

The Cartography of Ibero-Romance Agrammatic Deficits

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This paper aims at examining whether grammatical errors produced by Broca's aphasics are a consequence of a selective impairment of functional categories in three closely related Ibero-Romance languages — Catalan, Galician, and Spanish — for which almost no work had hitherto been done. In addition, a reinterpretation will be proposed under cartographical terms (Cinque 1999, 2002, 2006, Belletti 2004, Rizzi 2004) of previous structural neurolinguistic models of agrammatic production, more specifically the Tree-Pruning Hypothesis (Friedmann 1994, Friedmann & Grodzinsky 1997, and subsequent work). Cartography has been applied to the field of language variation. However, the present article constitute a completely new use. Since the Tree-Pruning Hypothesis was based on a model of monolithic nodes, the application of the cartographic tree structure provides us with further insights about the degree of structural preservation or damage of functional categories.

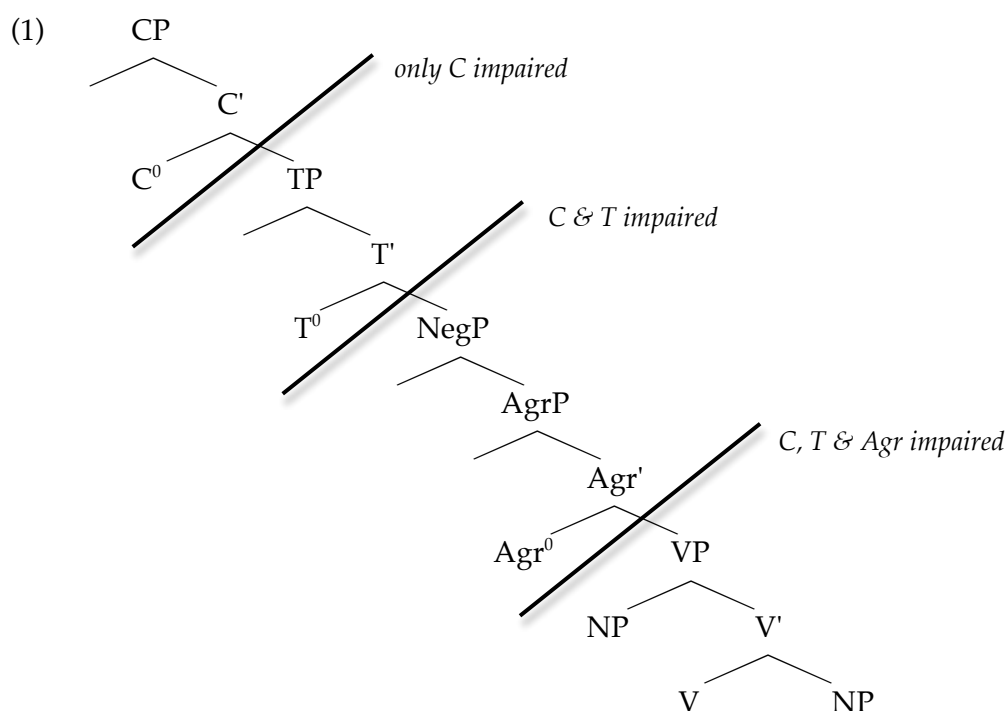
Keywords: Broca's aphasia; cartographic syntax; Catalan; functional categories; Galician; mild and moderate agrammatism; Spanish

1. The Departure Point

The departure point is the Tree-Pruning Hypothesis (TPH) of Friedmann (1994, 1998), Friedmann & Grodzinsky (1997, 2000), and much subsequent work. This hypothesis was first proposed after the observation of a clear dissociation between tense and agreement production in Hebrew and Palestinian Arabic agrammatic speakers. While tense was found to be impaired, agreement turned out to be spared in agrammatic subjects. This dissociation was accounted for in structural terms. According to the TPH, the functional heads C, T, or Agr may be underspecified in agrammatism. According to the authors, an underspecified node cannot project any higher (Friedmann & Grodzinsky 1997: 420). The possible sites of the deficit are represented in (1).

I am grateful to Cedric Boeckx, Anna Gavarró, Na'ama Friedmann, Stavroula Stavrakaki, and two anonymous reviewers for their comments and suggestions. I also acknowledge support from the projects HUM2006-13295-C02-01 (Ministerio de Educación y Ciencia) and 2009SGR1079 (Generalitat de Catalunya).





In this study, the tree structure illustrated above will be enriched according to cartographic proposals. Consequently, the traditional CP and TP nodes will be seen as complex arrays of functional projections as illustrated in (2) for the IP-field, in (3) for the clause-internal periphery, and (4) for the CP-field.

(2) *Cinque's (2006) inflectional hierarchy*

MoodP_{speech act} > MoodP_{evaluative} > MoodP_{evidential} > ModP_{epistemic} > TP_(past) >
 TP_(future) > Mood_{irrealis} > ModP_{alethic} > AspP_{habitual} > AspP_{delayed (or 'finally')} >
 AspP_{predispositional} > AspP_{repetitive (I)} > AspP_{frequentative (I)} > ModP_{volitional} >
 AspP_{celerative (I)} > TP_(Anterior) > AspP_{terminative} > AspP_{continuative (I)} > AspP_{perfect} >
 AspP_{retrospective} > AspP_{proximative} > AspP_{durative} > AspP_{progressive} > AspP_{prospective} >
 AspP_{inceptive (I)} > ModP_{obligation} > ModP_{ability} > AspP_{frustrative/success} >
 ModP_{permission/ability} > AspP_{conative} > AspP_{completive (I)} > VoiceP > PerceptionP >
 CausativeP > AspP_{inceptive (II)} > (AspP_{continuative (II)}) > AndativeP > AspP_{celerative (II)} >
 AspP_{inceptive (II)} > AspP_{completive (II)} > AspP_{repetitive (II)} > AspP_{frequentative (II)}
 (Cinque 2006: 12, 76, 82, 93)

(3) *Belletti's (2004) clause internal periphery*

TopP > FocP > TopP > *v*P

(4) *Rizzi's (1997, 2002) CP-field*

ForceP > (*TopP >) IntP > (*TopP >) FocP > (*ModP >) (*TopP >) FinP

2. Participants

To get the relevant data for our approach, 23 mild agrammatic speakers of Catalan, Galician, and Spanish plus one moderate Catalan agrammatic took part in a battery of tasks assessed to test different portions of a fully fledged functional structure; all participants were diagnosed as Broca's, mixed transcortical, and global aphasics. The battery of tests, which included eight tasks, was run in two experimental sessions involving 15 mild agrammatics (five per language), 15 controls (again, five 5 per language) and the one Catalan moderate agrammatic.¹

In session one, negation of simple tenses, negation of compound tenses and verbal periphrases, question production, and the production of relative clauses were tested. With the exception of CM, treated as a case study to control for the role of severity in agrammatic deficits, the participants in session one (10 men and five women) were classified as mild agrammatics by clinical consensus and varied in age between 27 and 83 years, with an average of 55 years. Time post-onset varied from one month to 11 years.

In session two, we tested clitic production, clitic comprehension, tense comprehension and comprehension of questions. 12 men and four women, all right-handed and with an age ranging from 29 to 82 years (mean age: 55.5), participated in the study: 15 mild agrammatic subjects plus one Catalan moderate agrammatic. Again with the exception of CM, all subjects were diagnosed as mild agrammatics with a time post-onset varying from one month to 9 years.

Despite the fact that all experimental subjects declared themselves bilingual Catalan-Spanish or Galician-Spanish to a varying degree, they were tested as monolinguals in the language of their choice. Consequently, no bilingual data is presented here. However, possible interferences were taken into account in the analysis of the results. Individual profiles including age, gender, education, etiology, time post-onset, and diagnosis have been plotted in the appendices A and B.

In addition to the brain-damaged group, 15 control subjects (five Catalan, five Galician, and five Spanish speakers) were recruited from the areas of Barcelona and Pontevedra, all right-handed; eight men and seven women. The age ranged from 45 to 85 years old (mean: 53.6) and the level of education also varied across subjects. Four subjects had completed primary school, seven secondary school, and four had received university education. All subjects declared themselves to be bilingual Catalan-Spanish or Galician-Spanish.

3. The IP-Field

In order to get a better insight into the inner organization of the IP-field and to check how agrammatic data can contribute to further confirm the ordering restrictions of the functional categories proposed by cartographic proposals, we have analyzed data involving different sections of the IP-area. Despite a major

¹ Only seven mild agrammatic participants could participate in both experimental sessions. Control subjects and the moderate agrammatic subject were kept constant for the entire battery of tests.

focus on production, some comprehension tasks have also been run to assess participants' performance aiming at a unified account across modalities.

3.1. Negation

Contrary to what is observed for multiple functional elements, where evidence shows a very robust pattern cross-linguistically, negation in agrammatism has given rise to a lot of debate due to conflicting evidence documented in the literature. While it has been found to be spared in Japanese (Hagiwara 1995), Hebrew and Palestinian Arabic (Friedmann & Grodzinsky 2000), and French (Lonzi & Luzzatti 1993), some studies report that it is damaged in English (Rispen *et al.* 2001).

To check the degree of preservation of negation in agrammatic Ibero-Romance, we ran a production task including 25 items containing simple tenses (simple present, imperfect, simple future) plus 25 items with complex forms and verbal periphrases. Such a design allowed not only to test production skills with respect to negation but also to check repetition skills for tense and agreement as well as complex verbal clusters.

As illustrated in examples (5) and (6) from Galician, subjects were asked to negate the declarative sentence produced by the experimenter. To do so, a negative marker had to be added to the given structure with no other modification required.

- (5) Os nenos actuaban o martes. Galician
the boys perform.IMP.3.PL the Tuesday
 'The boys were performing on Tuesday.'

Target answer:

Os nenos non actuaban o martes.
the boys not perform.IMP.3.PL the Tuesday
 'The boys were not performing on Tuesday.'

- (6) Vós destes en frega-los pratos. Galician
you take.PRET.2.PL in wash.INF-the dishes
 'You took to washing the dishes.'

Target answer:

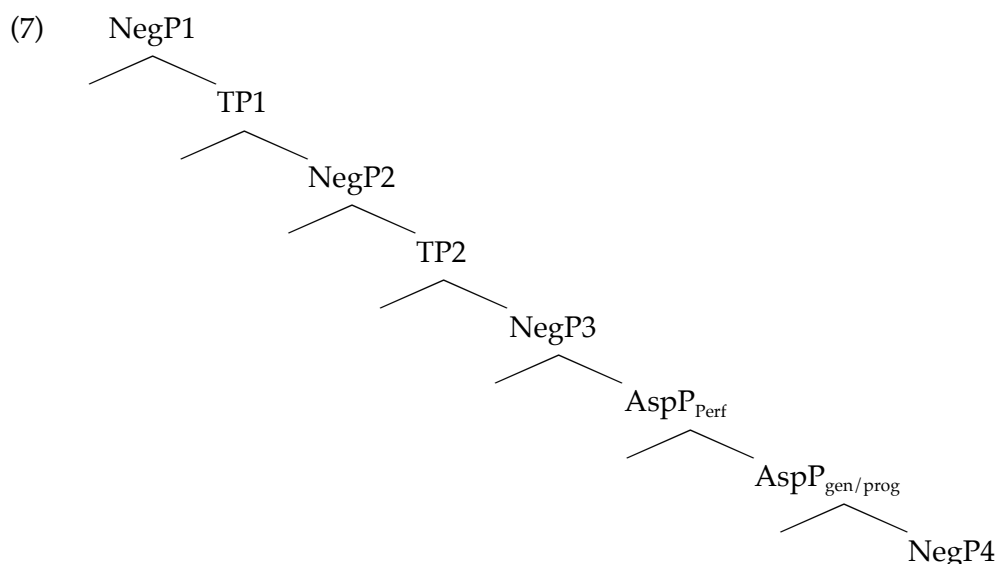
Vós non destes en frega-los pratos.
you not take.PRET.2ND.PL in wash.INF-the dishes
 'You didn't take to washing the dishes.'

The results of these tasks, summarized in Table 1, show that, despite its functional nature, negation is mostly spared for mild agrammatics. Though cross-linguistic differences with the control group proved to be significant, correct responses in the experimental group were as high as 97.5%.

	<i>Simple tenses</i> (correct/total)	<i>Complex tenses</i> (correct/total)
Catalan	99.2% (124/125)	99.2% (124/125)
Galician	97.6% (122/125)	96.8% (121/125)
Spanish	98.4% (123/125)	93.6% (117/125)
Total	98.4% (369/375)	96.5% (362/375)

Table 1: Negation of simple and compound tenses

The main error type we documented was the omission of the negative marker. To account for our results under the terms given by the TPH, we have to adopt an account based on the low generation position of negation, thus justifying its preservation. To do so, we will assume the complex system of positions postulated by Zanuttini (2001) and claim that agrammatic subjects can construct their negative structures relying on NegP4, situated in the lower portions of the IP-field.



3.2. Tense and Agreement

After testing negation, we proceeded with immediately close portions of the IP-area, those for tense. In order to assess the performance of the agrammatic participants on tense and agreement, we analyzed the results of the negation task as for participants' accuracy in repeating the finite tense (simple present, imperfect, and simple future with first and third person singular and plural agreement) in sentences containing four to five words. The production results, summarized in Table 2, show that, while tense is damaged (with an error rate of 14.6% across languages), agreement is spared (2.5%). This dissociation turned out to be significant in a Wilcoxon signed rank test ($Z = -3.318$, $p < 0.01$). No differences were found across languages. As for agreement, statistically significant differences with the control group were not found.

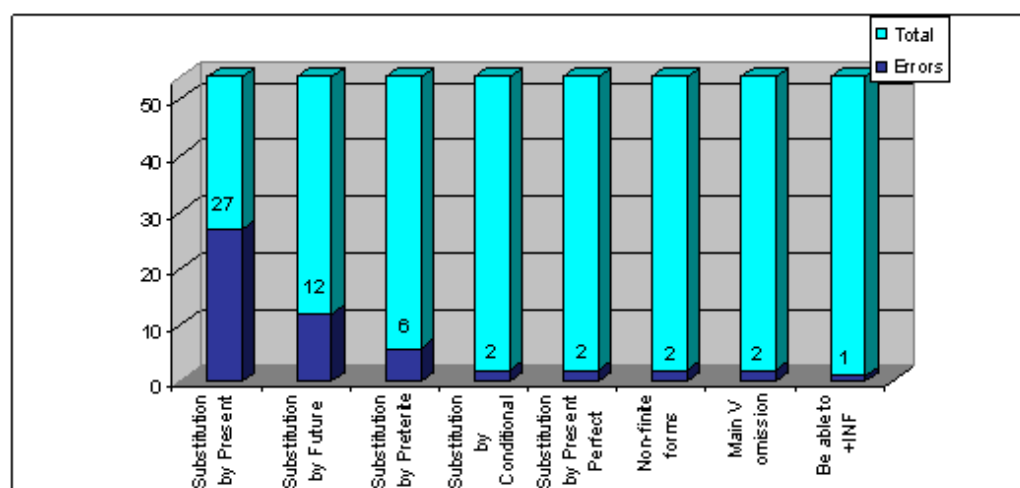
	<i>Tense</i> (correct/total)	<i>Agreement</i> (correct/total)
Catalan	85.5% (106/124)	94.3% (117/124)
Galician	84.4% (103/122)	99.2% (121/122)
Spanish	86.4% (108/125)	99.2% (124/125)
Total	85.4% (317/371)	97.5% (362/371)

Table 2: Repetition of tense and agreement

Despite being extracted from a repetition task, the results show a clear parallel with those documented in previous studies (Martínez-Ferreiro 2003, Gavarró & Martínez-Ferreiro 2007). The TPH provides us with exact predictions regarding the behavior of agreement, which is expected to be relatively spared. The fact that agreement is cross-linguistically less impaired than tense indicates that the two functional categories behave differently in agrammatism. In this work, along with Chomsky (1995 *et seq.*), we assume that AgrP is no longer an independent functional node but rather an operation taking place in a designated position lower than TP_(past) (Gavarró & Martínez-Ferreiro 2007).

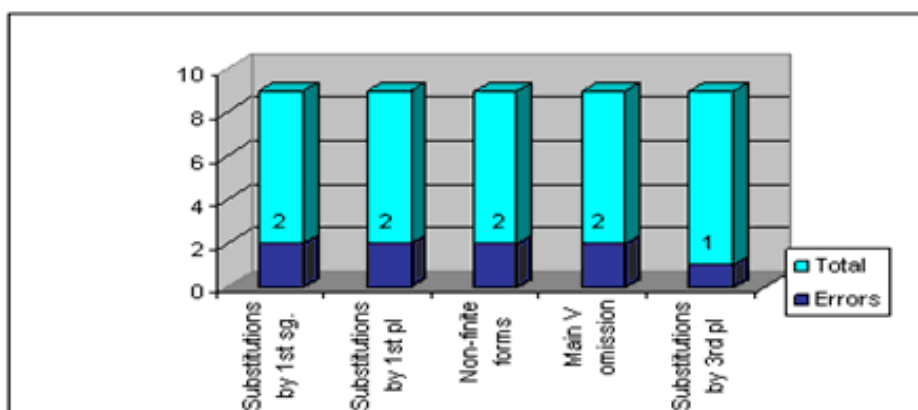
Regarding the nature of the errors, most were substitution errors being omissions restricted to the drop of the complete verbal form.² While tense errors revealed a consistent tendency towards the forms of the simple present (see Graph 1 below), the number of agreement errors was so scarce, that no default form was documented (as in Graph 2).

In addition to these results, substitutions of a finite verb by a non-finite verb form and main verb omissions were strikingly scarce. No non-finite forms were detected in Galician or Spanish and, in the case of Catalan, only two examples were registered. Participants also produced two omissions of lexical main verbs: one in the Catalan sample and the other in the Galician sample (representing 0.5% of the total number of errors).



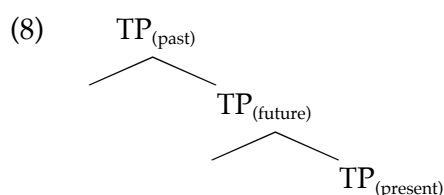
Graph 1: Tense substitutions in agrammatic Ibero-Romance

² Since the three languages under investigation display a stem-based morphology, omission of tense or agreement markers is banned (Grodzinsky 1990).



Graph 2: Agreement substitutions in agrammatic Ibero-Romance

Going back to tense errors, the present was not only the better preserved form (6% errors in Catalan and 2% in Galician and Spanish) but also the most productive form for substitution (62.8% of errors), followed by the future (27.9% of errors) and the past tense (9.3% of errors).³ Structurally, although Cinque's hierarchy does not provide us with a specific functional head for present tense, the results seem to point to the ordering in (8), where the present would occupy a low position in the TP-field. The assumption of the present as the default form in a framework just sensitive to the [\pm past] distinction would not predict the preference for future forms vs. past forms.⁴



In addition to the production results, we also tested participants' abilities for tense recognition by means of a comprehension task which included 25 items with simple tenses (simple present, imperfect, simple future). Items paralleled the structure of those included in the repetition task with a length of four to five words. After hearing a sentence read by the experimenter, participants were asked to select the right match among the stimulus visually presented; both example sentence and stimulus picture are provided in (9).

- (9) El chico abrió el bote.
the boy open.PAST.3.SG the jar
 'The boy opened the jar.'

Spanish



³ This error pattern (present > future > past) has also been documented for other languages such as Greek (Koukouloti & Bastiaanse 2010).

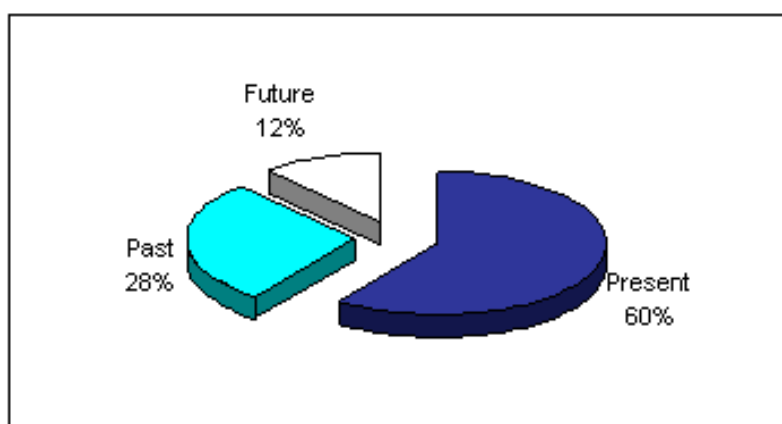
⁴ I am grateful to one of the reviewers for comments on this issue.

The results indicate that comprehension is also affected in mild agrammatics.

<i>Tense Comprehension</i> (correct/total)	
Catalan	82.4% (103/125)
Galician	86.4% (108/125)
Spanish	83.2% (104/125)
Total	84.0% (315/375)

Table 3: *Tense comprehension*

As illustrated in Table 3, out of 125 responses per language, there were 17.6% errors in Catalan, 13.6% in Galician, and 16.8% in Spanish. Misidentifications, as in the case of production, mainly leaned towards the present according to the ordering $TP_{(past)} > TP_{(future)} > TP_{(present)}$. This is illustrated in Graph 3:



Graph 3: *Tense misidentifications in Ibero-Romance agrammatic comprehension*

The statistical analysis revealed no significant differences between production and comprehension (Wilcoxon Signed Rank test, $p > 0.05$) even though the chance of providing the correct answer varied across tasks. While in the repetition tasks, subjects could opt for up to 6 simple tenses in indicative — simple present, simple past (except for Catalan in which this form is analytic), imperfect, pluperfect (only in Galician), simple future, and simple conditional — in the comprehension task, the chance probability was one in three (i.e. simple present, simple future, simple past).

3.3. *Modals, Aspectuals, and Temporal Auxiliaries*

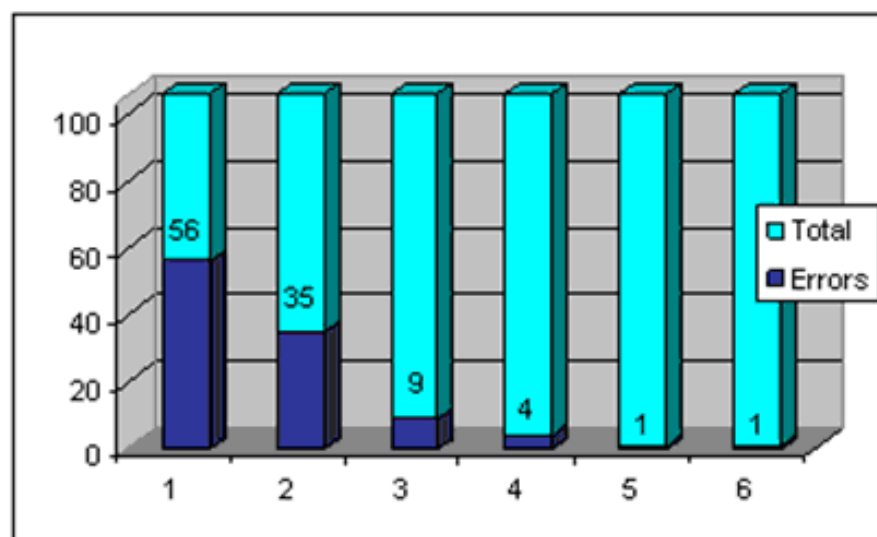
The next step towards the characterization of the agrammatic Ibero-Romance IP-field was to observe the repetition skills displayed by both our pathological and our control sample with respect to complex verbal forms. To that aim, we took our evidence from the negation task. Since Galician lacks compound tenses, the

	<i>Verbal periphrases (correct/total)</i>
Catalan	51.7% (31/ 60)
Galician	56.0% (70/125)
Spanish	63.3% (38/ 60)
Total	56.7% (139/245)

Table 5: Repetition of verbal periphrases

The results indicate a clear increase in the number of errors with modal and aspectual auxiliaries (57% preserved across languages, 138 out of 245 responses) with respect to tense (15% errors) and with respect to temporal auxiliaries (18.5% errors), even though statistical differences (at a 5% level) were only found for Galician.

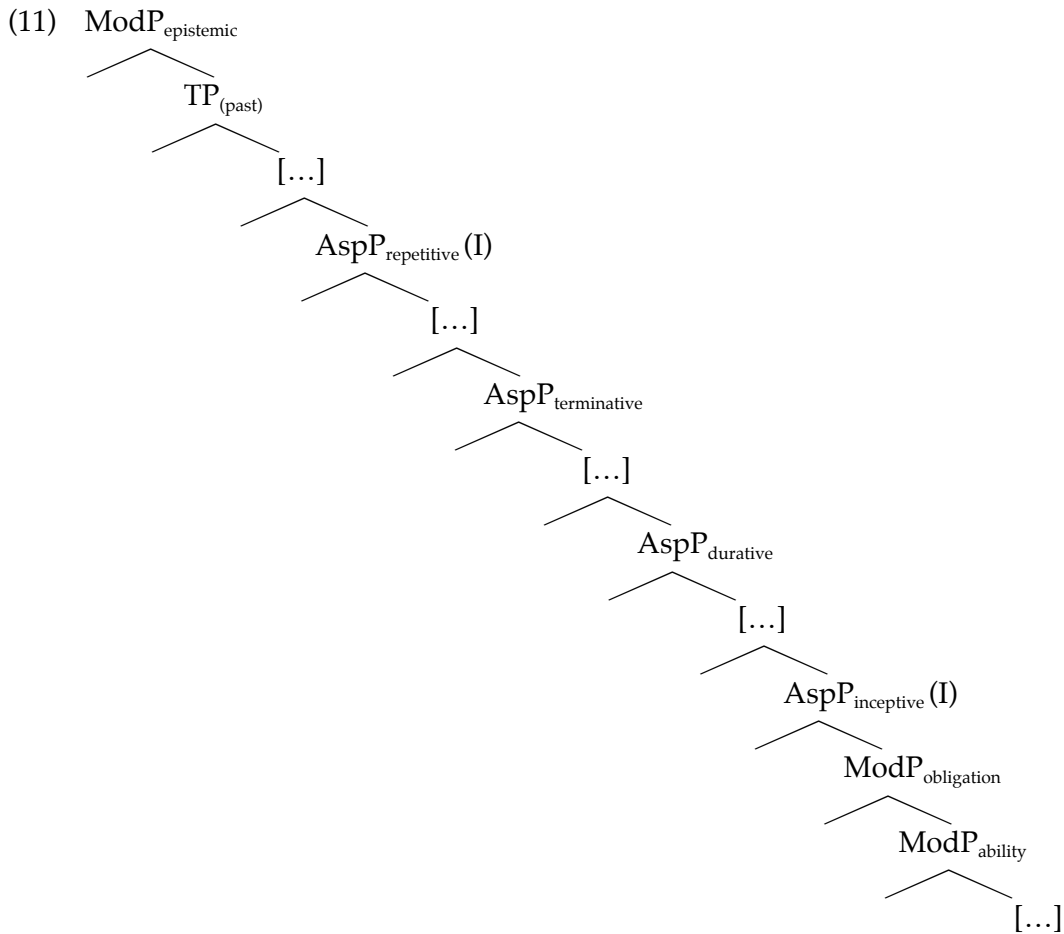
Regarding the nature of errors, 79.2% had to do with a simplification of the verbal cluster. A detailed analysis according to frequency is given in Graph 4:



1. Simplification of complex verbal clusters
2. Simplification of complex verbal clusters + T substitution
3. "Don't know" responses
4. Tense substitutions
5. Simplification + T/Agr substitution
6. T/Agr substitution

Graph 4: Errors in the repetition of periphrastic forms

Items included in the experimental design covered the categories illustrated in (11) following Cinque (2006). In the Catalan and Spanish tests, 12 items denoting aspect terminative (n=4), durative (n=2), inceptive (n=1), mood obligation (n=3), mood ability/possibility (n=1), and a mixed form mood/aspect were included. In the Galician version, items were distributed as follows: aspect repetitive (n=4), aspect terminative (n=5), durative (n=3), inceptive (n=5), mood obligation (n=6), mood ability/possibility (n=1), and a mixed form mood/aspect.



Errors were broken down by category and summarized in Table 6:

		5 Catalan & 5 Spanish subjects (correct/total answers)	5 Galician subjects (correct/total answers)
Aspectuals	Repetitive	—	60.0% (12/20)
	Terminative	67.5% (27/40)	60.0% (15/25)
	Durative	30.0% (6/20)	40.0% (6/15)
	Inceptive	70.0% (7/10)	60.0% (15/25)
Modals	Obligation	60.0% (18/30)	53.3% (16/30)
	Ability/Possibility	50.0% (5/10)	40.0% (2/ 5)
Modals/ Aspectuals		60.0% (6/10)	80.0% (4/ 5)

Table 6: Modals and aspectuals

These results do not seem to support Cinque's hierarchy with respect to modal and aspectual heads. However, it might also be the case that portions of the structure including immediately consecutive functional categories (as in the case of modals and aspectuals) may be damaged 'as a block' without reflecting an increasing level of difficulty — in line with Chinellato's (2002) Field Damage Hypothesis. Further testing may provide a better understanding on this specific issue.

3.4. Clitics

The last category observed in the IP-area was that constituted by clitics, including both object clitics and reflexive forms. In order to check how agrammatic deficits affected the highest portions of the IP, we tested both our experimental and our control populations for their production and comprehension skills.

The languages under investigation show considerable formal variation at this respect. While in Catalan and Spanish, reflexive and non-reflexive clitics appear in pre-verbal position with finite and post-verbally with non-finite forms and imperatives (12), in Galician, they tend to appear in post-verbal position (13).

- (12) a. *Reflexive:*
S'ha vist. / Veure's. Catalan
Se ha visto. / Verse. Spanish
 'She has seen *herself*.' / 'To see *herself*.'
- b. *Non-reflexive:*
La vigilava. / Vigilar-la. Catalan
La vigilaba. / Vigilarla. Spanish
 'I/He/She watched over *her*.' / 'To watch over *her*.'
- (13) a. *Reflexive:*
Viuse. / Verse. Galician
 'She has seen *herself*.' / 'To see *herself*.'
- b. *Non-reflexive:*
Vixiábaa. / Vixiala. Galician
 'I/He/She watched over *her*.' / 'To watch over *her*.'

Exceptions to the Galician enclitic pattern can be found with negation, with most subordinate constructions, with quantifiers, and with focalizations. In addition, in infinitival clauses, there are contexts in which both patterns appear in free variation (Uriagereka 1995, Raposo & Uriagereka 2005).

In order to be properly uttered, clitics, with independence of their position in relation to the verb, crucially depend on the projection of a functional projection residing between the CP- and the IP-areas — namely F (Ledgeway & Lombardi 2005, Raposo & Uriagereka 2005). To obtain production data that allow us to test the behavior of these forms in agrammatic speech, we ran an elicited production task with the support of pictures that included 13 items aimed at eliciting object clitics (14) plus 12 items for reflexive forms (15).

- (14) Quéfai o mozo co coche? Galician
what do-PRES.3RD.SG the teenager with-the car
 'What is the teenager doing with the car?'
 Target answer:
 (O mozo) lávao.
the teenager) wash-PRES.3RD.SG-IT
 'The teenager/He is washing it.'



- (15) Qué fai a nena co bambán?
what do-PRES.3RD.SG the girl with-the swing
 'What is the girl doing with the swing?'

Galician

Target answer:

- (A nena) bambéase.
the girl swing-PRES.3RD.SG-herself
 'The girl/She is swinging.'



The comprehension task was a sentence-picture matching task again including 13 items for object clitics and 12 items for reflexive forms supported by pictures. These items were parallel in structure to those included in the production task as for number of words and clitic position. An example is given in (16):

- (16) La hermana mayor la suena.
the sister older her blow-PRES.3RD.SG
 'The older sister is blowing her (younger) sister's nose.'

Spanish



The general results have been summarized in Tables 7 and 8:

	<i>Object clitics</i> (correct/total)	<i>Reflexive pronouns</i> (correct/total)
Catalan	40.0% (26/ 65)	83.3% (50/ 60)
Galician	53.8% (35/ 65)	83.3% (50/ 60)
Spanish	30.8% (20/ 65)	88.3% (53/ 60)
Total	41.5% (81/195)	85.0% (153/180)

Table 7: Clitic production

	<i>Object clitics</i> (correct/total)	<i>Reflexive pronouns</i> (correct/total)
Catalan	92.3% (60/ 65)	93.3% (56/ 60)
Galician	81.5% (53/ 65)	93.3% (56/ 60)
Spanish	93.8% (61/ 65)	90.0% (54/ 60)
Total	89.2% (174/195)	92.2% (166/180)

Table 8: Clitic comprehension

Clitics were found to be compromised, albeit to a varying degree. A significant dissociation was found between object clitics and reflexives in production: While reflexives reached a maximum correctness rate of 85% for all three languages, object clitics were more severely impaired. Significant differences between object clitics and reflexive pronouns ($Z = -3.409$, $p < 0.01$) were found in a Wilcoxon Signed Rank test.

Comprehension results show that, despite impairment with respect to controls, the percentages of correct responses are higher than those for production. But, as happened with the results for tense, the fact that the pattern of errors is shared — with 3rd person object clitics more severely affected than reflexive forms — has implications for the picture of agrammatism offered in studies like Grodzinsky (1990, 2000) or Friedmann & Grodzinsky (1997), where production is characterized in a way completely different from comprehension. In agreement with Luzzatti & Guasti (2000) and Friedmann (2006, 2008), the proper description of the deficit should hold across modalities.

However, a possible strategy allowed by the design can have favored the interpretation of object clitics. As shown in (16), the materials included a picture with one participant and a picture with two participants. If it was the case that participants suffer from a general deficit across reflexive and non-reflexive forms, they would not get any information regarding the clitic and be left with a partial utterance (e.g., *the girl wash* — neither her nor herself). Such a move would have favored the selection of the option with the two participants and, as a consequence, fewer errors in object pronouns and a higher number of errors in the interpretation of the reflexive forms would have been detected. Nevertheless, our production task indicates that reflexive forms are preserved cross-linguistically up to 85%, meaning that participants would have more chances to correctly identify the reflexive form than the object clitic (e.g., *the girl wash* — either her or \emptyset). This would explain the 92.2% correct comprehension of reflexive forms and, since the absence of clitic would still lead to the selection of the picture with two participants (in this case the correct answer), the dissociation in between object clitics in production and comprehension.⁶

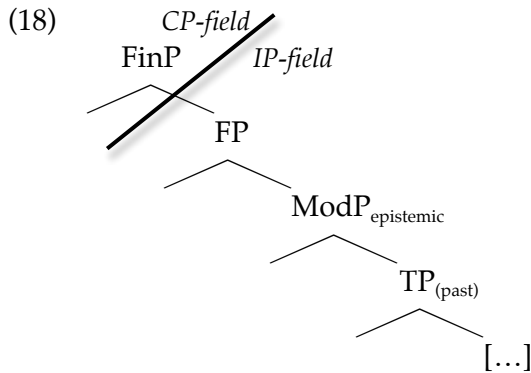
As for the nature of errors, out of the 141 errors, 82% of the agrammatic responses lacked a clitic. A list of errors in order of decreasing frequency is provided in (17):

- (17)
- | | | |
|----|-------------------------------------|---|
| 1. | Repetition of the given DP (53/141) | |
| 2. | Clitic omission (46/141) | Object clitics (29/46)
Reflexive pronouns (17/46) |
| 3. | Wrong clitic selection (17/141) | |
| 4. | Wrong answer (14/141) | |
| 5. | Clitic doubling (5/141) | |
| 6. | Clitic reduplication (4/141) | Duplication of the reflexive (3/4)
Reflexive <i>se</i> + DO clitic (1/4) |
| 7. | “Don’t know” responses (2/141) | |

⁶ I am grateful to one of the anonymous reviewers for useful comments on this issue.

Additionally, despite the fact that these forms are attached to the verb enclitically in the case of Galician and proclitically in Catalan or Spanish, neither differences among languages nor ordering errors were attested.

The high structural portions of the syntactic tree involved in the production of clitics (18) — relatively higher than verb morphology — make them susceptible to impairment, as predicted by the TPH (Friedmann 1994 *et seq.*).

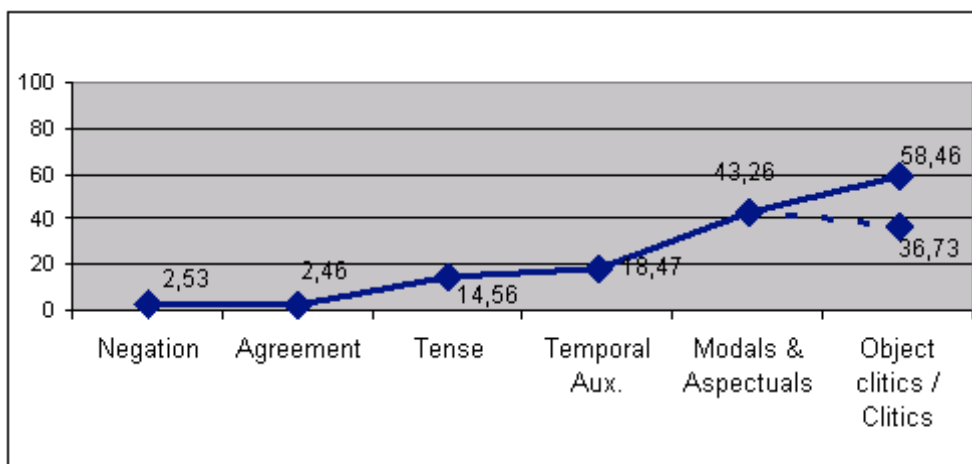


However, structural considerations would not explain the dissociation observed between clitic forms. Since the structural position would be the same for reflexives and object clitics (Uriagereka 1995) — be they enclitic or proclitic —, the dissociation may be attributed to: (i) absorption of one argument in the case of reflexive forms (Belletti 1982, Grimshaw 1982, among others), (ii) the licensing of a *pro*-object in the case of 3rd person object clitics (e.g. Jaeggli & Safir 1989), or (iii) the existence of inherently reflexive lexical entries for some verbs (Reinhart & Reuland 1993) or the cluster reflexive + verb as a result of a lexical operation (not a syntactic one, hence not susceptible to impairment in agrammatism).

4. Summary of Findings — IP-Field

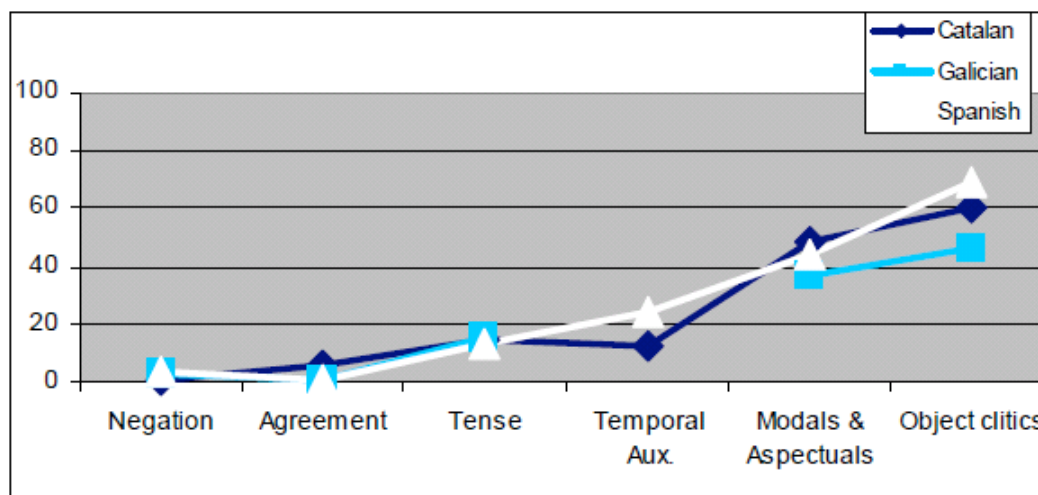
At this point, before abandoning the IP-domain, we can draw some interim conclusions. According to the summary of the mild agrammatic data represented in Graph 5, the IP-field of Ibero-Romance agrammatics is selectively impaired. The pattern of damage, attributed to syntactic factors, can be accounted for in structural terms.

Graph 5: Ibero-Romance mild agrammatic errors in the IP-field



*The dotted blue line indicates combined results for object clitics and reflexive forms.

The results also show a striking similarity among Ibero-Romance varieties, confirmed by statistical tests (Graph 6). This is attributed to the similarity in the grammatical system of the three languages under investigation.



Graph 6: Ibero-Romance mild agrammatic production

Both Graph 5 and Graph 6 confirm that there is an increasing percentage of errors as a function of the structural position an element occupies in the syntactic tree, with relatively low functional categories better preserved than higher ones. For mild subjects, almost completely spared abilities were detected for sentential negation and agreement, but high error rates were documented for modals, for aspectuals, and for object clitics.

The data are consistent with a structural account along the following lines — with agreement as an operation taking place in positions lower than $TP_{(past)}$:

- (19) Clitics > Mod_{epistemic}
 > Asp_{durative}
 > Asp_{terminative}
 > Mod_{permission/ability}
 > Mod_{obligation}
 > Asp_{inceptive}
 > Asp_{repetitive}
 > T_(past) [temporal auxiliaries]
 > Neg

Agrammatism offers an argument for the low position of both $T_{(pres)}$ and Neg in a cartographically developed tree structure.

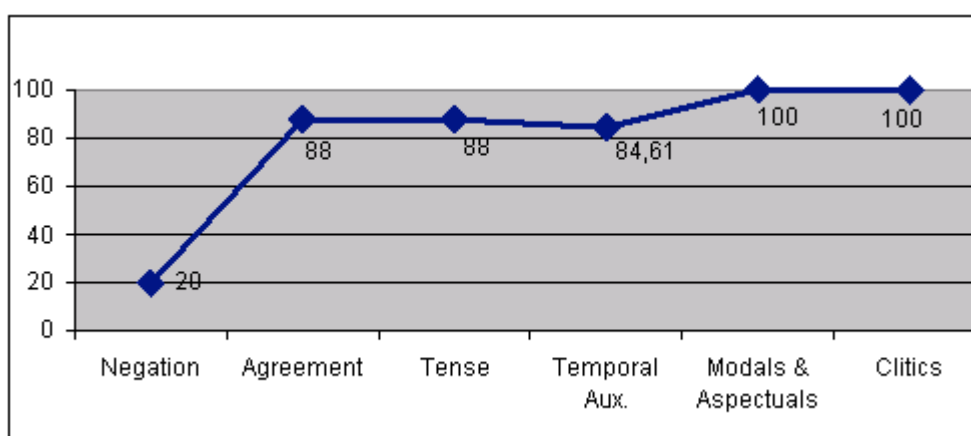
Our findings were also replicated with a moderate agrammatic subject. As expected by hypothesis, the pattern of deficit turned out to be the same as that for his mild agrammatic counterparts but with increased percentages of errors. The results are summarized in Table 9 and Graph 7.⁷

⁷ Notice that, as in sections 6 and 7 below, the performance of the moderate population is only based on the data from one Catalan moderate agrammatic speaker.

PRODUCTION			
	<i>% errors</i>	<i>Main error type</i>	<i>Task</i>
Negation	20.0%	"Don't know"	elicited production
Agreement	88.0%	MV omissions	repetition
Tense	88.0%	MV omissions	repetition
Temporal auxiliaries	84.6%	MV omissions	repetition
Modals & aspectuals	100%	MV omissions	repetition
Clitics	100%	omissions	elicited production

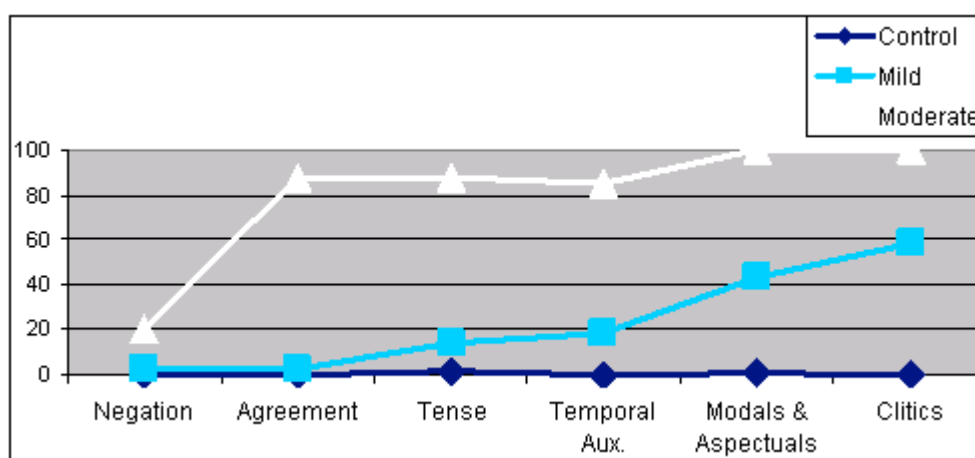
COMPREHENSION			
	<i>% errors</i>	<i>Main error type</i>	<i>Task</i>
Tense	52.0%	select wrong picture	sentence-picture matching
Clitics	36.0%	select wrong picture	sentence-picture matching

Table 9: Moderate agrammatic IP-field



Graph 7: Ibero-Romance moderate agrammatic errors in the IP-field

Graph 8, finally, summarizes the IP-field of the three populations under investigation.



Graph 8: Degrees of severity in agrammatic Ibero-Romance

5. The CP-Field

So far, we have assumed the TPH and sentential structure proposed by cartographic approaches to the syntactic representation (Cinque 1999 and further collected in Cinque 2002, 2006, Belletti 2004, and Rizzi 2004, for example) and provided evidence for the inner structure of the IP-field based on agrammatic Ibero-Romance. In this section, we will focus on the structures crucially depending on the left peripheral area. Two constructions will be investigated: interrogatives and subject embeddings.

5.1. Interrogative Sentences

In order to obtain data on question production, we ran an elicitation task which included 25 items: 13 aimed at eliciting a *wh*-question and 12 designed to force yes/no-questions. In addition, *wh*-questions were controlled for their distribution in seven adjunct and six argument questions as well as for the methodology used to elicit them.

Two types of tokens were introduced in the design. Based on Friedmann & Grodzinsky (2000), type I tokens did not include the *wh*-word in the instructions given by the experimenter (20), while in type II tokens, inspired by Crain & Thornton (1998), participants were presented with the *wh*-word (21). An example of the elicitation method for yes/no-questions is reproduced in (22).

- (20) Vou ir a algures e ti queres sabe-la data.
go.PRES.1.SG go.INF to somewhere and you want.PRES.2.SG know-INF-the date
 'I am going to go somewhere and you want to know the date.'

Target question:

Galician

Cando vas ir?
when go.PRES.2.SG go-INF
 'When are you going to go?'

- (21) Juan busca una cosa y tú quieres saber lo qué.
John search.PRES.3.SG a thing and you want.PRES.2.SG know-INF CL what
 'John is looking for something and you want to know what.'

Target question:

Spanish

¿Qué busca Juan?
what search.PRES.3.SG John
 'What is John looking for?'

- (22) Puede que Pedro toque el piano, pregúntamelo.
maybe that Peter play.PRES.SUBJ.3.SG the piano ask.IMP.2.SG.CL.CL
 'Maybe Peter plays the piano, ask me.'

Target question:

Spanish

Toca el piano?
play.PRES.3.SG the piano
 'Does he play the piano?'

In addition to the production task, a comprehension task aimed at checking participants' command of *wh*-words was run. The 25 tokens of the picture-sentence matching task included 13 pictures for (subject and object) question comprehension (23) and 12 tokens for *wh*-word comprehension (24).

- (23) A qui ajuda el policia? Catalan
 To who help.PRES.3.SG the policeman
 'Who is the policeman helping?'

Target response:

Subject points to the tourist.



- (24) Què va menjar en Joan? Catalan
 what AUX.PAST.3.SG eat the John
 'What did John eat?'

Target response:

Subject points to the plate of food.

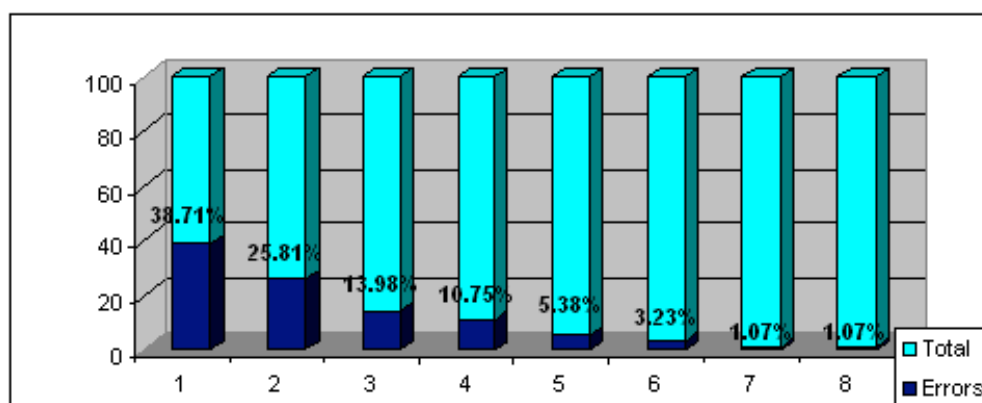


Our results show that production and comprehension skills in both *wh*- and yes/no-questions differ between agrammatics and control speakers. The general production results for the agrammatic participants have been plotted in Table 10:

	Wh-questions (correct/total)	Yes/no-questions (correct/total)
Catalan	60.0% (39/ 65)	71.7% (43/ 60)
Galician	44.6% (29/ 65)	51.7% (31/ 60)
Spanish	52.3% (34/ 65)	80.0% (48/ 60)
Total	52.3% (102/195)	67.8% (122/180)

Table 10: Interrogative sentence production

Table 11 shows a dissociation between question types which turned out to be statistically significant at 5% ($p < 0.05$, $Z = -1.993$). Damage was seen to be more severe in the case of *wh*-questions than in yes/no-interrogatives. Moreover, the most frequent strategy used by subjects to overcome problems in *wh*-question formation was replacing them with a yes/no-question (see Graph 9). Neither methodology nor the argument/adjunct distinction affected the outcome significantly.

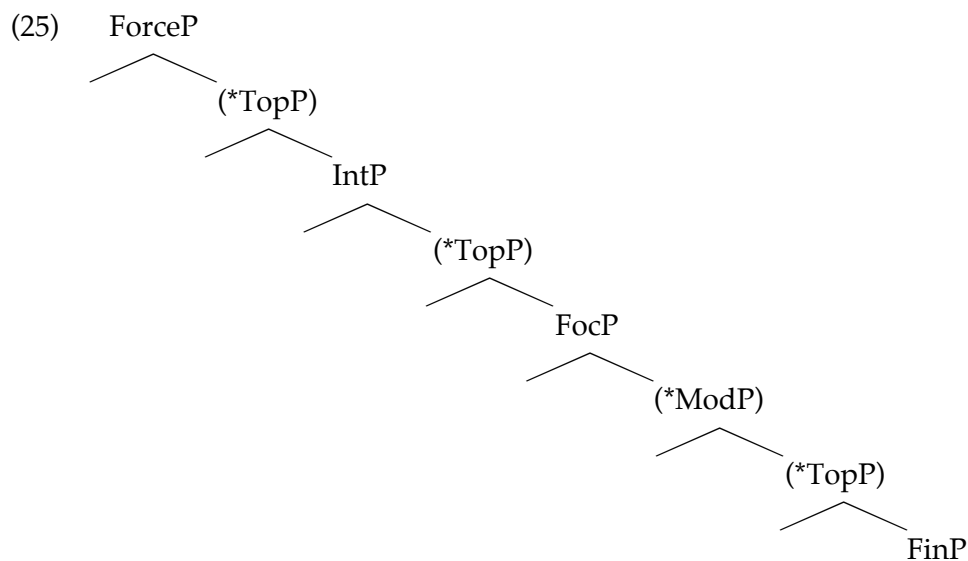


1. Y/N questions substitute for wh- questions
2. Wrong wh- morpheme selection
3. Declarative sentences
4. Unexpected question
5. "Don't know" responses
6. Wh- + DP
7. Wh- substituted by *why*
8. Wh- in situ

Graph 9: Distribution of errors in wh-questions

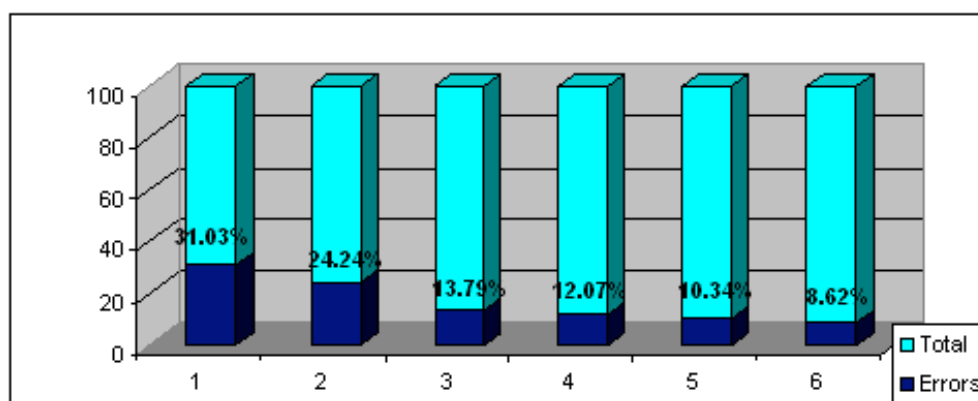
Friedmann & Grodzinsky account for this dissociation in terms of presence vs. absence of CP, with yes/no-questions claimed to be rooted in TP and hence more accessible for agrammatical participants. However, according to Suñer (1994), a non-overt element heads every yes/no-question in Spanish (correctly produced at 67.8% cross-linguistically in our mild agrammatical sample). The phonetically unrealized operator is claimed to be rooted in the CP-area. In addition, for the population under investigation, *wh*-questions were correctly produced at 52.3%, indicating that access to CP is not completely banned.

Rizzi (2002), for example, provides us with arguments for a dissociated position for the two question types included in the CP-area, with Int(errogative)P and Foc(us)P as the crucial nodes (25).



According to Cruschina (2007), the interrogative operator would occupy the position Int (higher than Foc — landing site for *wh*-elements) where it is base-generated together with other elements such as *why*. Nevertheless, the claim that null interrogative operators in polar questions are base-generated in Int is problematic for a truncation account, since it would attribute a higher position to yes/no-questions than to *wh*-questions (Int > Foc).

Regarding the errors in yes/no-questions (illustrated in Graph 10), the agrammatic results showed a revealing pattern indicating a clear trade-off in between yes/no- and *why*-questions.



1. *Why* substitutes for y/n questions
2. Declarative sentences
3. “Don’t know” responses
4. Unexpected questions
5. *Wh*- questions substitute for y/n questions
6. *How is it* substitutes for y/n questions

Graph 10: Distribution of errors in yes/no-questions

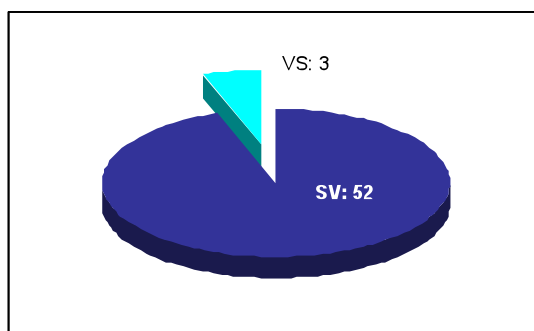
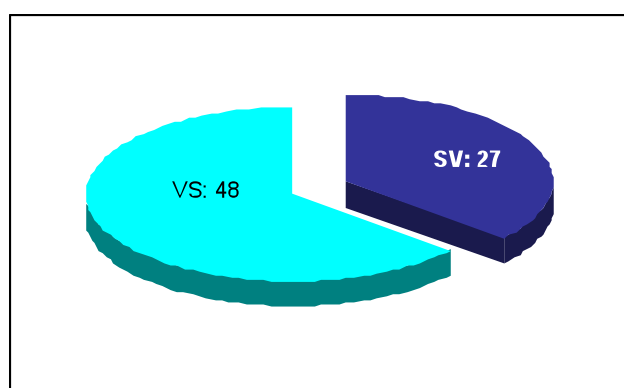
The cartographic approach predicts the use of *why* questions in substitution for yes/no-questions in Catalan (5/58 errors in our data) and Galician (13/58) straightforwardly. The fact that only *why*, but no other *wh*-operator, enters into competition with the production of yes/no-questions may indicate that the null operator in yes/no-questions and *why* compete for the same structural position, and that this position is different from the one for ordinary *wh*-operators. In our Ibero-Romance sample, the overt operator *why* seems preferable for some agrammatic participants with respect to the null operator of a yes/no-question, raising the question of the role of overt vs. null elements. This also applies to the uses of *Com és que* ‘how is it that’ found in the Catalan data.

In addition to the wrong responses, an analysis of correct answers including an overt subject revealed that there is a clear dissociation in between experimental and control subjects with respect to the strategy used to formulate yes/no-questions. Agrammatic subjects favor SV over VS, contrary to the pattern displayed by control subjects. Tables 11 and 12 summarize, respectively, the experimental and control data, illustrated in Graphs 11 and 12.

	<i>Correct</i>	<i>Overt subject</i>	<i>S-V</i>	<i>V-S</i>
Catalan	70.8% (34/ 48)	44.1% (15/34)	100% (15/15)	0% (0/15)
Galician	50.0% (25/ 50)	48.0% (12/25)	83.3% (10/12)	16.7% (2/12)
Spanish	78.7% (37/ 47)	75.7% (28/37)	96.4% (27/28)	3.6% (1/28)
Total	66.2% (96/145)	57.3% (55/96)	94.5% (52/55)	5.4% (3/55)

Table 11: *Subject-verb inversion (experimental subjects)*

	<i>Correct</i>	<i>Overt subject</i>	<i>S-V</i>	<i>V-S</i>
Catalan	100% (47/ 47)	48.9% (23/ 47)	43.5% (10/23)	56.5% (13/23)
Galician	100% (46/ 46)	56.5% (26/ 46)	32.0% (8/26)	69.2% (18/26)
Spanish	97.9% (47/ 48)	55.3% (26/ 47)	34.6% (9/26)	65.4% (17/26)
Total	99.3% (140/141)	53.6% (75/140)	36.0% (27/75)	64.0% (48/75)

Table 12: *Subject-verb inversion (control subjects)*Graph 11: *Subject-verb inversion in yes/no-question production (agrammatic subjects)*Graph 12: *Subject-verb inversion in yes/no-question production (control subjects)*

The inversion of subject and verb seems to be systematically avoided either by using the non-inverted option (in the case of yes/no-questions) or through the insertion of some element compatible with the order SV (such as *Com és que* 'how is it that' to substitute for *wh*-questions). Evidence for difficulties with VS structures in agrammatism can also be found in the studies by Garraffa (2008) or Beretta *et al.* (1996).

According to Belletti (2001, 2004), there are two requirements for inversion to take place: (i) a *pro*-element and (ii) a right-peripheral focus position located in the higher portions of the VP-field. Since the verb would occupy the same tense position in the TP domain, avoidance of the order VS can be attributed to a deficit in licensing a *pro*-element in pre-verbal position. Agrammatics may be opting for the alternative with an overt element in pre-verbal position in order to avoid the use of an expletive element. Avoidance of VS accounts for 94.5% of the correct answers with overt subjects in the data from our experimental group. Expletives (overt or null) do not contribute to the meaning of a sentence being susceptible to impairment in agrammatic speech.

Regarding comprehension results, even though comprehension of *wh*-questions might have benefited from a non-syntactic structure based on the selection of the figure not addressed in the question (such as “Look for a figure other than the policeman” in the context of a question like *Who does the policeman help?*),⁸ the results, summarized in Table 13, show that agrammatic participants have preserved knowledge of *wh*-words.

	Wh-questions (correct/total)	Wh-words (correct/total)
Catalan	92.3% (60/ 65)	96.7% (58/ 60)
Galician	90.8% (59/ 65)	93.3% (56/ 60)
Spanish	93.8% (61/ 65)	96.7% (58/ 60)
Total	92.3% (180/195)	95.5% (172/180)

Table 13: Comprehension of *wh*-words

5.2. Embedded Sentences

The last piece of evidence included in our testing battery comes from the production of subject embeddings, another construction that crucially depends on the left periphery, tested by means of an elicitation task with pictures. The 25 tokens specifically designed for that aim included 24 subject relatives (26) plus one object relative (27).

- (26) Éstes son os plátanos que custan tres euros.
these be.PRES.3.PL the bananas that cost.PRES.3.PL three euros
 ‘These are the bananas that cost three euros.’

Target utterance:

Catalan

Éstes son os plátanos que custan dous euros.
these be.PRES.3.PL the bananas that cost.PRES.3.PL two euros
 ‘These are the bananas that cost two euros.’



⁸ I am grateful to one of the reviewers for the comments on this specific issue.

- (27) Aquestes són les flors que veu en Joan
these be.PRES.3.PL the flowers that see.PRES.3.SG the John
 des de la seva finestra.
from the his window
 'These are the flowers that John sees from his window.'

Target utterance:

Catalan

Aquest és l'arbre que veu en Joan
this be.PRES.3.SG the.tree that see.PRES.3.SG the John
 des de la seva finestra.
from the his window
 'This is the tree that John
 sees from his window.'



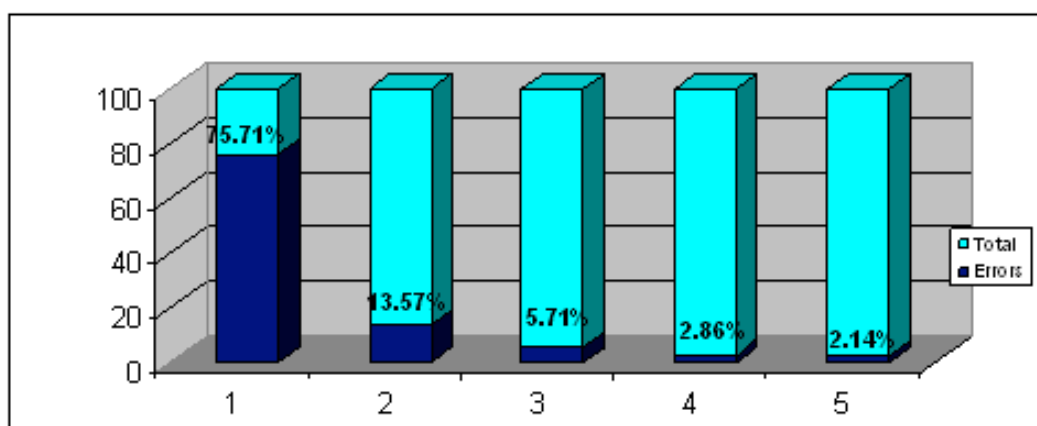
The general results are summarized in Table 14.

	<i>Embedding production (correct/total)</i>
Catalan	74.4% (93/125)
Galician	45.6% (57/125)
Spanish	68.0% (85/125)
Total	62.7% (235/375)

Table 14: Subject-embedding production

Our results indicate that the production of subject relatives was impaired. Significant differences were found in the contrast between experimental and control subjects (Mann-Whitney U test: $p < 0.01$, $Z = -4.904$). Even though the mean rate of errors was 36.39%, inter-subject variation was prominent (it ranged from 20% to 96% correct responses). Regarding error distribution, the classification of errors according to frequency has been illustrated in Graph 13 below.

With the scant data we have to date, we can only conclude that our Ibero-Romance agrammatic subjects either avoid or fail to produce well-formed embedded structures (at the level of non-pathological subjects) when these require the involvement of the CP-layer. In the case of embedded structures such as those under investigation, since the projection of ForceP — according to Rizzi (2002), the highest functional projection of the left-peripheral area — is required, structural accounts would straightforwardly predict the observed deficit.



1. Relative omission
2. Relative omission + Verb omission
3. Errors with the object relative
4. "Don't know" responses
5. Verbless relatives

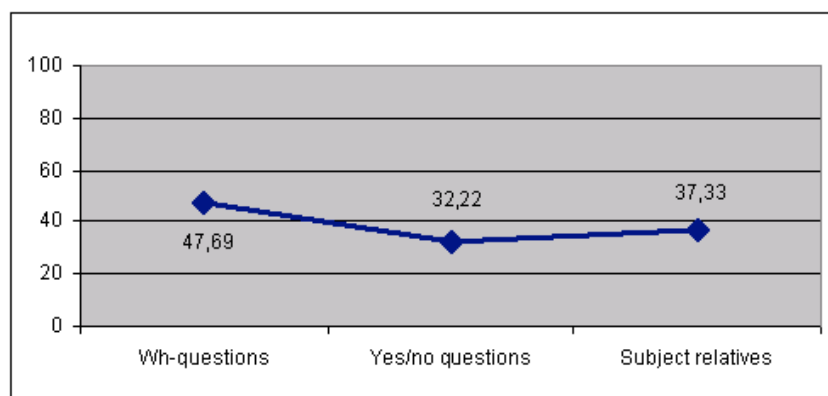
Graph 13: Distribution of Errors in Embedded Structures

6. Summary of Findings — CP-Field

Assuming (28), Ibero-Romance agrammatics suffer from a consistent syntactic deficit which affects structures crucially dependent on the left periphery. The homogeneous behavior among Ibero-Romance varieties is statistically confirmed. This is predicted under structural terms, since the CP-field constitutes the left end of the syntactic representation and is therefore expected to be the most severely impaired area.

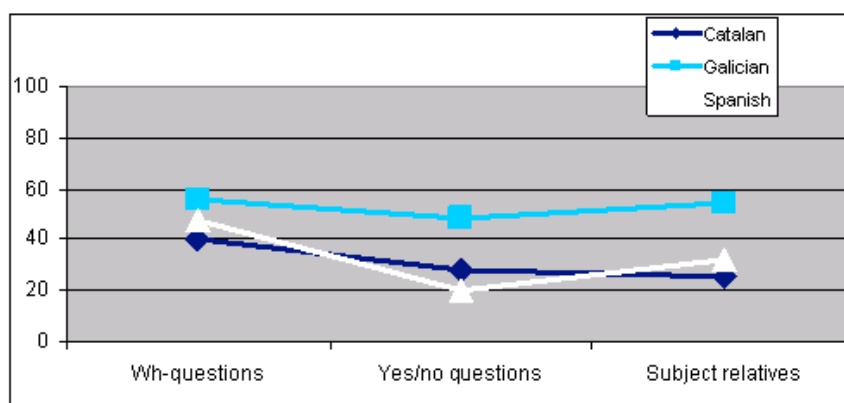
(28) ForceP > IntP > FocP

However, this structure makes us predict subject relatives (crucially dependent on the projection of ForceP) to be the most severely impaired category, followed by yes/no-questions (in IntP) and *wh*-questions (in FocP). Our results do not support this, as summarized in Graph 14, since *wh*-questions were found to be the most difficult for participants, while yes/no-questions were better preserved.



Graph 14: Ibero-Romance mild agrammatic errors in the CP-field

As with the IP-field, cross-linguistic differences were not found.

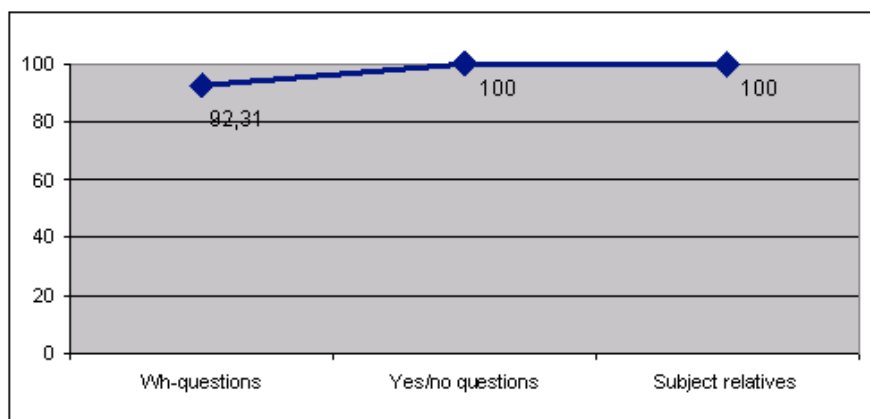


Graph 15: Ibero-Romance mild agrammatic production

Even though access to the left-peripheral area is restricted, mild participants may present a certain degree of preserved abilities. This is observable through the contrast with the results for our moderate agrammatic who failed, for example, to produce a single subject embedding. However, in contrast to the mild agrammatic sample, the Catalan moderate agrammatic does what we would expect under the TPH (Table 15, Graph 15).

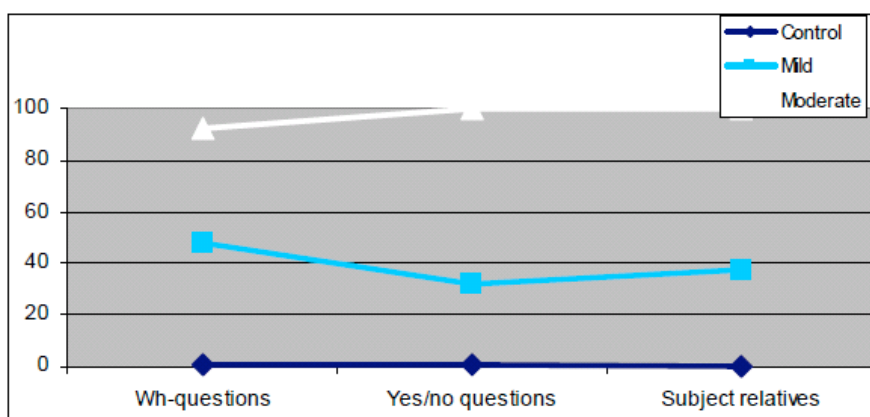
PRODUCTION			
	% errors	Main error type	Task
Wh-questions	92.3%	substitution with yes/ no	elicited production
Yes/No questions	100%	substitution with <i>why</i>	elicited production
Subject relatives	100%	relative omission	elicited production
COMPREHENSION			
	% errors	Main error type	Task
Wh-question comp.	38.5%	select wrong picture	forced-choice task
Wh-word comp.	7.7%	select wrong picture	forced-choice task

Table 15: Moderate agrammatic CP-field



Graph 16: Ibero-Romance moderate agrammatic errors in the CP-field

Finally, Graph 17 summarizes the IP-field of the three populations under analysis.



Graph 17: Degrees of severity in agrammatic Ibero-Romance

With the limited data available, we can only conclude that our Ibero-Romance agrammatic subjects either avoided or failed to produce well-formed structures (at the level of non-pathological subjects) when such structures required the participation of the CP layer. However, a proper account for our results must involve some additional factors.

7. Conclusion

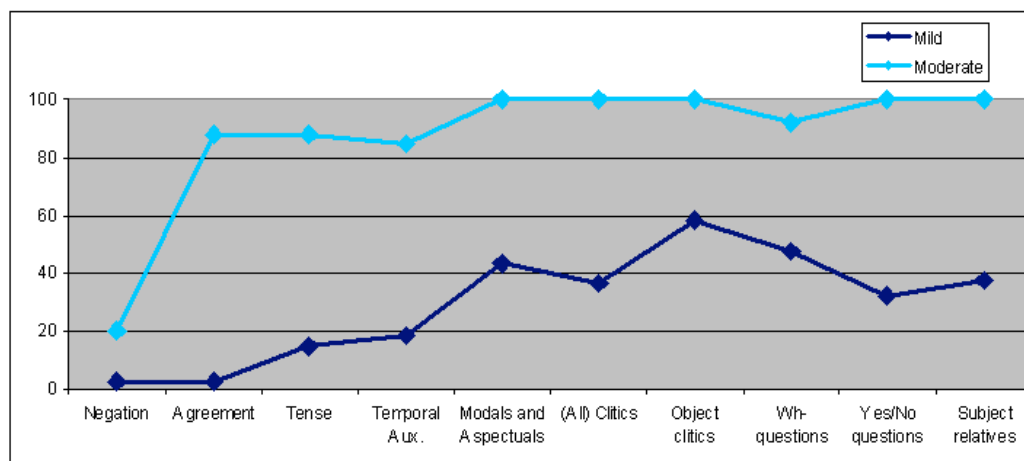
Our results indicate that most functional categories under investigation were not completely damaged in our sample of agrammatic participants. We account for both across-subject variation and within-subject variation in the following terms:

- (A) Non-pathological adult subjects are endowed with the resources to complete structures up to the left end of the left periphery.
- (B) In the case of deficit, the ultimate height they reach decreases; however, this does not necessarily entail that it is constant to the same exact extent

for every participant or that the same participant does not display a variable behavior across answers.

- (C) The more severe the agrammatic deficit is, the less high they can reach in the tree structure (Friedmann 2005).

Graph 18 illustrates that the number of errors made by the agrammatic sample is related to the structural position of the error type, with a tendency to greater errors as one moves up from the IP- to the CP-field.



Graph 18: Ibero-Romance agrammatic production errors

However, this correspondence is not perfect. Elements dependent on the higher portions of the IP-field (e.g., object clitics) can be seen to be more severely damaged than some elements in the left periphery (e.g., yes/no-questions).

In all, this approach to agrammatic results constitutes the first implementation of cartographic models to account for pathological data. Our results have the following implications for a super developed tree-structure:

- (A) Negation and $T_{(present)}$ must occupy a relatively lower portion, thus justifying the high degree of preservation.
- (B) If agreement is taken as an operation, it must take place lower than $T_{(past)}$.
- (C) The special status of *why* as compared to other *wh*-elements seems to be confirmed.
- (D) The tight relationship between yes/no- and *why*-questions also seems to be proved.

The experiments already conducted raise many new questions and leave others open for further exploration. This is the case for the low frequency of use of non-finite forms in the experimental conditions resulting from our design, which raises questions regarding their compatibility with results from other Romance varieties (Italian; Miceli *et al.* 1989, Garraffa 2003). The behavior of modals and aspectuals, and the degree of relative preservation or impairment as a function of their exact location on the tree, deserves further investigation too.

Appendix A: Background Information on Experimental Subjects — Session 1

Subject	Gender/age (years)	Edu.	Etiology	TPO	Aphasia classification (severity)
Catalan					
C1	m/63	3	Ischemic CVA Left fronto-insular ²⁰ infarction	5	Motor aphasia (mild)
C2	m/66	1	Ischemic CVA Left middle cerebral artery	4	Mixed Transcortical (mild)
C3	m/69	1	Ischemic CVA Left infarction affecting middle cerebral artery region	2	Motor aphasia (mild)
C4	m/70	3	Ischemic CVA Left middle cerebral artery	7	Global (mild)
C5	m/70	2	Ischemic CVA Left temporo-medial infarction	5	Mixed Transcortical (mild)
CM	m/28	2	Hemorrhagic CVA Left intraparenchymatous ²¹ hemorrhage affecting basal ganglia	6	Motor aphasia (moderate)
Galician					
G1	f/76	1	Ischemic CVA Left middle cerebral artery	0.9m	Motor aphasia (mild)
G2	f/83	1	Ischemic CVA Left, cardio-embolic	0.5m	Motor aphasia (mild)
G3	f/55	1	Hemorrhagic CVA Left intraparenchymatous hemorrhage affecting basal ganglia	3	Motor aphasia (mild)
G4	m/74	2	Ischemic CVA Left infarction affecting middle cerebral artery region	1.7m	Mixed Transcortical (mild)
G5	f/56	2	Hemorrhagic CVA Left intraparenchymatous hemorrhage	2	Motor aphasia (mild)
Spanish					
S1	m/27	2	Cranial-Encephalic Traumatism Left fronto-temporal	3	Motor aphasia (mild)
S2	m/74	1	Ischemic CVA Left Infarction affecting pre-central area	0.4m	Motor aphasia (mild)
S3	m/61	3	Hemorrhagic CVA Left intraparenchymatous hemorrhage affecting basal ganglia	11	Motor aphasia (mild)
S4	m/64	1	Hemorrhagic CVA Left middle cerebral artery affecting basal ganglia	0.1m	Motor aphasia (mild)
S5	f/38	2	Ischemic CVA Left middle cerebral artery	7	Motor aphasia (mild)

m = male; f = female; 1 = Primary education; 2 = Secondary education; 3 = University education; TPO = Time post-onset: years, months (m); CVA = Cerebrovascular accident; CVD = Cerebrovascular disease

Appendix B: Background Information on Experimental Subjects — Session 2

Subject	Gender/age (years)	Edu.	Etiology	TPO	Aphasia classification (severity)	
Galician						
G6	f/80	1	Ischemic CVA Left middle cerebral artery	0,4m	Mixed (mild)	Transcortical
G7	f/50	1	Hemorrhagic CVA Left temporo-occipital	0,2m	Mixed (mild)	Transcortical
G8	f/77	1	Ischemic CVA Left middle cerebral artery	0,1 m	Motor aphasia (mild)	
G9	m/64	2	Hemorrhagic CVA Left intraparenchymatous hemorrhage	0,3m	Motor aphasia (mild)	
G10	m/30	3	Ischemic CVA Left middle cerebral artery	1	Mixed (mild)	Transcortical
Spanish						
S6	m/65	1	Ischemic CVA Multiple left infarctions affecting Sylvian region	9	Motor aphasia (mild)	
S7	m/82	3	Ischemic CVA Left middle cerebral artery	0,1 m	Motor aphasia (mild)	
S8	m/42	2	Hemorrhagic CVA intraparenchymatous hemorrhage	3	Motor aphasia (mild)	

1 = Primary education; 2 = Secondary education; 3 = University education; TPO = Time post-onset: years, months (m); CVA = Cerebrovascular accident

References

- Belletti, Adriana. 1982. Morphological passive and *pro*-drop: The impersonal construction in Italian. *Journal of Linguistic Research* 2, 1–34.
- Belletti, Adriana. 2001. Inversion as focalization. In Aafke Hulk & Jean-Yves Pollock (eds.), *Subject Inversion in Romance and the Theory of Universal Grammar*, 60–90. New York: Oxford University Press.
- Belletti, Adriana. 2004. Aspects of the low IP area. In Rizzi (ed.), 16–51.
- Beretta, Alan, Carolyn Harford, Janet Patterson & Maria Piñango. 1996. The derivation of postverbal subjects: Evidence from agrammatic aphasia. *Natural Language and Linguistic Theory* 14, 725–748.
- Chinellato, Paolo. 2002. Agreement disorders, subject clitics and the structure of IP in dialectal agrammatism: The Field Damage Hypothesis. *Cortex* 38, 837–840.
- Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge, MA: MIT Press.
- Cinque, Guglielmo. 1999. *Adverbs and Functional Heads: A Cross-Linguistic Perspective*. New York: Oxford University Press.
- Cinque, Guglielmo (ed.). 2002. *The Cartography of Syntactic Structures*, vol. 1: *Functional Structure in DP and IP*. New York: Oxford University Press.
- Cinque, Guglielmo. 2006. *The Cartography of Syntactic Structures*, vol. 4: *Restructuring and Functional Heads*. New York: Oxford University Press.

- Crain, Stephen & Rosalind Thornton. 1998. *Investigations in Universal Grammar: A Guide to Experiments in the Acquisition of Syntax and Semantics*. Cambridge, MA: MIT Press.
- Cruschina, Silvio. 2007. Marking yes/no questions. Paper presented at CIDSIM – 2nd Cambridge Italian Dialect Syntax Meeting, Cambridge. [University of Cambridge, 26–27 January 2007.]
- Friedmann, Na'ama. 1994. Morphology in agrammatism: A dissociation between tense and agreement. Tel Aviv: Tel Aviv University M.A. thesis.
- Friedmann, Na'ama. 1998. Functional categories in agrammatic production: A cross-linguistic study. Tel Aviv: Tel Aviv University dissertation.
- Friedmann, Na'ama. 2005. Degrees of severity and recovery in agrammatism: Climbing up the syntactic tree. *Aphasiology* 19, 1037–1051.
- Friedmann, Na'ama. 2006. Generalizations on variations in comprehension and production: A further source of variation and a possible account. *Brain and Language* 96, 151–153.
- Friedmann, Na'ama. 2008. Traceless relatives: Agrammatic comprehension of relative clauses with resumptive pronouns. *Journal of Neurolinguistics* 21, 138–149.
- Friedmann, Na'ama & Yosef Grodzinsky. 1997. Tense and agreement in agrammatic production: Pruning the syntactic tree. *Brain and Language* 56, 397–425.
- Friedmann, Na'ama & Yosef Grodzinsky. 2000. Split inflection in neuro-linguistics. In Marc-Ariel Friedemann & Luigi Rizzi (eds.), *The Acquisition of Syntax: Studies in Comparative Developmental Linguistics*, 84–104. New York: Longman.
- Garraffa, Maria. 2008. Minimal structures in aphasia: A study on agreement and movement in a non-fluent aphasic speaker. *Lingua* 119(10), 1444–1457.
- Gavarró, Anna & Silvia Martínez-Ferreiro. 2007. Tense and agreement impairment in Ibero-Romance. *Journal of Psycholinguistic research* 36, 25–46.
- Giorgi, Alessandra & Fabio Pianesi. 1997. *Tense and Aspect: From Semantics to Morphology*. New York: Oxford University Press.
- Grimshaw, Jane. 1982. On the lexical representation of romance reflexive clitics? In Joan Bresnan (ed.), *The Mental Representation of Grammatical Relations*, 87–148. Cambridge, MA: MIT Press.
- Grodzinsky, Yosef. 1990. *Theoretical Perspectives on Language Deficits*. Cambridge, MA: MIT Press.
- Grodzinsky, Yosef. 2000. The neurology of syntax: Language use without Broca's area. *Behavioral and Brain Sciences* 23, 1–71.
- Hagiwara, Hiroko. 1995. The breakdown of functional categories and the economy of derivation. *Brain and Language* 50, 92–116.
- Jaeggli, Osvaldo & Kenneth J. Safir (eds.). 1989. *The Null Subject Parameter*. Dordrecht: Kluwer.
- Koukouloti, Vasiliki & Roelien Bastiaanse. 2010. Time reference in Greek aphasia: Is it only time reference? Paper presented at *Science of Aphasia XI*, Potsdam. [University of Potsdam, 27 August–1 September 2010.]
- Ledgeway, Adam & Alessandra Lombardi. 2005. Verb movement, adverbs, and clitic positions in Romance. *Probus* 17, 79–113.

- Lonzi, Linda & Claudio Luzzatti. 1993. Relevance of adverb distribution for the analysis of sentence representation in agrammatic patients. *Brain and Language* 45, 306–317.
- Luzzatti, Claudio & Maria Teresa Guasti. 2000. Agrammatism, syntactic theory, and the lexicon: Broca's area and the development of linguistic ability in the human brain. *Behavioral and Brain Sciences* 23, 41–42.
- Martínez-Ferreiro, Silvia. 2003. Verbal inflectional morphology in Broca's aphasia. Barcelona: Universitat Autònoma de Barcelona M.A. Thesis.
- Miceli, Gabriele, M. Caterina Silveri, Cristina Romani & Alfonso Caramazza. 1989. Variation in the pattern of omissions and substitutions of grammatical morphemes in the spontaneous speech of so-called agrammatic patients. *Brain and Language* 36, 447–492.
- Raposo, Eduardo & Juan Uriagereka. 2005. Clitic placement in Western Iberian. In Guglielmo Cinque & Richard S. Kayne (eds.), *The Oxford Handbook of Comparative Syntax*, 639–697. New York: Oxford University Press.
- Reinhart, Tanya & Eric Reuland. 1993. Reflexivity. *Linguistic Inquiry* 24, 657–720.
- Rispens, Judith, Roelien Bastiaanse & Ron M. van Zonneveld. 2001. Negation in agrammatism: A cross-linguistic comparison. *Journal of Neurolinguistics* 14, 59–83.
- Rizzi, Luigi. 1997. The fine structure of the left periphery. In Liliane Haegeman (ed.), *Elements of Grammar: Handbook of Generative Syntax*, 281–337. Dordrecht: Kluwer.
- Rizzi, Luigi. 2002. Locality and left periphery. In Adriana Belletti (ed.), *The Cartography of Syntactic Structures*, vol. 3: *Structures and Beyond*, 223–251. New York: Oxford University Press.
- Rizzi, Luigi (ed.). 2004. *The Cartography of Syntactic Structures*, vol. 2: *The Structure of CP and IP*. New York: Oxford University Press.
- Suñer, Margarita. 1994. V-Movement and the licensing of argumental *wh*-phrases in Spanish. *Natural Language and Linguistic Theory* 12, 335–372.
- Uriagereka, Juan. 1995. Aspects of the syntax of clitic placement in Western Romance. *Linguistic Inquiry* 26, 79–123.
- Veiga, Alexandre. 1991. Le système verbal du Galicien: Survivance d'un état proto-roman occidental? *Actes du XVIII Congrès International de Linguistique et Philologie Romanes*, vol. 3, 77–96.
- Zanuttini, Raffaella. 2001. Sentential negation. In Mark Baltin & Chris Collins (eds.), *The Handbook of Contemporary Syntactic Theory*, 511–535. Malden, MA: Blackwell.

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