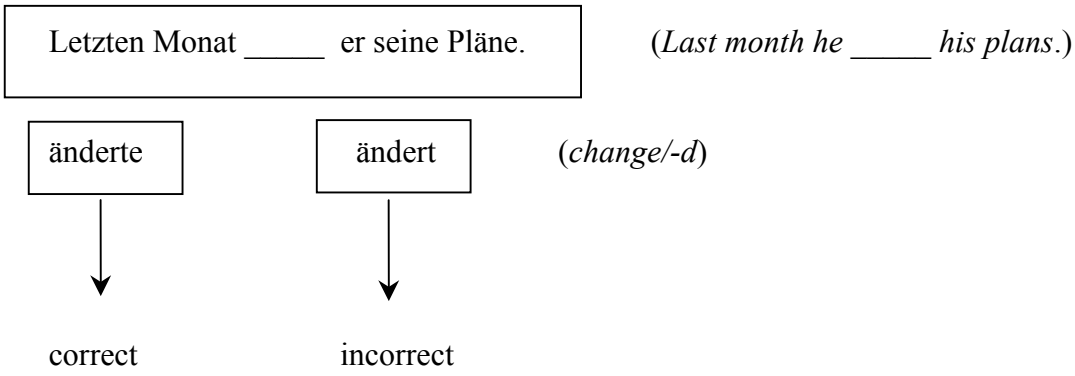
We investigated tense and agreement in two tasks, sentence completion and grammaticality judgment. In the sentence completion task, participants were presented with simple matrix clauses that contained a gap in the place of the finite verb and a set of candidate verbs one of which had to be inserted into the gap. As illustrated in (3), three candidate verb forms were offered in the agreement condition, one of which was correct in that it agreed with the (clause-initial) pronominal subject in person and number.

(3) Du _____ die Akten. (*You-sg* _____ *the files*.)

ordnet	ordnen	ordnest	(*arrange.*)
↓	↓	↓	
incorrect	incorrect	correct	

For the tense condition, illustrated in (4), sentences were presented with a (clause-initial) temporal adverbial and a gap in second position. Two candidate verb forms per sentence were offered to fill this gap, a present and a past tense form of the same verb, which both agreed with the pronominal subject in person and number, but only one of which matched with the temporal adverbial in terms of tense.

(4)



Participants were instructed to read both the incomplete sentences and the candidate verb forms aloud before deciding which one had to be inserted into the gap. Reading errors, which rarely occurred, were brought to the subjects' attention, and s/he was asked to read the word or sentence again.

In the *grammaticality judgment task*, participants were shown a counter-balanced set of grammatical and ungrammatical sentences with the same overall syntactic structure as those used in the sentence completion task. The ungrammatical sentences contained agreement violations (5a) or tense violations (5b), and were otherwise parallel to the grammatical sentences.

(5) a. Er *zitierst ein Gedicht
'He *recite-2nd sg. a poem'

b. Morgen *standen viele Themen zur Diskussion
'Tomorrow stood many topics on the agenda'
(= Tomorrow many topics were discussed.)

Participants were asked to read each sentence out loud and to decide whether or not it contains a grammatical error. To make sure that the subjects had understood the tasks, short practice sessions were administered in which feedback was provided.

Materials

In each task (sentence completion and grammaticality judgment), there were 40 critical sentences for tense and 40 for agreement. In the grammaticality judgment task, half of these were ungrammatical with respect to either agreement (see 5a) or tense (5b). Of the 40 tense items, 10 had regular ('weak') verbs, 20 were modal verbs, and 10 had suppletive forms of *sein*. Temporal adverbials were selected such that 20 sentences required a past tense verb form, and 20 a present tense form. Of the 40 experimental sentences testing for agreement, 30 had regular agreement forms, and 10 had suppletive forms of *sein*. In the grammaticality judgment task, the distribution of verb types (regulars, modals, suppletives) in the ungrammatical test sentences was the same as in the grammatical test items. Care was taken to make sure that the experimental sentences were similar in terms of their overall syntactic structure, but some differences were unavoidable due to different subcategorization requirements of the verbs involved. Main lexical verbs were transitive and always followed by a direct object NP. The verb *sein* was combined with a prepositional phrase, while the modal verbs were combined with an infinitival complement. In order to prevent subjects from developing particular response strategies, filler items were added which tested for other linguistic phenomena. There were 320 fillers in the grammaticality judgment task and 100 in the sentence completion task. The materials for both experiments can be made available upon request.

Participants

14 participants were studied, 7 agrammatic aphasics and 7 control subjects, all of whom were monolingual, right-handed native speakers of German, (even though the aphasics made, due to hemiplegia, either no or only limited use of their right hand). As shown in Table 1, there were three females and four males in the aphasic group; the age range was from 49 to 84

(mean age = 65). The control subjects were selected such that they individually matched with the aphasics in age and sex.

//Insert Table 1 about here//

All aphasic participants had a left unilateral brain lesion and were at least two years post-onset, i.e. they were physically stable. According to the Aachen Aphasia Test (Huber et al., 1983), six subjects presented with Broca's aphasia and one with non-classifiable aphasia. In addition, the speech therapists in charge had classified all patients as agrammatic on the basis of their spontaneous speech.

RESULTS

Sentence completion

//Insert Figure 1 about here//

The control group performed virtually perfectly on both tense (98.6%) and agreement (97.6%). With a mean score of 92.2% correct responses, the aphasic group did not exhibit any major problems with subject-verb agreement, whereas their performance on tense was considerably worse than that of the control group. The aphasics managed to select the required tense form in only 68.2% of all cases, which amounts to chance performance in a forced choice task with two options. Statistical between-group comparisons confirmed that the agrammatics performed significantly worse than the control subjects on tense (Mann-Whitney test: $Z = -3.18$, $p < 0.01$), whereas for agreement there was no statistically significant difference between groups (Mann-Whitney test: $Z = -1.83$, $p > 0.05$). Thus, the aphasics' performance on agreement, although worse than that of the control group, was still

within the normal range. Within-group comparisons revealed that the agrammatics had given significantly more correct responses to the agreement than the tense items (Wilcoxon test: $Z = -2.37$, $p < 0.05$). Crucially, no such difference was detected for the control group (Wilcoxon test: $Z = -0.32$, $p > 0.05$).

Table 2 presents the aphasics' individual scores in the sentence-completion task.

//Insert Table 2 about here//

Table 2 shows that the accuracy scores for tense are considerably lower than those for agreement. In fact, as indicated by the asterisks, the majority of subjects performed at or even below chance on tense. The only exception to this general pattern was EL who performed both worse on agreement and better on tense than the other members of the aphasic group.

Grammaticality judgment

//Insert Figure 2 about here//

Figure 2 shows the same performance pattern in the grammaticality judgment task as in sentence completion, even though the accuracy scores for the judgment task were overall lower than those of the completion task. Between-group comparisons revealed that the aphasics performed significantly worse than the control group in the tense condition (57.5% versus 96.4%, Mann-Whitney test: $Z = -3.09$, $p < 0.01$), whereas for agreement there was no statistically significant difference between the groups (81.4% vs. 94.3%, Mann-Whitney test: $Z = -1.88$, $p > 0.05$). Within-group comparisons showed that the control group obtained virtually the same high accuracy scores for tense and agreement (96.4% versus 94.3%). Accordingly, no significant difference was found in the statistical analysis (Wilcoxon test: Z

= -1.03, $p > 0.05$). The aphasic group, on the other hand, performed significantly worse on tense than on agreement (57.5% versus 81.4%, Wilcoxon test: $Z = -2.2$, $p < 0.05$).

Again, what has been said for the aphasic group as a whole also applies at an individual subject level, as shown in Table 3.

//Insert Table 3 about here//

Table 3 shows that the accuracy scores for tense were in most subjects considerably lower than those for agreement. In fact, as highlighted by the asterisks, all but one member of the aphasic group (= HM) performed at chance on tense, while KM was the only participant with chance performance in the agreement condition. Note, however, that KM was the only participant with consistent chance performance on the filler items as well (mean correct 56.9%), which suggests that she did not understand the task. For this reason her scores were excluded from the statistical analyses. Without KM, the aphasic group's mean accuracy score for agreement rises from 81.4% to 85.8%, which renders them even more similar to the control subjects with respect to agreement.

Across-tasks comparisons

//Insert Figure 3 about here//

Figure 3 shows that both participant groups performed less accurately in grammaticality judgment than in sentence completion, and this contrast is more pronounced in the aphasic group. More importantly, however, statistical between-task comparisons carried out separately for each group did not yield any significant difference either for the aphasics (Wilcoxon test: agreement/aphasics $Z = -1.57$, $p > 0.05$; tense/aphasics $Z = -1.26$, $p > 0.05$)

or for the controls (agreement/controls $Z = -1.58$, $p > 0.05$, tense/controls $Z = -1.86$, $p > 0.06$) showing that the different tasks had no reliable effect on their performance.

Error analysis

With respect to agreement, there was only a small number of incorrect responses, and the aphasics did not reliably differ from the control group on any measure. We have therefore not analyzed agreement any further. For tense, however, a detailed error analysis was conducted. To determine whether the aphasic subjects were biased towards a particular tense, we calculated the number of errors in present and past tense contexts in Table 4.

//Insert Table 4 about here//

Table 4 shows similar mean error rates for present and past tense contexts in both tasks. This is also confirmed statistically. Related-samples tests show no significant difference between the number of errors made in present and past tense contexts in either tasks (Wilcoxon test: sentence completion $Z = -0.91$, $p > 0.05$; grammaticality judgment $Z = -1.41$, $p > 0.05$). Thus, there is no evidence in our data that the aphasics use one of the two tenses as a fall-back or default option.

Finally, consider the question of whether there are any differences in terms of error scores between regular and irregular past-tense marking in the aphasic group.

//Insert Table 5 about here//

Table 5 shows that, while the error scores for the three verb types in the grammaticality judgment task are similar, the error scores for suppletives in the sentence completion task are

lower than those for the other two verb types. However, a two-way ANOVA with the within-subject factors 'Verb Type' and 'Task' did not yield any significant main effects or interactions (Verb Type: $F(2,10) = 2.34$, $p > 0.05$; Task: $F(1,5) = 2.51$, $p > 0.05$; Verb Type x Task: $F(2,10) = 1.72$, $p > 0.05$). From, this we conclude that the different verb types did not affect the aphasics' performance in either task.

Preliminary summary

We found that tense marking is severely impaired in German-speaking agrammatics, while (subject-verb) agreement marking is much better preserved. This pattern of performance was found for the aphasic group as a whole as well as for almost all participants at an individual subject level. The dissociation between tense and agreement was found in both experimental tasks, sentence completion and grammaticality judgment, without any significant task effects. Finally, the aphasics' difficulties with tense were found for morphologically different types of verb forms (regularly inflected verbs, modals, and suppletive forms) and there was no preference for either the present or the past tense.

DISCUSSION

Our first research question was whether the finding that tense and agreement are dissociated in agrammatism can be replicated for German. Since the agrammatics performed significantly worse on tense than agreement in the sentence completion task, the answer is clearly yes. This being so, our data are not only consistent with previous findings on agrammatic production in German (Höhle, 1995), but also provide further support for the cross-linguistic validity of a tense-agreement dissociation in agrammatic aphasia.

Our second research question was whether the dissociation between tense and agreement is production-specific or also holds for other modalities. Since the results of the

grammaticality judgment task were parallel to those of the sentence completion task and no significant task effects were found, the answer appears to be yes again. Therefore, it seems justified to assume that they originate from a central representational deficit.

There are different possibilities of how a tense-agreement dissociation can be explained in terms of impaired linguistic representations. Consider firstly, however, two other potentially relevant factors.

Perceptual saliency and frequency

One difference between (regular) tense and agreement markings in German is that the latter appear at the word boundary of a finite verb, whereas the former are suffixed to the unmarked stem and appear inside the finite verb, as for example in *lach-te-st* 'laugh-Past-2nd sg.' It is conceivable that agreement suffixes are easier to identify than the –te- tense affix, as they appear in a perceptually more salient position, and this may contribute to the observed dissociation in German agrammatics. Note, however, that the suppletive forms of the verb *sein* 'to be' have separate, perceptually highly salient tense forms; compare the paradigms in (2) above. Thus, if perceptual saliency was a decisive factor for the aphasics' performance, one would expect to find significantly fewer tense errors for suppletives than for regular tense marking. Our data show that this was not the case, indicating that a perceptual saliency account does not explain our findings.

Another potentially relevant factor is *frequency*. Clearly, agreement markings are more frequent in German usage than overt tense markings. This is because the simple past is rarely used in spoken German, and because agreement markings appear in both present and past tense contexts, whereas overt tense markings only appear in the past tense. If it is easier for aphasics to identify high-frequency morphemes than low-frequency ones, then their tense-marking difficulties could perhaps be attributed to the relatively low frequency of overt

tense forms in German. If this was correct, one would expect low-frequency forms to be more impaired in the aphasics than high-frequency forms. For example, we would expect to find present-tense forms (which are more frequent than past-tense forms) in past-tense contexts, but not vice versa. This was not the case, however. Instead, we found that in both experimental tasks, tense errors were equally distributed over present and past-tense contexts.

Morphological properties

One possibility that needs to be explored is whether the observed tense-agreement dissociation in German-speaking agrammatics can be explained in terms of impairments at the morphological level. Our findings indicate that this is not very likely. There were, for example, no reliable differences in the aphasics' tense-marking errors between morphologically different forms, i.e. target forms that require fully regular (past) tense marking, those that require suppletive past-tense marking (as in the forms of *sein*), and the so-called mixed past-tense markings required for modals. Moreover, from a morphological perspective there is a distinction between simple past (=preterite) and present tense forms in German in that the former have been claimed to be paradigmatically specified for [+pret], whereas the latter are left unspecified in the inflectional paradigm (see e.g. Wunderlich 1996); this captures the fact that the present tense does not have an overt form in the paradigm. Given this account, one might attribute the observed tense difficulties in the aphasics to a paradigmatic deficit, namely the loss of the feature [+pret] in their inflectional paradigms. If this was correct, one would expect them to rely on forms that are underspecified for [+pret], i.e. in our experiments on present-tense forms. This was not the case, however. As mentioned above, there were substitution errors in both directions with

present and past tense forms in the aphasic patients, suggesting that their tense deficit cannot be explained at the level of inflectional paradigms.

Summarizing, we do not think that perceptual saliency, frequency, or morphological properties of the inflectional morphemes involved can account for the observed tense-agreement dissociation in German-speaking agrammatics.

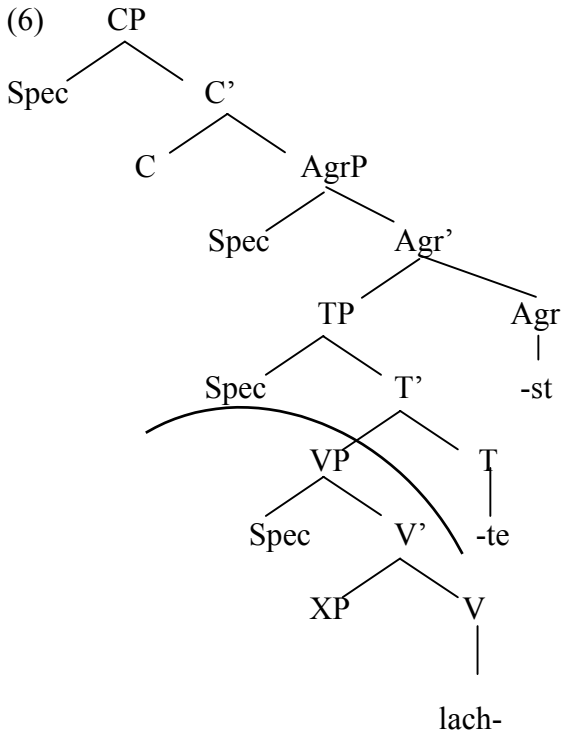
Tree pruning in German agrammatism

One prominent *syntactic* approach to explaining the dissociation of tense and agreement in agrammatism is the tree-pruning hypothesis (TPH) of Friedmann & Grodzinsky (1997, 2000), according to which higher layers of functional structure, i.e., TP and above, may be omitted from an aphasic's phrase-structure representation in production. Suppose that the hierarchy of functional categories with TP above AgrP illustrated in (1) above also holds for German. This, then, would predict that German-speaking aphasics exhibit difficulties with tense, but not with agreement, in production. Our findings are only partially compatible with this prediction in that we found the same tense/agreement dissociation not only in sentence completion (as predicted by the TPH), but also in the grammaticality judgment task.

There are also theoretical considerations that cast doubt on the linguistic assumptions upon which the TPH is built. The TPH presupposes a fixed hierarchy of functional categories CP-TP-AgrP-VP as originally suggested by Pollock (1989). Note, however, that for many languages, syntacticians working in the same framework have since posited the reversed order of AgrP and TP (see e.g. Belletti 1990). Likewise, those syntactic treatments of German that assumed separate functional categories for tense and agreement posited AgrP above TP (e.g. Grewendorf 1990, Grewendorf & Sabel 1994, Zwart 1996). This was motivated, for example, by the fact that tense markings appear closer to the verb root in

German than agreement markings, as for example, in the case of *lach-te-st* 'laugh-Past-2nd sg.'; see (6) adapted from Grewendorf & Sabel (1994).

(6)



Given this representation of German clause structure, the TPH requires the TP-layer to be pruned, to account for impaired tense marking in agrammatics. This, however, entails that all functional structure above TP is also pruned. Thus, the TPH predicts that in German agrammatism an impairment of tense co-occurs with impairments in agreement. Our results clearly disconfirm this prediction.

Moreover, while the TPH assumes both tense and agreement to be represented as separate functional categories, recent (Chomskian) syntactic theory treats tense and agreement as fundamentally different. According to Chomsky (2000), tense is an interpretable feature of the syntactic category T, whereas agreement is considered an *operation* by which certain uninterpretable features of T are checked, or 'valued'. This reflects the fact that agreement (but not tense) establishes a structural relation between two or more elements in a clause. Consequently, the functional category AgrP (and hence the CP-TP-AgrP hierarchy) have been eliminated from current syntactic theory (see Chomsky 1995

and subsequent work). Without these notions, however, the TPH cannot explain the observed dissociation between tense and agreement in agrammatism.

Towards a feature-based account of agrammatism: [±Past] vs. [±Realis]

As an alternative to tree pruning, we will briefly outline a possible feature-based account of the observed dissociation between tense and agreement in agrammatism. It should be noted, however, that this is very much a work in progress, which will probably raise more questions than it answers.

Chomsky (2000) argues that *Agree* is an operation that serves to check (or value) the uninterpretable person and number features of T/INFL against the interpretable person and number features of the subject. Under this view, subject-verb agreement presupposes the presence of T/INFL as the host of the uninterpretable features for Agree. Hence, the fact that agreement is largely preserved in agrammatics must be taken to imply that their grammars generate T/INFL. But if this is correct, how can we explain the observed tense deficits?

One aspect of finiteness marking that is often lost sight of is that finite forms do not only encode tense, but also mood. It is also worth noting that some languages (Burmese, Dyirbal, see Comrie, 1985) do not have any tense marking, but that the basic opposition here is mood, i.e. [±Realis]. In these languages, the realis form is used in both present and past-tense contexts, and temporal reference is expressed through adverbials, calendric expressions, or the discourse context. In finite verb forms of German, tense distinctions are made within both the indicative (i.e. [+Realis]) and the subjunctive ([-Realis]) mood. For early child language, Hyams (2001) and Radford (2000) have argued that the [±Realis] distinction is the most primitive opposition, with the realis mood expressing actual occurrence and the irrealis mood a desire, a necessity, or futurity of some event. The [±Past]

opposition is said to be secondary in acquisition, and is initially only marked within the [+Realis] mood.

With these considerations in mind, we may speculate that in agrammatism the syntactic category T/INFL is specified as carrying [±Realis], whereas [±Past] is left unspecified. Thus, the basic mood distinction between realis and irrealis forms would be maintained, while the secondary opposition between past and non-past forms would be lost. Recall that this is an option chosen in some languages, and, if Hyams and Radford are correct, also in early child language. Our findings on German agrammatics are compatible with this account. The materials presented to our participants all required indicative verb forms, (i.e. [+Realis]); they varied with respect to the required tense forms (as well as in terms of agreement). If [±Past] is lost and [±Realis] is preserved in agrammatism, then what should matter to the participants is that the form they choose is correct with respect to [±Realis]. Since all the forms they were offered were indicative, i.e. [+Realis], present and past-tense forms should be equally appropriate. Our results show that this was indeed the case. Tense distinctions did not matter to the aphasic patients, as tense errors were evenly distributed across present and past-tense contexts.

We concede that the idea that T/INFL is specified for mood, but not for tense in agrammatism requires further testing and theoretical elaboration. According to our proposal agrammatics should be capable of distinguishing between realis and irealis mood. For child language, Hyams (2001) argues that the root infinitives children produce in early stages of acquisition have a modal (= irrealis) interpretation, whereas the finite clauses they produce during the same period have a realis interpretation. Given large speech samples from agrammatics, one could examine whether a similar contrast holds for the finite versus non-finite clauses produced by agrammatics. Another way of further investigating our proposal would be to probe the agrammatics for indicatives versus subjunctives, rather than for

present versus past tense. If they are capable of distinguishing between indicatives and subjunctives, that would provide support for our proposal. A more general issue that requires additional theoretical elaboration concerns the question as to *why* the [±Past] distinction should be lost in agrammatism. The present study has not addressed this question. Note, however, that if tense and mood along with other notions constitute a *feature hierarchy* in which mood represents the more basic opposition (Hyams 2001), then the selective loss of [±Past] would be compatible with the more general view that basic feature oppositions are maintained in aphasia while less fundamental ones may be lost (see Jakobson 1941 and subsequent work).

CONCLUSION

Results from sentence completion and grammaticality judgment tasks with seven German agrammatic aphasics and seven controls demonstrate that subject-verb agreement is largely intact, while tense is severely impaired in German agrammatism. These findings suggest that inflectional morphology is not defective across the board. Contrary to Friedmann & Grodzinsky's (1997) claim that the dissociation between tense and agreement is a production-specific phenomenon, we found it to be equally manifested in grammaticality judgment, suggesting that difficulties with tense are modality-independent and rooted in a central representational deficit.

A discussion of various factors that might potentially account for our findings revealed that the aphasics' difficulties with tense marking cannot be attributed to peripheral factors such as perceptual saliency and frequency, and that morphological properties of the verb forms involved are also unlikely to cause these difficulties. We therefore explored different ways of accounting for the tense-agreement dissociation in syntactic terms. Friedmann & Grodzinsky's (1997, 2000) hypothesis that functional categories may be pruned from the

aphasics' phrase-structure representations was rejected on both theoretical and empirical grounds. We therefore explored an alternative idea, that the syntactic category T/INFL is tense-defective in agrammatism, i.e. specified for [±Realis] but not for [±Past]. Even though this proposal accounts for our findings, we acknowledge that further research is needed to test its validity.

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Table 1: The aphasic participants

Subject	Age	Sex	Years post-onset	AAT diagnosis	Etiology
DB	58	f	23	Broca‘s	Left ACM[1] occlusion
EL	49	f	22	Broca‘s	Left ACI[2] aneurysma
KM	84	f	2	Broca‘s	Left ACM[1] occlusion
MH	59	m	15	Broca‘s	Left ACI[2] occlusion
HM	66	m	12	Broca‘s	Left ACI[2] occlusion
WH	70	m	16	Broca‘s	Left basal ganglia haemorrhage
OP	69	m	2	Non-class.	Left ACM[1] occlusion

[1]ACM = Arteria carotis interna; [2]ACM = Arteria cerebri media

Figure 1: Group results of the sentence completion task

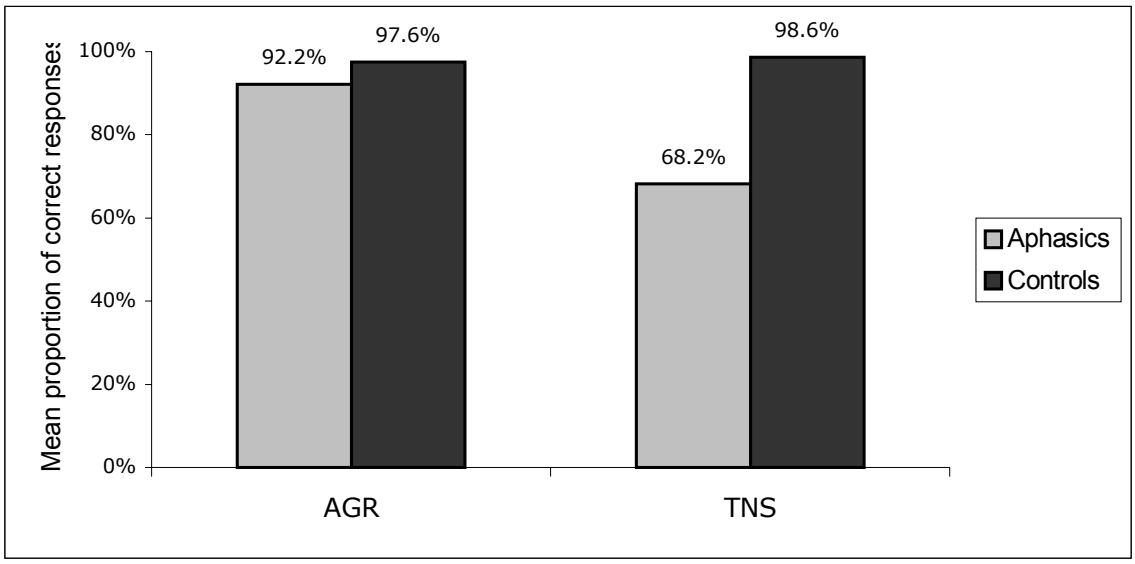

Table 2: Individual accuracy scores of the aphasics in the sentence completion task

Aphasic subjects	Agreement (% correct)	Tense (% correct)
DB	95.2	*70.0
EL	83.3	82.5
KM	90.5	72.5
MH	97.6	*67.5
HM	92.9	75.0
WH	85.7	*62.5
OP	100.0	**47.5

** = chance performance (50-70%); ** below-chance performance (< 50%)*

Figure 2: Group results of the grammaticality judgment task

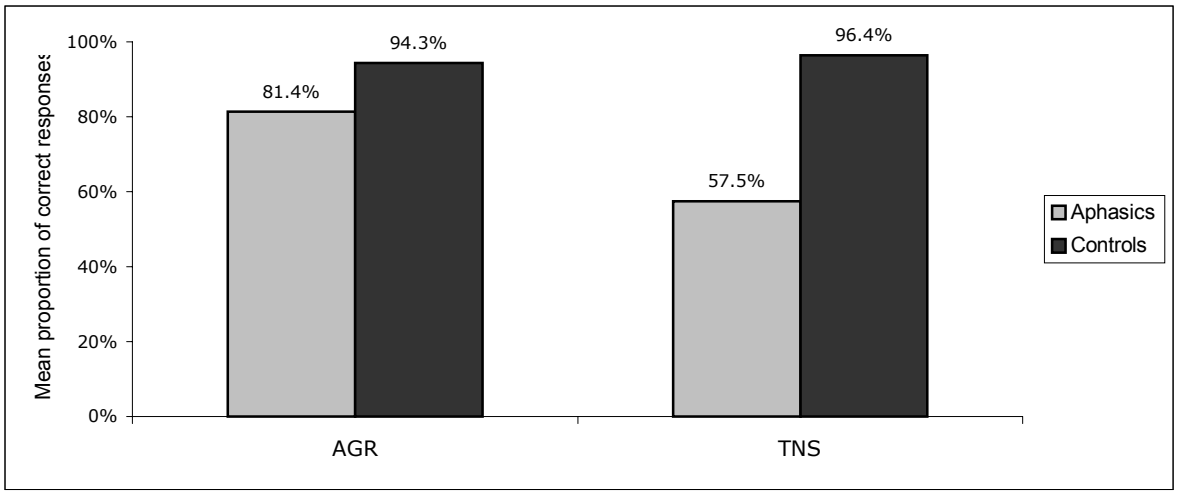

Table 3: Individual accuracy scores in the grammaticality judgment task

Aphasic subjects	Agreement (% correct)	Tense (% correct)
DB	82.5	*50.0
EL	92.5	*50.0
KM	*55.0	*57.5
MH	95.0	*57.5
HM	90.0	87.5
WH	75.0	*50.0
OP	80.0	*50.0

* = *chance performance (50-70%)*

Figure 3: Comparison of sentence completion (SC) and grammaticality judgment (GJ)

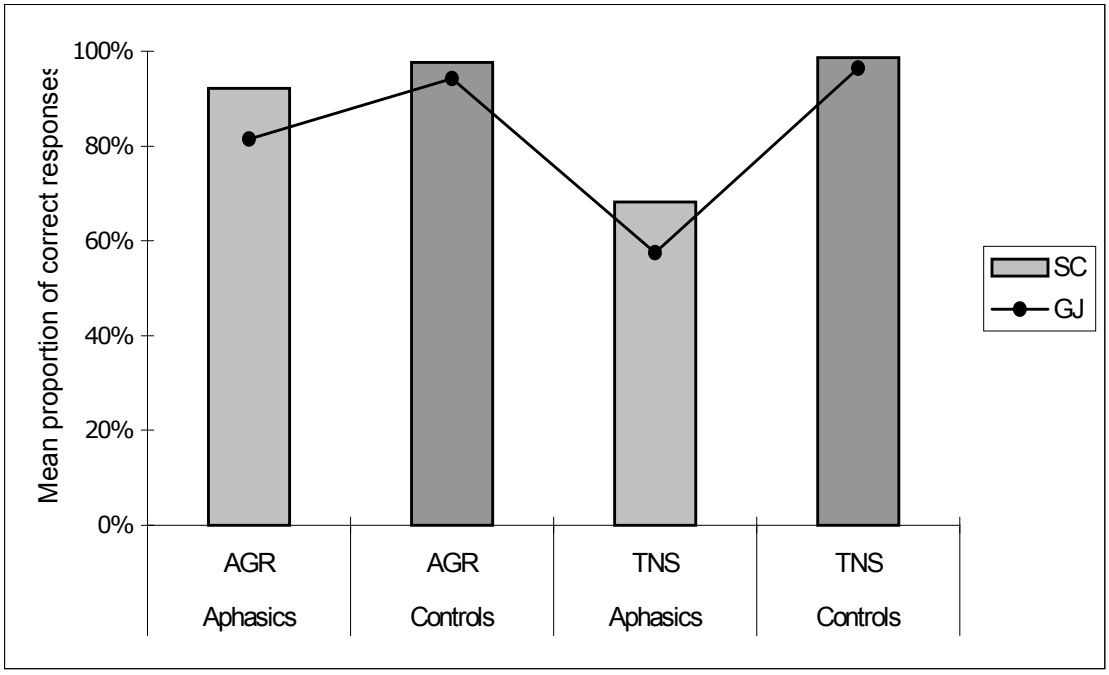

Table 4: Number of tense errors in present and past tense contexts

	Sentence completion		Grammaticality judgment	
Aphasic subjects	Present tense contexts	Past tense contexts	Present tense contexts	Past tense contexts
DB	6	6	10	10
EL	6	1	10	10
KM	3	8	(9)	(8)
MH	5	8	9	8
HM	7	3	3	2
WH	3	12	10	10
OP	13	8	10	10
Mean	6.1	6.6	8.7	8.3

Table 5: Tense errors across verb types

	Mean proportion of incorrect responses by verb type		
Task	Regular	Modal	Suppletive
Sentence completion	35.0	36.2	23.3
Grammaticality judgment	43.3	43.3	41.7