Tense and agreement impairment in Ibero-Romance

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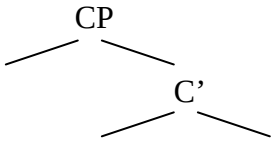
Abstract

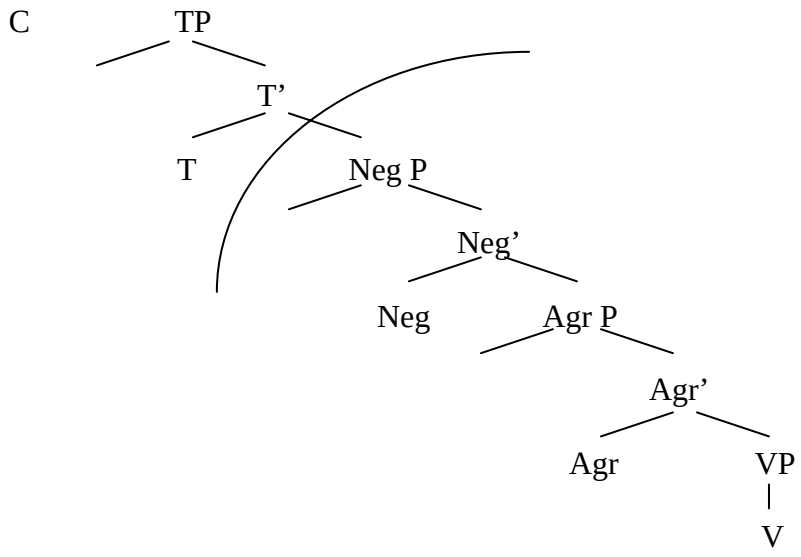
We examine the inflectional productions of 7 Catalan, 7 Galician and 7 Spanish speaking agrammatic subjects in an elicitation and a sentence repetition task and consider them in the light of the Tree Pruning Hypothesis (TPH). The results show relatively spared subject person/number agreement with the verb, and impaired tense marking for all subjects in all the languages. Recent reformulations of syntactic theory (Chomsky 1999, 2000) regarding the locus of agreement force a reconsideration of the TPH for it to make the desired predictions: it is shown that subject agreement must occur between the subject DP and a low functional head for selective impairment to result. Feature underspecification, formerly considered, is rendered unnecessary.

Keywords: agrammatism, sentence production, tense, agreement, Ibero-Romance, Catalan, Galician, Spanish, tree pruning, minimalism

The Tree Pruning Hypothesis, formulated by Friedmann (1994) and Friedmann and Grodzinsky (1997) asserts that agrammatic patients produce syntactic structures which are intact up to a certain node, but truncated or 'pruned' from that node up. As a result, agrammatic patients are predicted to display selective impairment of the various functional categories which compose a syntactic representation as in (1).

(1)





Empirical evidence for this hypothesis can be brought forward for Hebrew (Friedmann 1994), Arabic (Friedmann and Grodzinsky 1997, Friedmann 2001), English (Goodglass et al. 1993, Benedet et al. 1998), Italian (Miceli et al. 1989), French (Nespoulous et al. 1988) Japanese (Hagiwara 1995), German (Höhle 1995, Wenzlaff and Clahsen (to appear)), and Dutch (Kolk 2000), with the putative counterexample of Korean, Lee (2003). It is the purpose of this paper to bring original evidence for the selective impairment of tense and agreement with a new set of languages, belonging to the Ibero-Romance family: Catalan, Galician and Spanish. Of these, only Spanish had been previously examined in Benedet et al. (1998), and their results indicate that subject agreement was on average correct 63% of the time, while low content verbs and tense marking was correct only 25% and 5% of the time, respectively – supporting the TPH. However, Benedet et al.'s low content and tense markers correspond to functional projections higher than those considered in our experiment (following Cinque 1999). Here we aim at enlarging the empirical coverage of the studies of inflectional decifit in agrammatism crosslinguistically, and consider the parallelism existing in language disruption in three related languages.

The paper proceeds as follows. In section 1 the basic features of the verbal inflectional system of Ibero-Romance are presented. In section 2 the experimental study is detailed, including subjects, experimental design and procedure. In section 3 our results are presented and their implications are drawn, especially with regard to functional categories. In section 4 some theoretical considerations raised by the study are undertaken: how tree pruning and recent minimalist approaches to language interrelate.

1. Verbal inflection in Ibero-Romance

Catalan, Spanish and Galician are Romance languages spoken in the Iberian peninsula which display in all their varieties a rich array of verbal inflectional markers. Finite verbs consist of a verbal root followed by a tense/mood marker, and a subject agreement marker (consisting of person and number features). Verb roots on their own are in general not (morphologically) possible words. Verbs belong to different verb classes, typically I, II and III conjugations, characterised by the appearance of certain vowels in some of the members of the paradigm and preceding tense/mood markers, as in the infinitives in (2); conjugations are of no semantic import.

(2)	cant-a-r	I conjugation	(Spanish)
	sal-i-r	III conjugation	

Allomorphy is common in all verb classes. The tense/mood combinations possible in a simple tense for each of the languages appears in (3), and the person/number combinations in (4).

(3) {present, preterite, imperfect, future, conditional; present subjunctive, past subjunctive; infinitive, gerund, participle} for Catalan, Galician, Spanish
{past perfect, pluperfect} for Galician

(4) {1 person, singular; 2 person, singular; 3 person, singular; 1 person, plural; 2 person, plural; 3 person, plural}[1]

The examples in (5) illustrate finite verb forms in the three languages:

(5) a. cant–a–re–m (Catalan)
sing I fut 1pl
'We-will-sing.'

b. and-ou (Galician)
go past perf 3sg
'He had gone.'

c. cant–e–s (Spanish)
sing pr.subj 2sg
'You(sg.)-sing(subj).'

Catalan, Galician and Spanish are null subject languages, so that sentences with an implicit subject are common, and other properties of null subject languages are attested.

2. The experiment

[1] Galician has an infinitive marked for person/number, unlike Catalan and Spanish.

To the extent that verbal forms in Ibero-Romance are complex with regard to inflection, they provide a good testing ground for any hypothesis claiming that inflectional impairment is selective. Our experimental design replicates that in Friedmann and Grodzinsky (1997) for Hebrew, and involves delayed sentence repetition and completion tasks.

Design – The experimental items included are person/number combinations and two tense contrasts for the three languages, thus providing 12 variables. The tenses chosen were all indicative, present vs. past tense; in particular, in Spanish and Galician the preterite was chosen (6a), while in Catalan the preterite was replaced by the imperfect (6b). This was due to the fact that the preterite is a compound form in most Catalan varieties (*vas arribar* past+2s arrive 'you arrived') and avoidance of the auxiliary forms was preferable on the founded grounds that auxiliaries involve further functional projections (Cinque 1999).

(6)	a.	corro	corrí	(Spanish)
		corr-es	corr-iste	
		corre	corrió	
		corremos	corrimos	
		correis	corristeis	
		corren	corrieron	
	b.	temo	temia	(Catalan)
		tems	temies	
		tem	temia	
		temem	temíem	

temeu	temíeu
temen	temien

Confounding forms which could lead to misinterpretation were avoided (e.g. Spanish *cantamos*, both 1st person plural present and preterite).

In the delayed repetition task, subjects heard a sentence of the type in (7) for Spanish being uttered by the experimenter.

(7) El niño come manzanas.
the child eats apples

Subjects were then asked to count up to three (to block phonological echoing responses, Baddeley 1990), and reproduce the given sentence.

In the completion task, subjects were exposed to a complete sentence with a clause initial temporal adverbial. The experimenter then started providing an incomplete sentence they had to complete; crucially, the incomplete sentence was the partial reproduction of the first one but with a change in the temporal marker (8a) (in order to trigger a change in tense) or in the subject (8b) (to trigger a change in agreement). Subjects were asked to complete the sentence:

(8) a. Avui, la Maria pinta un quadre. Ahir, la Maria ———.
today det Maria paints a picture yesterday det Maria

b. Ahir, jo saltava les tanques. Avui, ells ——.
yesterday I jumped the fences yesterday they

The gap in the sentence type (8b) can be filled with more than one tense to give rise to a well formed sentence; e.g. in Catalan, present and present perfect are both compatible with the verb in (8b) above. As adverbs were introduced to trigger a change in tense, whenever the subject produced a change that gave rise to grammaticality, the response was accepted as a correct response.

Subjects – The experiment was undergone by 7 Catalan, 7 Galician and 7 Spanish speaking patients in most of the cases in stable neurological condition[2]. They were right-handed from the metropolitan area of Barcelona and from the Pontevedra area in Galicia; the time of lesion ranged from 3 months to 20 years prior to testing. The age of subjects ranged, for Catalan from 62 to 82 (mean age: 70), for Spanish from 26 to 83 (mean age: 61,3) and for Galician from 50 to 82 (mean age: 66,5). Background information about the subjects appears in Table 1 (where C identifies Catalan speakers, G Galician speakers and S Spanish speakers).

Table 1: Background information on subjects

Subject	Age	Education	TPO	Hand	Etiology	Related disorders

[2] We are grateful to the Associació Sant Pau of Language Disorders in Barcelona, as well as the Hospital Provincial de Pontevedra and the Asociación Amencer of Pontevedra and Villagarcía for facilitating access to the patients who so kindly took part in our experiments.

Catalan						
CA	62	3	3	R	CVA Embolic	Memory and attention disorders
CB	65	1	3	R	CVA	*
CC	82	1	5	R	*	*
CD	68	1	6	R	*	*
CE	69	1	4,5	R	*	*
CF	69	3	6	R	CVA	Memory disorders
CG	81	1	4	R	*	*
Galician						
GA	68	3	2,5	R	Brain attack	No
GB	82	1	4m	R	Ischemic CVA	Weak Right Hemiparesis
GC	62	1	3m	R	*	*
GD	73	2	7m	R	CVA	Right Hemiparesis
GE	55	2	1	R	Hemorrhagic CVA	Paresis in the Right Arm
GF	75	1	*	R	*	*
GG	50	1	*	R	*	*
Spanish						
SA	73	1	3m	R	Ischemic CVA	Right Hemiparesis
SB	66	2	3	R	Ischemic CVA	Right Hemiparesis, Dysarthria
SC	57	3	2	R	Hemorrhagic CVA	Right Hemiparesis
SD	83	1	3m	R	Ischemic CVA	Dysarthria
SE	74	1	1	R	*	Hemiplegia
SF	50	2	2	R	CVE	Dysarthria
SG	26	2	2	R	Cranial-Encephalic Traumatism	Dysarthria

1 = Primary education; 2 = Secondary education; 3 = University studies; TPO = Time post-onset (in years – m: months); R = Right-handed (even though, due to hemiplegia, subjects presented a varying degree of use of their right hand); CVA = Cerebrovascular accident; CVE = Cerebrovascular disease; * = No data available

Procedure – Relevant information was collected at the beginning of each individual session. The experiment, run in a quiet room, included the two tasks, with sentence repetition run first. A 5-minute pause was optionally included after the first 25

experimental items. Tokens were read aloud by the experimenter at a normal reading speed, and repeated if necessary. The total duration of the tasks oscillated between 20 and 40 minutes depending on the subject.

The same tests were carried out with three control groups, paired with the experimental subjects. The procedure was the same as with the experimental subjects, and tasks were run in a quiet place in 20-minute individual sessions.

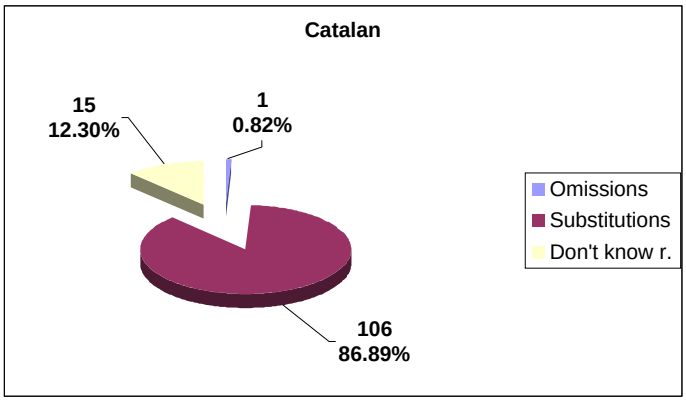
The experimental sessions were fully videotaped, including explanations by subjects and experimenter, repetitions, false starts and conversation during pauses. Naturalistic data, when relevant, were also analysed.

3. Results

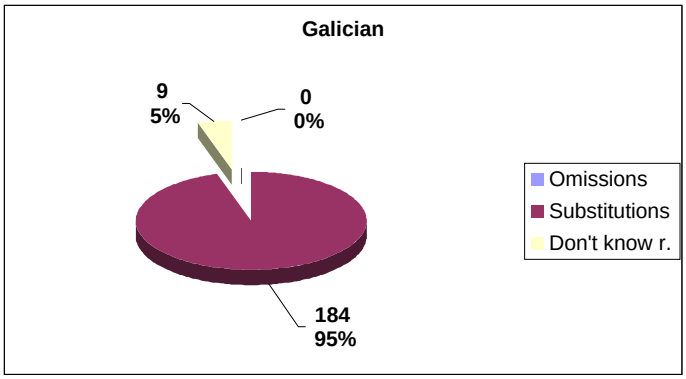
A quantitative analysis of the data was carried out: percentages of errors in tense and agreement were calculated and analysed along linguistic parameters. In this section we provide the results keeping apart (i) different kinds of morphological errors: omissions versus substitutions; (ii) tense versus subject agreement errors for each of the tasks (completion and repetition). Naturally, the results for the three languages considered are compared.

Taken from a morphological point of view, the errors encountered were substitutions, and not omission errors, as represented in graphs 1, 2 and 3, for Catalan, Galician and Spanish respectively. The only omission error computed (out of 700 responses elicited per language) corresponds to an omission in Catalan which did not affect the inflection, but part of the verbal root (*sem* for *sabem* ‘we know’).

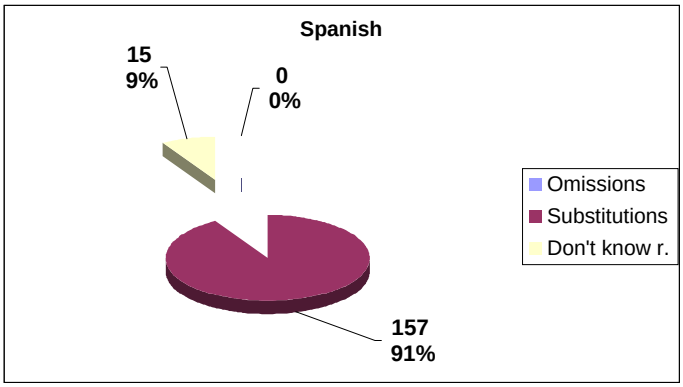
Graph 1: Distribution of errors and ‘don't know’ responses in Catalan



Graph 2: Distribution of errors and ‘don’t know’ responses in Galician



Graph 3: Distribution of errors and ‘don't know’ responses in Spanish



With respect to subject agreement and tense inflection, results for Catalan, Galician and Spanish appear in table 2, with repetition and completion separately. For all languages tense marking is more impaired than subject agreement marking; a two-way ANOVA showed significant differences between tense and agreement at a level of

$p < 0.01$. This difference holds also for all the subjects reported; two subjects (CC, CG) produced no agreement errors at all, and two more (CD, GA) reached only 1–2% error rates, which is close or identical to the error mean obtained for the controls. Finally, one subject, SC, produced no errors at all, an indication that in the agreement/tense syntactic field her productions were intact.

Table 2: Distribution of tense and agreement errors for the two tasks

Catalan

	Tense		Agreement	
	Repetition	Completion	Repetition	Completion
CA	2% (1/50)	20% (10/50)	0% (0/50)	10% (5/50)
CB	24% (12/50)	26% (13/50)	8% (4/50)	6% (3/50)
CC	2% (1/50)	18% (9/50)	0% (0/50)	0% (0/50)
CD	0% (0/50)	10% (5/50)	0% (0/50)	2% (1/50)
CE	6% (3/50)	28% (14/50)	2% (1/50)	12% (6/50)
CF	8% (4/50)	14% (7/50)	0% (0/50)	6% (3/50)
CG	0% (0/50)	10% (5/50)	0% (0/50)	0% (0/50)

Galician

	Tense		Agreement	
	Repetition	Completion	Repetition	Completion
GA	0% (0/50)	36% (18/50)	0% (0/50)	4% (2/50)
GB	0% (0/50)	40% (20/50)	0% (0/50)	10% (5/50)
GC	0% (0/50)	58% (29/50)	0% (0/50)	12% (6/50)
GD	2% (1/50)	40% (20/50)	2% (1/50)	16% (8/50)
GE	4% (2/50)	36% (18/50)	0% (0/50)	8% (4/50)
GF	4% (2/50)	42% (21/50)	2% (1/50)	6% (3/50)
GG	0% (0/50)	40% (20/50)	0% (0/50)	6% (3/50)

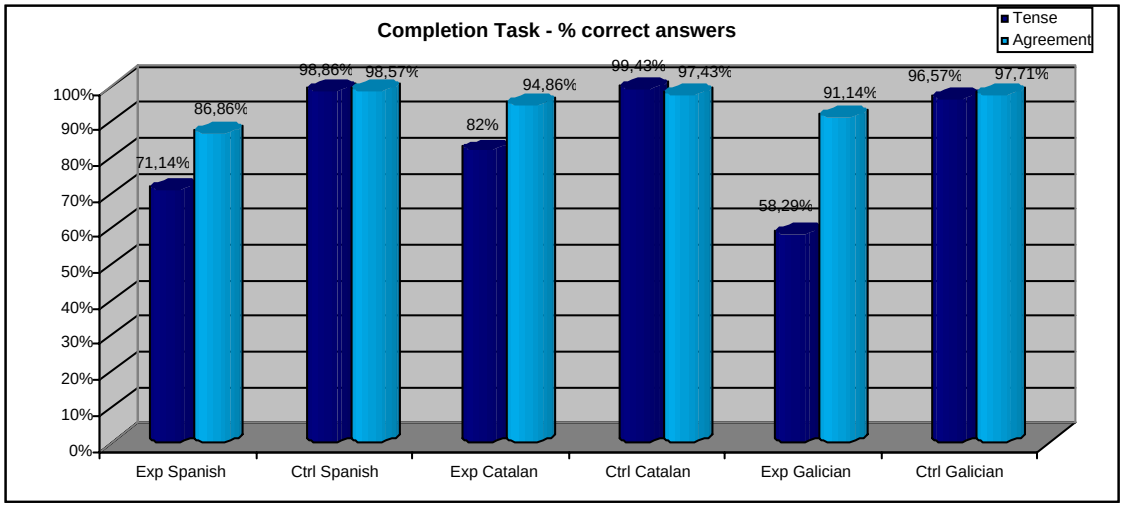
Spanish

	Tense	Agreement

	Repetition	Completion	Repetition	Completion
SA	2% (1/50)	26% (13/50)	0% (0/50)	18% (9/50)
SB	4% (2/50)	16% (8/50)	0% (0/50)	6% (3/50)
SC	0% (0/50)	0% (0/50)	0% (0/50)	0% (0/50)
SD	10% (5/50)	52% (26/50)	2% (1/50)	32% (16/50)
SE	0% (0/50)	32% (16/50)	0% (0/50)	14% (7/50)
SF	0% (0/50)	56% (28/50)	0% (0/50)	16% (8/50)
SG	2% (1/50)	20% (10/50)	0% (0/50)	6% (3/50)

Across tasks, completion was found to be harder than repetition for all languages (and all subjects: agrammatic and control); the difference was significant at $p < 0.01$ in a two-way ANOVA. Comparison of the aphasic subjects with the controls for the two tasks appears in graph 4.

Graph 4: Distribution of correct responses by experimental subjects and controls



The difference between controls and agrammatic subjects is significant in the three languages considered (in a two-way ANOVA $p < 0.01$), even though the error rate for agrammatics was relatively low – presumably due to the mildness of the subjects' aphasia. Between-group comparisons show that differences in behaviour between

Catalan, Galician and Spanish agrammatics are not significant (for Catalan and Spanish at $p < 0.01$, for Galician at $p < 0.05$).

4. Discussion

The results reported are relevant to our understanding of the mechanisms at play in agrammatic linguistic production in two respects: (i) aspects of intact linguistic abilities (the morphological ones), and (ii) the relative impairment of two syntactic phenomena, tense and agreement inflection.

4.1 Morphological well-formedness

With respect to the first issue, the subjects in our experiment produced substitution errors rather than omission errors, which would have given rise to non-words in the languages under examination[3]. It can thus be concluded that agrammatics preserve their linguistic abilities when it comes to word well-formedness conditions even when these are considerably complex, as happens in Ibero-Romance and Romance verbal morphology in general (performance has been target-like for all subjects). This outcome is in line with what has been found in a number of languages and led to the assertion that

(9) Lexical well-formedness considerations are operative in agrammatism. (…) To meet lexical well-formedness, then, a word *must* be inflected if it does not have a zero-form.
(Grodzinsky 1990:58)

More recently, and in line with previous work too, Grodzinsky (2000) has stated that "if we assume that inflectional features (ϕ-features) are underspecified in the syntactic representation of agrammatic Broca's aphasics (Grodzinsky 1984; 1990), we get errors of inflection, whose type depends on the +/–zero-morphology property of a given language: Underspecified features in a +zero-morphology-language would result in omission, whereas in a –zero-morphology-language the result would be substitution. There is, then, a varied manifestation of the syndrome (…)' (Grodzinsky 2000: 15). Our results are consistent with Grodzinsky's contention, insofar as there is –zero-morphology in Ibero-Romance. What happens in +zero-morphology-languages is, from a theoretical perspective, more controversial: word well-formedness conditions are preserved whether the words produced in these languages are root or inflected. Unless some further condition is added, morphological well-formedness does not discriminate between a root form such as *eat* and an inflected one like *eats*. Even if verbs with omission may be the first resort for agrammatic subjects in e.g. English and Japanese, this is to our knowledge not *predicted* by any theory. Underspecification of a feature implies that a verbal item enters the enumeration with its features underspecified for the purposes of checking, regardless of which specification they had for features of finiteness, person, number, etc. Leaving that aside, as far as Catalan, Galician and Spanish are concerned, our results meet the expectations of (9) above.

More critically, underspecification of ϕ–features implies that these are not available for any syntactic computation; if, as is now clear, inflection is selectively impaired, the lexical items that enter the numeration cannot be underspecified: rather, they may enter the numeration with whatever specification and have all or some of their features not checked against a functional category. This interpretation is in line with an

[3] The errors found did not include resource to infinitival forms, which have been attested as errors in other

approach such as that of Distributed Morphology (Halle and Marantz 1993), in which the syntax manipulates morphosyntactic features, but the mechanisms of word formation apply prior to the syntax. Briefly, we contend that underspecification cannot be the source of the agrammatics' deficit. The TPH suffices to grant the behaviour observed, as we will show.

4.2 Truncation and minimalism

As movement operations have been recast in recent minimalist proposals, a former problem with tree-pruning has been resolved: if we assumed that movement is motivated by a feature that needs to be checked out in a higher functional projection (Chomsky 1995), leaving any such feature unchecked should result in the crash of the derivation. In agrammatism, if tree-pruning takes place, we would expect – contrary to fact – the crash of numerous truncated structures[4]. In more recent proposals (Chomsky 1999, 2000), movement is a consequence of the attraction of an element with an interpretable feature (the goal) by a higher constituent with a corresponding uninterpretable feature (the probe). Attraction of the goal by the probe allows for the cancelling out of the uninterpretable feature, which must be erased for the derivation to converge. Motivation for raising lies in the element that bears the uninterpretable feature, since uninterpretable features must be erased for a derivation not to crash. Truncation of this element causes the goal not to raise, but does not make the derivation

languages (e.g. Dutch, de Roo 1999) – interestingly, they are reported in Benedet et al. (1998) for Spanish, to a non specific degree. The source of these infinitival forms remains a topic for future research.

[4] In fact, this was argued to be the reason for the lack of root infinitives in child Romance in the first truncation proposal, due to Rizzi (1993/1994).

crash.[5] So the shift from the first to the second approach to movement receives some empirical support from agrammatism, particularly agrammatic production.

Just as movement operations have come to meet the needs of the syntactic characterisation of agrammatism, the basic sentential structure postulated has evolved in a controversial direction.

As pointed out in a similar study of the selective impairment of tense and agreement in German, Wenzlaff and Clahsen (to appear), contemporary generative work establishes a sentential structure that is in contradiction with the earlier assumptions of Friedmann (1994) and Friedmann and Grodzinsky (1997) represented in (1) above, based on Pollock (1989). Chomsky's minimalist program (Chomsky 1995) involves no agreement node, on the grounds that agreement is a *relation* that holds between constituents, rather than a *category* in itself. If so, it is crucial to determine the locus of subject person-number agreement to grant the predictions of the TPH in the former structure.

In view of this state of affairs, Wenzlaff and Clahsen (to appear) propose that dissociation of tense and agreement is a consequence of T being underspecified for different tense features, but correctly specified for mood features ([+/–realis]) in agrammatic production. This approach suffers from two shortcomings. First, there is no empirical evidence for the maintenance of the [+/–realis] distinction. Second, and with more detrimental effects, there is a considerable amount of evidence pointing to a structural deficit in agrammatic production. Specifically, nodes higher than TP have been shown to be affected as a consequence of tree-pruning at the TP level: disruption of embedding and wh-questions, V2 phenomena, etc., result from it. The clustering of

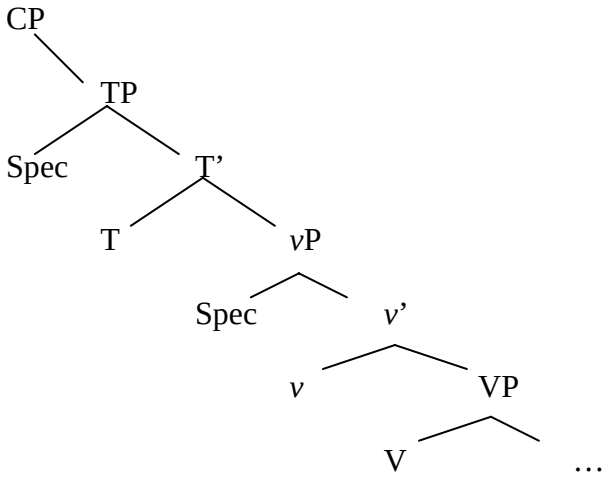
[5] There is indeed evidence for lack of raising in truncated structures in agrammatic production, as for instance in lack of V2 in Dutch (van Zonneveld and Bastiaanse 1999) or residual V2 in Hebrew (Friedmann 2001).

all these phenomena follows in the TPH, but becomes accidental in Wenzlaff and Clahsen's (to appear) analysis, and as a consequence a generalisation is missed.

Along a different line, Belletti (1990) and Guasti and Rizzi (2001) propose an agreement node (or an agreement field, with various categories) higher than TP. Assuming the TPH, then the predictions would be that selective impairment would result in disruption of agreement without disruption of tense, contrary to fact.

Let us basically assume the structure proposed in recent minimalist proposals (Chomsky 1999, 2000), with no agreement node:

(10)



It could be assumed that number/person features of a subject DP would check against the features in T from the specifier position of TP; the raising of the subject to the specifier of TP would primarily be a consequence of an EPP feature in T, but also result in subject/verb agreement. However, as is evident in the null subject Romance languages, subject agreement may occur without raising to the Spec of TP, as postverbal subjects agree with the verb in most varieties (although there are also Romance varieties in which number/person agreement differs between pre- and postverbal position; see Rigau 2000 for Catalan, Costa to appear for Brazilian Portuguese).

(11) a. El Joan canta/*cantes. (Catalan)
The Joan sings/sing-2s
b. Canta/*cantes el Joan.
Sings/sing-2s the Joan
'Joan sings.'

The proposal that subject-verb agreement takes place prior to raising is consistent with Chomsky's (1999, 2000) contention that Agree allows for a long-distance checking of features. There are other, recent empirical findings that support this view: Wurmbrand (2003) argues that, although English and German, as non-null subject languages, never allow postverbal subjects, subject-verb agreement must occur via Agree to grant the interpretation of German scope freezing contexts. Independently, Costa (to appear) argues for Portuguese that post-verbal subjects are necessarily licensed under Agree, rather than raising, and adduces some locality effects that witness the licensing taking place in the lower position (in particular, infinitivals may have subjects, provided they are embedded in restructuring verb phrases). However, the two analyses mentioned assume a single TP node, with which feature checking takes place.

We assume that Agree is responsible for person/number checking between the verb and a higher functional projection. Clearly, if we also assume that the TPH holds, Agree must take place between V and a functional category *other than* T when T is pruned; otherwise pruning of TP would result in simultaneous disruption of tense and person/number agreement. We take the sentential structure of the clause to be that proposed in Cinque (1999), where T materialises in a series of differentiated

tense/mood/aspect functional heads. Our experiment focuses on one of those heads, TP(Past) in (12).

(12) $ModP_{epistemic}$ > TP(past) > TP(Future) > $MoodP_{irrealis}$ > (…) $AspP_{habitual}$ > (…) > TP(Anterior) > $AspP_{terminative}$ > $AspP_{continuative}$ > (…) > VP

If the operation to eliminate uninterpretable features of person and number is to take place without problem despite pruning at TP(Past), those features must reside lower than TP (Past), for example in a lower AspP. Movement of the subject is motivated by EPP features, not by person/number agreement. With respect to agreement, Cinque (1999) argues that it may occur at different points in the hierarchy; the EPP feature that forces subjects to raise to preverbal position is responsible for the DP subject to raise to the front of all tense-mood projections, generally not to remain in intermediate positions (see Cinque 1999). Nothing precludes raising of the subject to a specifier position to the left of the verb due to an EPP feature.

The patients of Ibero-Romance tested present various degrees of disruption: some are affected mildly in the projection of TP (and by hypothesis we presume that all nodes higher – a prediction to be considered in future research), while other patients present disruption lower than TP, at the level where subject-verb agreement is checked. Subjects with no disruption in subject agreement and no disruption in tense are either able to build syntactic trees or else present tree pruning at a higher point than tested (e.g. at CP). Crucially, the prediction that failure of subject agreement implies failure in tense is fulfilled for all subjects, in all languages. This analysis extends to the findings in Benedet et al. (1998), which involved subject agreement, and tense and modal projections high in the functional hierarchy.

In summary, what we have found is the previously attested dissociation between subject agreement and tense inflectional morphology, with a new set of languages, the Ibero-Romance. This dissociation appears to be cross-linguistically robust. To the extent that the dissociation is a consequence of a structural disruption characteristic of agrammatism, if the TPH is to be maintained, it follows that subject/verb agreement has to take place between the subject DP and a functional projection lower than T. Fine-grained studies of impaired and normal language to explore the further implications of this hypothesis remain a topic for future research.

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