Ibero-romance agrammatism and Tree-pruning.

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Abstract

The present study checks the validity of the Tree-pruning hypothesis (Friedmann 1994ss, Friedmann and Grodzinsky 1997ss) to account for the experimental results of nine Ibero-Romance agrammatic subjects (4 Catalan, 2 Galician and 3 Spanish) in two controlled production tasks: completion of tense and agreement and question elicitation.

According to the TPH, which is based on Principles and Parameters (Chomsky 1981), there is a direct correlation between position in the syntactic tree and number of errors, being the higher nodes the most susceptible of impairment. Our sample was tested for inflexional morphology and question production skills and their results analyzed to obtain the relevant data for our analysis. If relative percentages of error for Wh-questions, T and Agr (with Agr as the better preserved) are taken in isolation, the results are predictable under the TPH. Nevertheless, not only the status of Agr has been widely debated (Belletti 1990, Chomsky 1995ss) but the same tense-agreement dissociation was documented for non-pathological populations (De Vincenzi *et al.*, in preparation). In addition, some fine-grained patterns that cast some doubt on the adequacy of the TPH were found. The observed dissociation in the production of Ibero-romance Wh- vs. Y/N questions is not easily accountable under a purely structural account.

1. Introduction

Agrammatism, the main sympthom of motor aphasia [1], has been traditionally characterized as the frequent omission or substitution of both bound and free-standing functional words as a consequence of a selective impairment (Grodzinsky 1990, 2000). In the present study we aim to approach this phenomenon in three virtually unexplored languages, namely Catalan, Galician and Spanish. To fulfill that aim, the Tree-Pruning hypothesis (Friedmann 1994, 1998, 2001, 2002 and Friedmann and Grodzinsky 1997, 2000), a structural

account claiming that agrammatism is a narrowly constrained deficit based on degrees of impairment of the syntactic tree, will be the departure point for the analysis.

According to structural accounts, agrammatism is directly related to problems with the projection of the syntactic tree up to the higher nodes. These derive into the production of truncated or pruned structures what has been know in the field of agrammatism as the Tree-Pruning Hypothesis illustrated in tree (1) [2].

Tree (1): Tree-pruning hypothesis:
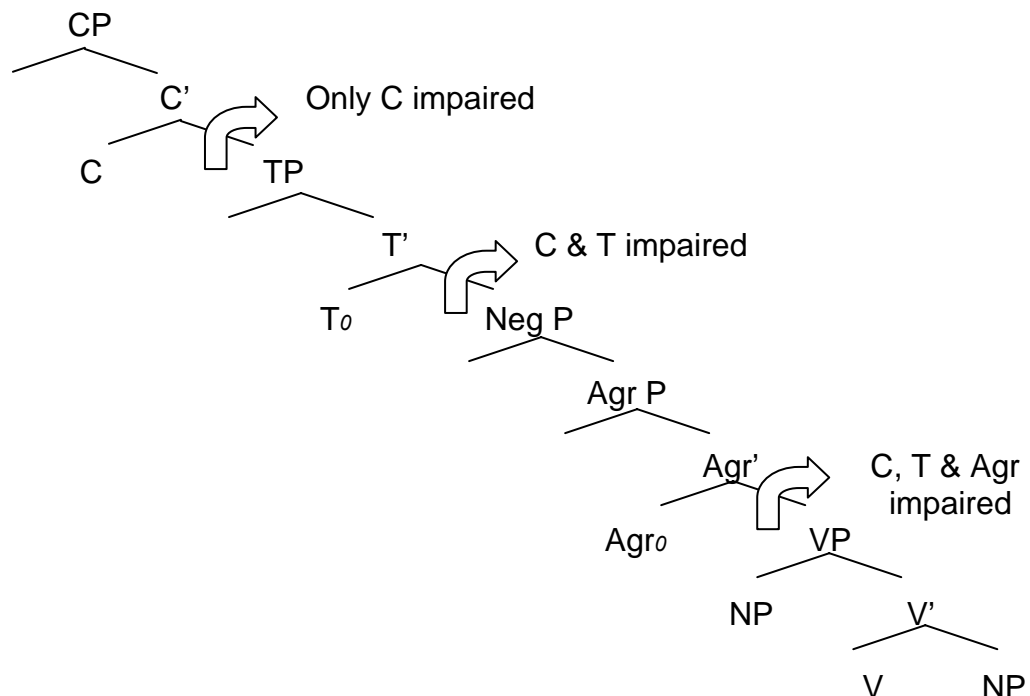
The Tree-Pruning Hypothesis, originally proposed to account for an observed dissociation between Tense and Agreement (Friedmann and Grodzinsky 1997), was postulated according to Pollock's (1989) Split-Inflection Hypothesis following the relative order of functional categories: CP – TP – AgrP – VP. With this assumptions, the authors claim that C, T or Agr can be impaired in agrammatism. Since an impaired node cannot project, portions located higher than the pruning site will be absent from the representation (Friedmann & Grodzinsky 1997). Consequently, lower nodes are less susceptible of impairment than higher ones. The Tree-Pruning Hypothesis allows for different degrees of severity of the agrammatic deficits by varying the

pruning site. Severe agrammatism will be related to problems in C, T and Agr while, in its mild version, it will be restricted to problems in C or C and T.

2. Previous evidence

Previous studies through programmed tasks run in several languages have been used as evidence to support that Tense and Agreement behave as two separate functional nodes. The tense/agreement dissociation has been found in Hebrew, Palestinian Arabic, French, Italian or German among others. Friedmann and Grodzinsky (1997, 2000) present the case of Hebrew and Palestinian Arabic agrammatic speakers who performed normally for Agreement while Tense was severely impaired (3.2% vs. 38% errors in completion and 0% vs. 23% in repetition). An example is given in (1):

(1)   * Maxar   dani   haya   ba-yam   Past instead of Future tense
          tomorrow Danny was in-the-sea   Intact agreement
                              (Friedmann and Grodzinsky 2000: 91)

Friedmann (2001) studies the case of 12 Hebrew and 2 Palestinian Arabic agrammatic subjects who corroborate these findings (2% errors in Agr vs. 29% errors in T). This dissociation, which will be shown to hold cross-linguistically, is attributed to the relatively higher position of T with respect to Agr. The results across tasks are displayed in table 1.

TABLE 1: Repetition and completion results for Hebrew and Palestinian Arabic.

Hebrew	*Tense errors*	*Agreement errors*
Completion	41%	4%
Repetition	16%	0%

Arabic	*Tense errors*	*Agreement errors*
Completion	69%	9%

(Friedmann 2001)

Further evidence from Romance languages have been also documented in the literature. Benedet, Christiansen and Goodglass's (1998) compare the behavior of Spanish and English agrammatic subjects both in production and comprehension. Completion of given sentences and one-sentence descriptions of target pictures were the oral production tasks used. The results for the production and comprehension of T and Agr in Spanish were significantly different: 36% Agr errors vs. 94.5% T errors. The main error in verbal agreement was substitution of the inflection.

Nespoulous, Dordain, Perron, Ska, Bub, Caplan, Mehler, and Lecours (1988) and Nespoulous, Dordain, Perron, Jarema and Chazal (1990) provides us with evidence from mild agrammatic French. According to the authors, T and higher nodes are impaired while agreement stays intact in the speech of Mr. Clermont. An example of a tense error has been included in (2) below:

(2)   * et   j'ai   encore   étouffais
          and I have (aux. Pres.) still   suffocate (Impf.)
                      (Nespoulous *et al.* 1990: 700)

Further evidence from Romance languages can be found in Miceli, Silvery, Romani and Caramazza's (1989) and in De Blesser and Luzzati's (1994) studies of Italian. Miceli *et al*'s. (1989) study of 20 Italian agrammatic speakers clearly shows three groups of subjects according to the results: those with T and Agr impaired, those with intact T and Agr and those with T impairment and intact Agr. No cases of Agr impairment without T impairment are observed. Four subjects showed deficits in tense with almost normal agreement while another group showed impairment in neither, C being the only affected node. A third group presented impairment of both categories.

The picture for the Germanic languages confirms the validity of the cross-linguistic tense-agreement dissociation. Wenzlaff and Clahsen (2002) study the case of 7 agrammatic and 7 control German subjects in sentence completion and grammaticality judgment tasks. The findings suggest a deficit in tense but not in the agreement features. While subject-verb agreement appeared almost intact, the results for tense were significantly worse than those of the control

group (Wilcoxon test: Z = -2.37, p < 0.05 [3]). Table 2 summarizes the individual scores in the sentence completion task:

TABLE 2: Sentence repetition results from 7 German agrammatic speakers.

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

(Wenzlaff and Clahsen 2002: 32)

In addition to the tense-agreement dissociation, question production has also attracted a lot of attention among researchers. Friedmann (2002) show a clear difference between wh- and yes/no question production in the agrammatic speech of Hebrew and Palestinian Arabic subjects with the former more severely damaged than the latter (87% vs. 22%). The individual results have been plotted in table 3.

TABLE 3: Question elicitation in Hebrew and Arabic.

		Wh- questions		Yes/No questions	
		% correct	(correct/total)	% correct	(correct/total)
Hebrew	AL*	8%	(2/24)	88%	(21/24)
	RA*	15%	(7/48)	100%	(9/9)
	ML*	44%	(21/48)	100%	(24/24)
	HY*	13%	(6/48)	88%	(21/24)
	RN*	27%	(13/48)	67%	(12/18)
	IE*	29%	(7/24)	100%	(24/24)
	PK*	14%	(3/21)	92%	(22/24)
Arabic	HH*	21%	(5/24)	65%	(15/23)
Mean		22%	(64/285)	87%	(148/170)
Hebrew	RS	0%	(0/20)		

		% correct	(number)
	AG	0%	(0/6)
	TA	45%	(5/11)
Mean		13%	(5/37)

<div align="right">(Friedmann 2002)</div>

Friedmann attributes this dissociation to the fact that yes/no questions do not require CP in Hebrew or Palestinian Arabian languages what turns them into more easily accessible for agrammatic subjects. Under this approach, Germanic languages such as English or German which need the full projection of the syntactic tree for both question types are not expected to show such a phenomenon (Friedmann 2002).

Thompson & MacReynolds (1986), Wambaugh & Thompson (1989), Thompson et al. (1993, 1996) provide evidence from agrammatic English. The authors found severe deficits in the production of partial interrogatives (>75%) together with auxiliary omission and absence of S-V inversion in total interrogatives. This pattern indicates that findings were predictable under the TPH. Evidence from German agrammatism is provided by Burchert, Swoboda-Moll and De Bleser (2005). As expected, total and partial interrogatives are equally damaged: 48% vs. 38%. According to Friedmann (2002), this is attributable to the requirement of the CP node to build up both construction types.

TABLE 4: Question elicitation in German.

		Wh- questions		*Yes/No questions*	
		% correct	(number)	% correct	(number)
German	MP	79%	(19)	96%	(23)
	AF	54%	(13)	92%	(22)
	WR	38%	(9)	88%	(21)
	JK	79%	(19)	17%	(4)
	JR	79%	(19)	4%	(1)
	RK	38%	(9)	4%	(1)
	WE	17%	(4)	4%	(1)
	RG	4%	(1)	0%	(0)
Mean		48%	(11.6)	38%	(9.1)

SD – Standard deviation

(Burchert, Swoboda-Moll and Ria De Bleser 2005)

3. Methodology

In order to collect further evidence from Ibero-romance, we tested a sample of nine experimental subjects, 4 Catalan, 2 Galician and 3 Spanish, for their abilities in tense and agreement completion and elicited question production. The tense/agreement production task was based on Friedmann and Grodzinsky's (1997) study and included a total of 50 items in which the subject was exposed to a complete sentence and then expected to correctly complete the verbal morphology of the incomplete one (3) (Martínez-Ferreiro 2003):

(3)　a.　Hoy, María lava la ropa.　　　　　　　　　　(tense)
　　　　　Today, Mary washes the clothes.
　　　　　Ayer, María _____ .
　　　　　Yesterday, Mary _____ .

　　　b.　Ayer, María cantó una canción.　　　　　　(agreement)
　　　　　Yesterday, Mary sang a song.
　　　　　Ayer, los niños _____ .
　　　　　Yesterday, the boys _____ .

　　　　Question production skills were analyzed by means of 25 experimental items. The elicitation task included 13 wh-questions with two possible contexts (including or not the wh-operator) and 12 yes/no questions (Martínez-Ferreiro, work in progress). Examples of both token types have been included as (4) and (5) respectively:

(4)　a.　Juan　busca　una cosa y tú quieres saber lo qué.
　　　　　John is looking for something and you want to know what.
　　　　Expected answer: Qué busca Juan?
　　　　　　　　　　what's John looking for?

　　　b.　Yo comí un montón caramelos y tú quieres saber el número.
　　　　　I ate a load of sweets and you want to know the number.
　　　　Expected answer: Cuántos caramelos comiste?
　　　　　　　　　　How many candies did you eat?

(5)　A lo mejor, yo toco el piano. Pregúntamelo.
　　　Maybe, I play piano. Ask it to me.
　　　Expected answer: ¿Tocas el piano?
　　　　　　　　　　Do you play piano?

4. Results

Graph 1 summarizes the production results for inflectional morphology (including both tense and agreement errors) obtained by means of the completion task. While tense morphology was impaired to a 29,11% across-languages, agreement was better preserved with an error rate of 10,39%.

Graph 1: Ibero-Romance Agrammatic production I.

Percentage of wrong responses
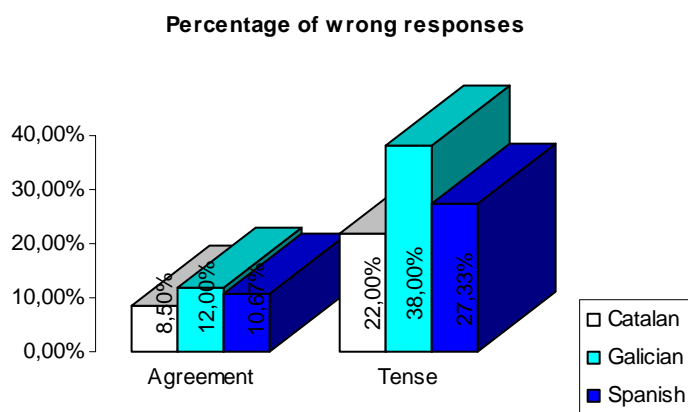
The observation of these results seems to fully confirm the predictions of the TPH. Agreement, which would be placed in low positions of the syntactic representation, is the most spared node while Tense, relatively higher according to the authors, is more severely damaged.

Nevertheless, a great amount of debate regarding the status of agreement has taken place in the literature. Not only its position in the tree structure has been questioned (see Belletti (1990) for the reverse relative order of Tense and Agreement) but even its appearance as an independent functional node has been neglected (Chomsky 1995ss). Different approaches have been summarized in (6):

(6)   1.   Pollock (1989) $\rightarrow$ TP > AgrP

2.   Belletti (1990) $\rightarrow$ AgrP > TP

3.   Chomsky (1992) $\rightarrow$ AgrsP > TP > Agr_oP

4.   Chomsky (1995ss) $\rightarrow$ AgrP no longer seen as an independent
             functional node

In addition, a more controversial issue is the fact that the same tense-agreement dissociation attested for agrammatic subjecs, central for the formulation of the TPH in its original terms, has been show to be consistent in non-pathological adults. De Vincenzi *et al.* (in preparation) demostrated, by controlling reading times, that subjects were sensitive to tense errors later than to agreement errors when faced with a controlled stimulus introducing one of these violations. According to the results, processing agreement would be less complex than processing tense. If this claim turns out to be true, it follows that agreement would be favoured in agrammatic production with respect to tense with independence of structural position.

Leaving Tense and Agreement aside for the moment, the results of wh- and yes/no question production reveal a dissociation similar to that documented for Hebrew and Palestinian Arabic (Friedmann 2002). The production of wh-interrogatives, crucially depending on the projection of CP, is the most severely damaged construction under analysis (56,19% across-languages). Even though both question types where problematic for our agrammatic sample, Graph 2 show that, yes/no questions are the better preserved group (30,56% errors). Differences have been found to be significant in a Wilcoxon Signed Rank test (p < 0.05).

Graph 2: Ibero-Romance agrammatic production (II).

Percentage of wrong responses
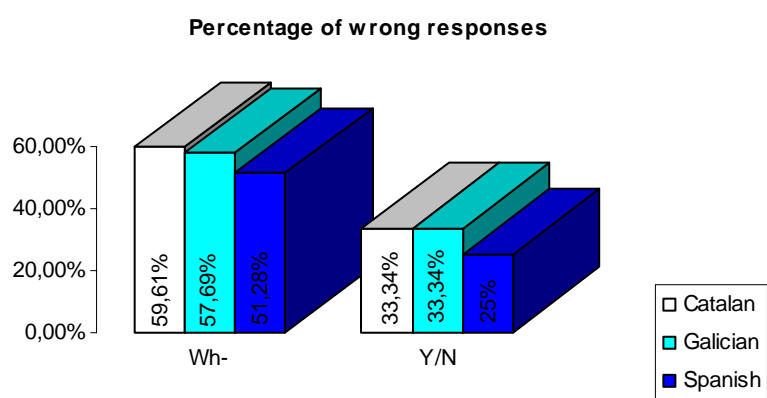
At the individual level, there are some exceptions to this pattern. One of the Catalan subjects was found to perform the opposite way with wh-question formation better preserved than yes/no question formation (69.23% correct wh- vs. 8.33% correct yes/no). For one of the Spanish subjects, both strategies

were found to be equally difficult to implement (30.77% correct wh- vs. 33.33% correct yes/no).

If yes/no questions were approached as structures rooted in TP, the solution adopted in Friedmann (2002), we would correctly predict the results. In fact, the most widely spread substitutory strategy among agrammatic subjects is the substitution of a wh-question by a yes/no question. Nevertheless, both question types in Catalan, Galician and Spanish have been claimed to require the participation of higher nodes of the syntactic tree to be correctly projected (Suñer 1994). If CP is a requirement for both question types, the observed differences would be unjustified from a structural perspective.

5. Discussion.

Refinements in the syntactic framework during the last decade allow us to deal with some of the problems presented in section 4. An alternative concerning agreement has been presented in Gavarró and Martínez-Ferreiro (2007). In this article, the authors claim that TP is no longer a monolithic node but a whole field of functional projections (in line with Cinque 1999). According to this proposal, agreement is not seen as an independent functional category but if the TPH holds, the functional projection with which the φ-features of the subject are checked has to be neccesarily lower than TP(Past), e.g., AspP (7).

(7) ModPepistemic > TP(past) > TP(Future) > MoodPirrealis > *(. . .)* AspPhabitual > (…) > TP(Anterior) > AspPterminative > AspPcontinuative > *(. . .)* > VP

(Cinque 1999)

Agree must take place between V and a functional category other than T when T is pruned; otherwise agreement morphology would not be properly checked. In these terms, combining minimalist and cartographical approaches (see Chomsky 1995ss for minimalism and Cinque 1999, Rizzi 2002 among others for cartography), a structural proposal such as the TPH would equally hold.

Even if agreement is deleted from the representation, there is a consistent increase in the number of errors for tense morphology and those observed in the production of wh-interrogatives. But, what happens with total

interrogatives? According to Suñer (1994), both wh- and yes/no questions require CP to be properly uttered. Adopting a more cartographical view we will claim that in the case of wh-questions, the wh-operator moves from its base-generation position to Focus position in the left periphery (Rizzi 2002) (8).

(8)   Force (*Top) Int (*Top) Focus (*Mod) (*Top) Fin IP

Yes/no questions are claimed to be headed by a null operator which would be first merged in the CP area (Suñer 1994). Evidence supporting the existence of this null operator can be found in some Romance varieties such as central and southern Italian dialects (*che* in Tuscan, *chi* in Sicilian) which display an overt interrogative operator for yes/no question formation.

(9)   Chi a puzzu addumari a luci?   (Sicilian)
       INT it be able to-pres.1st.sg swithch-on the light
       Can I switch on the light?
                        (Cruschina 2007)

The interaction of overt operators with topics and focus (10) has been taken as evidence for the claim that these elements occupy a position between the nodes for Force and Focus, namely Int (see 8) (Cruschina 2007). We claim in this paper that Int position is the base-generation site for both the null and overt interrogative operators in yes/no question formation in Ibero-romance.

(10)   a.   A Maria chi a salutasti?   (Sicilian)
             to M. INT her greet-pret.2nd.sg
             Did you greet Maria?
       b.   Chi a Maria salutasti?
             INT to M. Greet-pret.2nd.sg
             Was it Maria that you greeted?

Decomposing the CP area into a set of functional categories would result into a hierarchy of interrogative operators, with yes/no higher than wh-. Nevertheless, this order would be contra-intuitive for a TPH account since the prediction would be that yes/no questions are more severely damaged than wh-questions, something contradicted by our data. Apart from structural position, Wh- and yes/no questions were found to differ in two main aspects. While in the

case of wh-questions we have an overt operator moved to its surface position, yes/no questions are generated with a null operator base-generated, a position shared by both overt yes/no question operators and *why*. The contrast between question types has been illustrated in (11):

(11)   <u>Wh-questions</u>   <u>Yes/No questions</u>
        Moved operator   Base-generated operator
        Overt operator   Null operator
        Foc position   Int position

As we have shown, even though the TPH provides researchers with a very strong predictable tool, on its own, this hypothesis does not suffice to account for all the agrammatic symptoms observed through our experimental tasks. We propose a framework combining structural position and movement operations as the causes for language disruption in the following terms:

a)   Agrammatic subjects tend to avoid the projection of the higher nodes of the syntactic tree.

b)   Nevertheless, once the left periphery is compulsory activated, those utterances involving movement will add an extra cost to the representation not present in the case of base-generated elements.

Agrammatic speakers, whose resources are limited, would choose the option with no movement involved (yes/no questions) on the basis of its less costly nature. Considerations such as movement vs. base-generation, i.e. the number of movement operations in an utterance, have to be considered in order to properly account for a series of fine grained phenomena observed in the data. Even though the problem does not have to do with the movement operation per se, its cost may be decisive for a derivation to collapse.

6. Conclusion.

Despite the predictable power of the THP, a purely structural account suffers from some shortcomings to explain Ibero-romance agrammatic data. Considerations such as movement vs. base-generation, i.e. operations that may

play a role in the economy of a derivation, have to be taken into consideration in order to give a proper account of the observed phenomena.

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NOTES:

[1] **Aphasia**: Regressive pathology affecting the language faculty of previously non-pathological individuals after a lesion to the areas of the brain involved in language processing. Type of aphasia is a function of the locus and the extent of the lesion (Grodzinsky 1990). **Motor aphasia**: classically associated to a lesion in Broca's area – Brodmann's areas 44 and 45 –, it has to do with difficulties in speech production. Short utterance length is prevalent. Samples of verbal production contain mainly content words and lack most of the grammatical morphemes. Even though comprehension is also impaired, it is so to a lesser extent (Grodzinsky 1990).

[2] See Hagiwara (1995) for a similar proposal for agrammatic speech. See also Rizzi's (1994, 2005) Truncation Hypothesis for child language.

[3] Wilcoxon test: non-parametric test generally used when the observations are paired and do not meet the assumption of normality to test the null hypothesis that the population median of the paired differences of the samples is zero (Hollander and Wolfe 1973).