THE AGRAMMATIC COMPREHENSION OF CONTRASTIVE FOCUS AND CLITIC LEFT DISLOCATION IN CATALAN

IO SALMONS

Supervised by Dr. Anna Gavarró

A doctoral dissertation submitted for the degree of
Philosophiæ Doctor in Cognitive Science and Language

Facultat de Filosofia i Lletres
Departament de Filologia Catalana
Centre de Lingüística Teòrica
September 2015

Als meus pares

ABSTRACT

This dissertation is a study of the comprehension of contrastive focus, clitic left dislocation and clitic constructions in Catalan agrammatism. These structures remain mostly unexplored in agrammatic literature, and present some relevant properties that make them suitable for evaluating current hypotheses on the deficit in agrammatic comprehension. Here I present new data from five experimental tasks –two truth-value judgement tasks and three sentence-picture matching tasks– designed to assess the interpretation of the referred structures by Broca's aphasics. The findings from a preliminary discrimination task corroborate that agrammatics preserve their ability to distinguish the intonational contours characteristic of these constructions and, therefore, that the impairment in comprehension cannot be attributed to a misperception of prosodical patterns. The results from the comprehension tasks indicate that the agrammatics' interpretation of declaratives, subject focalisations and topicalisations and clitics is preserved, whereas their performance on object topicalisations and focalisations is compromised. The results also show that the notions of movement and intervention are useful to explain the patterns of loss in agrammatic comprehension and, consequently, provide further support for accounts based on these notions, namely, the Trace-Deletion Hypothesis Grodzinsky (2000a) and the Feature-Underspecification Hypothesis Grillo (2008). For the purpose of testing these two hypotheses, I also examine the role of morphosyntactic features in the comprehension of the referred constructions to learn whether the deficit selectively affects only discourse-scope features, in line with the FUH's predictions, or copies, as hypothesised by the TDH. A mismatch between relevant features that function as attractors of movement is expected to prevent minimality effects from occurring in object-derived structures under the FUH. The finding that a mismatch of number between the displaced object and the subject does not improve the aphasics' performance on focalisations and topicalisations shows that agrammatic aphasics cannot use morphosyntactic features to establish syntactic chains, thus strengthening the TDH's assumption that copies are deleted from aphasics' representations. Finally, the experimental data reported in this dissertation also provide further evidence in favour of the derivational analysis of clitic left dislocation (López, 2009; Rubio, 2014).

"There is no deeper knowledge without the experience of disease,
and all heightened healthiness must be achieved by the route of illness."

Thomas Mann, *Freud and the Future* (1937).

ACKNOWLEDGMENTS

DECLARATION

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

Bellaterra, September 2015

CONTENTS

INTRODUCTION

1.1 AGRAMMATIC COMPREHENSION

The relation between brain and language has long been explored in aphasia studies. At the beginning of the nineteenth century, phrenologists associated the anterior lobes with the articulation of language (Gall and Spurtzheim, 1810; Bouillaud, 1825) based partly on reports of cases of aphasia after brain injury (see Brown and Chobor (1992) for a review). The work that Paul Broca presented in 1861 was especially relevant, as he examined the brain of two aphasic patients with major difficulties in speaking that provided anatomical evidence in favour of the localisation approach (Figure 1). Broca (1861) located "the faculty of spoken language" in the inferior frontal area in the left hemisphere, but in a much more posterior point in the anterior lobe than the orbital arch, the region where it lied according to the Phrenologist School.
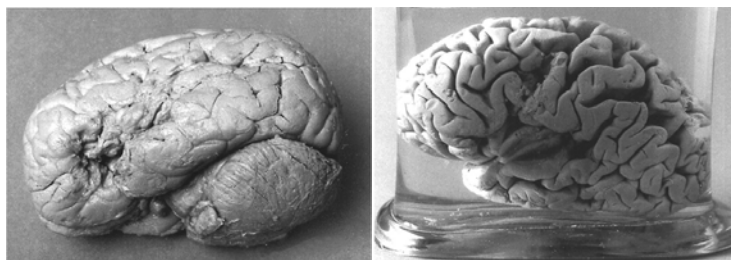
Figure 1: Lateral view of the left hemisphere of the brains of Broca's patients Leborgne (left) and Lelong (right). Source: Dronkers et al. (2007)

Broca's work was further developed by other researchers, such as Wernicke (1874) and Lichtheim (1885), and revived more recently by Geschwind (1970). A model of organisation of language in the left hemisphere was proposed based on aphasia studies, correlating abnormal linguistic behaviour with brain lesions. Hence, communication skills were related to specific neural modules: Broca's area was considered to be the neural centre of production, and to be independent of comprehension, which was supposed to rely on Wernicke's area (in the left posterior lobe). In Figure 2, these two centres are represented

in the left hemisphere of a human brain: B stands for Broca's area, W for Wernicke's area, and A for the *arcuate fasciculus* (a link between Broca's and Wernicke's areas).
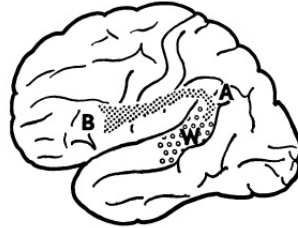
Figure 2: Lateral surface of the left hemisphere with the three main language centres. Source: Geschwind (1970)

From very early on, it was observed that Broca's aphasics are often unable to produce grammatical sentences and their speech was described as effortful, telegraphic and poorly articulated. Nonetheless, they were considered to have retained other abilities such as comprehension. Therefore, the classification of aphasias –still prevailing in the clinical field– is largely the result of a channel-based model in which Broca's aphasia, in contrast to Wernicke's aphasia, is considered to impair speech production. However, during the 70s, several researchers claimed that Broca's aphasics also presented a deficit in comprehension (Parisi and Pizzamiglio, 1970; Zurif et al., 1972, 1974; Lesser, 1974; Heilman and Scholes, 1976; Zurif and Caramazza, 1976; Caramazza and Zurif, 1976; Goodglass et al., 1979; Schwartz et al., 1980). Zurif and colleagues conducted several experiments to assess the comprehension of Broca's aphasics and concluded that patients suffered from a syntactic deficit underlying both production and comprehension. In Caramazza and Zurif (1976), a sentence-picture matching task was carried out to test the comprehension of centre embedding. Broca's aphasics were able to interpret active sentences (1 a) without difficulties and, interestingly, they also showed a good performance on the comprehension of semantically nonreversible object relative clauses (1 b). However, their performance dropped considerably on the semantically reversible object relatives (1 c) as they tended to choose the thematic foil (reversed roles), indicating that they were not able to decode sentences in which semantic cues were removed and the interpretation depended only on syntactic properties. The authors concluded that agrammatic aphasics suffered from a complete loss of syntax and that their apparently intact ability to

comprehend was due to the use of heuristic strategies[1], which mainly refer to their knowledge of the world and a tendency to interpret all sentences as S(ubject)-V(erb)-O(bject) sentences, as per the canonical word order in English.

(1)   (a) The girl is kicking a green ball.

        (b) The apple that the boy is eating is red.

        (c) The horse that the bear is kicking is brown.

A new model of the organisation of language in the brain was proposed instead of the traditional view held in the nineteenth century. The new approach remained basically unchanged, but language modalities (production, comprehension) were substituted by linguistic levels of representation (syntax, semantics). Hence, Broca's area was considered to be responsible for syntax, while semantics was placed in Wernicke's area (Zurif, 1995).

From the 1980s onwards, several studies reported data on the agrammatic comprehension of other syntactic constructions using different methodologies and alternative characterisations of the deficit were proposed. Schwartz et al. (1980) rejected the idea that no syntax is available in Broca's aphasia as held by Caramazza and Zurif (1976), and claimed that the impairment observed was rather triggered by a processing deficit. They reported evidence from five agrammatic aphasics from a sentence-picture matching task on the comprehension of semantically reversible actives (2 a) and passives (2 b). Actives were, on average and individually, better understood than passives (mean of 68.33% and 50.83% of correct responses respectively). Yet only three patients achieved an above-chance performance on actives, and passives were not interpreted consistently as canonical SVO sentences either. This led the authors to conclude that since aphasics did not interpret sentences applying a fixed word order (the canonical SVO), they were unable to map thematic roles onto the syntactic configuration.

(2)   (a) The clown applauds the dancer.

        (b) The dancer is applauded by the clown.

This approach, the Mapping Hypothesis, was also backed up by Linebarger et al. (1983) and Linebarger (1989), who reported the results of a grammaticality judgement task where aphasics' grammatical knowledge was tested. Agrammatics succeeded in recognising the ungrammaticality of

---

1 Healthy speakers have also been claimed to partially rely on heuristics to interpret certain sentences, see Phillips (2012) for a review.

sentences such as gapless relatives (3) despite the fact that such syntactic constructions had been shown to be problematic in comprehension.

(3)   *The man that the boy is pushing the girl is tall.

The results were interpreted as evidence of retained grammatical knowledge, thus challenging hypotheses that postulated a complete loss of syntax. In a posterior study (Caplan and Futter, 1986), the comprehension of a large variety of syntactic constructions was examined, leading the authors to conclude that the aphasic participant showed, on the one hand, sensitivity to the syntactic structure (at least to nouns and verbs), since her performance depended on the sentence type, and on the other hand, a tendency to interpret sentences linearly, according to an interpretive rule anticipated in earlier studies (Caplan, 1983; Caplan et al., 1981) that assigns the agent, theme and goal roles to the first, second and third Determiner Phrases (DP, hereafter). Hence, the patient was able to map theta-roles onto syntactic constituents (contrary to Schwartz et al. (1980)). The formulation of this rule is problematic, since it does not explain all the data provided (for example, the guessing performance on passives and object clefts), but it highlights what is going to be a crucial property in agrammatic studies: word order.

   Grodzinsky (1986; 1990; 2000a) focused on the contrasts among syntactic structures and the patterns related to them: such contrasts were observed between actives, subject relatives and subject cleft constructions, which were well understood, and passives, object relatives and object clefts, which were poorly understood. According to Grodzinsky, the accounts that denied the syntactic nature of the disturbance could not predict the performance of Broca's aphasics because they were not sensitive to structural differences among tested utterances. The observation that aphasics' performance depended on syntactic structure led to the conclusion that agrammatics present a partial and selective impairment in comprehension concerning either syntactic structures or processes, instead of a severe loss of syntactic knowledge as postulated in previous research (Caramazza and Zurif, 1976; Caplan and Futter, 1986; Berndt and Caramazza, 1980). Furthermore, Grodzinsky rejected the idea that the impairment in production paralleled that in comprehension, and espoused two different accounts for the production and comprehension deficits in Broca's aphasia: the Tree-Pruning Hypothesis (Friedmann and Grodzinsky, 1997) and the Trace-Deletion Hypothesis (Grodzinsky 1990; 2000a; 2000b) respectively.

   According to the TDH, agrammatic individuals have problems in comprehending sentences that involve syntactic phrasal movement, such

as the constructions discussed above (passives, object relatives and object clefts). Broca's aphasics lack traces of moved phrasal constituents from their grammatical representations and thus the transmission of thematic roles is disrupted and their comprehension compromised. When the theta-role assignment cannot occur by normal syntactic means, a default strategy assigns thematic roles linearly; the combination of both mechanisms predicts the performance of patients. Even though the TDH has been very influential, strong claims have been raised against it regarding both theoretical and experimental issues. Other researchers have proposed alternative accounts. For example, Mauner et al. (1993) postulated the Double-Dependency Hypothesis, according to which aphasic individuals are expected to have problems in comprehending sentences that involve two or more dependencies. Grillo (2008) hypothesised that the problematic property for agrammatics are scope-discourse features, which are underspecified due to a processing deficit, thus triggering the disruption of theta-role assignment. Other researchers, however, have proposed more general linguistic characterisations of the deficit: Bastiaanse and van Zonneveld (2005) gave word order a crucial role in agrammatism. They argued that Broca's aphasics have problems –both in production and comprehension– whenever sentences do not display the basic word order.

The debate on the nature of the deficit is still ongoing, and several alternative accounts for the agrammatic comprehension have been proposed over the last few decades based on crosslinguistic experimental data. I address the above-mentioned approaches to agrammatic comprehension in more detail in Section 2.1.

1.1.1 *Crosslinguistic characterisation of the agrammatic comprehension*

There is extensive experimental work on the comprehension by Broca's aphasics across languages and methodologies. Most studies have focused on the interpretation of sentences that present noncanonical word orders, which have been often shown to be problematic for agrammatic patients. Regarding the comprehension of actives and passives, a more or less established pattern of performance has been observed in English (see Grodzinsky et al. (1999) for a review): agrammatic individuals show good comprehension of actives and poor comprehension of passives. English passives present a DP–V–by-DP order, as exemplified in (4 b), where the DP in the subject position (*the girl*) is assigned the thematic role theme and the DP in the Prepositional Phrase (PP)

is assigned agent. The thematic assignment is thus superficially noncanonical, unlike canonical sentences such as declaratives in which the agent is assigned to the subject and the theme to the DP in the object position (4 a). In addition, passives present another interesting syntactic property: they are derived by movement. The DP assigned theme is base-generated in the object position and, due to some syntactic requirements that will be considered in Chapter 2, it moves to the subject position. The displaced DP leaves a copy in its original position –and in intermediate positions that I ignore for now–, the copy is structurally represented, but phonetically silent (within brackets in example (4 b)). The displaced element and its copies form a syntactic chain. In fact, the theme role is assigned by the VP to its object position and further transmitted to its antecedent through the common link they share. As I have already mentioned, these two properties –canonicity and syntactic movement– are crucial for current hypotheses on the comprehension deficit in Broca's aphasia.

(4)   (a) *The boy   kissed   the girl.*
          AGENT   THEME

      (b) *The girl$_i$ was kissed <the girl>$_i$ by the boy.*
          THEME   AGENT

The same pattern of performance has been observed for relatives and clefts: the comprehension of subject relatives and clefts is intact but, on the contrary, the comprehension of object relatives and clefts is compromised (Caramazza and Zurif, 1976; Caplan and Futter, 1986; Hickok et al., 1993). Subject relatives and clefts –(5 a) and (5 c)– are very similar to declaratives, as they present the canonical SVO word order in English and do not trigger problems in aphasic subjects. In contrast, object relatives and clefts –(5 b) and (5 d)– present movement of the object (*the girl* in the examples) and a noncanonical OSV word order.

(5)   (a) *The boy$_i$ [that <the boy>$_i$ kissed   the girl]   is   tall.*
          AGENT   THEME

      (b) *The girl$_i$ [that   the boy   kissed   <the   girl>$_i$]   is   tall.*
          THEME   AGENT

      (c) *It is   the boy$_i$ [who <the boy>$_i$ kissed   the girl].*
                   AGENT   THEME

      (d) *It is   the girl$_i$ [who   the boy   kissed   <the girl>$_i$].*
                   THEME   AGENT

The poor performance in comprehending passives and object relatives has also been replicated in other SVO languages, like Catalan (Gavarró and Dotti, 2014), Hebrew (Friedmann and Gvion, 2003; Friedmann, 2008), Italian (Luzzatti et al., 2001; Garraffa and Grillo, 2008) and Spanish (Beretta et al., 1996; Benedet et al., 1998; Beretta et al., 2001; Gavarró and Dotti, 2014). Yet in some languages with a basic SVO word order like Mandarin and Cantonese Chinese, the pattern is the opposite: the comprehension of object relatives maintained, whereas the comprehension of subject relatives is impaired. The Chinese complementiser follows the relative clause –instead of preceding it, as in English (5 a)–, which makes subject relatives present a noncanonical VOS word order (see example (6 a) in Mandarin Chinese from Su et al. (2007)), while object relatives preserve the canonical word order (6 b). This phenomenon was observed by Law and Leung (1998, 2000) and Su et al. (2007), who conducted a comprehension task with two Cantonese-speaking and four Mandarin-speaking agrammatic individuals. The aphasic subjects performed on average better on object relatives than on subject relatives.

(6) (a) *[<mau>$_i$ zhuei*   *gou]*   *de$_i$*   *mau$_i$*   *hen*   *xiao.*
          chase-PAST.3 dog   COMP   cat   very   small
                        THEME   AGENT

      "The cat that chased the dog was very small."

     (b) *[gou*   *zhuei*   *<mau>$_i$]* *de$_i$*   *mau$_i$*   *hen*   *da.*
          dog   chase-PAST.3   COMP   cat   very   big
          AGENT   THEME

      "The dog that the cat chased was very big."

Aphasic speakers of languages with other basic word orders behave accordingly: for example, the basic word order in Japanese is SOV (see the active sentence in (7 a)), and derived passives present a noncanonical order of thematic roles (7 b), since the theme role is assigned to the displaced DP in the subject position and the agent role to the *by*-phrase. Hagiwara (1993) conducted a sentence-picture matching task with ten agrammatic patients to test the comprehension of actives (7 a) and derived passives (7 b) in Japanese. The mean performance on the active condition reached a 87% of correct responses, while the mean performance on the passive condition dropped to 52% of correct responses.

(7) (a) *Okaasan-ga*   *otoko-no-ko-o*   *os-i-ta.*
          mother-NOM   a boy-ACC   push-PAST
          AGENT   THEME

"The mother pushed the boy."

(b) *Otoko-no-ko$_i$-ga okaasan-ni <otoko-no-ko>$_i$ os-are-ta.*
Taro-NOM   a boy-by   push-PASS.PAST
THEME   AGENT
"The boy was pushed by (his) mother."

Interestingly, Hagiwara (1993) also tested the comprehension of base-generated passives with transitive (8 a) and intransitive verbs (8 b) in Japanese, and despite the noncanonical assignment of thematic roles, agrammatic subjects succeeded in comprehending such sentences (mean of 87% and 95% of correct responses respectively).

(8) (a) *Okaasan-wa musuko-ni kaze-o hik-are-ta.*
mother-NOM a boy-by a cold-ACC catch-PASS.PAST
GOAL   AGENT   THEME
"The mother had (her) son catch a cold on her."

(b) *Okaasan-ga akachan-ni nak-are-ta.*
mother-NOM a baby-by cry-PASS.PAST
THEME   AGENT
"The mother had (her) baby cry on her."

Similarly, Grodzinsky et al. (1991) tested the comprehension of English adjectival passives (9 b), which are argued not to be derived by movement (Levin and Rappaport, 1986), by means of a task in which subjects were given three cards with words printed on them, and were required to form a sentence that matched the picture shown to them. Adjectival passives contained a PP introduced by a preposition other than *by* to avoid the verbal interpretation of the passive. Four Broca's aphasics participated in the experiment. All of them produced grammatical sentences with the cards, in which all and any errors consisted of theta-role reversals and affected only structures derived by movement like verbal passives (9 a), that were understood at chance (mean of 50% of correct responses). By contrast, their performance on adjectival passives was above chance (mean of 79% of correct responses) despite the passive morphology and the noncanonical assignment of thematic roles.

(9) (a) *The boy is pushed by the man.*
THEME   AGENT

(b) *The doctor was interested in the soldier.*
THEME   EXPERIENCER

The finding that adjectival passives are well comprehended has also been replicated by Beretta et al. (1996): five Spanish-speaking aphasics who performed at chance on verbal passives, showed an above-chance performance on adjectival passives with preverbal and postverbal subjects.

These data suggest that canonicity alone cannot explain the comprehension deficit in Broca's aphasia, and have led several researchers to argue that the problem may be somehow related to movement and syntactic chains in different ways (Grodzinsky, 1990; Mauner et al., 1993; Grillo, 2008). However, there may be several factors that interact with the comprehension deficit, such as the semantic properties of the constituents. In fact, several experimental tasks showed that the aphasics' comprehension also depends on the referentiality of arguments. Saddy (1995) reported some data on the comprehension of an English-speaking Broca's aphasic, who showed the typical at-chance performance on reversible passives, but understood their quantified counterparts (10) above chance.

(10)   <Every boy>$_i$ was pushed <...>$_i$ by a man.

In a subsequent study (Grodzinsky et al., 1993), aphasic individuals did not detect the ungrammaticality of the interpretation of the object pronoun in English sentences like (11 a) as coreferential with the referential subject (*Mama Bear* in the example; the coreferential reading in the example is marked by the common index they share), but they succeeded in rejecting the coreferential reading when the antecedent contained a quantifier (*every* in (11 b)).

(11)   (a) Is Mama Bear$_i$ touching her$_{*i/j}$?

        (b) Is every bear$_i$ touching her$_{*i/j}$?

Nonetheless, it is unclear whether agrammatic aphasics' ability to comprehend quantifiers is intact, given that some experimental work (Saddy, 1995; Philip and Avrutin, 1998) suggests that aphasic individuals may interpret them in a slightly different way than healthy speakers. In Philip and Avrutin (1998), when presented with a picture of three boys, each of them driving a car, and one car without any driver, healthy speakers accepted it as an interpretation for a sentence like (12), whereas Broca's aphasics rejected it. According to the authors, the scope of quantifiers may fall over events, rather than over individuals, in the agrammatics' interpretation due to processing limitation.

(12)   Every boy is driving a car.

Furthermore, Hickok and Avrutin (1996) conducted an experimental task with two agrammatic individuals on the comprehension of *who-* and

which-questions in English. As expected, patients performed above chance on subject *which*-questions (13 a), and at chance on object *which*-questions (13 b). Surprisingly, they showed a different pattern of performance for *who*-questions, as both subject and object questions were well understood –(13 c) and (13 d)–. This finding has also been replicated in further studies (among others, Salis and Edwards (2008) for English, Fyndanis et al. (2010) for Greek, and Martínez-Ferreiro (2010) for Galician, Spanish and Catalan; however, see Tait et al. (1995) for more mixed results from four English-speaking aphasics).

(13) (a) Which lion$_i$ <...>$_i$ chased the tiger?

(b) Which lion$_i$ did the tiger chase <...>$_i$?

(c) Who$_i$ <...>$_i$ chased the tiger?

(d) Who$_i$ did the tiger chase <...>$_i$?

The difference between these two types of *wh*-questions lies in the semantic properties of the operators *who* and *which*, given that only the latter presupposes the existence of a set of possibilities (in the examples above, the existence of at least two lions) and, hence, it is d(iscourse)-linked and referential (Pesetsky, 1989). Neither the operator *who* nor quantifiers are referential; therefore, aphasic individuals are apparently able to assign thematic roles to nonreferential DPs, even in movement-derived sentences that display a noncanonical word order. Different types of syntactic chains have been postulated in linguistic theory (Rizzi, 1990; Cinque, 1990) depending on their syntactic and semantic properties. For instance, binding chains differ from government chains in that the former are d-linked, whereas the latter are not. According to this distinction, the comprehension deficit in agrammatism would affect binding chains exclusively, as only *which*-questions are d-linked.

The focus of interest was then turned upon other binding relations, such as those containing reflexive and object pronouns. Within the classical Binding Theory (Chomsky, 1981), reflexive pronouns must be bound in their governing category (Principle A), whereas pronouns are free in their governing category (Principle B). Hence, the pronoun *her* in (14 a) cannot be bound by the subject *Mama Bear* given that the subject c-commands the pronoun. Yet, the anaphor *herself* must corefer with the subject because it falls within its governing category (14 b).

(14) (a) Is Mama Bear$_i$ touching her$_{*i/j}$?

(b) Is Mama Bear$_i$ touching herself$_{i/*j}$?

Grodzinsky et al. (1993) tested the comprehension of English object and reflexive pronouns in simple sentences like (14 a) and (14 b). The results showed a dissociation between the aphasics' responses on both conditions: patients performed above chance on reflexive pronouns, that is, they were able to interpret the coreferential relation between the subject and the pronoun; but they performed poorly on object pronouns, as they allowed the coreferential reading half of the time. The authors interpreted these findings as evidence of a limited processing device that interferes when interpreting object pronouns, due to more complex requirements that involve an extra interpretive rule (Grodzinsky and Reinhart, 1993). The finding that English-speaking agrammatics' comprehension of pronouns is impaired has been replicated in offline and online studies (Love et al., 1998; Avrutin et al., 1999). However, crosslinguistic research shows a slightly different pattern of response. Baauw and Cuetos (2003) conducted a truth-value judgement task with four Spanish-speaking Broca's aphasics, who performed well in comprehending both object clitics and reflexive pronouns –(15 a) and (15 b)–, contrary to previous results in English. The researchers also tested the comprehension of pronouns and reflexives in Exceptional Case Marking (ECM) contexts ((15 c) and (15 d)), where the pronoun in the matrix clause is coreferential with the null subject pronoun (PRO) of the infinitival clause.

(15) (a) *La niña$_i$ la$_j$ tocó.*
            D   girl   CL   touch-PAST.3S

        "The girl touched her."

      (b) *La niña$_i$ se$_i$ tocó.*
            D   girl   REFL   touch-PAST.3S

        "The girl touched herself."

      (c) *La niña$_i$ la$_j$ vio   [PRO$_j$ bailar].*
            D   girl   CL   see-PAST.3S   dance-INF

        "The girl saw her dance."

      (d) *La niña$_i$ se$_i$ vio   [PRO$_i$ bailar].*
            D   girl   REFL   see-PAST.3S   dance-INF

        "The girl saw herself dancing."

The results showed a dissociation between the comprehension of object clitics and reflexive pronouns, since only reflexive pronouns were well understood in ECM contexts. In fact, aphasic participants interpreted object pronouns in ECM contexts as coreferential with the subject half of the time. These findings

were also replicated in other clitic-type languages, such as Catalan, Galician, Greek and Italian (Gavarró (2008); Martínez-Ferreiro (2010); Nerantzini et al. (2012) and Luzzatti et al. (2001), respectively), but also in Germanic languages like Dutch (Ruigendijk et al., 2006).

It has also been attested that agrammatic aphasics preserve their comprehension of sentences involving other types of syntactic movement, regardless of the resulting word order. Lonzi and Luzzatti (1993) reported data from three Italian-speaking aphasics who were able to correctly place adverbs around verbs, even when the verb moved to a higher position in the syntactic tree, which indicates that patients retained their ability to process verb movement. Similarly, English-speaking Broca's aphasics succeeded in judgement grammaticality tasks of sentences involving verb movement by judging the position of auxiliaries –(16 a) and (16 b)– and negations around verbs (Linebarger et al., 1983; Grodzinsky and Finkel, 1998).

(16) (a) Could they have left town?

(b) *Have they could leave town?

The good performance on sentences involving verb movement has also been attested in crosslinguistic studies (among others, Hagiwara and Caplan (1990) for Japanese, Friedmann and Shapiro (2003) for Hebrew and Bastiaanse and Edwards (2004) for Dutch).

While this review is not exhaustive, it represents the most influential results on agrammatic comprehension in the literature of the last few decades, which have led researchers to put forward several accounts considered in Chapter 2; and it also gives a glimpse of the general characterisation of the deficit. The extensive research on agrammatic comprehension demonstrates that Broca's aphasics do preserve their ability to interpret a wide range of syntactic constructions and, hence, that their comprehension is only partially impaired. However, it has been shown that several structures are problematic for agrammatic aphasics across languages –despite the use of other linguistic or nonlinguistic compensation means–, suggesting that several syntactic and semantic factors may interact with the deficit.

The variability debate

The patterns of performance described above are not free of controversy. Some data have challenged these so established active-passive and subject-object relatives and clefts contrasts (see Berndt et al. (1996) for a review). For instance, Caramazza et al. (2005) carried out a study with thirty-eight Italian-speaking

agrammatic subjects to test the comprehension of actives (17 a) and passives
(17 b). Passives in Italian behave like passives in English, the only difference
being that the past participle –*abracciata* in example (17 b)– matches in gender
and number with the subject of the passive. The results of a sentence-picture
matching task –in which the participants were asked to decide between the
correct foil and the reversed role foil[2]– did not show a single pattern of
response across subjects. As a group, the aphasic subjects performed better
on actives than passives, even though their performance on passives was
unexpectedly high (mean of 77% and 68% of correct responses respectively).
In addition, the results presented a great variability among participants and,
according to the authors, only a few subjects reproduced the expected pattern
of performance: only three out of thirty-eight subjects performed significantly
better on actives than passives, and only six performed above chance on actives
and at chance on passives.

(17)　(a)　*Il　ragazzo　abraccia　la　ragazza.*
　　　　　D　boy　　　hug-3s　　D　girl
　　　　　　　AGENT　　　　　　THEME
　　　　"The boy is hugging the girl."

　　　(b)　*La　ragazza　è　　abracciata　　dal　ragazzo.*
　　　　　D　girl　　　be-3s　hug-PART.fs　P+D　boy
　　　　　　　THEME　　　　　　　　　　　AGENT
　　　　"The girl is being hugged by the boy."

These results (and similar data, see Friedmann (2006) for a review) challenge
current theories on agrammatic comprehension, as actives had been shown to
be well comprehended by agrammatic aphasics crosslinguistically. Intersubject
variability, though, affects all types of syntactic structures, not only passives.
Several studies, for example, report results from English-speaking aphasics
on the comprehension of *which-* and *who*-questions that differed from the
pattern of performance attested in the studies described above (Tait et al., 1995;
Thompson et al., 1999; Edwards and Salis, 2005).

　Grodzinsky et al. (1999) argued for the legitimacy of groups studies by
carrying out statistical analyses of results reported in agrammatic literature,
which revealed general structure-dependent patterns of performance. The
methodology and criteria to include or exclude certain data was questioned

---

2 The experimental design in Caramazza et al. (2005) also includes trials in which the subject was
shown, apart from the correct foil, either a morphological foil or a lexical foil. Here I only take
into consideration the results from the trials with reversed role foils.

by Caramazza et al. (2001), who considered that a group analysis diluted individual differences and carried out a new analysis that led the authors to conclude that Grodzinsky et al.'s (1999) findings were not replicated in individual patterns of response, in line with Berndt et al. (1996), who claimed that Broca's aphasia cannot be characterised as a uniform syndrome and alternatively proposed case-studies as the most adequate procedure. Drai and Grodzinsky (2006a; 2006b) analysed data from sixty-nine aphasic patients with a new method that allowed quantification of individual variation and the analysis of group performance, which revealed that contrasts were only found between sentences involving movement and sentences without movement (or irrelevant movement).

Even though the intersubject variability debate in aphasia literature has often focused on the TDH's inability to account for all crosslinguistic data, the problem also applies to all hypotheses that attempt to characterise the comprehension deficit in Broca's aphasia. The variability among subjects is unavoidable, and probably corresponds to individual differences such as severity of the impairment, etiology, anatomical differences, etc. Despite the between-subject variability, general patterns of response can still be observed throughout tasks and languages, as evidenced by findings in previous literature, and they mainly concern syntactic structures that involve movement.

1.1.2 *Agrammatic comprehension in Catalan*

There is very little work on the comprehension of Catalan-speaking aphasics, but they seem to show a pattern of comprehension that parallels the results reported in other languages. The canonical word order in Catalan is SVO, like English; however, there are several constructions that present noncanonical word orders, like passives or contrastive focus, which have been studied in the Catalan agrammatic literature. Peña-Casanova et al. (2001) evaluated a Catalan-speaking patient in her chronic phase with the Catalan version of the Barcelona Test (Peña-Casanova, 1990) and the Bilingual Aphasia Test (Paradis, 1989). The authors focused mainly on the production deficit and claimed that the patient's comprehension was "relatively well preserved"; on the other hand, they mentioned that the patient presented some problems in comprehension, especially when dealing with "noncanonical sentences such as passives". Regarding passives, Gavarró and Dotti (2014) carried out a truth-conditional task to test the comprehension of seven Catalan-speaking agrammatics of actives (18 a), short passives (18 c) and long passives (18 b).

Note that Catalan short passives, unlike English, do not admit the adjectival reading of the passive; therefore, short passives are not ambiguous. The results are in line with those previously reported in English studies (Balogh and Grodzinsky, 2000): aphasics showed an above-chance performance on declaratives (mean of 83.3% of correct responses), but performed at chance on short and long passives (means of 52.9% and 53.8% of correct responses, respectively).

(18) (a) *El pare   pentina   el nen.*
         D father comb-3s D boy
             AGENT   THEME
         "The father is combing the boy."

      (b) *El nen   és   pentinat   pel   pare.*
         D boy   be-3s comb-PART by+D father
             THEME   AGENT
         "The boy is being combed by the father."

      (c) *El nen   és   pentinat.*
         D boy   be-3s comb-PART
             THEME
         "The boy is being combed."

The comprehension of reflexive pronouns (19 a) and object clitics (19 b) was considered in Gavarró (2008) and Martínez-Ferreiro (2010). The interesting contrast between these two pronouns is that the reflexive pronoun is coreferential with the subject, while the object clitic is not.

(19) (a) *La nena$_i$ s$_i$'eixuga.*
         D girl   REFL+dry-3s
             AGENT THEME
         "The girl is drying herself."

      (b) *La nena$_i$ l$_j$'eixuga.*
         D girl   CL+dry-3s
             AGENT THEME
         "The girl is drying her."

Gavarró (2008) carried out a truth-conditional task with three patients diagnosed with Broca's aphasia. The third person pronouns were presented in three different contexts: (a) in sentences with a pronoun in the preverbal position –examples (19 a) and (19 b)–, (b) sentences with clitic doubling of a reflexive or an object clitic (20 a), and (c) in Exceptional Case Marking (ECM)

contexts (20 b), where the pronoun in the matrix clause (*La nena es/la veu* in the example) is coreferential with the null subject pronoun (PRO) of the infinitival clause (PRO *fer bombolles*).

(20) (a) *La   nena   s'/l'   eixuga   a   ella   mateixa/ella.*
         D   girl   REFL/CL   dry-3s   to   her   self/her
              AGENT   THEME
         "The girl is drying herself/her."

     (b) *La   nena   es/la   veu   fer   bombolles.*
         D   girl   REFL/CL   see-3s   make-INF   bubbles
              AGENT   THEME
         "The girl sees herself/her making bubbles."

Agrammatic subjects performed at ceiling on all conditions involving a reflexive pronoun (mean of 100% of correct responses in the three contexts); the interpretation of object clitics was slightly worse in the two first conditions, but still above chance (mean of 81% and 95% of correct responses). By contrast, their performance dropped significantly in the ECM context to an at-chance performance (mean of 66% of correct responses). When errors occurred, object clitics were therefore interpreted as reflexives, that is, as coreferential with the subject in 34% of the ECM contexts. Martínez-Ferreiro (2010) also tested the comprehension of five Catalan-speaking agrammatics of object clitics (19 b) and reflexive pronouns (19 a) via a forced-choice task. Subjects were asked to listen to a sentence and choose between a picture depicting a transitive action or a picture depicting a reflexive action. The results are consistent with those reported in Gavarró (2008) and previous studies (Baauw and Cuetos (2003) for Spanish, Ruigendijk et al. (2006) for Dutch, and Nerantzini et al. (2012) for Greek, but contrary to English (Grodzinsky et al., 1993)): 92.31% and 92.33% of correct responses on the object clitic and the reflexive pronoun conditions, respectively.

Martínez-Ferreiro (2010) also carried out an experimental task to test the comprehension of interrogatives and *wh*-words. Six Catalan-speaking agrammatic subjects were asked subject and object questions –examples (21 a) and (21 b)–, and were expected to answer them by pointing to the right character in a picture. Notice that subjects appear in the postverbal position in Catalan object questions (21 b). Items like example (21 c) were included to assess the comprehension of *wh*-words; in such case, participants were shown two pictures: one depicting the right answer (e.g. some food for example (21 c)) and the other one consisting of a picture that corresponded to another *wh*-word (e.g. a dining room, that could answer the question "*where* did Joan eat?").

(21) (a) *Qui   pinta   a   la model?*
who   paint-3s   to-ACC   D model
AGENT   THEME

"Who is painting the model?"

(b) *A qui   ajuda   el policia?*
to-ACC who   help-3s   D policeman
THEME   AGENT

"Who is the policeman helping?"

(c) *Què   va   menjar   el Joan?*
what   aux-PAST.3s   eat   D Joan
THEME   AGENT

"What did Joan eat?"

The five mild aphasics showed high percentages of correct responses in the comprehension of *wh*-questions –(21 a) and (21 b), mean of 92.31%– and in the comprehension of *wh*-words (21 c) –mean of 96.67%–. However, the performance of one moderate aphasic significantly differed in the comprehension of *wh*-questions, as his percentage of correct responses only reached 61.54%. His performance on *wh*-words, though, was very high: 92.31% of correct responses. The percentages of correct responses for subject and object questions separately are not given for Catalan-speaking aphasics; yet, this experiment tells us very little on the impact that the movement of the object could have had on the interpretation of thematic roles. Patients should have been able to point to the right character regardless of the thematic role assigned to them, since the target answer for semantically reversible subject and object questions is the same: in a picture depicting a boy and a girl kissing, the expected answer for both "who is kissing the girl?" and "who is the girl kissing?" would be "the boy". Hence, the patient would point to the boy in the picture, even if the picture did not match the sentence, as the patient was not required to decide whether the picture matched the sentence or not, but to answer it by pointing to the right character. It is very unlikely that agrammatics would have had problems interpreting noncanonical sentences like those included in the experiment, as they could rely on their knowledge of the world to interpret the pseudoreversible object questions included in the task, like "who is the teacher teaching?" (the student) or "who is the woman caressing?" (the baby), among others.

The interpretation of Catalan contrastive focus was explored by Gavarró (2005), who carried out a truth-value judgement task with two agrammatic patients. The materials consisted of declaratives (22 a) and ambiguous

subject/object contrastive focus ((22 b) and (22 c); focalised elements appear in capital letters, which reflects the typical prosodic stress associated with contrastive focus). Since focalised sentences were ambiguous, participants were expected to answer affirmatively when being shown both a picture with the subject or the object interpretation of the sentence.

(22) (a) *La nena mira els elefants.*
D girl look at-3s D elephants
"The girl is looking at the elephants."

(b) *LA GIRAFA, persegueix el cavall.*
D giraffe chase-3s D horse
"THE GIRAFFE, is chasing the horse."

(c) *EL CAVALL, persegueix la girafa.*
D cavall chase-3s D giraffe
"THE HORSE, is chasing the giraffe."

Healthy participants performed at ceiling on the declarative and both focalisation conditions (mean of 100% of correct responses). As for agrammatic individuals, when they were shown a picture depicting the SVO interpretation of the contrastive focus, the answer was mostly affirmative (mean of 83.3% affirmative responses), while the percentage of affirmative answers decreased to a 50% when patients were shown a picture depicting the OVS interpretation.

In Table 1, the levels of performance reported in Catalan agrammatic literature and described above are summarised. As already said, Catalan-speaking agrammatic individuals show similar patterns of performance to those observed crosslinguistically in previous research.

Construction type		WO	Performance level
Active	*El pare pentina al nen.*	SVO	above chance
S focus	*LA GIRAFA, persegueix el cavall.*	SVO	
O clitic	*La nena l'eixuga.*	SclV	
Refl pronoun	*La nena s'eixuga.*	SreflV	
Long passive	*El nen és pentinat pel pare.*	ϑ_2V by-ϑ_1	chance
Short passive	*El nen és pentinat.*	ϑ_2V (ϑ_1)	
O focus	*EL CAVALL, persegueix la girafa.*	OVS	

Table 1: Summary of agrammatic performance levels of tested syntactic structures in Catalan literature

The present study aims at investigating the agrammatic comprehension of contrastive focus and clitic left dislocation in Catalan. These structures present interesting properties as they involve noncanonical word orders that are only licensed in specific –yet highly productive– discourse contexts, and are generally derived by movement. Thus, they enable empirical examination of syntactic movement and constitute a critical test for theories on the comprehension deficit in agrammatism. On this basis, the following research questions are formulated:

- Can the impairment in comprehension be partly attributed to a deficit in the perception of intonational contours?

- Are the results compatible with current accounts on the comprehension deficit? What is the crucial property –movement or intervention– to explain the deficit in agrammatic comprehension?

- Do *phi*-features such as gender and number have an effect on agrammatic comprehension? Can they inform us about the underlying aphasics' representations?

- Are the patterns of sparing and loss replicated through different methodologies? Does the level of performance shown by aphasics follow from the type of task or the patients' representations?

- Which syntactic analysis on the derivation of clitic left dislocation in Romance is consistent with the aphasics' pattern of performance?

In order to answer these questions, first I designed a discrimination task to test the aphasics' sensitivity to intonational contours. The pragmatics associated with contrastive focus and clitic left dislocation are expressed both by syntactic and prosodic means. In fact, the intonational patterns are crucial for a correct interpretation of these utterances, as sentential meaning is known to be partly conveyed by prosody. Hence, it is important to establish that Broca's aphasics have access to the information provided by prosody to rule out the possibility that their comprehension deficits are due to misperception of intonational patterns.

The remaining questions have been addressed by means of five comprehension tasks designed to assess the aphasics' comprehension of contrastive focus, clitic left dislocation and clitics. While there is extensive

literature on the deficit in aphasic comprehension of passives, relatives and questions, the interpretation of focalisations and topicalisations has only been addressed more recently and studies are scarce. Catalan allows for a wide range of movement-derived syntactic constructions, and differs from previously tested languages in that, in the latter, all arguments are overtly case marked. Even though here I only focus on three syntactic constructions, four different superficial word orders have been tested, since the tasks involved object focalisations and topicalisations with both postverbal and preverbal subjects. Consequently, Catalan has the properties that make it suitable for testing current hypotheses on the agrammatic comprehension deficit. Here, I consider five linguistic-based accounts that hypothesise that either canonicity, syntactic movement and/or intervention effects are the crucial property that explains the impairment observed. The syntactic constructions under examination also constitute a critical test in that respect, as the structures tested are derived by movement and display different word orders –canonical and noncanonical– which interact with different types of intervening and nonintervening elements.

Moreover, I show that the Trace-Deletion Hypothesis (Grodzinsky, 2006) in its most recent version is also an account based on the notions of locality and intervention and, hence, makes predictions similar to those of the Feature-Underspecification Hypothesis (Grillo, 2008). I examine relevant aspects that can set apart one hypothesis from another, such as their basic assumptions on the element of grammar impaired in agrammatic representations. To this effect, I look at the impact that *phi*-features could have had on the comprehension of aphasic patients to find out whether agrammatic aphasics' representations consist in deleted or impoverished copies, which are hypothesised to lack only discourse-related features.

Likewise, I investigate whether the guessing performance shown by aphasic patients is the result of a two-agent interpretation –as predicted by the TDH– or is due to differences in the experimental methodologies –as argued by Hickok et al. (1993), and pursued by Grillo (2009)–. In this regard, I tested the aphasics' comprehension through two different methodologies: namely, by means of two truth-value judgement tasks and three sentence-picture matching tasks. I examine the differences in performance in my results and claim that, despite the fact that the experimental design influences the aphasics' performance, they cannot be accounted for in the spirit of Hickok et al. (1993).

The present study also aims at evaluating current syntactic theories of Romance clitic left dislocation, which has been a much-discussed topic in syntax literature. The data reported in the subsequent chapters can contribute

to the ongoing debate on the analysis of clitic left dislocations, as two different analyses have been proposed: under the representational approach, the dislocated element is hypothesised to be base-generated in the left periphery, whereas under the alternative derivational approach, it is argued to be derived by movement. As already discussed above, Broca's aphasics show that their comprehension of noncanonical base-generated sentences is intact (Grodzinsky et al., 1991; Hagiwara, 1993; Beretta et al., 1996); therefore, the level of performance on Catalan clitic left dislocations may provide further evidence in favour of one analysis, as comprehension problems are only expected to arise if the dislocate is derived by movement.

In addition, I have included sentences with three arguments (subject, direct and indirect object) to observe whether the performance patterns are replicated in other thematic relations. Even though it is not the explicit goal of this thesis, the testing of sentences with three arguments allows to control for other psychological measures, such as the complexity of sentences (in this case due to the number of arguments).

Finally, the intersubject variability is carefully examined throughout the comprehension tasks. I note that intersubject variability is present only in specific structures and in a quite consistent manner. I argue that the basis of such variability is most likely related to anatomical and physiological variation as already pointed out, but also that it is an indicator of the underlying deficit and that reflects the linguistic knowledge and compensatory resources available.

The dissertation is organised in six chapters: in this chapter, I have reviewed the main crosslinguistic data on the comprehension deficit in Broca's aphasia to provide a general characterisation of agrammatic comprehension. Also, I have shaped the current state of the experimental research on Catalan agrammatic comprehension and, finally, I have set the goals of the present study. The remaining chapters are organised as follows: Chapter 2 provides the theoretical framework on which the study is based: the first section is devoted to the accounts I take into consideration, whereas the crucial syntactic properties and linguistic analysis of the relevant structures are discussed in the second section. In the third chapter, I examine and discuss the aphasics' sensitivity to prosodical patterns by means of a discrimination task, in which participants were asked to discriminate between identical and different pairs of utterances. The experimental work on the comprehension of contrastive focus, clitic left dislocations and clitic constructions is explained in Chapters 4 and 5, which outline a review and discussion of previous literature, the research methodology and the data analysis. Chapter 4

comprises a truth-value judgement task and a sentence-picture matching task, though only the latter includes focalisations with preverbal subjects (along with focalisations with postverbal subjects). In Chapter 5, I describe three experimental tasks on the comprehension of clitic left dislocations and clitics: the first two replicate the tests described in the previous chapter; data were therefore obtained through two different methodologies –a truth-value judgement task and a sentence-picture matching task–, and only the second task involves dislocations with preverbal subjects. The third task consists of a sentence-picture matching task containing utterances with three arguments: subject, direct object and indirect object; thus, clitics and dislocated items correspond to indirect objects, which are assigned the thematic role goal. In this task, dislocations with both preverbal and postverbal subjects are included. In Chapter 6, I critically analyse and discuss the data collected in relation with previous relevant literature, syntactic theory and accounts for the deficit in the first section. The final section highlights the contributions of the research, provides a conclusion for the overall study and makes suggestions for further research.

THEORETICAL BACKGROUNDUN

2.1 ACCOUNTS FOR THE COMPREHENSION DEFICIT

2.1.1 *The Trace-Deletion Hypothesis*

In the late 1980s, Grodzinsky (1986; 1990) postulated the Trace-Deletion Hypothesis (TDH) embedded in the Transformational Grammar framework (TG, Chomsky, 1965) in order to account for the comprehension deficit observed in agrammatism. According to the TDH, the impairment is syntactic in nature and restrictive, that is, aphasic individuals retain most of their syntactic knowledge, and the deficit only affects certain syntactic processes. After considering the contrasts of performance reported in previous studies (reviewed in Chapter 1) between actives and subject relatives, and passives and object relatives, Grodzinsky hypothesised that aphasics' syntactic representations lack traces, which are crucial for the assignment of thematic roles. The first instances of linguistic theory consisted of four levels of representation, two of them relevant for the TDH: the D(eep)-Structure and the S(urface)-Structure. Each level has its domain to which some optional rules can be applied; however, the application of such rules is limited by several constraints (principles) that determine the wellformedness of utterances. TG not only posits a hierarchical relationship among constituents which belong to different levels, but also accounts for rules that explain dependencies among them. One optional rule was postulated in order to explain mapping from D-structure to S-structure, Move-Alpha, which permits constituents to move freely. In passive, the rule Move-Alpha is triggered by the properties of the verb: a passivized verb loses the ability of assigning case to its object and, as a consequence, the utterance violates the constraint known as Case Filter, resulting in an ill-formed sentence. In example (23 a), the D-structure of a passive sentence is represented. The DP occupying the object position needs to move to the subject position, to which structural case can be assigned. This position is represented as [e] in (23 a), which stands for "empty", as it is an empty position (not phonologically overt, but structurally represented). Moreover, the Projection Principle constrains the application of Move-Alpha to guarantee that lexical requirements are fulfilled. As an example, required

elements cannot be deleted without violating the Projection Principle: hence, in passivisation, where the DP in the object position is deleted after moving to the subject position (23 b), it is necessary to postulate an abstract marker –a trace– left in the base position. Traces are structurally represented, but phonologically empty; and they must be linked through a common index to their antecedents forming a syntactic chain.

(23)   (a) *[e] was kissed [John]

(b) [John$_i$]$_{NOM}$ was kissed t_i

Another principle, the theta criterion, guarantees a proper assignment of thematic roles (agent, theme, goal, etc.; Jackendoff, 1972): each argument can be associated with only one theta-role, and each theta-role can be assigned to one argument. The theta criterion also regulates which categories can be assigners of thematic roles –like verbs and prepositions– and which categories can be assignees –for example, DPs–. In addition, every lexical entry has its own theta grid (Stowell, 1981), which determines the number of thematic roles to be assigned, and the identity of their assignees. For example, the verb *send* has the theta grid represented in (24 a); so, a sentence like (24 b) violates the theta criterion, as the verb *send* also requires an object to assign it the theme role.

(24)   (a) send: <agent, theme>

(b) *John sends.

In passives, for example, the verb –or the VP– assigns the theme role to the trace occupying the object position, which is further transmitted to its antecedent in the specifier of the I(nflectional)P(hrase), as exemplified in (25). The assignment of thematic roles is thus mediated by traces when the assignee cannot receive the theta-role directly from the assigner.

(25)

IP
├─ DP
│   └─ A letter$_i$ [NOM][$u\theta$]
└─ I′
    ├─ I
    │   └─ was
    └─ vP
        ├─ t_i [$u\theta$]
        └─ VP
            ├─ V
            │   └─ sent
            ├─ DP
            │   └─ t_i [θ_2][uC]
            └─ PP
                └─ by John [θ_1]

θ_2
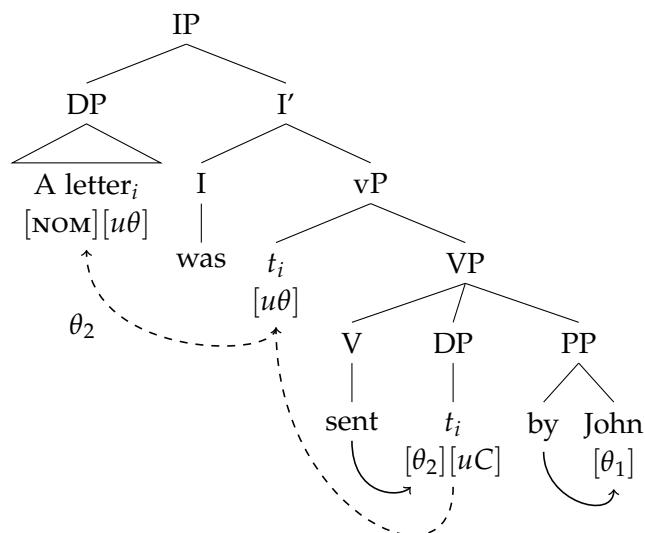
Yet according to the TDH, Broca's aphasics delete traces from their syntactic representations and, hence, the transmission of thematic roles is disrupted when syntactic movement is involved. This is the case for passives, whose agrammatic structural representation appears in examples (26 a) and (26 b): the deletion of traces causes the subject *Mary* to be in a nonthematic position and, hence, it results in a construction that violates the theta criterion. By hypothesis, Broca's aphasics assign a thematic role by means of a nonlinguistic linear strategy in order to compensate for the deficit: the default strategy, which assigns agent to the first-initial DP in a nonthematic position, in languages with a basic SVO word order.[1] This is represented in example (26 b), where the agent role assigned by the default strategy appears in lower case, and the agent role assigned grammatically in upper case. Thus, the aphasic representation contains two agent roles: given that the theta criterion establishes that each theta-role can only be associated with one argument, the two agent roles are in conflict and patients must guess the interpretation of the passive. Therefore, the TDH predicts chance performance in syntactic structures of this kind. On the other hand, the default strategy suffices to compensate the deficit in structures that involve traces in subject positions, such as subject relative

---

1 A similar strategy had already been proposed in earlier studies by Caplan and colleagues (Caplan et al., 1981; Caplan, 1983; Caplan and Futter, 1986). According to Grodzinsky (1990), however, the default strategy is not an agent-first strategy, as it takes into account the thematic properties of the assigner and assigns to the first DP in a nonthematic position the theta-role canonically associated with the position it occupies.

25

clauses, which have been shown to be well understood by agrammatic aphasics (26 c).

(26) (a) *[Mary] was * kissed * by John.*
           AGENT

(b) *[Mary] was * kissed * by John.*
    agent   AGENT

(c) *[The girl] that * kissed the boy is tall.*
    agent   THEME

Hence, the first formulations of the TDH consisted of two steps: (a) the deletion of traces resulting from movement, and (b) the application of a linear nonlinguistic strategy, the default strategy.

A trace-based account

Most of the crosslinguistic data that motivated the TDH was already discussed in Chapter 1. The results on the comprehension of base-generated structures that present noncanonical word orders and are still well comprehended by agrammatic aphasics, such as Japanese base-generated passives or English and Spanish adjectival passives, led Grodzinsky to postulate a comprehension impairment that affects movement-derived structures. In addition, the finding that aphasic individuals retain knowledge of several syntactic aspects led him to the conclusion that the deficit must selectively concern the assignment of thematic roles in movement-derived sentences, which is mediated by traces. However, not all types of traces are hypothesised to be deleted from aphasics' representations: considering previous literature (see, for example, data on head movement and d-linked chains reviewed in Chapter 1), only traces from referential phrasal constituents are hypothesised to be deleted from aphasics' representations. This distinction corresponds to structural differentiated types of movement described in linguistic theory. For instance, within the Relativized Minimality framework (Rizzi, 1990), movement is divided into three types: (a) head movement, (b) A-movement and (c) A'-movement. Only the latter two are hypothesised to be disrupted in agrammatism. On the one hand, head movement, which involves movement from a head position to another head position such as in example (27), has been shown not to be problematic for aphasic speakers (Grodzinsky and Finkel, 1998).

(27) [$_{CP}$ Could$_i$ [$_{IP}$ they <could$_i$> have$_j$ [$_{VP}$ <could$_i$ have$_j$> left town]]]?

The other two types of movement involve movement to a specifier position: A-movement concerns movement to argument positions within the inflectional layer, and it is motivated by licensing of argumental features (φ-features), such as case-checking. This is the kind of movement that passives undergo (see example (25)). Finally, A'-movement moves constituents to the periphery of the sentence, to a nonargument position within the complementiser layer, and it is driven by the need of matching features that bear scope-discourse properties (Ω-features) such as interrogative, topic or focus. This is exemplified in (28), which reproduces a syntactic structure involving *wh*-movement that Hickok and Avrutin (1996) found to be impaired in agrammatic comprehension.

(28) [$_{CP}$ Which lion$_i$ [$_{IP}$ did the tiger [$_{VP}$ chase <...>$_i$]]]?

Traces resulting from A- and A'-movement behave differently, as A- and A'-chains have different properties: A-traces behave like anaphors and, hence, must be bound in the antecedent's local domain, whereas A'-traces are like referential expressions that must be free within their domain. However, within the Copy Theory of Movement (Chomsky, 1993), traces are replaced by copies, which have a similar function but present some advantages over traces: on the one hand, copies entirely reproduce the structural and lexical information of the antecedent, whereas traces are impoverished in that respect; and, on the other hand, traces are generated during the syntactic derivation as the result of movement; instead, copies are present in the initial syntactic structure, since a lexical item has the property of being represented simultaneously in different syntactic positions (though it is only phonetically realised in one of them). In addition, copies are not in conflict with the Inclusiveness Condition (Chomsky, 1995), which bans syntax from creating new elements during the syntactic derivation. Despite the differences between copies and traces, this should not represent a challenge for the TDH as some researchers have pointed out (see the discussion in Grodzinsky, 2000a): displaced constituents receive the thematic role within the lexical layer and are further moved up in order to satisfy feature-checking requirements. The TDH can therefore accommodate such minimalist claims, as copies mediate the transmission of thematic roles, like traces, and an abnormal thematic assignment would follow from a deficit concerning the representation of copies.

Whether the deficit in agrammatic comprehension is due to the deletion of copies (in contemporary terms) or not has been largely discussed in the literature on aphasia. Linebarger (1989) reported results that demonstrated that patients suffering from Broca's aphasia were able to judge the grammaticality of syntactic constructions which had been shown to be impaired in

comprehension, such as passives (29). This fact was interpreted in line with previous studies (Schwartz et al., 1980; Linebarger et al., 1983), that is, as evidence that agrammatic aphasics are able to represent the syntactic structure, including traces. According to the authors, the differences in performance on passives across tasks are explained by differences in the experimental methodology: the good performance in grammaticality judgement tasks is due to their ability to represent the syntactic structure, whereas the poor performance is due to their inability to map thematic-roles from syntactic positions.

(29) *The boy was followed the girl.

However, the materials included in Linebarger (1989) are not useful to test the patients' sensitivity to movement of phrasal constituents, as they did not test the knowledge of relevant syntactic phenomena concerning syntactic chains. Grodzinsky and Finkel (1998) reported data from a judgement task that tested the patients' ability to judge the grammaticality of sentences involving movement of phrasal constituents, and the results showed that agrammatic participants did not detect violations of movement constraints such as (30).

(30) *Which woman did David think that saw John?

Grodzinsky (2000a) also claims that studies that investigate the online processing of sentences involving movement with aphasic population constitute further evidence for a trace-based deficit, as several studies reported that aphasic individuals did not show priming or gap-filler effects at the gap position while listening to movement-derived sentences (Swinney and Zurif, 1995; Meyer et al., 2012).[2]

The default strategy

The implementation of the default strategy has also been highly controversial, though in psychological studies it is often assumed that agrammatic aphasics –and even healthy speakers– apply an agent-first strategy when interpreting sentences. Some criticisms focus mostly on how the default strategy interacts with the grammar; more specifically, in cases where the TDH predicts guessing performance as the result of the assignment of two agent roles –one of them assigned grammatically, and one of them assigned by the default strategy– that are in conflict. Some researchers have considered it

---

2 However, see Phillips and Wagers (2007) who argue that the presence of traces does not follow from the evidence of filler-gap dependencies in real-time studies.

unnecessary to hypothesise a compensatory strategy to explain the aphasics' poor interpretation of problematic structures: for instance, Hickok (1992); Hickok et al. (1993) and Mauner et al. (1993) claimed that the application of the default strategy needed to be revised in light of new developments in linguistic theory –referring to the VP-internal Subject Hypothesis (Koopman and Sportiche, 1991, among others)–, and experimental data that compromised the two-agent interpretation predicted by the TDH. Under the VP-internal Subject Hypothesis, even subjects of active sentences undergo movement from the VP-internal position to the VP-external position in order to receive case. The agent role is assigned to the [Spec, vP] position, where the argument that receives it is base-generated; whereas the nominative case is assigned to the specifier of the IP. According to the Minimalist Program (MP, Chomsky, 1995), movement is a last resort operation and, hence, it is only triggered to satisfy interface requirements. The formal requirement that triggers syntactic movement is feature-checking. This is the case for subjects that move to get case: an Extended Projection Principle (EPP) feature[3] is associated with an uninterpretable φ-feature ($u\varphi$) on the Inflectional head –the probe–, that enters into an agree relation with a phrase made active by an uninterpretable case feature (uC) –the goal–, and attracts it to the [Spec, IP]. An example of subject movement is represented in (31), where other types of movement are ignored for reasons of clarity.

(31)
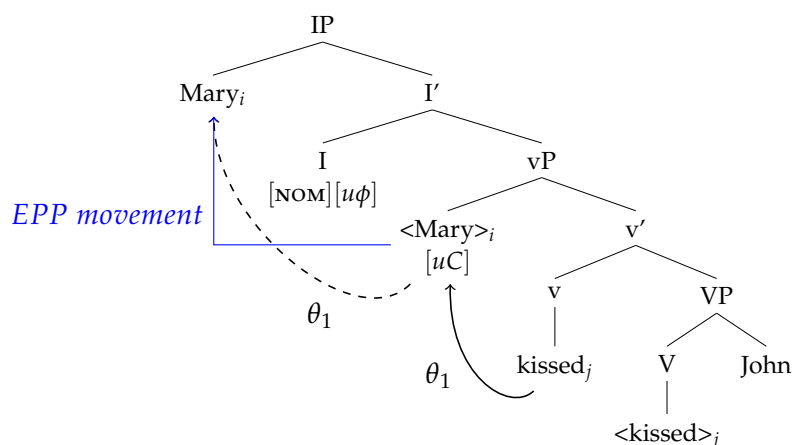
The default strategy would compensate for the deficit in an active sentence like the one in (31). Yet, as Hickok, Mauner and colleagues pointed out, when subject movement is taken into account, the TDH's prediction that agrammatic

---

3 The EPP requires that the specifier must be filled.

aphasics guess on sentences such as object relatives is compromised, given that both the subject and the object undergo movement and, hence, the TDH predicts that such sentences are consistently interpreted as SVO sentences, triggering a below-chance performance, contrary to fact. This is illustrated in (32).

(32) *The girl$_i$ [that the boy$_j$ <...>$_j$ kissed <...>$_i$] is tall.*
       agent   theme

Mauner et al. (1993) and Hickok et al. (1993) took this as evidence that the TDH needed to be revised, together with the data reported by Hickok and colleagues from an experimental task that tested the comprehension of object clefts: aphasic participants did not show the guessing performance predicted by the TDH, but below-chance performance on the object cleft condition in a truth-value judgement task. Mauner, Hickok and colleagues claimed that the TDH needed to be improved with regard to the default strategy, and proposed their own alternatives: Hickok et al. (1993) formulated the Thematic Assignment Representation instead, which establishes that aphasic individuals are unable to interpret sentences whenever there is more than one DP in a nonthematic position. Similarly, Mauner et al. (1993) postulated the Double-Dependency Hypothesis, which predicts that sentences with only one syntactic chain are well understood by agrammatic aphasics; whereas sentences with two or more dependency relations are predicted to be poorly understood (without distinguishing between at-chance and below-chance performance).

   In order to explain the poor performance of aphasics in passives, Mauner et al. (1993) assumed the passive analysis proposed by Jaeggli (1986) and Baker et al. (1989), according to which the passive participial morpheme (*en*) receives the agent role, which is further assigned to the *by*-phrase indirectly (as exemplified in (33)). Under this analysis, passives involve more than one dependency relation, which is predicted to be problematic for aphasics by Mauner, Hickok and colleagues.[4]

(33) [A boy]$_i$ is being chase+en$_j$ t_i by [a girl]$_j$.

This analysis implies an advantage over analyses where the external argument is hypothesised to be eliminated (Grimshaw, 1990, among others): given that the theta grid of a transitive verb like *chase* in the example assigns two

---

4 Grodzinsky (1995) pointed out that these two dependencies are different in nature: only the dependency between the DP and the trace is considered to be a movement chain.

thematic roles. As already argued, the theta criterion stipulates that every theta-role must be assigned to one argument: however, this statement would be violated in passives without a *by*-phrase, as there is only one argument to be assigned a thematic role. This analysis thus solves this theoretical problem by postulating that the agent role is implicitly active in short passives. In fact, the comprehension of nonagentive passives was assessed in Balogh and Grodzinsky (2000), who carried out a truth-value judgement task with four English-speaking agrammatic aphasics. The participants showed at-chance performance on the short passive condition (see (34), where the asterisks stand for deleted traces), despite there is only one syntactic chain or one single DP to be assigned a thematic role. According to the TDH, the guessing performance can only be explained if the agent-role assigned by the default strategy is in conflict with the implicit agent-role; otherwise, the expected response would be below chance. Therefore, Balogh and Grodzinsky (2000) demonstrated that the TDH is consistent with data on short passives, and even to test linguistic theories on the structural analysis of passive; however, it remains unclear whether the DDH is able to account for these data.

(34) *[The man] is * paid *
      agent   AGENT

The view that the distinction between different levels of performance, namely below-chance and chance performance, is unnecessary was challenged by experimental data on the comprehension of passives with psychological verbs. Grodzinsky (1995) reported data from an experimental task that tested four patients' comprehension of sentences with different thematic structures, and pointed out that the thematic structure of sentences also interacts with the syntactic deficit in agrammatic comprehension. The aphasic patients' performance on passives with actional verbs was at chance (mean of 55.35% of correct responses); however, their performance significantly dropped on passives with psychological verbs (35), as their performance was below chance (mean of 32.17% of correct responses).

(35) *[Mary] was * admired * by John.*
      agent   EXPERIENCER

The theta grid of a psychological verb differs from that of an actional verb because an experiencer role is assigned to the subject position, instead of an agent role (e.g. *admire*: <experiencer, theme>). In passive sentences like (35), the experiencer role is syntactically assigned to *John* by the preposition, whereas the default strategy assigns the agent role to the DP in the subject

position. Since two different thematic roles are assigned, the theta criterion is not violated and the two roles can coexist. Yet, if we follow Jackendoff's (1972) proposal that thematic roles are constrained by a universal hierarchy[5], the agent role prevails over other thematic roles and, hence, in a sentence like the one in example (35), the subject *Mary* will be interpreted as the agent. Such interpretation results in the below-chance performance observed in Grodzinsky (1995)[6]. Therefore, the default strategy was proven here to be able to account for the different levels of performance observed in experimental tasks, and to be more precise in its predictions.

Later on, Beretta and Munn (1998) designed a sentence-picture matching task in order to test the default strategy and to find out whether aphasics' representations of passives involved two agents. For a semantically reversible passive like (36), participants were shown a picture in which two agents were performing the action (e.g. a woman and a giraffe kicking a dog), a picture of a role reversal, and the target picture.

(36)   The giraffe was kicked by the woman.

The results showed that aphasic individuals hardly ever chose the picture where both characters were depicted as agents. The results were interpreted as evidence against the default strategy. Yet, the default strategy does not imply that aphasics' interpretations involve two characters as agents; instead, it triggers a conflicting representation where two agent-roles are assigned to two different DPs, and aphasics are forced to choose between the two possible agents. Thus, the guessing performance follows from the fact that they randomly interpret either one or the other constituent as the agent, rather than both of them. Yet even if the implementation of the default strategy triggered the two-agent interpretation as argued by Beretta and Munn (1998), linguistic constraints would block such an interpretation because it would be inconsistent with the theta criterion requirements –or with its more recent version, Full Interpretation (Chomsky, 1995); see Gavarró and Dotti (2014) for a proposal along these lines–.

In a more recent study, Meyer et al. (2012) investigated the online processing of English active and passive sentences. The eye movements of

---

5 In the Thematic Hierarchy Condition proposed by Jackendoff (1972), the thematic roles are ordered as follows: Agent < Location, Source, Goal < Theme. There have been several proposals that differ in the ordering of thematic roles (among others, Belletti and Rizzi, 1988; Grimshaw, 1990); yet, they all place the agent role in the highest position in the hierarchy, and when the experiencer role is included, it is always ranked below the agent and above the theme roles.

6 See Beretta (2001) for a discussion on the validity of these data due to the criteria of patient selection and number of items tested.

ten aphasic and ten aged-matched control participants were tracked while performing a sentence-picture matching task. The offline results showed the typical performance for the aphasic group: above chance on actives, and at chance on passives. Regarding the eyetracking results, aphasics' processing mainly differed from the controls' online comprehension in that agrammatic individuals showed random looking fixation on both active and passive conditions throughout the sentence, whereas control subjects achieved an interpretation earlier. In fact, agrammatic individuals looked at the target picture only at the end of the sentence in the active condition; whereas they showed random looks throughout the sentences in passives. The authors claimed that eye movement data on the processing of passives supported the findings in Beretta and Munn (1998) against the two-agent interpretation predicted by the default strategy, since aphasic subjects did not show an agent-first strategy in their real-time interpretations which, according to them, is what would be predicted if the default strategy assigned agent to the first DP. Or, in case that the default strategy applies after interpretation fails, Meyer and colleagues interpreted that the TDH would then predict that patients would look at the thematic foil at the *by*-phrase (because it is assigned the agent role grammatically) and show the at-chance looks again at the end of the sentence. However, the at-chance looks throughout passive sentences were probably due to the fact that aphasics do not reach an interpretation until all DPs are assigned a thematic role, either by grammatical means or via the default strategy. As Gavarró and Dotti (2014) pointed out, the default strategy is to be thought as a repair strategy at the interface, to which aphasic speakers resort only after the grammatical theta-assignment has failed. The aphasics' results on active sentences are also consistent with the TDH, as they are also predicted to achieve the final interpretation via the default strategy; in fact, the control participants' preference for the target picture emerged at the verb position in active sentences, whereas aphasics cannot assign the agent-role at that point because they lack traces from phrasal movement and, hence, they only reach an interpretation when the default strategy applies.

The default strategy has also been questioned from a theoretical point of view, given that it is a nonlinguistic strategy (Hickok et al., 1993; Mauner et al., 1993; Beretta and Munn, 1998; Beretta, 2008). Yet, the implementation of a nonlinguistic strategy does not need to be inconsistent with the linguistic theoretical background, as the interaction with more general nonlinguistic devices is assumed in generative grammar.

Theta-bridging

The TDH was updated in order to reflect relevant changes in linguistic theory, and to fit the findings reported in recent studies on agrammatic comprehension Grodzinsky, 2006. As already mentioned, subjects move from their base position, where theta-roles are assigned, to upper positions in order to satisfy syntactic requirements (see (31) on page 29 as an example). Since, according to the TDH, all copies from phrasal movement are deleted in agrammatism and, as a consequence, the transmission of theta-roles is disrupted, also copies from subject movement are hypothesised to be deleted. As for declaratives, the default strategy would suffice to compensate for the deficit; however, as already pointed out, it still remained unclear how subjects are assigned the agent role in sentences involving object fronting, such as object relatives, in order to explain the guessing performance shown by agrammatic aphasics. In addition, data on the comprehension of passives in Germanic SOV languages challenged the TDH's predictions. For instance, several studies in Dutch and German (Kolk et al., 1985; Kolk and van Grunsven, 1985; Friederici and Graetz, 1987; Burchert and de Bleser, 2004) reported that the aphasics' comprehension of passives was not disrupted (see an example from German in (37)), contrary to other crosslinguistic evidence reviewed in the previous chapter.

(37) *Der Gaul$_i$ wird   vom Esel   <...>$_i$ getreten.*
      D   horse   AUX-PAST.3S by   donkey   kick-PART
            THEME   AGENT
      "The horse was kicked by the donkey."

These facts led Grodzinsky to revise the formulation of the TDH (Grodzinsky, 2006; Drai and Grodzinsky, 2006a), and propose an additional mechanism, labeled theta-bridging, in order to account for the referred data. According to Grodzinsky, displaced constituents in agrammatic representations are able to receive their corresponding theta-roles if two conditions are met: (a) if the DP moves in the same direction as theta-assignment and does not cross the verb, and (b) if no other potential intervener –an element that can potentially receive that thematic role– stands between the copy and the antecedent.

   German and Dutch are SOV languages (or at least this is a possible analysis), therefore, theme-role is assigned to the structural position at the left of the verb. In German passives, the theme is displaced to the subject position but, unlike English, the movement goes in the same direction as theta-role assignment and does not cross the verb. This is represented in (38): importantly, the *by*-phrase does not act as an intervener, given its quasi-adjunct condition (Grimshaw, 1990).

(38)

IP
├─ Der Gaul$_i$ [θ_2]
└─ I′
   ├─ wird
   └─ vP
      ├─ < ... >$_i$
      └─ VP
         ├─ PP
         │ ├─ vom
         │ └─ Esel [θ_1]
         └─ < ... >$_i$ [θ_2] getreten

θ-bridging
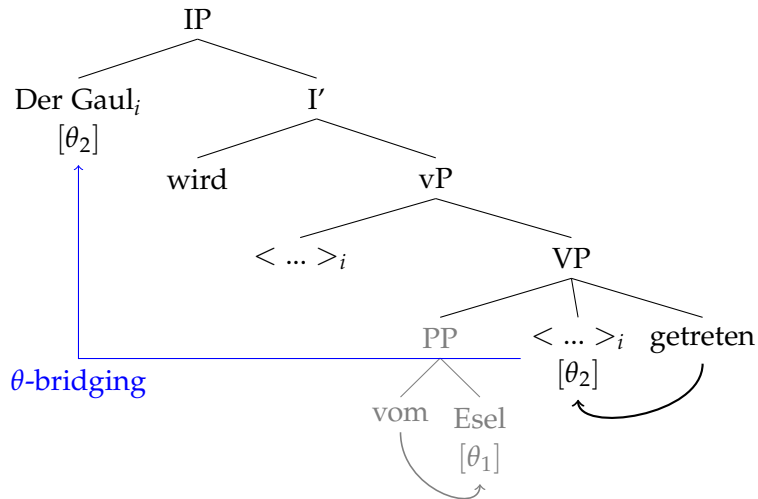
On the contrary, subjects in English passives undergo movement in the opposite direction to the thematic assignment (see (39)): the displaced constituent is base-generated in a postverbal position and it crosses the verb to move to the subject position. As a result, the theme-role transmission is disrupted, and aphasic individuals resort to the default strategy, which assigns it the agent-role as it appears in the first nonthematic position.

(39)

IP
├─ The horse$_i$
└─ I′
   ├─ was
   └─ vP
      ├─ < ... >$_i$
      └─ VP
         ├─ kicked
         ├─ < ... >$_i$ [θ_2]
         └─ PP
            ├─ by
            └─ the donkey [θ_1]

verb crossing!
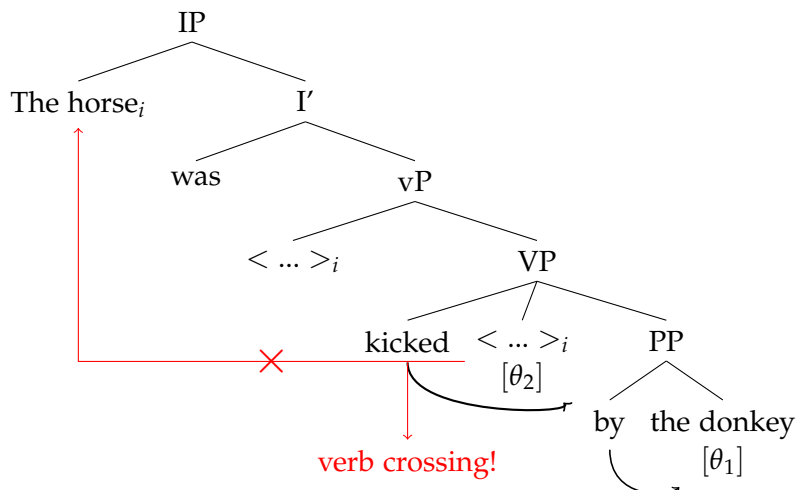
The formulation of this additional mechanism has also been a source of strong criticisms. Beretta (2008:160), for example, considers the formulation of theta-bridging an unnecessary extra burden that is theoretically inappropriate:

The latest version of the TDH simply gets rid of the offending extra dependency relation by decree: a strategy, labeled theta-bridging, stipulates that Broca's aphasics do not need to bother with subject movement, thus overcoming an unwelcome intrusion by syntactic theory that subject movement out of VP does indeed occur.

Beretta (2008) highlighted an important issue, namely, that it is unclear whether this mechanism is consistent with syntactic theory. Strictly, theta-bridging does not imply that any kind of movement is deleted or ignored, but that the thematic role bridges from the structural position, where it is assigned, to the adjacent DP; and it is applied as a compensatory strategy that takes advantage of the patients' remaining syntactic knowledge: a thematic role is assigned to an empty position resulting in an ungrammatical construction that violates the principle of Full Interpretation and, hence, it is further transmitted to the adjacent DP.

To sum up, the most upgraded version of the TDH (40) postulates that (a) all copies from phrasal movement are deleted from agrammatic aphasics' representations; (b) as a consequence, the transmission of theta-roles is disrupted if the displaced element undergoes movement in the opposite direction to the theta-role is assigned, and whenever there is an intervening DP standing between the copy and its antecedent. And, finally, aphasics apply a nonlinguistic linear strategy to compensate for the deficit, the default strategy.

(40) *Trace-Deletion Hypothesis* (Grodzinsky, 2006)

(a) Trace-deletion: Delete all traces of phrasal movement.

(b) Interpret Referential Elements: A theta-argument satisfies [Full Interpretation] either by theta-bridging, or by a linear default strategy that assigns it a role.

2.1.2 *Double-Dependency Hypothesis*

Mauner et al. (1993) postulated the Double-Dependency Hypothesis (41) (DDH) as an alternative to the TDH in order to accommodate the finding in linguistic theory that subjects undergo movement from the VP-internal to the VP-external subject position, and also as an attempt to account for the data without assuming a nonlinguistic strategy such as the default strategy.

(41) *Double-Dependency Hypothesis*

(a) The deficit underlying asyntactic comprehension affects the processing of R-dependencies.

(b) When there is only one such dependency, the resulting syntactic representation, although abnormal, is not ambiguous, but when there are two such dependencies the resulting representation is semantically ambiguous.

The facts that motivated the formulation of the DDH have already been introduced in Section 2.1.1, where some experimental data that compromises Mauner and colleagues' predictions are also discussed. According to the authors, aphasic individuals are expected to have problems in comprehending sentences which involve two or more dependencies, whereas syntactic structures with only one dependency relation are predicted to be well comprehended. Under the DDH, when there is more than one dependency, there is no way to determine which referential antecedent is coindexed with which copy in the agrammatic representation (see example (42)). As already discussed, this analysis successfully accounted for the contrast in performance between active sentences involving subject movement and passives or object relatives.

(42)   [The boy]$_*$ that [the girl]$_*$ t_* chased t_* is tall.

However, it is now generally assumed that all arguments undergo movement, including objects; hence, it is unclear how the DDH would explain the above-chance performance on active sentences that involve two dependencies without resorting to a lineal repair strategy or introducing the notion of intervention. Furthermore, the DDH is also challenged by crosslinguistic experimental data on the comprehension of other sentences involving more than one dependency relation that are well comprehended, like Dutch and German passives, or English short passives.

2.1.3   Derived Order Problem Hypothesis

Under the Derived Order Problem Hypothesis (43) (DOP-H, hereafter), which was postulated by Bastiaanse and van Zonneveld (2005), all derived word orders are difficult to comprehend (and to produce)[7].

(43)   *Derived Order Problem Hypothesis*

---

7 According to Drai and Grodzinsky (2006b), this hypothesis is undistinguishable from the Mapping Hypothesis (Schwartz et al., 1980; Linebarger et al., 1983), as it also predicts that agrammatic aphasics are unable to map thematic roles onto syntactic positions if they do not appear in the base position.

All orders different from the basic order are derived and therefore, difficult to produce and comprehend/parse.

The DOP-H was postulated first to account for data on the production of sentences displaying a noncanonical word order and it was later extended to comprehension. Bastiaanse et al. (2003) first introduced the DOP-H to account for the results from an experimental task in which patients showed problems in producing sentences where the object was scrambled over an adverb in Dutch focalised sentences (44), despite the fact that theta-roles appear in the basic order in Dutch (SOV).

(44) *Jan heeft   het boek$_i$ gisteren   <...>$_i$ gekocht.*
     Jan AUX-3S D book yesterday   buy-PART

     "Jan bought THE BOOK yesterday."

Thus, it is a movement-based account; yet, under the DOP-H, all types of syntactic movement are predicted to be difficult for Broca's aphasics, including verb movement (Bastiaanse et al., 2000; 2012). This is problematic, as head movement has been shown to be spared in agrammatism (Linebarger et al., 1983; Grodzinsky and Finkel, 1998; Luzzatti et al., 2001). Likewise, it is unclear how the DOP-H would account for the above-chance performance of active sentences in German and Dutch, as the verb is found in the second position after rising to C (and the subject also undergoes movement). Also, it fails in predicting the above-chance performance that patients show on Dutch and German passives, despite the fact that the arguments are not in their base positions. And, finally, as Drai and Grodzinsky (2006b) pointed out, it does not accommodate contrasts in performance reported in the literature between *which-* and *who*-object questions, or between quantified and nonquantified subjects in passives; hence the DOP-H is highly problematic.

2.1.4   *Tree-Pruning in comprehension*

Friedmann (2006) proposed an alternative hypothesis for the comprehension deficit based on the Tree-Pruning Hypothesis (45) (Friedmann and Grodzinsky, 1997; TPH, hereafter). The TPH accounts for the production deficit in Broca's aphasia by claiming that higher nodes in the syntactic tree are inaccessible to aphasics. Friedmann aimed at accommodating crosslinguistic data on the comprehension in agrammatism, despite the between-subject variability attested in the literature, and claimed that the inconsistencies in performance are due to different levels of severity.

(45) *Tree-Pruning Hypothesis*

(a) T is underspecified in agrammatic production.

(b) An underspecified node cannot project any higher.

Under the TPH, patients suffering from a severe aphasia are not be able to access the CP and TP nodes of the syntactic tree; whereas patients with a mild condition can access all the syntactic tree but the CP node (46).

(46)
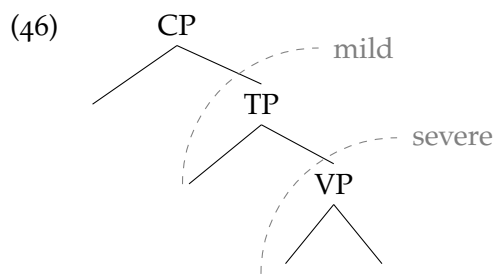
According to Friedmann (2006), this analysis fits compromising data from agrammatic aphasics who show an above-chance performance in passives, but perform at chance on object relatives. Under the TPH, this pattern of performance corresponds to an aphasic with a low level of severity, who is able to represent the syntactic tree up to the TP node (passives), but has no access to upper nodes (object relatives).

The disruption of the lower node entails the disruption of the upper node; it is consequently predicted that patients who perform well on passives will not fail in interpreting object relatives. These predictions fit the experimental data reviewed in the paper, and it is useful for Friedmann to explain crosslinguistic results on the comprehension of scrambled actives (see Friedmann et al., 2010, for example, for a review of German, Hebrew and Russian focalisations along these lines). However, the hypothesis is challenged by empirical evidence. As Drai and Grodzinsky (2006b) pointed out, it is unclear why aphasic individuals should show unimpaired comprehension of sentences involving verb and subject movement to the CP node (such as subject relative clauses) or movement to the TP node in some languages (German and Dutch passives, for example). Hence, Friedmann's proposal manages to overcome the problem of intersubject variability, but needs some modifications in order to accommodate evidence from crosslinguistic agrammatic studies.

2.1.5 *The Feature-Underspecification Hypothesis*

The Feature-Underspecification Hypothesis (47) (FUH, hereafter) was postulated by Grillo (2008; 2009) within the linguistic framework of Relativized Minimality (RM) developed by Rizzi (1990; 2004).

(47) *Feature underspecification (Grillo, 2008)*

Agrammatic aphasics cannot represent the full array of morphosyntactic features associated with syntactic categories. Underspecification selectively targets scope-discourse features.

RM operates as a principle that restricts the possible syntactic chains in natural languages to local configurations. For example, in (48), X and Y are able to stand in a local configuration if Z does not belong to the same structural type as X and cannot, therefore, act as a potential intervener.

(48) ... X ... Z ... Y ...

Rizzi (2004) postulated four different classes of syntactic features related to specific morphosyntactic features –see (49 a)-(49 d)[8]– associated with syntactic heads, which create the structural positions for their interpretation.

(49) (a) Argumental: person, gender, number, case

(b) Quantificational: *wh*, negation, measure, focus...

(c) Modifiers: evaluative, epistemic, negation, frequentative, celerative, measure, manner...

(d) Topic

Hence, in (50 a), the displaced constituent *which boy* can enter into a local configuration with its copy because they both belong to the same class; however, in (50 b), an element of the same class between the antecedent and the copy intervenes, and minimality effects arise and block the formation of the syntactic chain.

(50) (a) [Which boy]$_{ClassQ}$ did [the girl]$_{ClassA}$ <the girl>$_{ClassA}$ kiss <which boy>$_{ClassQ}$?

(b) *[Which boy]$_{ClassQ}$ [which girl]$_{ClassQ}$ <which girl>$_{ClassQ}$ kiss <which boy>$_{ClassQ}$?

---

8 Note that the distinction between A- and A'-chains is redefined here, as it was too restrictive and did not account for grammatical structures present in natural language.

According to the FUH, aphasics' representations are impoverished with respect to discourse-related morphosyntactic features, due to a processing deficit; and, as a result, moved elements are indistinguishable from intervening elements if they lack the relevant features that make them belong to a specific feature class. This is represented in example (51) (from Grillo, 2008): the feature *wh* is underspecified (marked with an asterisk) and, as a consequence, the displaced object belongs to the same class as the subject, which stands between the object and its trace; hence, the subject intervenes and blocks the formation of the syntactic chain, disrupting the transmission of the thematic role. Therefore, according to the FUH, the comprehension deficit observed in agrammatism is the result of generalised minimality effects.

(51) *The boy$_i$*   *[who]$_i$ the girl$_j$ <...>$_?$ kissed <..>$_?$*
      $(\theta_?,\phi_s,*)$ ClassA $(\theta_?,\phi_s)$ ClassA $(\phi_s,*)$ ClassA

The hypothesis is motivated by psycholinguistic studies that show that different linguistic levels are processed at different times (Frazier, 1998): more specifically, that discourse information is processed at a later stage. Grillo (2009) interprets this in line with the movement hierarchy proposed by Abels (2007), according to which morphosyntactic features are merged earlier than scope-discourse features (52): that is, arguments are first merged in the corresponding thematic position, and move up to other syntactic positions later such as in (50 a). This has also been observed by other researchers: Rizzi (2004), for example, claims that syntactic chains start at semantic-selection positions where constituents are assigned thematic roles, go through intermediate positions and end up at criterial-selection positions, endowed with interpretative properties.

(52) ϑ < ... < Case < ... < Scrambling < ... < wh < ... < Topic

Likewise, several studies on the online comprehension of aphasic individuals reported that patients showed a slower-than-normal processing (among others, Piñango and Burkhardt, 2001; Burkhardt et al., 2008), and also that the processing cost was significantly higher when dealing with syntactic operations at a discourse level (Vasic et al., 2006; Avrutin, 2006). Grillo (2008) made several claims reported in previous literature converged into one account: the postulation of a processing deficit that results in a selective impairment of discourse-related features (Avrutin, 2006) which mainly involve the CP layer[9] (Friedmann, 2006) and that affects movement-derived structures

---

9 However, Grillo (2008) assumes the analysis proposed in Belletti (2004), according to which discourse-related positions are postulated at the edge of lower phrases (and not only within the CP layer).

(Grodzinsky, 2000a; Bastiaanse and van Zonneveld, 2005), and accommodated it to the current linguistic framework (Starke, 2001; Rizzi, 2004; Abels, 2007).

The FUH accounts for a great variety of data reported in agrammatic literature, including passives under the syntactic analysis proposed in Gehrke and Grillo (2008), according to which movement in passives is also driven by a topic-like discourse feature associated with the VP. In addition, Grillo (2008) assumes the passive analysis represented in (53): the object moves to the subject position over the *by*-phrase,[10] which intervenes and blocks the formation of the syntactic chain between the moved object and its copy.

(53)
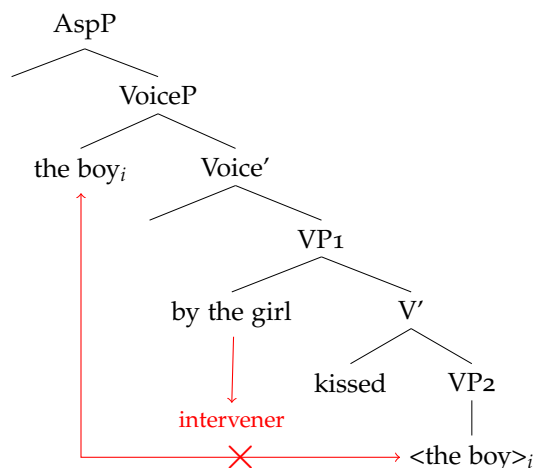
According to Grillo (2009), the FUH is also consistent with the observed at-chance performance on short passives; however, it is unclear why intervention effects would arise despite the fact that the *by*-phrase is not phonetically realised. Similarly, the aphasics' good performance on German and Dutch passives compromises the FUH, given that the *by*-phrase also stands between the copy and the displaced subject (see (38) on page 35). Regarding other types of passives, the different levels of performance observed in Grodzinsky (1995) concerning passives with actional and psychological verbs cannot be derived by the FUH, either. Grillo (2008:87) argues that this distinction in performance is the result of using different methodologies; however, the data reported in Grodzinsky (1995) is from a single experimental task in which patients where required to order sentence fragments into a sentence that described the picture shown. In fact, the chance performance on passives with actional verbs was replicated in Grodzinsky (1995) even though

---

10 Contrary to Grodzinsky (2006), who argues that adjuncts do not count as interveners.

the methodology was different from the commonly used sentence-picture matching task. Hence, the different levels of performance cannot be explained by differences in the experimental design. Grillo (2008:128) later argued that the below-chance performance observed in psychological passives is also due to the more complex predicate of a passivized psychological verb, which supposes an extra burden for the agrammatic's slowed-down processing:

> In order to be able to passivize purely stative predicates, like the *psych*-verbs, a complex predicate has to be formed syntactically in order to introduce a consequent state the passive will operate on. Considering agrammatics' problems with timing of lexical access and general slow-down of the structure building system, I assume that this additional operation will add extra processing complexity.

This rendering is inaccurate, given that the below-chance performance observed in Grodzinsky (1995) indicated that aphasic participants consistently interpreted *psych*-passives as SVO sentences (as the errors consisted of role reversals), whereas they guessed when interpreting passives with actional verbs. Hence, the distinct levels of performance entail different interpretations rather than different levels of severity: that is, a lower rate of correct responses cannot be interpreted as a more severe impairment, because in behavioural tasks in which aphasics are forced to choose between the target or the thematic foil, it corresponds to a specific interpretation.

The contrast in performance observed by Hickok and Avrutin (1996) between *which-* and *who*-object questions, only the latter being well understood, is explained in Grillo (2009:1436) either because (a) *which*-questions are more complex given the discourse properties associated with them (in line with Avrutin (2006)'s interpretation), or because (b) "a perfect match between the impoverished moved object and the intervening subject obtains only with the *which*-NP type of question". The former explanation assumes that *which-* and *who*-questions are associated with different subclasses of features, as Starke (2001) argued: the *which*-NP is associated with a feature subclass of Q, Specific-Q, that has an additional property –discourse-linking (Pesetsky, 1989), referentiality (Cinque, 1990; Rizzi, 1990) or an existential presupposition and specificity (Starke, 2001)–. Given that the feature subclass of *which*-NP is higher in the hierarchy and more complex to represent than the lower Q class associated with *who*-questions, it is underspecified in agrammatism. The second explanation was further developed by Friedmann et al. (2009), in which data on the acquisition of relatives is analysed as an instance of generalised minimality effects. The authors pointed out that the relevant property that

sets *which*-questions apart from *who*-questions is the fact that *which*-questions contain a lexical NP, such as the intervening subject. Interestingly, the authors also rejected the idea that the d-linking property is the crucial one to explain the asymmetries in performance, since *who-* and *which*-questions are presented with pictures that represent the discourse context and, hence, both are d-linked. This observation highlights the need to review the commonly assumed idea that the d-linked property associated with *which*-questions explains the contrast in performance in crosslinguistic comprehension studies between *which-* and *who*-questions (found, among others, by Hickok and Avrutin, 1996; Salis and Edwards, 2008; Martínez-Ferreiro, 2010). However, Grillo (2008) himself reported diverging evidence from a production task carried out with one Italian-speaking aphasic, who successfully produced *what*-object questions (54), but failed in producing *who*-object questions (55). The author pointed out that the mismatch of animacy between the subject and the object crucially helped the patient. In comprehension, the aphasic patient would only need to rely on his knowledge of the world to interpret the sentence, as it is semantically irreversible. Nevertheless, it is unclear why minimality effects arise in a sentence such as (55), given that, based on the reasons above, *who*-questions are argued not to trigger intervention effects in comprehension regardless of the semantic properties. Hence, this dissociation between comprehension and production of *who*-object questions is problematic for the FUH.

(54) *Che cosa$_i$*   *pro$_j$*   *hai   mangiato   <che   cosa>$_i$?*
     [-ANIMATE] [+ANIMATE]
     "What did you eat?"

(55) *Chi$_*$*   *pro$_*$*   *hai   baciato   <chi>$_*$?*
     [+ANIMATE] [+ANIMATE]
     "Who did you kiss?"

The FUH has been shown to be consistent with most data reported in agrammatic studies: for instance, it can predict the above-chance performance on unaccusatives reported in Piñango (1999), as the displaced constituent does not cross any potential intervener (56). Here the prediction is radically different of that of the TDH, as theta-bridging is only fulfilled if it goes in the same direction as the thematic assignment.

(56) *The girl$_i$ fell   <the girl>$_i$ because of the boy.*
     THEME

Furthermore, the postulation of a processing deficit that affects hierarchically higher movement types allows for intersubject variability, as Friedmann (2006) had already argued. This automatically entails that the more severe the impairment, the more features are underspecified in agrammatic representations: given the hierarchy proposed by Abels (2007) and reproduced in (52), the FUH predicts that an aphasic individual with a mild impairment might be able to represent those features that are activated earlier and, hence, perform well on, for example, scrambled sentences but fail in comprehending topicalisations.

2.2 SYNTACTIC ANALYSIS OF THE RELEVANT STRUCTURES

2.2.1 *The left periphery*

As already pointed out, movement is a last resort operation within the Minimalist Program framework (Chomsky, 1995) and, as such, it is only occurs when necessary. The formal requirement that motivates syntactic movement is matching of features; so, for example, an element X bearing a feature F attracts an element Y with the same feature:

(57) (a) $X_F ... Y_F$

(b) $Y_F X_F ... <Y_F>$

This is the case with subjects that move from the internal vP position to get Case, as already discussed in Section 2.1.1, and it is also the case with constituents that move to scope-discourse positions in the left periphery in order to satisfy interface requirements, which include a great variety of phenomena (see the examples in (58 a)-(58 d)). For example, in the *which*-question in (58 b), *which car* is interpreted as the complement of the verb and as the interrogative operator.

(58) (a) The car_i that he bought <the car>$_i$ was red.

(b) Which car_i did he buy <which car>$_i$?

(c) THIS CAR_i, he bought <this car>$_i$.

(d) This car_i, he bought it <this car>$_i$.

The licensing of discourse-scope features mainly takes place in the CP, though not exclusively, as it has been shown that discourse-related positions also appear at the periphery of lower layers (see, among others, Belletti, 2004).

However, the main focus of the present study is on movement to the CP layer, which very often results in sentences that display a superficial noncanonical word order in several languages and, hence, are predicted to be problematic in Broca's aphasia. The configuration of the CP has been a much debated topic in the literature. One of the more prominent attempts to describe the structure of the left periphery is the Cartographic approach (among others, Rizzi, 1997; Cinque, 1999; Belletti, 2004; Aboh, 2004), under which researchers have developed highly detailed syntactic maps of the left periphery. A proposed syntactic configuration of the left periphery (Rizzi, 1997) is represented in (59), even though this has been revised and reformulated later (see, for example, Rizzi, 2004). The basic assumption is that there are as many functional heads as relevant features postulated to be associated with them.

(59)

```
ForceP
   /\
  TopP*
     /\
    FocP
      /\
     TopP*
       /\
      FinP
        /\
        IP
```
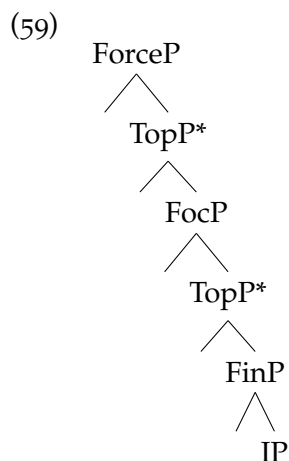
Most syntactic features have been postulated because they are morphologically overt in some languages. For example, both Force and Finiteness are expressed in Welsh (see (60), from Roberts, 2004). These two features are the C positions at the top and bottom edges: Force is related to the higher interface, that is, the discourse, and it expresses the fact that a sentence is a question, a declarative, an exclamation, a relative... while Finiteness is related to the lower interface, the IP.

(60) *Dywedais i mai 'r dynion fel arfer a werthith y ci.*
say-PAST I *op* D men as usual *op* sell-FUT D dog
    FORCE   FIN
"I said that the men will sell the dog as usual."

The need of more than a unique C position is justified by the fact that operators cannot always be preceded or followed by topics and foci. In between Force

and Finiteness, focus and topic positions are hypothesised; such specific heads are postulated because they are also morphologically expressed in languages such as Gungbe (Aboh, 2004). Given that topicalisation is recursive, unlike focus, the CP structure contains more than one topic position. Rizzi (1997) proposed that the focus position lied between two topic positions, since topics can either precede (61 a) or follow (61 b) focalisations.

(61) (a) *Credo che domani, a Gianni, QUESTO gli dovremmo dire.*
          think that tomorrow to-Gianni this   CL should say
              FORCE TOP   TOP   FOC   IP

        "I believe that tomorrow, to Gianni, THIS, we should say to him."

    (b) *Credo che QUESTO, a Gianni, domani, gli dovremmo dire.*
             FORCE FOC   TOP   TOP   IP

        "I believe that THIS, to Gianni, tomorrow, we should say to him."

2.2.2 *General characterisation of topic and focus*

Even though both structures involve movement to the left periphery and entail pragmatic meaning, there are several differences between topics and focus. Moreover, the notions of "topic" and "focus" are too broad, as there are several types of topicalisations and focalisations with different syntactic and interpretive properties. Here, I will concentrate on contrastive focus and clitic left dislocation (as Cinque, 1983 labeled it) from now on, since these are the syntactic constructions tested in the experimental tasks carried out in the present study. Topicalisation is used to isolate the old information in an utterance, in order to emphasise that some new information –comment– about the topicalised item is going to be introduced (see example (62 a)). By contrast, focalisation is used to stress certain information, and especially to contrast new information with the presupposed belief of the listener (within parentheses in (62 b)).

(62) (a) The car, he bought it.

```
                    TopP
                  /      \
                DP        Top'
               / \       /    \
          The car  Top       he bought it
          [TOPIC]               [COMMENT]
```
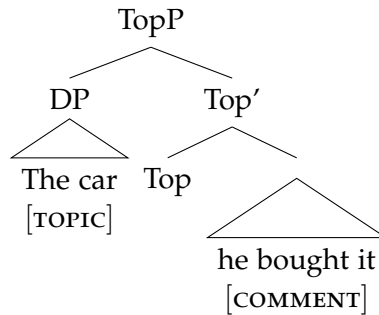
(b) THE CAR, he bought (not the truck).

```
                    FocP
                  /      \
                DP        Foc'
               / \       /    \
          THE CAR  Foc       (not the truck)
          [FOCUS]             [PRESUPPOSITION]
```
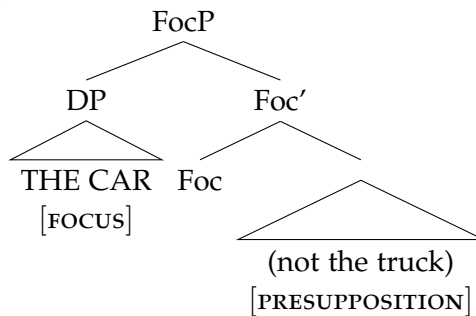
Syntactic properties

Clitic left dislocation (CLLD, hereafter) is a typical Romance syntactic construction which involves an element that undergoes movement to the left periphery (*la llibreta* in the Catalan CLLD in (63)), and a resumptive clitic that agrees with the topicalised element in number, gender and case (*la* in (63)). There is extensive literature on CLLD in different Romance languages (see, among others, Rivero, 1980; Cinque, 1990; Rizzi, 1997; Villalba, 2000; López, 2009); yet, this structure has also been attested in languages in other language families, such as Greek (Anagnostopoulou, 1997).

(63) *La llibreta$_i$,   la$_i$ compra el Joan <...>$_i$.*
      D   notebook   CL buy-3s   D   Joan

      "The notebook, John is buying it."

Focalised constructions can optionally present the focalised element in the left periphery (64 a) or *in situ* (64 b), and do not involve a resumptive element.

(64) (a) *LA   LLIBRETA$_i$ (i no el llibre), compra el Joan   <...>$_i$.*
           D   notebook   buy-3s D Joan

"THE NOTEBOOK (not the book), Joan is buying."

(b) *El Joan compra LA LLIBRETA (no el llibre).*

There are some other differences between these two syntactic constructions: as already pointed out, topic has the property of being recursive (see examples 61 a and 61 b); whereas focalisation is not, as exemplified in (65).

(65) **AL PERE, LA LLIBRETA, compra el Joan.*
to+D Pere   D   notebook   buy-3s   D   Joan

"*TO PERE, THE NOTEBOOK, Joan is buying."

Furthermore, quantified NPs can be focalised ((66 a), examples in Italian from Rizzi, 1997), whereas they cannot be topicalised (66 b).

(66) (a) *TUTTO$_i$ ho   fatto   <...>$_i$.*
everything   AUX-1s   do-PART

"EVERYTHING, I did."

(b) **Tutto, lo ho fatto.*

Also, *wh*-questions are only compatible with topicalisation, though in a fixed word order: the dislocate always precedes *wh*-operators ((67), Catalan data from Villalba, 2000).

(67) *De   la Maria$_i$, quan   en$_i$ parlarem   <...>$_i$?*
PREP D Maria   when   CL   talk-FUT.1p

"Mary, when will we talk about her?"

And, finally, only focus can rise Weak Cross-Over effects ((68 a)-(68 c), examples from Rizzi, 1997).

(68) (a) *Gianni$_i$, sua$_i$ madre   lo$_i$ ha   sempre apprezzato   <...>$_i$.*
Gianni   his   mother   CL   AUX-3s   always   cherish-PART

"Gianni, his mother has always cherished him."

(b) **GIANNI$_i$, sua$_i$ madre ha sempre apprezzato <...>$_i$.*

(c) *GIANNI$_i$, sua$_j$ madre ha sempre apprezzato <...>$_i$.*

2.2.3 *The derivational approach to clitic left dislocation*

Traditionally, and given all these differences, topicalisation and focalisation were proposed to involve different syntactic operations: CLLD was analysed as

base-generated (Hernanz and Brucart, 1987; Cinque, 1990; Fernández-Soriano, 1995), contrary to focalisation, which was assumed to undergo movement to the left periphery. The representational analysis was also motivated by contrasts observed between other movement types, such as *wh*-movement. For example, resumptive clitics only cooccur with topicalisation, not with focalisation or *wh*-movement. Cinque (1990) claimed that the resumptive clitic behaves as an argument in CLLD, and that holds a coreferential-like relation with the full DP in the left periphery. Yet, the main argument for the representational analysis of CLLD is based on the fact that topicalisation is not as sensitive to island constraints as *wh*-movement, as evidenced by the Spanish examples below (from Rubio, 2014): the crossing of an island barrier triggers island effects in (69 a), which results in an ungrammatical sentence; while the topicalisation in (69 b) is allowed to cross the weak island.

(69) (a) *¿*Qué*ᵢ *no*   *sé*   *dónde* *he*   *puesto* *<...>ᵢ?*
           what   NEG   know-1s   where   AUX-1s   put-PART

           "*What don't I know where I've put?"

      (b) *Las* *llaves*ᵢ *no* *sé*   *dónde* *las* *he*   *puesto*   *<...>ᵢ.*
           D   keys   NEG   know-1s   where   CL   AUX-1s   put-PART

           "The keys, I don't know where I've put them."

Cinque (1990) interpreted this phenomenon as evidence that topicalisation is base-generated in the peripheral clause, as a syntactic dependency between an antecedent and its copy cannot be established if one element appears in an island and the other one outside. Yet more recent proposals (Boeckx, 2003; López, 2009; Rubio, 2014) argue that clitic left dislocation is derived by movement. For instance, as Rubio (2014) pointed out, Cinque's (1990) analysis is inadequate to explain why island effects do arise in other contexts, such as when a topicalised element crosses a strong island:

(70) *A *Juan*ᵢ, *te*   *fuiste*   *antes* *de*   *saludarlo*ᵢ.
       to Juan   pro-2s leave-PAST.2s   before   PREP   say-hi+CL

       "John , you left before saying hi to him."

Rubio (2014) argues that, among other factors, the feature configuration of the displaced element and the island play a role, in line with Rizzi's (2004) RM, according to which the morphosyntactic feature of topic is different from other syntactic features such as those that trigger *wh*-movement (see (49 a)-(49 d)). Hence topicalisation, in contrast with *wh*-movement, would be allowed to

cross certain barriers, namely *wh*-islands, because *wh*-elements do not act as interveners.

Also, the contrasts between clitic left dislocation and hanging topic left dislocation (HTLD) –another type of topicalisation, structurally and pragmatically different– are of special interest given that the latter is base-generated. In fact, HTLD is immune to strong island constraints, unlike CLLD ((70); in Catalan, from Villalba, 2000):

(71) *Aquest llibre$_i$, estic convençut   que llegir-lo$_i$ no   és   fàcil.*
      this book   be-1s convinced that read-CL NEG be-3s easy

      "This book, I am convinced that it is not easy to read."

In addition, the dislocate agrees with the clitic in number, gender and case in CLLD (63); whereas in HTLD, the dislocate cannot be introduced by a preposition or receive case; thus it only agrees with the clitic in number and gender ((72 a) vs the CLLD in (72 b); Catalan examples from Villalba, 2000). According to theories of case assignment, case features are checked within the vP or the TP domains (Pesetsky and Torrego, 2011) and, hence, the displaced constituent must receive case in a lower position than the CP. As pointed out by López (2012) and Rubio (2014), the fact that hanging topics do not receive case indicates that the dislocated element must have been base-generated in the CP layer, where it gets default case. Actually, the relation between the topicalised constituent and the resumptive element is mainly discursive, rather than syntactic; so the resumptive element in HTLD can either be a clitic, a strong pronoun (like in example (72 a)) or a full NP; whereas in CLLD only clitics are allowed as resumptive elements.

(72) (a) *La Maria$_i$, serà   millor que parlis amb ella$_i$ aviat.*
          D Maria   be-FUT.3s best   that talk-2s PREP pro   soon

          "Maria, the best will be that you talk to her soon."

      (b) *Amb la Maria$_i$, serà millor que hi$_i$ parlis aviat.*

Also, contrary to CLLD ((73 b), data in Spanish, from López, 2012), HTLD does not show reconstruction effects (73 a). In (73 b), the topicalised item appears in a position where the R-expression *el muy tonto* cannot c-command it, which indicates that the dislocate has been generated in a lower position and further moved to the CP layer; whereas in (73 a), the semantic reconstruction is not allowed because the topic is base-generated in the left periphery.

(73) (a) **El árbito$_i$, el muy tonto$_i$ dice   que el jugador no   lo$_i$ vio.*
          D   referee D very silly say-3s that D player NEG CL see-3s

"The referee, the fool says that the player didn't see him."

(b) *Al árbito_i, el muy tonto_i dice que el jugador no lo_i vio t_i.*

The structural differences between HTLD and CLLD are reflected in their interpretations as well. According to Bianchi and Frascarelli (2010), topics can be classified at least into three different types depending on their syntactic and pragmatic properties: (a) the aboutness-shift topic, which introduces a new topic in the discourse and is base-generated (HTLD), (b) the given-topic, which resumes background information, and (c) the contrastive-topic, which is derived by movement and introduces a topic that contrasts with other topics (CLLD), whereas the comment expresses the new information on the topic. Each topic is associated with a specific prosodic pattern; the intonational contour typically associated with Catalan CLLD is described in Chapter 3.

For all the reasons exposed above, several researchers (Boeckx, 2003; Rizzi, 2004; López, 2009; Rubio, 2014, among others) claim that clitic left dislocation is derived by movement, similar to focalisation. This debate is relevant for aphasia studies, since the accounts reviewed in the previous section predict that Broca's aphasics have problems in comprehending movement-derived syntactic structures. Thus the present study can contribute to this still ongoing debate.

2.2.4   *Subjects in Catalan left-peripheral constructions*

Preverbal subjects: movement to [Spec, TP]

The position of the external argument in nullsubject Romance languages has been a much-discussed topic in syntax literature (Bonet, 1990; Solà, 1992; Vallduví, 1993 for Catalan; among others). Rizzi (1982) proposed that preverbal subjects in Italian are in [Spec, TP]; his analysis was pursued by several researchers (Torrego, 1984; Goodall, 2001; Suñer, 2003; Villa-García, 2013; among others) that applied it to other Romance languages, including Catalan (Bonet, 1989; see example (74 a)). However, the observation that preverbal subjects have A′-properties (see Rosselló, 1986; Solà, 1992 for Catalan) has led some syntacticians to argue that nullsubject languages like Catalan or Spanish lack the EPP feature that attracts the subject in the VP-internal subject position to [Spec, TP] (Alexiadou and Anagnostopoulou, 1998; Ordóñez and Treviño, 1999). Under this approach, the [Spec, TP] position is not projected and case-checking requirements are satisfied by the subject-verb agreement in the subject's base position, given the rich morphology of the tensed verb.

Preverbal subjects are proposed to undergo movement to an A′-position higher than the inflectional layer, so that they are interpreted as topics (74 b).

(74) (a) [$_{TP}$ *La nena$_i$ pentina*   [$_{VP}$ *<...>$_i$ l'àvia.]]*
        D   girl   comb-3s   D-grandmother

    "The girl is combing the grandmother."

   (b) [$_{CP}$ *La nena$_i$* [$_{TP}$ *pentina* [$_{VP}$ *<...>$_i$ l'àvia.]]]*

The CP account for preverbal subjects in Romance has been questioned by evidence showing distributional asymmetries between preverbal subjects and A′-elements. For instance, Goodall (2001) pointed out that embedded preverbal subjects allow for *wh*-extraction (75 a), in contrast with embedded topicalised elements (see example (75 b)).

(75) (a) *¿A quién crees*   *[que Juan le   dio   el premio]?*
        to who think-2s that Juan CL.DAT give-3s D prize

    "Who do you think that Juan gave the prize to?"

   (b) **¿A quién crees*   *[que el premio se   lo   dieron]?*
        to who think-2s that D prize CL.DAT CL.ACC give-3p

    "Who do you think that they gave the prize to?"

Villa-García (2013) also provided evidence of asymmetries in distribution between preverbal subjects and CLLDed constituents in the context of Spanish *que* "that" and subjunctive verbs with exhortative meaning. As exemplified in (76 a), a preverbal subject can appear between *que* and the subjunctive verb. However, this is not the case for topicalised or focalised elements (see example (76 b)). Instead, they can be dislocated to the left of *que*, that is, above FinP (this was originally pointed out by Demonte and Fernández-Soriano, 2009), as exemplified in 76 c. Interestingly, subjects can also occur in the position above FinP, which indicates that preverbal subjects can appear both in [Spec, TP] (76 a), and in the [Spec, CP] like an A′-element (López, 2009; see (76 d), where the subject *Ángela* is topicalised).

(76) (a) *¡Que Ángela se vaya   con su hermana a Toronto!*
        that Ángela CL go-SUBJ.3s with her sister   to Toronto

    "I demand that Ángela go to Toronto with her sister!"

   (b) **¡Que SOLO A TU   MADRE$_i$ inviten <...>$_i$ (, no a tu*
        that only to your mother   invite-SUBJ.3p not to your
        padre)!
        father

"I demand that they invite only your mother, not your father!"

(c) *¡De mi hija_i,*   *que no hablen*   *<...>_i nunca más!*
   of   my   daughter   that   not   talk-SUBJ.3p   never   more

"I demand that they not talk about my daughter ever again!"

(d) *¡Ángela_i, que*   *<...>_i se*   *vaya*   *con su hermana a*
   Ángela   that   pro   go-SUBJ.3s   with   her   sister   to
   Toronto!
   Toronto

"Ángela, I demand that she go to Toronto with her sister!"

Goodall (2001) also highlighted the fact that preverbal subjects (76 a) and topicalised subjects (76 d) are associated with different intonational patterns which, according to him, constitutes further evidence in favour of locating preverbal subjects in [Spec, TP]. Yet, this argument was challenged by Solà (1992), who argued that the prosodical contour associated with CLLD –described in Chapter 3– is not obligatory in Romance; and more specifically, the comma intonation is often omitted by speakers. Alternatively, Solà (1992); Masullo (1992) and Zubizarreta (1999) propose an intermediate solution claiming that the [Spec, TP] position has A'-properties and, hence, can also be the landing site of A'-elements.

   In the present study, the experimental tasks contained both declaratives (see examples (74 a) and (77 a)), and subject topicalisations and focalisations (examples (74 b) and (77 b), respectively). Each token was contextualised and prerecorded to make sure that the pragmatics and prosodical pattern associated with each sentence type were present through the task; here, the stress on the focalised item is marked with capital letters and the intonational properties of topic with a comma. In addition, some of the object focalisations and topicalisations tested display an OSV word order, as exemplified in (77 c) and, hence, the subject occupies the preverbal position.

(77)   (a) *[_{TP} Les soldats_i van mullar [_{VP} <...>_i al*   *policia.]]*
          D   soldier   AUX   wet   ACC+D   policeman

       "The soldiers wetted the policeman."

   (b) *[_{CP} LES SOLDATS_i, [_{TP} <...>_i van mullar [_{VP} <...>_i al policia.]]]*

   (c) *[_{CP} AL POLICIA_i, [_{TP} les soldats_j van mullar [_{VP} <...>_j <...>_i.]]]*

Subject-object inversion in left-peripheral structures

Although it is claimed that the basic word order of Romance languages is SVO, there is a wide range of constructions in which the subject is in the postverbal position and, among them, sentences involving elements in the left periphery. The comprehension tasks carried out in the present study also comprised focalisations and clitic left dislocations showing a superficial OVS word order, such as the object focalisation exemplified in (78).

(78) *AL   POLICIA,   mullen les soldats.*
     ACC+D policeman wet-3s D   soldier

     "THE POLICEMAN, the soldiers wetted."

The subject-object inversion in (78) is compulsory in some cases: for example in (79 a), where the raising of the subject to [Spec, TP] is blocked by the movement of a *wh*-phrase (Suñer, 1994).

(79) (a) *Què$_i$ diu   <...>$_i$ el   Joan?*
         what   say-3s D   Joan

         "What is Joan saying?"

     (b) **Què$_i$ el Joan diu <...>$_i$?*

The first syntactic analyses of subject inversion assumed that the verb occupied the C head (Torrego, 1984), as previously argued for the Germanic languages. However, unlike English, subjects can optionally appear in the postverbal or preverbal position in Catalan left-peripheral structures like relatives (80 a), or even in discourse-linked *wh*-questions (see (80 b)). This suggests that verbs stay in the T head (Masullo, 1992; Suñer, 1994; Ordóñez, 1998; among others), that is, in a lower position than preverbal subjects.

(80) (a) *El Joan és la persona amb   qui ha   parlat   la Maria / la*
         D   Joan is D   person   with REL AUX talk-PART D   Maria / D
         Maria ha   parlat.
         Maria   AUX talk-PART

         "Joan is the person who Maria talked to."

     (b) *Amb   quina d'aquestes noies el Joan no   vol   parlar /*
         with which D-these   girls D   Joan NEG want-3s   talk   /
         no   vol   parlar el Joan?
         NEG want-3s talk   D   Joan

         "Which one of these girls Joan doesn't want to talk to?"

The position of clitics around verbs gives further evidence in favour of this analysis. As discussed in the subsequent section, clitics usually precede verbs in Catalan because they adjoin the TP (81 a); however, they appear in the postverbal position if the verb is in the imperative mood (81 b), as imperatives undergo movement to a position above the TP, the C node (Rivero and Terzi, 1995). This is corroborated by the fact that they cannot be negated (81 c), given that the negation head is not allowed to cross over another nuclear element without violating the Head Movement Constraint (Travis, 1984). Instead, a verb in the subjunctive mood is to be used, and it can be negated because it stays in the TP; and, hence, the clitic precedes the verbs after adjoining the T head (81 d).

(81) (a) *El llegeix.*
CL read-2s

"Read it!"

(b) *Llegeix-lo!*
read-IMP.2s+CL

"Read it!"

(c) **No llegeix-lo!*
NEG read-IMP.2s+CL

"Don't read it!"

(d) *No el llegeixis!*
NEG CL read-SUBJ.2s

"Don't read it!"

Therefore, indicative verbs in Catalan occupy the T head, from which it follows that postverbal subjects in sentences like the ones tested in the present study are not in the Spec of TP, but in a lower position.

The very first accounts hypothesised that postverbal subjects were the result of a right-adjunction to the VP (Rizzi, 1982; Torrego, 1984; Suñer, 1994). However, as Ordóñez (1998) pointed out, this analysis is challenged by data from Spanish VOS and VSO structures and presents some disadvantages. Instead, postverbal subjects were proposed to remain in the first merged position in Romance (Bonet, 1989; Ordóñez, 1998; Solà, 1992, among others), and satisfy case-checking requirements via subject-verb agreement (see example (82), which corresponds to an OVS focalisation included in Experiment 3 in Chapter 4.3).

(82) $[_{CP}$ *AL POLICIA$_i$, $[_{TP}$ mullen$_j$ $[_{vP}$ les soldats $[_{VP}$ \<mullen\>$_j$ \<AL POLICIA\>$_i$.]]]]*

In addition, the postverbal position of subjects seems to be related to pragmatics: in contrast with preverbal subjects, inverted Catalan subjects are interpreted as focalised elements (Solà, 1992); thus, the apparently free optionality to place subjects around verbs in Romance languages is motivated by discourse-properties (Belletti, 2001).

VOS word order: the [Spec, FocusP] position

The comprehension of sentences with CLLDed indirect objects was also tested, both with preverbal (83 a) and postverbal subjects (83 b): as already argued, the subject in ISclVO items is in [Spec, TP]. However, the postverbal subject in IclVOS appears in a lower position than the object, which suggests that either the subject or the object does not appear in their base position.

(83) (a) *Al   senyor, el metge li   treu   l'abric.*
         ACC+D man   D doctor CL take off D+coat

         "The man, the doctor takes off his coat."

      (b) *Al senyor, li treu l'abric el metge.*

For Spanish, it was first assumed that the subject stayed in the first merged position and the object scrambled above it in VOS sentences, whereas it stayed in its base position in VSO (Ordóñez, 1998). Ordóñez (2007) later reexamined the alternation between VSO and VOS structures in Spanish, and proposed that there is more than one position for subjects within the TP (in line with the split-TP proposal by Pollock, 1989): the specifiers of SubjP and FocP (see examples (84 a) and (84 b) for VSO and VOS constructions, respectively). Interestingly, the VSO and VOS alternation observed in Spanish, Portuguese and Romanian is not found in other Romance languages like Italian or Catalan (Solà, 1992; Ordóñez, 2007; see the Catalan examples in (84 c) and (84 d)). Ordóñez (2007) argues that the SubjP projection is only available in those languages that allow the VSO distribution.

(84) (a) *Hoy   comprará   Juan   la comida.*
         today   buy-FUT.3S Juan   D meal
                            SubjP

         "Juan will buy the meal today."

      (b) *Hoy comprará la comida Juan.*
                                   FocP

(c) *Avui comprarà en Joan el menjar.
today buy-FUT.3s D Joan D meal
*SubjP

"John will buy the meal today."

(d) *Avui comprarà el menjar en Joan.*
FocP

Thus, Catalan only allows for one landing site between the VP and the highest subject position in the TP, namely, the Spec of FocP (in line with Belletti's (2001) analysis of Italian postverbal subjects). In addition, the object undergoes movement to a position higher than FocP triggered by prosodic motivations that require focused elements to come last (p-movement; Zubizarreta, 1998). According to this approach, the analysis of the underlying structure of the IclVOS items included in Experiment 6 (Chapter 5.3) is the one represented in (85): crucially, the subject undergoes movement in focalisations and topicalisations with postverbal subjects, along with the indirect object.

(85) $[_{CP}$ *Al senyor$_i$*, $[_{TP}$ *li$_i$ treu l'abric$_j$* $[_{FocP}$ *el metge$_k$* $[_{vP}$ *<el metge>$_k$* $[_{VP}$
<l'abric>$_j$ <al senyor>$_i$.]]]]]

The movement of the direct object here is not relevant for aphasia studies, given that it is inanimate and the sentences are only semantically reversible with respect to the subject and the indirect object. And, as already mentioned in the previous chapter, Broca's aphasics do not have problems comprehending irreversible sentences as they can rely to their knowledge of the world (Caramazza and Zurif, 1976).

2.2.5 *Object clitic constructions*

Considering the fact that clitic left dislocation, unlike focalisation, involves a resumptive clitic, simple active sentences with direct and indirect object clitics have also been included in the experimental tasks reported in the present study. There is extensive literature on clitics in the Romance languages (among others, Jaeggli, 1982; Borer, 1984; Kayne, 1989; Uriagereka, 1995; Sportiche, 1996; Belletti, 1999). Clitics in clitic constructions function as a full DP or strong pronoun but behave slightly different (see the Catalan examples in (86 a) and (86 b)). For instance, clitics show a different distribution which is determined by the mood of the verb that c-commands them: clitics appear in the postverbal position if the verb is imperative, gerundive or infinitive;

otherwise they precede the verb (86 b), regardless of the fact that the basic word order in most Romance languages is SVO.

(86) (a) *El Joan llegeix el llibre.*
      D Joan read-3s D book

      "Joan is reading the book."

   (b) *El Joan el llegeix.*
      D Joan CL read-3s

      "Joan is reading it."

Derivational analyses have been proposed in order to explain why clitic constructions present an atypical word order configuration. Kayne (1975) first analysed French clitics as the result of syntactic movement, and later on several researchers (Sportiche, 1988; Suñer, 2000) provided additional evidence for the presence of movement in the derivation highlighting the similarities between clitics and other types of movement, such as movement of subjects or *wh*-movement. As an example, clitic constructions like the one in (87 a) parallel subject constructions with floating quantifiers (see example (87 b)), in which the quantifier and the DP are generated as a single constituent in the [Spec, VP] position (Sportiche, 1988).

(87) (a) *Els van veure a tots.*
      CL AUX see-INF to all-Q

      "They saw all of them."

   (b) *Els estudiants van veure tots la pel·lícula.*
      D students AUX see-INF all-Q D movie

      "All the students watched the movie."

This evidence led Kayne (1989) to the conclusion that clitics are heads that adjoin to the T node and thus constitute an instance of head movement. From the analysis of Italian sentences in which the participle agrees in gender and number with the object clitic (see example (88); this phenomenon is also attested in Catalan), Sportiche (1998) and Belletti (1999) proposed that clitics are first generated as maximal projections in the object position, and afterwards move to the specifier of PartP in which the agreement between the participle and the clitic takes place; they ultimately move as heads and adjoin the T head.

(88) *Li$_i$+T ho [$_{XP}$ <...>$_i$] visti [$_{XP}$ <...>$_i$].*
      CL-mp AUX   see-PART.mp

      "I saw them."

In this chapter, I have described both the linguist framework and the accounts on the comprehension deficit in agrammatism that will be empirically evaluated in the following chapters. The structures under examination involve several syntactic properties that make them suitable for this purpose. The six experimental tasks designed to test the agrammatic comprehension of the referred structures are described in chapters 3, 4 and 5.

3
THE DISCRIMINATION OF INTONATIONAL CONTOURS

Agrammatic patients are known to have difficulties in comprehending certain structures, and this behaviour has been attributed to diminished syntactic capabilities, on the unverified assumption that perception of intonation is intact. The question is particularly relevant given that sentential meaning is known to be partly conveyed by prosody (Pierrehumbert, 1999). If a meaningful representation is partly built on the information provided by prosody, in particular by intonation, failure to perceive intonation is expected to have an impact on comprehension. As a consequence, should there be a deficit in the perception of intonation in Broca's aphasia, we would expect a comprehension deficit to ensue without having to postulate any deficit in syntax. It is important to establish that Broca's aphasics have access to the information provided by intonation to rule out the hypothesis that their comprehension deficits are due to misperception. Here I examine the assumption that agrammatic aphasics preserve their phonological abilities intact by means of a discrimination task. Catalan presents interesting properties for this purpose, as it allows for intonation to be the only variable over four sentence types (declaratives, yes/no questions, topicalisations and contrastive focus constructions).

3.1 ANTECEDENTS

Few studies on the relation between prosody and Broca's aphasia have been carried out. Most of them have focused on the effect that prosody might have on the general auditory comprehension of spoken language, not on the prosodic abilities of Broca's aphasics such as the recognition of intonational patterns. For instance, Baum et al. (1982) conducted an experiment to test whether prosodic cues helped agrammatics to comprehend 'homonymous' sentences, which were disambiguated either by a stress (marked by capital letters in examples (89 a) and (89 b)) or by manipulating the juncture in morpheme boundary (see examples (90 a) and (90 b)).

(89) (a) They fed her dog BISCUITS.

(b) They fed her DOG biscuits.

(90) (a) He noticed it snows here.

 (b) He noticed its nose here.

Finally, they presented pairs of identical sentences: once with the neutral pattern (91 a), and once with a raised stress on a functor word (91 b). Participants were presented with the target picture, the representation of the homonymous and a distractor. The results showed that aphasics' performance did not improve in the stressed conditions. The authors concluded that the aphasics' perception of stress and juncture is impaired, which in turn did not benefit their comprehension.

(91) (a) The spoon is in the glass.

 (b) The spoon is IN the glass.

Burchert et al. (2005b) designed an experimental task to learn whether aphasics used prosodic features as a cue to comprehension. They tested four agrammatic aphasics for their comprehension of German OVS sentences with contrastive focus (92) through a sentence-picture matching task. Sentences were unambiguous, as all the arguments were overtly case marked. The results obtained were compared to OVS sentences without contrastive focus from a previous study (Burchert et al., 2003). The aphasic participants performed at chance, regardless of whether the object was contrastively focused or not. From this, the authors concluded that prosody does not enhance comprehension in Broca's aphasia. However, this does not mean that prosody is not correctly perceived.

(92) *DEN   VATER such   der   Sohn.*
      D.ACC father seek-3s D.NOM son

      "It is the father who the son is seeking."

Raithel (2005) designed three experimental tasks to learn whether Broca's aphasics are able to recognise intonational contours. In the first experimental task, twelve German sentences were recorded and presented to aphasic patients, who were asked to identify them as questions (rising contour) or declaratives (falling contour). German syntax forces word order alternations, so declaratives present the verb in second position (V2) as in (93 a), while interrogatives are verb initial, as in (93 b).

(93) (a) *Die Eltern   essen   Suppe.*
           D   paretns eat-3p soup

           "The parents are eating soup."

(b) *Kannst   du   mir heute   helfen?*
    can-2s you   me   today   help-INF
    "Can you help me today?"

Raithel tested well-formed utterances like the ones in the examples, and also incongruous utterances in which the intonation did not match the word order; more specifically, sentences with declarative word order emulated a rising intonational contour appropriate for an interrogative. The results showed that agrammatic aphasics performed above chance on all conditions, except on the incongruent utterances. As the author pointed out, participants most probably judged sentences by their syntax (word order), as items were confusing. This is also evidenced by the control participants' performance, which also worsened in the incongruous condition.

In the second experiment, the same sentences with a low-pass filter masking the lexical content were tested. The purpose of masking the content was to stop Broca's aphasics relying on syntax during the task, and force them to focus on the prosodic contour. Aphasics succeeded in identifying the prosodic contours, and the statistical analysis revealed that there were no significant differences between the first and the second test.

The third task consisted of a discrimination task in which declarative sentences were compared with narrow focus sentences. Each utterance was presented twice consecutively (forming pairs), and participants were asked to state whether the two utterances were identical or not. The task comprised seven sentences pairs: in six of these seven pairs, one utterance was the original recorded (a neutral declarative; i.e. *Point to the blue circle*) and the other one was manipulated in order to stress one word of the utterance (narrow focus; i.e. *Point to the BLUE circle*). The remaining pair consisted of the same utterance repeated twice (that is, two neutral declaratives). Both healthy and aphasic participants performed below chance (mean of 42.14% and 34.43% of correct responses, respectively). The fact that the performance was poor even for healthy subjects calls into question the experimental design.

For English, Seddoh (2006) investigated the contrast between a declarative (94 a) and an echo question (94 b) and asked fluent and agrammatic aphasic subjects to identify the utterances as declarative or interrogative. In a second experiment, the stimuli consisted of only the terminal or the preterminal contour areas of the sentences in the first experiment.

(94)   (a) John went with Jane.

       (b) John went with Jane?

Aphasic patients performed well on the identification of declaratives, but not on the interrogatives. In the second experiment they performed like the control subjects in the identification of terminal contours, but not in the identification of preterminal contours. The results were interpreted as indicating that prosodic information is available to aphasic subjects –as witnessed by the accurate identification of declaratives–, whereas some components of the contours may be poorly identified –as shown by the performance in the second experiment–. However, what is labeled by Seddoh (2006) as the "terminal contour" corresponds to the nuclear contour, which goes from the last tonic syllable to the end of the utterance and carries the crucial information for interpretation of the sentence (see Section 3.2.1). Hence the fact that patients were not able to identify the pretonic contour does not imply the conclusion that they are insensitive to prosodic features. Also, it is unclear why aphasic participants were not able to identify the interrogative contour, but recognised it when they were presented only with the terminal contour.

3.2 EXPERIMENT 1: THE DISCRIMINATION OF INTONATIONAL CONTOURS

As we have seen, there are relatively few behavioural studies on the perception of intonation in Broca's aphasia, hence the need for new studies to be conducted. Furthermore, there are some respects in which Catalan, by its properties, allows us to explore prosody more neatly than German or English. By virtue of the fact that Catalan syntax is not constrained in the same way that German or English syntax are, the same word order can be found in declaratives, interrogatives, topicalisations, and focalisations. The only overt marker differentiating these four structures is the intonational contour.

The discrimination task carried out with Catalan-speaking aphasics was in part conceived as a replication of one of Raithel's (2005) experiments. In the present study, however, only natural spoken sentences were used, which removed all the problems regarding the perception of focus contours due to an inaccurate manipulation of focus. Hence, the distinction of focus according to the parameter manipulated was deleted, because it did not take into account the whole intonational contour of the focus. Moreover, the number of identical and different pairs was balanced to prevent participants applying answer strategies.

Note that the experimental work presented here has been published in *Clinical Linguistics and Phonetics* in the form of a journal article (Gavarró and Salmons, 2013).

3.2.1 *Prosodic analysis of relevant structures*

The Autosegmental-Metrical model (AM, hereafter) is a system of prosodic representation developed by Pierrehumbert (1980) within the generative framework. The main characteristic of the AM model is the division of different levels (Beckman and Pierrehumbert, 1986), two of them crucial for the characterisation of intonation: the intonational phrase (ι), and the phonological or intermediate phrase (φ). The former contains at least one of the latter phrases. The edges of an intermediate phrase show a lower degree of separation between contiguous prosodic units, but still mark a prosodic unit. These units are related to the syntactic properties of the utterances (Chomsky and Halle, 1968; Pierrehumbert, 1999) and are often crucial for the interpretation of otherwise ambiguous sentences. This is illustrated in (95 a) and (95 b) (Catalan examples from Prieto, 2002): both examples contain two intermediate phrases (φ), but have different syntactic properties which are reflected in the intonational characteristics of the utterances. In (95 a), the first prosodic unit only includes *la vella,* while in (95 b), the first intermediate boundary tone is placed after the word *llança*. The prosodic properties disambiguate these two utterances, as they tell us whether *llança* must be interpreted as a noun (95 a) or a verb (95 b).

(95) (a) *[ι [φ La vella] [φ llança l'amenaça]].*
             D   old-lady   throw-3s D-threat

       "The old lady threatens her/him."

  (b) *[ι [φ La vella llança] [φ l'amenaça]].*
             D   old   spear   CL-threaten-3s

       "The old spear threatens him/her."

Intonation can also be used to organise a discourse (demarcative function), to report the speaker's attitude or intentions (expressive function) or to rank some information (focalise).

The Tones and Break Indices labelling system (ToBI) was first developed to reach a common standard system for transcribing the intonational patterns of English utterances (Silverman et al., 1992; Beckman and Hirschberg, 1993; Pitrelli et al., 1994), and was later adapted in other languages. In intonational

languages like English or Catalan, words usually have a lexical fixed accent –although there are some unstressed words, like prepositions– to which a prosodic tone can be attached. In such languages the same syllable can be produced either with a high or a low tone, depending on the general pattern, and without affecting the meaning of the sentence. According to Pierrehumbert (1980), there are two kinds of tones: pitch accents and boundary tones. Pitch accents can be either low or high (see Figures 3a and 3b, where each square represents a syllable –highlighted in grey if it is the tonic syllable–), and are related to lexical stressed syllables which show more prominence (in order to show this relationship, they are always orthographically marked with an asterisk). When these tones are not realised as a H or a L tone, but rather as a rising or falling movement during the accented syllable, a bitonal signal is used: one of its two tones is marked with an asterisk and produced on the stressed syllable, while the other one is displaced either on the posttonic (e.g. L*+H) or pretonic (e.g. L+H*, see Figure 3c) syllable. The ">" sign is used to express that the rise of the frequency (F0) is extended to the posttonic position (Beckman et al., 2002), as exemplified in Figure 3d. Boundary tones are realised at the edge of the intonational phrases (and marked with a percentage sign, e.g. H% like in Figures 3e and 3f).

(a) H*   (b) L*   (c) L+H*   (d) L+>H*   (e) H%   (f) HH%
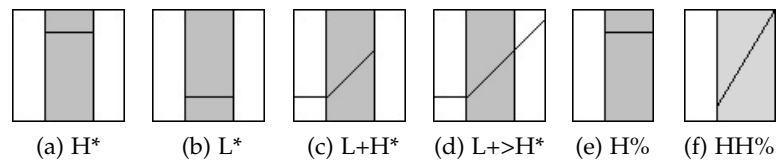
Figure 3: Examples of Catalan pitch accents (a-d) and boundary tones (e-f)

The most important part of the intonational pattern is the nuclear contour, which goes from the last tonic syllable to the end of the utterance (including the last pitch accent and final boundary tone). A lot of prosodic and linguistic information is carried by the nuclear contour, so it is crucial for interpretation. All utterances must have, at least, a nuclear pitch accent and a final boundary tone. The basic nuclear configurations in Catalan are mainly reported by Prieto et al. (2009) and Prieto (2014), who also made the Catalan version of the labelling system ToBI (Cat_ToBI) on the basis of a large corpus of spoken Catalan, including different dialects and previous studies on Catalan intonation (among others, Bonet, 1984; Mascaró-Pons, 1986; Bonet and Lloret, 1998; Prieto, 1995; Celdrán et al., 2005; Prieto, 2007; Font, 2007).

The typical intonation for neutral declaratives –in Central Catalan– is a general falling F0, as exemplified in Figure 4. The prenuclear contour is characterised by a rising high pitch accent on the first stressed syllable, which consist of a low pitch accent that is extended through the accented syllable, and displaces the high tone to the posttonic syllable. The prenuclear configuration is followed by a low pitch accent on the nuclear stressed syllable. The pitch falls until the end of the intonational phrase and ends with a low pitch accent and a final low boundary tone.
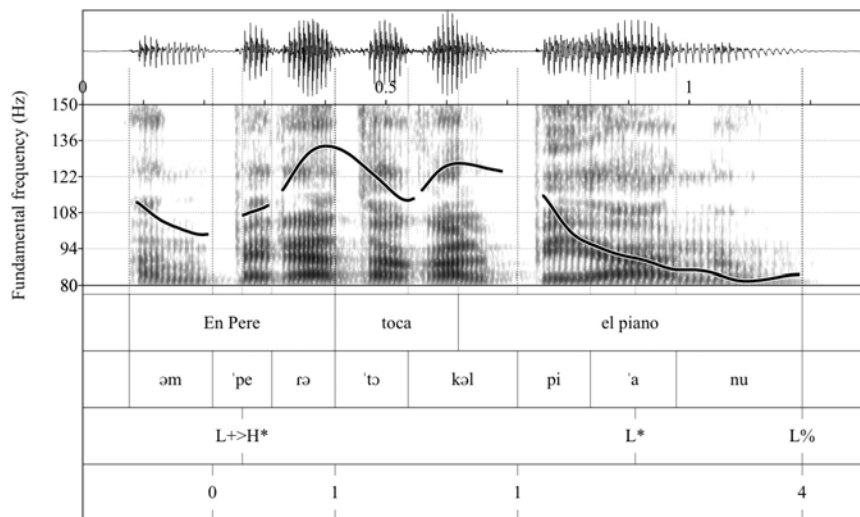
Figure 4: Intonational contour of the neutral declarative *En Pere toca el piano* "Pere is playing the piano"

Yes/no questions present the opposite intonational contour and are easily distinguishable from declaratives (see Figure 5). This type of contour begins with a slight fall that stops on the first tonic syllable, where a low pitch accent is realised, and then the pitch rises during the posttonic syllables to slightly fall again. The nuclear syllable is formed by a low pitch accent and the typical question's final rising contour.
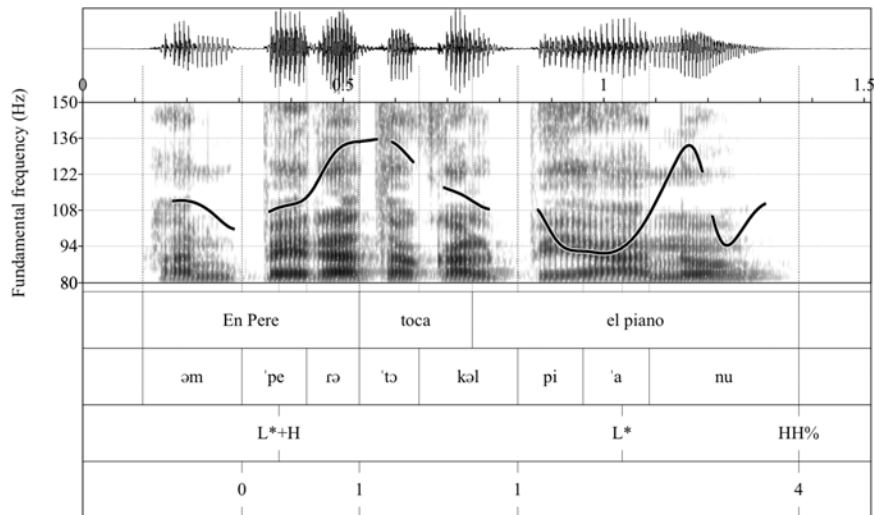
Figure 5: Intonational contour of the yes/no question *En Pere toca el piano?* "Is Pere playing the piano?"
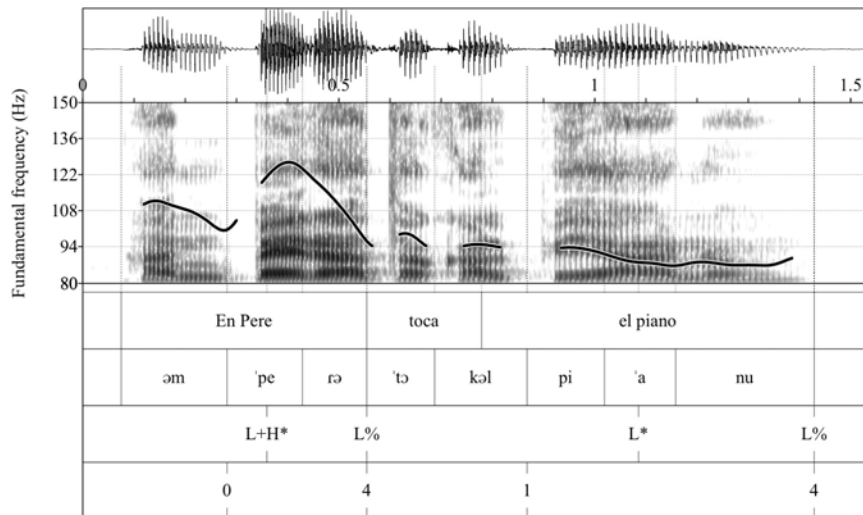
Figure 6: Intonational contour of the focalisation *EN PERE, toca el piano* "It is Pere who is playing the piano"

Contrastive focus is prosodically marked by a prominent accentuation of the focused item, as exemplified in Figure 6. The tonic syllable of the focused constituent is preceded by a rising low Fo and emphasised by a high pitch tone. After the high peak, the Fo falls immediately to reach a low frequency. Hence, the item dislocated to the left constitutes the focus and it is marked prosodically, while the second prosodic unit is deaccented; this fact induces the dependency of the second unit –the comment– on the first accented constituent –the focus–.

Topicalisation is prosodically marked as well. In fact, as already argued in the previous chapter, several researchers (Solà, 1992; Masullo, 1992; Zubizarreta, 1999) claim that this differentiated contour is not obligatory in Romance. However, the utterances tested in the present study were uttered according the prosodical pattern associated with topicalisation in Catalan (Figure 7) in order to avoid any possible ambiguities in interpreting these structures, and hence focus on the thematic interpretation of participants.
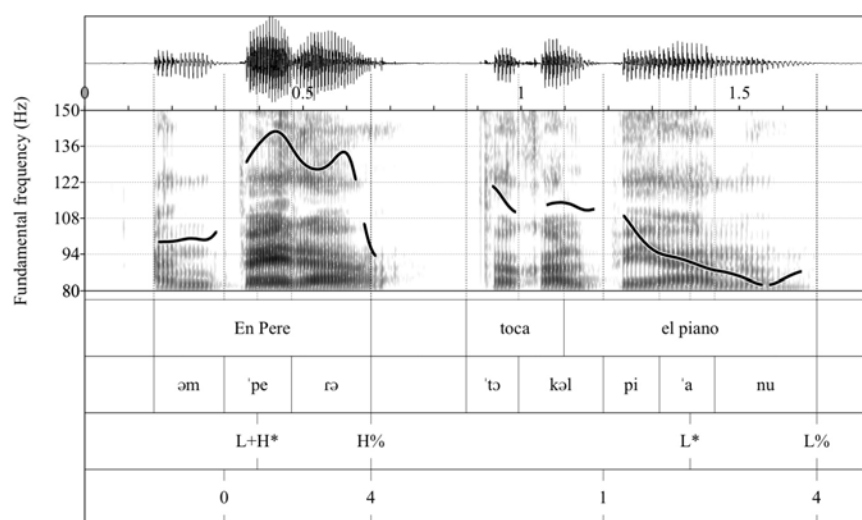
Figure 7: Intonational contour of the topicalisation *En Pere, toca el piano* "Pere, he is playing the piano"

The topic constitutes an independent prosodic unit, clearly isolated from the rest of the utterance. An optional pause can occur after the topic in order to emphasise its autonomy. The first prosodic unit involves the topic itself and

it is formed by a rising F0, which is the typical frequency in Catalan, to leave the utterance unfinished and introduce a new prosodic unit (whose content depends on the first one). The second unit is characterised by a falling contour. In Figure 7, both prosodic units are observable: the first one, with a rising pitch accent and a high final boundary tone; and the second one, with a low pitch accent on the last stressed syllable and a low final boundary tone.

3.2.2 *Participants*

The study was conducted with ten agrammatic participants selected from the patient pool of the *Associació Sant Pau de Trastorns de la Comunicació* in Barcelona. All of them were native speakers of Catalan and were diagnosed with the Western Aphasia Battery (Kertesz, 1982, Catalan version based on the Spanish version by Kertesz et al., 1990). Details of age, education, etiology, time post onset of their condition and the clinical diagnosis appear in Table 2.

APHASIC SUBJECT	AGE	EDUCATION	LESION SITE	ETIOLOGY	TPO (YEARS)	APHASIA	SEVERITY
A1	34	2	-	ICVA	4	Broca	2
A2	59	1	LFT	ICVA	6	Broca	2
A3	23	2	-	ICVA	7	Broca	2
A4	76	3	LMCA	ICVA	12	Global	1
A5	53	3	LMCA	HCVA	18	Broca	2
A6	69	3	LMCA	ICVA	18	Broca	1
A7	57	3	LMCA	ICVA	5	Broca	2
A8	68	3	LMCA	ICVA	11	Broca	1
A9	74	1	LMCA	ICVA	11	Broca	1
A10	81	1	-	CVA	15	Broca	2

Education: 1, basic; 2, secondary; 3, higher; Lesion site: L, left; FT, frontotemporal area; MCA, medial cerebral artery; Etiology: H, hemorrhagic; I, ischemic; CVA, cerebrovascular accident; TPO, time post onset; Severity: 1, mild; 2, moderate; 3, severe.

Table 2: Agrammatic subjects' individual characteristics

CONTROL SUBJECT	AGE	EDUCATION	APHASIC MATCHED
C1	32	Secondary	A1
C2	58	Primary	A2
C3	24	Secondary	A3
C4	78	University	A4
C5	51	University	A5
C6	67	University	A6
C7	56	University	A7
C8	69	University	A8
C9	70	Primary	A9
C10	84	Primary	A10

Table 3: Control subjects' characteristics

None of the participants had a history of drug abuse, hospitalisation for psychiatric disorders, speech/language disorders or learning disabilities before the stroke. None of the participants suffered from articulatory impairment. They were all right-handed except for A5 and A7, who were left-handed. The severity of their impairment was determined by a speech therapist of the neurological board of the association. Based on age and education, they were matched with ten healthy control subjects (see Table 3).

3.2.3 *Methods*

3.2.3.1 *Materials*

The materials included four different types of intonational contours associated with specific syntactic structures in Catalan: neutral declaratives (96 a) and yes/no questions (96 b) as control items, and focalisation (96 c) and topicalisations (96 d).

(96) (a) *En Pere toca el piano.*
     D Pere play-3s D piano
     "Pere is playing the piano."

   (b) *En Pere toca el piano?*
     D Pere play-3s D piano

"Is Pere playing the piano?"

(c) *EN PERE, toca   el piano.*
    ᴅ   Pere   play-3s ᴅ piano

"It is PERE, who is playing the piano."

(d) *En Pere, toca   el piano.*
    ᴅ   Pere play-3s ᴅ piano

"Pere, he is playing the piano."

These four sentence types are suitable for testing the perception of intonational contours as they present the same superficial SVO word order. The semantics and grammar of sentences were very simple. Very common and familiar words were used to avoid the interference of syntactic and semantic properties in their judgements. In this way, participants were obliged to rely solely on intonation.

The experiment consisted of thirty-two pairs of matched sentences. Eight of those were pairs of declarative/interrogative (97) and were used as control trials, given the salience of the contrast between the declarative and the interrogative. The remaining pairs were the experimental items, which involved twelve pairs of identical contours: declarative/declarative (98), focalisation/focalisation, topicalisation/topicalisation; and twelve pairs of different contours: focalisation/declarative, declarative/topicalisation, topicalisation/focalisation.

(97)   *En Pere toca el piano.*
       En Pere toca el piano?

(98)   *En Pere toca el piano.*
       En Pere toca el piano.

All the sentences were recorded separately in a radio studio, and the trial pairs were formed using Audacity software. A native male speaker of Catalan read the sentences at a normal reading speed and produced the different intonational contours analysed and described in the previous section. The pairs of identical contours were in fact the very same recording played twice in succession, so that no difference in phonetic detail, syllable shape, etc., could induce the subjects to judge them different.

3.2.3.2   *Procedure*

The items were presented in pseudorandom order (see Appendix A.1) on a laptop, using the free software PsyScope (Carnegie Mellon, Pittsburgh, PA). To

reproduce sound with a good quality, external loudspeakers were used. The volume level was determined by each subject to best suit them.

Subjects were asked to listen carefully and decide whether the sentences sounded alike or different. Subjects were asked to press a red key if they thought the sentences to be different, or a green key if they thought the sentences to be the same. Each trial was activated automatically three seconds after the subject had pressed a response key, but there were no limitations of time to respond and pairs could not be played more than once. They were not asked to identify the different contours or to explain their decision.

The task with the agrammatic subjects was conducted in a quiet room at the *Associació Sant Pau de Trastorns de la Comunicació* in Barcelona. All the experiments with control subjects were conducted at their homes. Prior to the task, the experimenter interviewed all the participants to collect relevant personal information, and afterwards the task was explained. In addition, some trials were presented as examples before running the experiment in order to ensure that the participant had understood the task.

3.2.4 *Results*

The overall correct responses by group appear in Table 4. Agrammatic participants performed correctly in 285 of the 320 trials and, hence, their performance is well above chance. Yet, the control subject's performance was slightly better, as they only erred in 14 out of the 320 trials. In fact, even if the performance of the aphasic group is good, the regression model revealed a statistically significant difference between the performance of the aphasic and that of the control group (χ^2=6.23, p<0.05).

	Count	Mean (%)
CONTROLS	306/320	95.60
APHASICS	285/320	89.10

Table 4: Overall correct responses (aphasic and control subjects)

The individual means of correct performances of control and aphasic participants are represented in Figure 8. Agrammatic subjects all performed in a similar way at an individual level, their answers not showing great variability: between 75% and 100% of correct responses. If we compare each individual

with his/her control, performance is similar, with the difference being fairly pronounced only in the case of subject A1. The results were therefore quite consistent among patients.
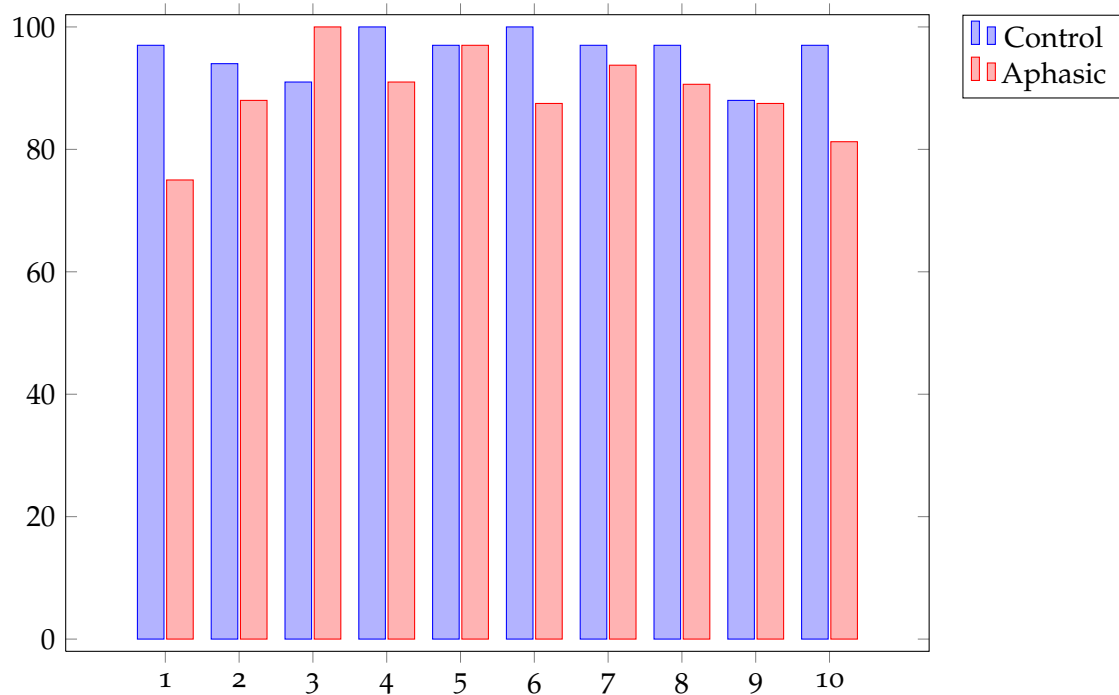
Figure 8: Mean percentages of correct responses by individual (control and aphasic subjects)

The mean correct responses of both groups by condition appear in Table 5. As expected, control subjects performed at ceiling on all conditions, while aphasics' performance was slightly worse but still above chance. Almost all identical sentence pairs were correctly judged as such by the aphasic group. For the dissimilar pairs, the control condition, which includes an interrogative and a declarative sentence, is also correctly identified; the topicalised/focalisation condition is identified as dissimilar both by the aphasic and the control group equally. There are two conditions in which aphasics do not perform as well as the controls: the declarative/topicalisation condition and the focalisation/declarative condition; these are the only two cases in which the difference in performance is statistically significant (χ^2=5.81 and χ^2=5.07, p<0.05, respectively). Nevertheless, aphasic participants reached

very high percentages of responses on these two conditions: means of 82.5% and 70% of correct responses.

		D/I	D/D	F/F	T/T	D/T	T/F	F/D
CONTROLS	count	75/80	40/40	39/40	39/40	38/40	38/40	37/40
	mean (%)	93.75	100.00	97.50	97.50	95.00	95.00	92.50
APHASICS	count	77/80	39/40	37/40	37/40	33/40	34/40	28/40
	mean (%)	96.25	97.50	92.50	92.50	82.50	85.00	70.00

Table 5: Mean correct responses by condition (control and aphasic subjects)

To consider the possibility that the aphasics' results may follow from a yes bias, the answers were computed taking into account whether the answer was "same" or "different": a yes bias would lead us to expect better performance on the "same" items. Table 6 shows absolute numbers and the percentage of correct answers depending on the answer expected. There were no statistically significant differences between "same" and "different" pairs of items.

	DIFFERENT		SAME	
	Items	Mean (%)	Items	Mean (%)
INCORRECT	28/200	14.00	7/120	5.83
CORRECT	172/200	86.00	113/120	94.16

Table 6: Contingency table with correct and incorrect responses for "different" and "same" pairs

The ROC curve plotting correct rejection versus miss is provided in Figure 9. We can conclude that there are no differences in performance between "same" and "different" pairs of items that could account for our results.
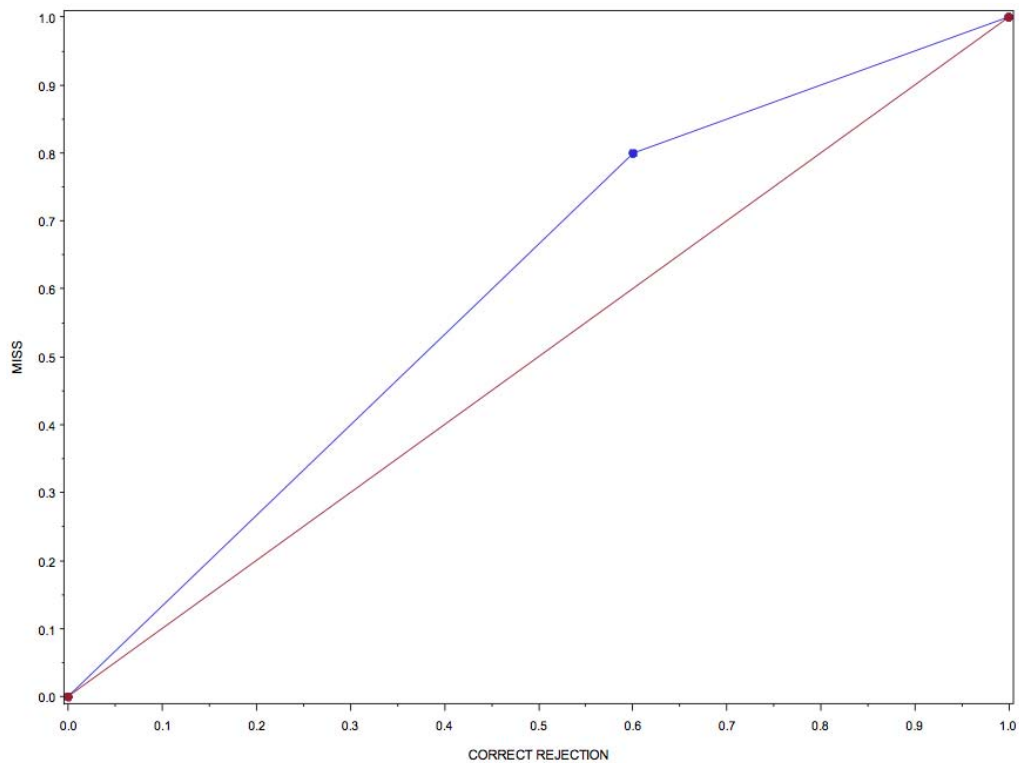
Figure 9: ROC curve for correct rejections and misses for different items

3.3 DISCUSSION

The interpretation of a sentence rests on the identification of a word sequence as well as the identification of an intonational contour. It is on the basis of both that the speaker can build a grammatical representation of the sentence from which the interpretation is drawn. Therefore, the possibility remains that poor comprehension in agrammatism is partially or totally due to misperception of intonational patterns. Here I have examined this possibility through a discrimination task designed to assess the aphasics' phonological competence. Catalan is a language particularly suited to this purpose, as it allows for intonational variation on the same word order. By contrast, this is not the case for previously investigated languages like English or German.

The results show that there were no significant differences in performance between control and aphasic participants in five out of the seven conditions tested. For the two other conditions, there are statistically significant

differences between the two groups, but agrammatic subjects perform well above chance in one of these two conditions. There is the possibility that patients may have been able to perform well in the experiment because of preserved ability to discriminate melodic-musical contours; this cannot be excluded, and behavioural studies of this kind are certainly limited in addressing this issue. Still, the null hypothesis in the field is that the grammatical and processing mechanisms underlying agrammatic performance are the same as those of healthy subjects, unless we have evidence to the contrary; to our knowledge, there is no evidence in this case that Broca's aphasia subjects resort to melodic-musical discrimination to perceive intonation. We conclude that it is justified to assume, as is tacitly the case in the literature, that the perception of intonation is broadly spared in agrammatism.

THE COMPREHENSION OF CONTRASTIVE FOCUS

This chapter focuses on the comprehension of contrastive focus in Catalan agrammatism in order to learn whether Catalan focalisations are problematic for Broca's aphasics, without neglecting any of the syntactic characteristics that contrastive focus involves. The first section provides an in-depth review of previous literature on the crosslinguistic comprehension of focalisations and scrambled structures in agrammatism. In the two remaining sections, I present the results on the interpretation skills of Catalan agrammatic aphasics, which were assessed via two experimental tasks: a truth-value judgement task (4.2) and a sentence-picture matching task (4.3).

4.1 ANTECEDENTS

4.1.1 *Previous studies on the comprehension of focalisation*

During the last decade a few studies on the comprehension of focalisations have been carried out, having found robust results across languages. Friedmann and Shapiro (2003) conducted a sentence-picture matching task with seven Hebrew aphasic speakers, which included ninety sentences (thirty of each type): declaratives (with the basic word order in Hebrew, SVO; see the example in (99 a)), and two types of object focalisations displaying two different noncanonical word orders: OSV (99 b) and OVS (99 c). The authors' syntactic analysis of the tested sentence types is represented below. According to them, both focalisations are equivalent in meaning; the difference lies in the syntactic structure, since OSV structures involve only one movement operation (the object), while OVS involves two movement operations (the object and the verb).

(99) (a) *Ha-rofe$_i$ <...>$_i$ mecayer et ha-xayal ha-ze.*
        D-doctor   draw-3s ACC D-soldier D-this
        "The doctor is drawing this soldier."

     (b) *Et   haxayal$_j$ ha-ze   ha-rofe$_i$ <...>$_i$ mecayer <...>$_j$*
        ACC D-soldier D-this D-doctor   draw-3s
        "THIS SOLDIER, the doctor is drawing."

(c) *Et   haxayal$_j$ ha-ze   mecayer$_v$ ha-rofe$_i$ <...>$_i$ <...>$_v$ <...>$_j$
   ACC D-soldier D-this draw-3s D-doctor
   "THIS SOLDIER, the doctor is drawing."

Results showed that aphasics performed on average above chance on the declarative condition, but at chance on the OSV and OVS focalisations. Individually, all the participants presented the same pattern, except for one patient who reached a 70% on the OSV focus condition. Statistically, the performance of SVO sentences was significantly better than the performance on focalised structures, while no differences were found between the two focalisations conditions. The authors interpreted these results as evidence that syntactic movement interacts with the comprehension deficit in agrammatism, given that aphasics were unable to comprehend movement-derived focalisations. But they went on to claim that the TDH alone fails to explain the above-chance performance on SVO declaratives, given that such sentences also present movement of a DP (the subject),[1] and they proposed a complementary strategy in order to account for the results: the Avoid Movement strategy, according to which aphasics ignore the movement of the subject and leave it in its base position, where it would receive the theta-role directly from the verb. This strategy apparently explains the direct assignment of the agent-role; however, avoiding syntactic movement would violate linguistic principles and might trigger further problems. The fact that no significant differences were found between the two focalisation structures confirmed what had been observed before, that is, that verb movement is spared in Broca's aphasia (Lonzi and Luzzatti, 1993; Grodzinsky and Finkel, 1998) since, according to Friedmann and Shapiro (2003), the only difference between the two focalisation conditions lies in that OVS involves verb movement. In addition, the aphasics' at-chance performance on object focalisations is interpreted as evidence that they are sensitive to case markers. The authors claimed that the expected performance would otherwise have been below-chance. But according to the Avoid Movement strategy, the subject remains in its base position, and the agent role is directly assigned by the verb in both types of focalisation. Hence, only the object would remain in a nonthematic position, which would be also assigned the agent-role by the default strategy. Therefore, the predicted level of performance would also be at chance, independently of the presence of case markers.

---

1 Note that Grodzinsky (2006) had not introduced the theta-bridging mechanism yet. However, the default strategy would suffice to interpret declaratives; here, the problem would rather lie in the assignment of the agent role in object focalisations, since it is needed in order to predict the at-chance performance.

Burchert and colleagues also reported results from two experimental tasks carried out with German-speaking aphasics. In Burchert et al. (2001; 2003), several structures were tested in order to investigate whether aphasic subjects showed sensitivity to morphological cues, namely, case markers and subject-verb number agreement. The second experiment conducted by Burchert et al. (2003) contained –among other sentence types ignored here– ambiguous focalisations that can be interpreted as subject or object sentences (100 a), and two different types of unambiguous object focalisations: either disambiguated by case markers (100 b) or by the number agreement between the subject and the verb (100 c). The truth-conditional task included eleven items of each condition, which were presented twice: once with the matching picture, and once with the reversed role. In the case of ambiguous sentences, participants were expected to accept both interpretations.

(100) (a) *Die   Frau   sucht   das   Kind.*
D-NOM,ACC woman seek-3s D-ACC,NOM child

"It is the woman that is seeking the child." or "It is the woman that the child is seeking."

(b) *Den   Vater   sucht   der   Junge.*
D-NOM father seek-3s D-ACC boy

"It is the father that the boy is seeking."

(c) *Die   Frauen   küsst   das   Kind.*
D-ACC,NOM.p women kiss-3s D-NOM,ACC.s child

"It is the women that the child is kissing."

Seven aphasics participated in the task, along with fourteen control subjects. The results of control and aphasic participants are in Table 7. Control participants performed above chance on all conditions, but tended to reject the object interpretation of ambiguous sentences (100 a). The statistical test revealed that their performance was at chance on this condition; probably due to the fact that the materials in the study were not prosodically marked, which should render the OVS interpretation of such sentences ungrammatical.

	AMBIGUOUS		CASE-MARKED		S-V AGREEMENT	
	SVO	OVS	SVO	OVS	SVO	OVS
CONTROLS	96.4%	62.7%	99.5%	99.1%	99.5%	89.6%
APHASICS	80.6%	68.7%	89.6%	70.1%	99.5%	51.9%

Table 7: Mean percentages of correct responses by condition (Burchert et al., 2003)

Strikingly, aphasics showed an above-chance performance on the OVS-interpretation of ambiguous sentences (though it is slightly worse that their performance in the SVO ambiguous condition). Regarding case-marked focalisations (100 b), aphasic participants performed above chance on the subject and object interpretations; although a statistically significant difference was found between the two conditions. The performance on focalised sentences with mismatch of number (100 c) depended on the interpretation of the sentence: above-chance performance on the SVO interpretation and at-chance performance on the OVS interpretation of focalisations.

A wide variability among subjects was also observed, which is probably due to the heterogeneity of the aphasic group (five Broca's, one global and one mixed transcortical aphasics), and to clinical factors that may vary across patients (such as etiology, lesion site, severity, etc.). The authors considered the individual results in other to test the TDH's predictions and concluded that the majority of individual aphasic performances were not consistent with them, since only three participants showed the pattern of performance predicted by the TDH (above chance on canonical sentences and at chance on noncanonical ones). Yet they also claimed that a canonicity effect was observed in their results if the overall results were taken into consideration (including those on other types of sentences, like relatives and clefts), i.e. canonical sentences were better comprehended than syntactic constructions displaying noncanonical word orders.

As I have already pointed out, the use of prosodically unmarked focalisations might have been problematic in this study. This is evidenced by the at-chance performance of control subjects in the ambiguous condition when matched with the OVS interpretation. Healthy subjects should be expected to accept both the subject and the object interpretations of ambiguous sentences (100 a) in a verification task, if focalisations were actually tested. In the case of stimuli such as those used in this task, in which the syntactic, prosodic and pragmatic properties of focus have been ignored, the object interpretation of such sentences should have been considered ungrammatical and triggered a below-chance performance. The guessing performance on this condition may also indicate further problems with the experimental design (for example, the expected answer was always affirmative). In spite of this, the authors interpreted controls' at-chance performance as evidence that they do not apply an agent-first strategy (Burchert et al., 2003:337):

> In stimuli lacking overt morphology, control subjects do not automatically select a nonmovement derived structure

or use an agent-first strategy. This would have led to below-chance performance on noncanonical versions [...]. The lack of morphological cues to sentence analysis would put them in an asyntactic state without structural means to sentence analysis and therefore overall guessing.

Yet, this interpretation is problematic. On the one hand, it is based on the false presupposition that case markers mediate the assignation of thematic roles[2]; and on the other hand, in the experiment sentences were also ambiguous when matched to the SVO interpretation pictures. If we interpret the controls' above-chance performance in this condition in line with the OVS results' interpretation, it would appear that control subjects did apply the agent-first strategy or selected a "nonmovement derived structure" by default.[3] Hence their justification for the object interpretation of ambiguous sentences is inconsistent with their results on the subject interpretation of these sentences.

Regarding the comprehension of case-marked and S-V agreement sentences, materials also lacked the characteristic intonational contour and pragmatics associated with focalisations; we would therefore expect the OVS word order as given to be ungrammatical as well. The fact that such sentences may be ungrammatical did not prevent healthy speakers from succeeding in the task, due to morphological cues (still, there is no indication that that theta-roles are assigned through case markers). Finally, aphasics as a group showed a better performance on the case-marked OVS condition (mean of 70.1% of correct responses) than in the S-V agreement focalisations (mean of 51.9% of correct responses). It is unclear why aphasics should fail in comprehending OVS sentences with S-V agreement, when they show an above-chance performance of ambiguous sentences. Therefore, due to problems in the experimental design, it is very difficult to draw conclusions from this study.

Later, Burchert et al. (2005b) designed another verification task in order to test the comprehension of prosodically marked focalisations. The task was conducted with four German-speaking aphasics and nineteen control subjects. The four aphasic participants had already shown good comprehension of SVO focalisations and a deficit in comprehension of unambiguous case-marked OVS focalisations (see example (100 b), from Burchert et al., 2003). The materials consisted of forty-four sentences, half of them displaying SVO word

---

2 As seen in Chapter 2, thematic roles are assigned to specific positions in the syntactic tree. In fact, the agent role does not always coincide with the subject position or the nominative-marked DP (for example, in passives).

3 Even though V2 declarative sentences are also derived by movement in German, whose basic word order is SOV.

order (101 a), and the other half involving OVS word order (the object being focalised in this case, as in example (101 b)). All sentences were unambiguous due to case markers.

(101) (a) *Der   Sohn sucht   den   Vater.*
         D-NOM son   seek-3s D-ACC father

         "The son is seeking the father."

     (b) *DEN   VATER sucht   der   Sohn.*
         D-ACC father   seek-3s D-NOM son

         "The FATHER, the son is seeking."

The results showed that control subjects performed individually and on average at ceiling on both conditions. Aphasic participants also performed above chance on the SVO condition (range of correct responses: 16-22 out of 22 items). It is claimed that the four aphasic subjects show an at-chance performance on the focalised OVS condition, although three of them reached a quite high percentage of correct responses (73%, 64% and 86%), while one subject only scored a 50% of correct responses in this condition. The authors claimed that not only the agrammatic comprehension of object focalisations is impaired, but also that aphasic subjects did not benefit from prosodical cues. However, the authors neither reported the quantitative results on the SVO condition nor compared the scores on the comprehension of OVS focalisation to the results on the SVO condition, so it is unclear how these results should be interpreted.

As I have already mentioned in Chapter 1.1.2, there exists one study on the comprehension of Catalan agrammatic aphasics. Gavarró (2005) carried out a truth-value judgement task with two aphasic participants. The experimental task included declaratives (102 a) and ambiguous focalisations (102 b), that is, sentences that can be both interpreted as subject or object focalisations. Hence, participants were expected to answer affirmatively when they were shown pictures representing both interpretations.

(102) (a) *La nena mira   els elefants.*
         D   girl   look at-3s D   elephants

         "The girl is looking at the elephants."

     (b) *LA GIRAFA, persegueix el cavall.*
         D   giraffe   chase-3s   D   horse

         "THE GIRAFFE, the horse is chasing." / "THE GIRAFFE, is chasing the horse."

84

The overall mean percentages of correct responses for all participants are in Table 8: the two aphasic participants accepted the object interpretation of focalised sentences 50% of the time only. Gavarró (2005) claimed that Broca's aphasics presented a deficit in comprehension of Catalan object focalisations, and interpreted the results as contrary to the TDH predictions, since both the object and the subject move in Catalan focalisations and, according to the TDH, the default strategy assigns agent to the left-most DP –the object– and theme to right-most constituent –the subject–. Hence, the agrammatic participants would be expected to perform below chance in object focus. However, the sample is too small to draw any conclusions. Moreover, the experimental design presents one of the problems in Burchert et al. (2003) for ambiguous sentences, that is, that the expected response was always affirmative and materials were therefore unbalanced.

	SVO DECL	SVO FOC	OVS FOC
CONTROLS	100%	100%	100%
APHASICS	100%	83.3%	50%

Table 8: Mean percentages of correct responses by condition (Gavarró, 2005)

In a more recent study, Friedmann et al. (2010) tested the agrammatic comprehension of Russian focalisations by means of a sentence-picture matching task, which consisted of declaratives displaying the basic SVO word order (103 a), and two types of object focalisations displaying OSV ((103 b); in which the authors' analysis is represented) and OVS (103 c) word orders. Three Broca's aphasics and fifteen healthy speakers participated in the study.

(103) (a) *Devochka risuet mal'chika.*
girl-NOM drawing boy-ACC

"The girl is drawing the boy."

(b) *Ehtu zhenshhim$_i$ devochka risuet t$_i$.*
this-ACC woman-ACC girl-NOM drawing

"THIS WOMAN, the girl is drawing."

(c) *Ehtu zhenshhim$_i$ risuet$_v$ devochka t$_v$ t$_i$.*
this-ACC woman-ACC drawing girl-NOM

"THIS WOMAN, the girl is drawing."

The percentages of correct responses for aphasic and control participants are in Table 9. Control participants performed above chance on the three conditions, while aphasics failed in comprehending focalisations. Friedmann et al. (2010) considered these results and the data reported in previous studies (Friedmann and Shapiro, 2003; Burchert et al., 2005a), and discussed them in terms of the TPH, according to which agrammatic aphasics do not have access to the highest nodes in the syntactic tree (see Chapter 2). Given that focalised constituents appear in the left periphery of the clause, the aphasics' comprehension is compromised. The authors also claimed that morphological cues did not help aphasic participants to interpret noncanonical focalisations. As in the previous study with Hebrew-speaking agrammatic aphasics (Friedmann and Shapiro, 2003), Friedmann and colleagues interpreted the aphasics' guessing performance in object focalisations as evidence that patients were sensitive to case markers, otherwise they would predict the performance level to be below chance. However, if the subject is in the lower IP node, under this analysis, aphasic participants should have been able to represent it and interpret it as an agent. Hence the prediction of a below-chance performance on the object focalisation conditions is ruled out.

	SVO DECL	SVO FOCUS	OVS FOCUS
CONTROLS	100%	99.5%	99.5%
APHASICS	76%	54%	58%

Table 9: Mean percentages of correct responses by condition (Friedmann et al., 2010)

Data from a sentence-picture matching task (with four choices) on the comprehension of Serbian and Greek focalisations is reported in Jovanov (2011). The task included two types of object focalisations: either with the focalised object *in situ* (see (104 a) for Serbian and (104 c) for Greek), or with the focalised object displaced to the first position ((104 b) for Serbian and (104 d) for Greek).

(104) (a) *Muŝkarac gleda STARCA.*
man-NOM look-3s man-ACC
"The man is looking at THE OLD WOMAN."

(b) *ŜENU SA ŜALOM ljubi starac.*
woman-ACC with shawl kiss-3s old man-NOM
"THE WOMAN WITH THE SHAWL, the old man is kissing."

(c) *O   adras   kitazi   TON   PAPU.*
   D-NOM man-NOM look-3S D-ACC old man-ACC

   "The man is looking at THE OLD MAN."

(d) *TON   PAPU   kitazi   o   adras.*
   D-ACC old man-ACC look-3S D-NOM man-NOM

   "AT THE OLD MAN, the man is looking."

The two Serbian- and the two Greek-speaking aphasic participants performed poorly on both conditions: 48% and 0% of correct responses on Serbian SVO and OVS focalisations, respectively; and 50% and 37% of correct responses on Greek SVO and OVS focalisations. The aphasic participants, according to the author, never chose the lexical foil, so their errors always consisted of thematic role reversals: hence, aphasic participants constantly interpreted OVS sentences as SVO structures. However, their performance is also very low on SVO sentences, that is, aphasic subjects interpreted them mostly as OVS sentences. This probably indicates further problems with the experimental design (e.g. only four items per condition were tested) since, despite the *in situ* focalisation of the object in such sentences, aphasics should have been able to understand SVO sentences. In fact, the same patients had performed badly on other structures that involved canonical word orders also tested in the same task. The results reported in this study are therefore inconclusive.

4.1.2 *Previous studies on the comprehension of scrambling*

Some languages are argued to have a relatively free word order. This is the case of Asian languages like Japanese or Korean, whose basic word order is SOV, though they allow scrambling of constituents quite productively. Some researchers have investigated the agrammatic comprehension of scrambled sentences across languages. Even though these structures are not always treated as focalisations (or topicalisations) in the literature, they show very similar properties, as they are often motivated by the pragmatics of the sentence. Hence, the studies on the comprehension of scrambling can be of interest here. Hagiwara and Caplan (1990) conducted an experimental task with thirty Japanese-speaking aphasics, which included declarative sentences displaying the basic word order (105 a) and scrambled OSV actives (105 b):

(105) (a) *Taro$_i$-ga <...>$_i$ Hanako-o   osi-ta.*
         Taro-NOM   Hanako-ACC push-PAST
         AGENT   THEME

"Taro pushed Hanako."

(b) *Hanako$_i$-o*   *Taro-ga$_j$ <...>$_j$ <...>$_i$* *osi-ta.*
Hanako-ACC Taro-NOM   push-PAST
THEME   AGENT

"Taro pushed Hanako."

The experimental task also contained subject and object pseudo-clefts
((106 a) and (106 b), respectively, in which the authors' syntactic analysis is
represented). Note that discourse information is sometimes overtly marked in
Japanese (by the morpheme *wa* in the examples), and that focalised items are
displaced to the right edge of the sentence.

(106) (a) *<...>$_i$* *Hanako-o*   *osi-ta-no-wa*   *Taro$_i$-da.*
            Hanako-ACC push-PAST.COMP.FOC Taro-copula
            THEME   AGENT

"It was Hanako who Taro pushed."

(b) *Taro$_i$-ga <...>$_i$ <...>$_j$* *osi-ta-no-wa*   *Hanako-da$_j$.*
Taro-NOM   push-PAST.COMP.FOC Hanako-copula
AGENT   THEME

"It was Taro who pushed Hanako."

Finally, right dislocations were also included; in this type of sentences, the
subject (107 a) or the object (107 b) moves to the right edge of the sentence, the
typical position for focus in Japanese.

(107) (a) *<...>$_i$* *Kuma-ga$_j$* *osi-ta*   *zoo-ga$_i$.*
            bear-ACC push-PAST elephant-NOM
            THEME   AGENT

"The bear pushed the elephant."

(b) *Kuma-ga$_i$ <...>$_i$ <...>$_j$* *osi-ta*   *zoo-o$_j$.*
bear-NOM   push-PAST elephant-ACC
AGENT   THEME

"The bear pushed the elephant."

The brain-damaged participants were not selected on the basis of clinical
criteria like aphasia type, etiology or lesion site, so the results are more
indicative than conclusive. The aphasic subjects performed above chance on
declaratives and subject pseudo-clefts (90% and 72% of correct responses
respectively), but at chance on scrambled actives and object pseudo-clefts (64%
and 65% of correct responses). Regarding dislocations, patients reached quite

high scores of correct responses for both subject and object right dislocations (75% and 72%, respectively). According to the authors, these findings indicated that Japanese-speaking agrammatics tended to assign the theme role to the immediate preverbal NP and that aphasics therefore retained their ability to construct the VP, where the theme role is directly assigned to the object in the preverbal position. They also interpreted the results as indicative of the influence of language-specific properties in the use of heuristics, and not only more general aspects like knowledge of the world as it had been claimed in previous studies (Caramazza and Zurif, 1976); given that aphasic participants showed sensitivity to word order.

In a more recent study, Beretta et al. (2001) reported results from three Korean-speaking agrammatic aphasics, whose comprehension on active and passive scrambled sentences was tested in a sentence-picture matching task. Korean is also an SOV language (see the declarative sentence in (108 a)). The authors argued that word order in Korean is relatively free and allows scrambling of active sentences like example (108 b), where the word order of constituents is not canonical.

(108) (a) *Key-ka$_i$ <...>$_i$ saja-lul   mul-eyo.*
       dog-NOM   lion-ACC bite-COMP
       AGENT   THEME
       "The dog bit the lion."

    (b) *Saja-lul$_j$ key-ka$_i$ <...>$_i$ <...>$_j$ mul-eyo.*
       lion-ACC dog-NOM   bite-COMP
       THEME   AGENT
       "The lion, the dog bit."

Passive sentences also display a noncanonical assignment of thematic roles, as the theme role is assigned to the left-most DP (109 a); however, the *by*-phrase can be moved to the initial position and, then, the resulting superficial word order is the canonical agent-theme-verb (ATV, see (109 b)).

(109) (a) *Kyengcal-i$_i$ kirin-ekey <...>$_i$ cae-i-n-ta.*
       policeman-NOM giraffe-BY   kick-PASS
       THEME   AGENT
       "The policeman is kicked by the giraffe."

    (b) *Kirin-ekey$_i$ kyengcal-i$_j$ <...>$_i$ <...>$_j$ cae-i-n-ta.*
       giraffe-BY   policeman-NOM   kick-PASS
       AGENT   THEME
       "The policeman is kicked by the giraffe."

The individual results by item type (twenty tokens per condition) are presented in Table 10. The three agrammatic participants reached very high percentages of correct responses in SOV declaratives; yet their performance on the other conditions was rather poor.

	DECLARATIVE		PASSIVE	
	SOV	OSV	TAV	ATV
JJP	85%	55%	65%	50%
KTS	80%	55%	55%	50%
KKM	90%	65%	35%	55%

Table 10: Individual correct responses by condition for Korean agrammatic patients in Beretta et al. (2001)

The authors also presented some results from two Spanish-speaking aphasics, whose comprehension on "scrambled" actives and passives is tested. The materials included in the task as scrambled actives, though, are clitic left dislocations, which I consider in Chapter 5, and I will focus here only on the results reported on passives and "scrambled" passives. Spanish passives (110 a), like English ones, present a noncanonical thematic order, given that the subject receives the thematic role theme, and the preposition *by* assigns the agent role to the postverbal NP. The "scrambled" passives (110 b) used in the task, despite the authors' claims,[4] present a highly marked word order in Peninsular Spanish (the dialect of the agrammatic aphasics who participated in the study), as the *by*-phrase can only be fronted if it is focalised. Also, the fact that the subject *la jirafa* appears in a preverbal position renders the sentence doubly marked, as the subject typically stays in the postverbal position when a constituent is moved to an A'-position. Moreover, passives are not as productive in Spanish like in other languages (English, for instance), so sentences like the ones tested in Beretta et al. (2001) can sound unnatural.

(110) (a) *La jirafa$_j$ está   siendo   empujada <...>$_j$ por la mujer.*
      D giraffe   is   being   pushed   by D woman
      THEME   AGENT

      "The giraffe is being pushed by the woman."

---

4 "This word order is highly marked, if not unacceptable, in English, but is fully acceptable in both Spanish and Korean" (p.8).

(b) *Por la mujer*$_i$ *la jirafa*$_j$ *está siendo empujada <...>$_j$ <...>$_i$*
   by D woman D giraffe is being pushed
   AGENT   THEME

   "The giraffe is being pushed by the woman."

The two Spanish aphasic participants showed the typical pattern of performance on declaratives and passives: above chance on active sentences (85% and 80% of correct responses) and at chance performance on passive sentences (60% and 55% of correct responses). The patients' comprehension of focalised passives varies across patients (50% and 80% of correct responses).

The authors interpreted the results from Korean- and Spanish-speaking Broca's aphasics as contrary to linear accounts for the agrammatic comprehension (namely, the Trace-Deletion, the Argument-Linking (Piñango, 2000) and the Mapping Hypotheses). According to the authors, linear accounts erroneously predict that aphasic patients show no problems in comprehending scrambled passives both in Korean and Spanish, as thematic roles appear in a canonical word order (agent-theme-verb). However, the Korean and Spanish aphasic participants performed at chance on this type of sentences. Hence, Beretta and colleagues claimed that their findings only favoured nonlinear accounts, more specifically, the Double-Dependency Hypothesis (Mauner et al., 1993), that predicts that aphasics have difficulties in understanding sentences with more than one movement operation due to a processing deficit. However, this interpretation is inaccurate, given that sentences that are well comprehended (actives) also involve more than one movement operation, at least in Spanish, where all the constituents are hypothesised to move from their base positions (including objects). Furthermore, the TDH would predict the guessing performance found, as the *by*-phrase is assigned agent grammatically and the default strategy assigns the agent role to the leftmost constituent in a nonthematic position:

(111) *Por la mujer*$_i$ *la jirafa*$_j$ *está siendo empujada <...>$_j$ <...>$_i$*
     AGENT   agent

     "The giraffe is being pushed by the woman."

More importantly, Beretta et al. (2001) provided further evidence that linearity alone –that is, the superficial word order– did not suffice to account for the comprehension deficit observed in the study, and they interpreted this fact as indicative of their retained knowledge of some syntactic processes.

To sum up, previous studies have shown that the comprehension of object focalisations is impaired in Broca's aphasia.

The first experimental task designed to assess the comprehension of focalisations in Catalan agrammatism was a truth-value judgement task similar to the experiments carried out by Burchert et al. (2001; 2003) and Gavarró (2005), in which participants were asked to judge the veracity of focalised sentences with respect to pictures representing scenes.

4.2.1 *Participants*

The task was carried out with five agrammatic participants and five education- and age-matched control participants, all of them native speakers of Catalan (and bilingual speakers of Spanish). The aphasic subjects were selected from the patient pool of the *Associació Sant Pau de Trastorns de la Comunicació* in Barcelona. They were all diagnosed via the Catalan or Spanish version of the Western Aphasia Battery (Kertesz, 1982; Kertesz et al., 1990). None of the participants had a history of drug abuse, hospitalisation for psychiatric disorders, speech/language disorders or learning disabilities before the stroke. Only one patient, A4, was left-handed. None of the participants suffered from articulatory impairment. A speech therapist determined the severity of the impairment. The individual characteristics of aphasic participants are specified in Table 11, and the characteristics of control subjects in Table 12.

APHASIC SUBJECT	AGE	EDUCATION	LESION SITE	ETIOLOGY	TPO (YEARS)	APHASIA	SEVERITY
A1	68	3	LMCA	CVA	1	Motor	1
A2	39	2	LFT	HCVA	13	Motor	2
A3	70	3	LMCA	ICVA	15	Motor	2
A4	55	3	LMCA	ICVA	6	Motor	2
A5	57	1	LMCA	CVA	6	Motor	3

Education: 1, basic; 2, secondary; 3, higher; Lesion site: L, left; FT, frontotemporal area; MCA, medial cerebral artery; Etiology: H, hemorrhagic; I, ischemic; CVA, cerebrovascular accident; TPO, time post onset; Severity: 1, mild; 2, moderate; 3, severe.

Table 11: Aphasic subjects' individual characteristics

CONTROL SUBJECT	AGE	EDUCATION	APHASIC MATCHED
C1	66	University	A1
C2	42	Secondary	A2
C3	71	University	A3
C4	55	University	A4
C5	55	Primary	A5

Table 12: Control subjects' characteristics

4.2.2 *Methods*

4.2.2.1 *Materials*

The experimental design consisted of a total of fifty items: ten declaratives (112 a), twenty subject focalisations (112 b) and twenty object focalisations (112 c).

(112) (a) *Els nens dibuixen a la mare.*
D child-mp draw-3P ACC+D mother-fs

"The children are drawing the mother."

(b) *ELS NENS, dibuixen a la mare.*
D children draw ACC+D mother

"THE CHILDREN are drawing the mother."

(c) *A LA MARE, dibuixen els nens.*
ACC+D mother draw D children

"THE MOTHER, the children are drawing."

Note that objects are preceded by the colloquial accusative marker (preposition *a*). The use of the accusative marker with animate objects (differential object marking: DOM, hereafter) is extended in colloquial Catalan (Hualde, 1992; Aissen, 2003), though it is not normative (Fabra, 1918; Badia, 1994). When the object is displaced to the left periphery, the use of the accusative marker is standard for interpretative reasons (Solà, 1994). But the DOM is not crucial in interpreting the items included in the experiment: the verb agrees in number with the subject, and all the items involved mismatch of number between subjects and objects to avoid ambiguity. Moreover, in Central Catalan, the

masculine determiner preceded by the object marker (*al*) is pronounced the same as the masculine determiner alone (*el*); so, the marker is only noticed when it precedes a feminine determiner (*a la*).

In addition, all the items were contextualised in order to make the contrastive focus contour sound natural. Each trial consisted of a brief conversation between two speakers, the first one uttering a sentence with wrong information involving a third character, and a second speaker correcting the first one. See two examples in (113 a) and (113 b) for the situations depicted in Figure 11, in which the three characters mentioned in the conversation are displayed. The target answer would be true or false, respectively.

(113) (a) *A: Les nenes   pentinen   a la mare.*
　　　　　　　AGENT　　　　　　　THEME

　　　　"The girls are combing the grandmother."

　　　　B: No.   A L'ÀVIA,   pentinen   les nenes.
　　　　　　　　THEME　　　　　　AGENT

　　　　"No. THE GRANDMOTHER, the girls are combing."

　　(b) *A: Els nens   truquen   a l'àvia.*
　　　　　　　AGENT　　　　　THEME

　　　　"The children are calling the grandmother."

　　　　B: No.   ELS PARES,   truquen   a l'àvia.
　　　　　　　AGENT　　　　　　　　THEME

　　　　"No. THE PARENTS, are calling the grandmother."

(a)　　　　　　　　　　　　　　　　(b)

Figure 10: Examples of the pictures presented in Experiment 2

94

The presence of a third character was needed in order to make the items consistent with the pragmatics of contrastive focus. Contrastive focus consists of a correction of a presupposed belief. In the present experimental task, the presupposed belief involves the third character included to prevent the use of contrastive focus from sounding awkward. Although most studies in agrammatic literature neglect the pragmatics in the experimental design, here the presupposed belief that justifies the use of a contrastive focus is present in the materials.

Besides the contrastive focus, the sentences were very simple and short, and always displayed a DP-V-DP order. All the verbs and nouns in the task were very common in Catalan. The list of items can be seen in Appendix A.2 (each participant started the task from a different item in the list).

4.2.2.2 *Procedure*

Prior to the task, all the participants were interviewed to collect relevant personal information, and afterwards the task was explained. Before running the experiment, some trials were presented as examples in order to make sure that the task was understood. All the materials were recorded in order to preserve the characteristic intonational pattern associated with contrastive focus (described in Chapter 3.2.3).

The participants were asked to listen carefully to sentences and decide whether they correctly described the picture on the screen. Hence, participants were expected to answer true whenever the sentence correctly described the depicted situation, and false if the sentence described a situation different from the one shown in the picture (reversed role). The experiment was run on a laptop and conducted in a quiet room with loudspeakers. The trials were presented in a pseudorandom order and participants could ask for an item to be played more than once. There was no limitation of time to complete the task. Agent characters were placed on the left and right in order to control any bias resulting from picture paralleling the order of mention of subjects and objects.

4.2.3 *Results*

The overall correct responses for all participants appear in Table 13. The odds ratio from the logistic regression model revealed that there was a significant difference between the performance of control and aphasic participants (OR=8.33, CI (3.52, 19.78). This can also be observed comparing the estimated

means of correct responses, which is higher for controls than for aphasics: 0.96, CI (92.20, 98.14) and 0.75, CI (66.17, 82.15), respectively.

	Count	Mean (%)
CONTROLS	239/250	95.67
APHASICS	160/250	68.33

Table 13: Overall correct responses (control and aphasic subjects)

However, if we examine the results by item type, the aphasics' performance only differed from the controls' performance in the object focus condition. As shown in Table 14, control participants performed at ceiling on all conditions, while the aphasics' performance was only good on the declarative and subject focus conditions (90% of correct responses in both conditions) and, in fact, there were no statistically significant differences between the two groups' performances in these two conditions. However, the aphasic performance on the object focus condition dropped to a 25% of correct responses. The estimated mean of correct responses for the object focalisation condition was much lower for aphasics than controls (0.25, CI (0.17, 0.35) versus 0.93, CI (0.86, 0.97)), which indicates that there was a significant difference between controls and aphasics in the referred condition (also confirmed by the odds ratio test: OR=39.86, CI (9.76,162.69)).

	SVO DECLARATIVE		SVO FOCUS		OVS FOCUS	
	Count	Mean (%)	Count	Mean (%)	Count	Mean (%)
CONTROLS	48/50	96.00	98/100	98.00	93/100	93.00
APHASICS	45/50	90.00	90/100	90.00	25/100	25.00

Table 14: Mean correct responses by condition (control and aphasic subjects)

The aphasics' individual results were quite consistent on the declarative and subject focus conditions (see Figure 11): all the aphasic participants performed above chance on declaratives and, regarding the subject focus condition, there was only one participant whose rate was lower than that of other subjects, A6, whose mean of correct responses reached a mean of 65%. However, performance varied considerably across individuals on the object

focus condition: participants A1, A2 and A3 performed very poorly (less than 5 correct answers), while A4 and A5 answered correctly in 9 and 10 items, respectively.
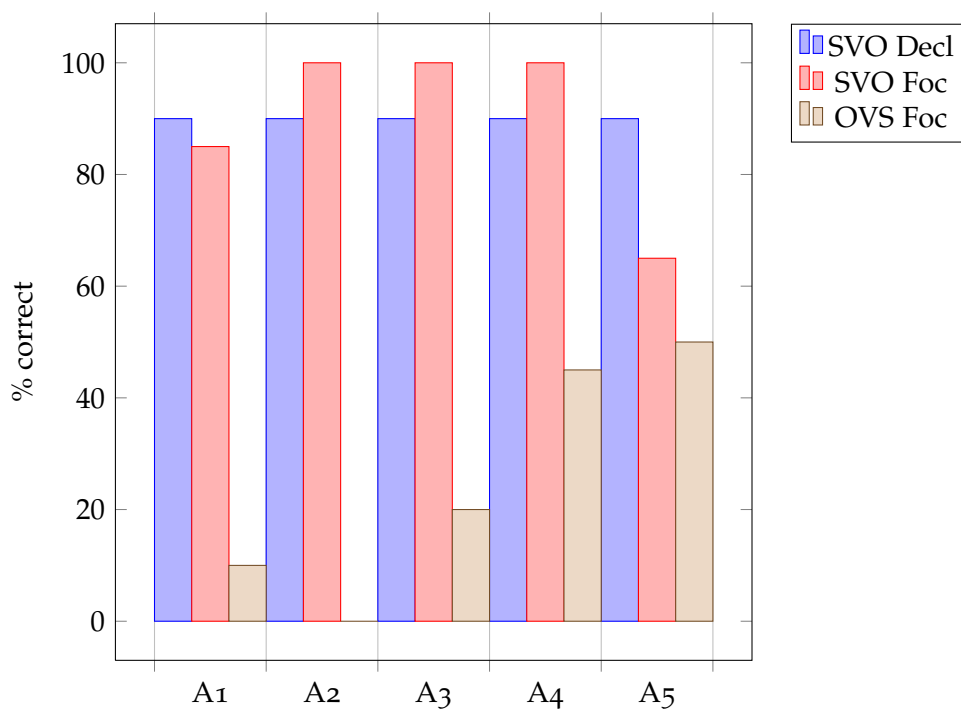
Figure 11: Individual correct responses by condition (aphasic subjects)

The mean percentages of correct responses by level of severity and item type are shown in Table 15, where the number of aphasic patients of each condition is specified in parentheses.

	SVO DECL	SVO FOC	OVS FOC
MILD (1)	90.00%	85.00%	10.00%
MODERATE (3)	90.00%	100.00%	21.67%
SEVERE (1)	90.00%	65.00%	50.00%

Table 15: Mean percentages of correct responses by severity and condition (aphasic subjects)

Mild and moderate aphasics replicated the pattern of response described above: good comprehension of declaratives and subject focalisations, but poor comprehension of object focalisations. However, the only patient suffering from a severe aphasia performed at chance on both focalisations conditions; and his performance on SVO focalisations is still better than on their OVS counterparts.

Thus, in spite of the intersubject variability, we can still observe general patterns of response across subjects (Figure 12): patients performed above chance on declaratives and subject focalisations, and below chance on object focalisations (mean estimate: 0.25, CI (0.17, 0.35)). An odds ratio was computed in order to find out whether there are statistical significant differences among sentence types within the aphasic group, and it revealed that there were differences between object and subject focus conditions (OR=0.04, CI (0.01, 0.11)), and between the object focus and declarative items (OR=0.04, CI (0.01, 0.15)).
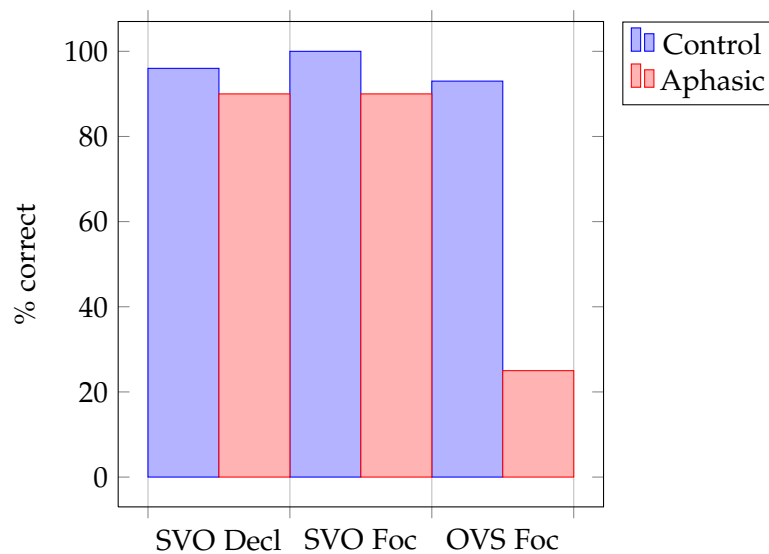
Figure 12: Mean percentages of correct responses by condition (aphasic and control subjects)

The analysis of correct and incorrect responses indicated that false items were slightly more complicated than the true ones. Such an effect can be observed by looking at the error distribution of aphasics' responses by item type (Figure 13): the aphasic participants' errors in the object focus condition particularly concern more false items (41 misses out of 50 tokens) than true

items (34 false alarms out of 50 tokens). In the other two conditions, the number of mistakes was lower, but the same effect is observed: out of a total of 25 false declaratives, aphasics erred 5 times, while they performed at ceiling on the other 25 declaratives matched to target pictures. Regarding subject focalisations, the number of correct responses for true items (hits) was 49 out of 50 tokens; the correct response for false items was also very high (41 correct rejections out of 50 tokens). This reflects the fact that false items presented greater difficulty than true items. However, this does not imply that the deficit in comprehension observed is due to the experimental design alone. On the one hand, aphasic participants also showed poor performance on object focalisations when matched to the target picture and, on the other, the high performance on both declarative and subject focus conditions indicate that the deficit is structure-dependent.
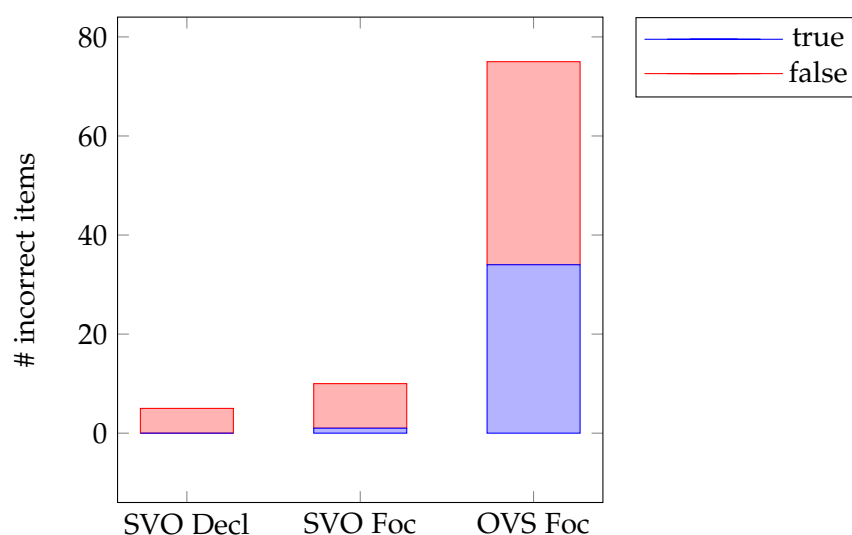
Figure 13: Error distribution by truth or falsity of items (aphasic subjects)

The individual estimated proportions of correct responses were compared with a random pattern of response in order to learn whether aphasics' performances could be at chance. A standard goodness of fit (GOF) test was used for this purpose. The p-values for the three conditions are represented in Figure 14: p-values lower than 0.05 –marked with a line in the graph– indicate that the null hypothesis that the aphasics' performance presents a random distribution is to be ruled out. The test revealed that the guessing performance can be ruled out for all patients through the three

conditions, except for the performance of subjects A4 on OVS focalisations, and A5 on SVO and OVS focalisations. Hence, the GOF test corroborates what has already been said: that is, that aphasics performed above chance on declaratives and subject topicalisations, and concerning the performance on object focalisations, three patients showed at-chance performance, whereas the other two performed below chance.
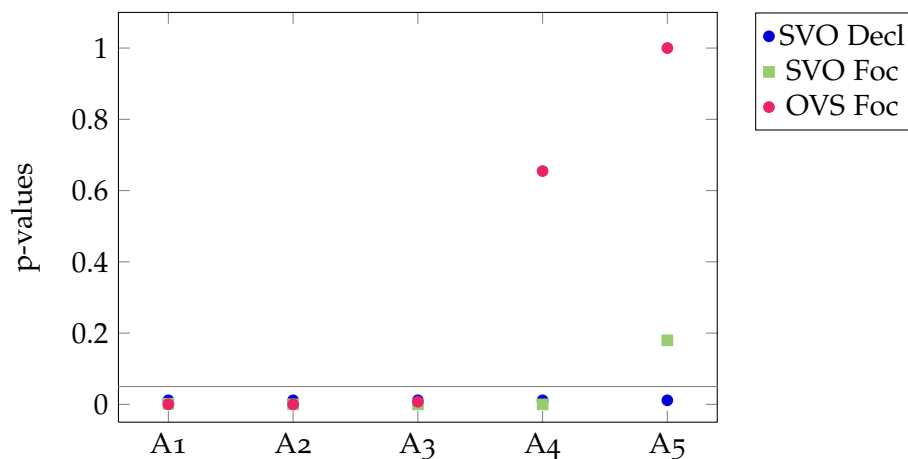
Figure 14: Individual p-values by condition from the standard goodness of fit test (aphasic subjects)

4.3 EXPERIMENT 3: OVS AND OSV FOCALISATION

The second experiment on the comprehension of contrastive focus in Catalan was a sentence-picture matching task: unlike in the previous experimental task, participants were forced to choose between two pictures depicting either the target interpretation of the sentence or its role reversal. Moreover, this task included two types of object focalisations displaying different word orders (OVS and OSV), in order to see whether the results in previous studies (Friedmann and Shapiro, 2003; Friedmann et al., 2010) were replicated.

4.3.1 *Participants*

Seven aphasic individuals participated in the task. The patients were selected from the patient pool of the *Associació Sant Pau de Trastorns de la Comunicació* (Barcelona), and they were diagnosed via the Catalan and Spanish version of Western Aphasia Battery (Kertesz, 1982; Kertesz et al., 1990). All the

participants were native speakers of Catalan, and none of them had a history of drug abuse, hospitalisation for psychiatric disorders, speech/language disorders or learning disabilities before the stroke. They were all right-handed. Details of age, education, etiology, time post onset of their condition and the clinical diagnosis appear in Table 16. In addition, the task was conducted with seven age- and education-matched control participants, whose characteristics are detailed in Table 17.

APHASIC SUBJECT	AGE	EDUCATION	LESION SITE	ETIOLOGY	TPO (years)	APHASIA	SEVERITY
A1	70	3	LMCA	CVA	3	Motor	1
A2	41	2	LFT	HCVA	15	Motor	2
A3	72	3	LMCA	ICVA	14	Motor	1
A4	80	1	MCA	ICVA	17	Global	3
A5	72	3	LMCA	ICVA	17	Motor	2
A6	38	2	FT	HCVA	9	Motor	2
A7	61	2	FT	HCVA	15	Motor	2

Education: 1, basic; 2, secondary; 3, higher; Lesion site: L, left; FT, frontotemporal area; MCA, medial cerebral artery; Etiology: H, hemorrhagic; I, ischemic; CVA, cerebrovascular accident; TPO, time post onset; Severity: 1, mild; 2, moderate; 3, severe.

Table 16: Aphasic subjects' individual characteristics

CONTROL SUBJECT	AGE	EDUCATION	APHASIC MATCHED
C1	66	University	A1
C2	42	Secondary	A2
C3	67	University	A3
C4	82	Primary	A4
C5	71	University	A5
C6	40	Secondary	A6
C7	59	Secondary	A7

Table 17: Control subjects' characteristics

4.3.2.1 *Materials*

The experimental design consisted of four conditions with fourteen items each. The materials included declaratives and subject focalisations ((114 a) and (114 b), respectively) as control items, and two types of object focalisations: OSV (114 c) and OVS (114 d) focalised sentences.

(114) (a) *El   policia   va   mullar   a   les*
D-ms policeman-ms AUX-PAST.3S wet-INF ACC+D-fp soldier-fp
soldats.

"The policeman wetted the soldiers."

(b) *EL POLICIA, va   mullar a   les   soldats.*
D policeman AUX wet   ACC+D soldiers

"THE POLICEMAN wetted the soldiers."

(c) *A   LES   SOLDATS, el   policia va   mullar.*
ACC+D soldiers D   policeman AUX wet

"THE SOLDIERS, the policeman wetted."

(d) *A   LES   SOLDATS, va   mullar el   policia.*
ACC+D soldier AUX   wet D   policeman

""THE SOLDIERS, the policeman wetted."

Like in the previous task, all the items presented mismatch of number between the subject and the object in order to avoid ambiguity, as well as the colloquial accusative marker (the preposition *a*) through all sentence types. Note that this marker is only noticed when precedes a feminine article as both the masculine article with (*al*) and without (*el*) case marker are pronounced the same.

Sentences were simple and short, and all the nouns and verbs used are very common in Catalan. The complete list of tested trials appears in Appendix A.3; note that each participant started the task from a different item. Unlike in the previous experimental task, not all items presented the same DP-V-DP order; for instance, object focalisations with preverbal subjects display a DP-DP-V order (114 c). These items are not as productive as object focalisations with postverbal subjects (114 d), though they are not ungrammatical. However, they present a higher marked word order than OVS focalisations, given that the subject in the preverbal position is probably in a topicalised position. OSV focalisations were included in order to test further word order combinations

in Catalan and to be able to compare my results with those reported in the previous literature.

4.3.2.2 *Procedure*

The experimental task was conducted in a quiet room with loudspeakers in the *Associació Sant Pau de Trastorns de la Comunicació* (Barcelona) with agrammatic aphasics, and at their homes with control participants. Before starting with the experiment, the participants were explained the task, and some trials were presented as examples in order to ensure that it was comprehended. The trials were presented in a pseudorandom order, and they could be played more than once. There were no limitations of time to complete the task.

Since the experimental task was a sentence-picture matching task, participants were shown two pictures (see Figure 15) and were asked to listen carefully to a sentence and point to the picture that matched it. The materials were prerecorded in a studio in order to preserve the characteristic intonational contour associated with contrastive focus; and the pictures were shown on paper. Agent characters were placed both on the left and on the right to control for any bias resulting from picture paralleling the order of mention of subjects and objects.

The items were also contextualised to justify the use of a contrastive focus: a female speaker described the picture incorrectly, and a male speaker corrected her. The first speaker's error always involved a lexical foil, as it has been shown that this type of foil is not problematic for agrammatic aphasics (Caramazza and Zurif, 1976). See an example of an object focalisations with a postverbal subject in (115) for the token in Figure 15, in which the three characters mentioned in the conversation are displayed. The participants were expected to point to picture 15b.

(115) *A: La nena   va banyar   als infermers.*
            AGENT   THEME

     "The girl bathed the nurses."

    B: No. ALS PALLASSOS,   va banyar   la nena.
            THEME   AGENT

    "No. THE CLOWNS, the girl bathed."

(a)   (b)

Figure 15: Examples of the pictures presented in the sentence-picture matching task

4.3.3 *Results*

The aphasic participants performed well on average (see Table 18), though significantly worse than control subjects: the estimated mean of correct responses is higher for controls than for aphasics (0.97, CI (0.95, 0.99) vs 0.78, CI (0.68, 0.87)). This is also corroborated by the odds ratio from the logistic regression model (OR=12.96, CI (4.44, 37.82)).

	Count	Mean (%)
Controls	382/392	97.45
Aphasics	280/392	71.43

Table 18: Overall correct responses (control and aphasic subjects)

The results by condition for both aphasic and control participants appear in Table 19 and Figure 16. The control subjects performed at ceiling on all conditions, whereas the aphasic individuals only reached a high percentage of correct responses in the declarative and subject focalisation conditions. There are no statistical significant differences between groups in these two conditions, as the odds ratio reveals (OR=5.22, CI (0.54, 50.33) for declaratives and OR=2.38, CI (0.59, 9.47) for subject focalisations). However, the aphasics' performance on object focalisations is much lower: 48.98% and 51.02% of correct responses for OSV and OVS focalised sentences. The statistical analysis indicated that the control and aphasic performances differed significantly in

both conditions (OR=101.04, CI (12.16, 839.95) for object focalisations with preverbal subjects and OR=22.56, CI (6.38, 79.80) for object focalisations with postverbal subjects).

	SVO DECLARATIVE		SVO FOCUS		OSV FOCUS		OVS FOCUS	
	Count	Mean (%)	Count	Mean (%)	Count	Mean (%)	Count	Mean (%)
CONTROLS	97/98	98.98	94/98	95.92	97/98	98.98	94/98	95.92
APHASICS	93/98	94.90	89/98	90.82	48/98	48.98	50/98	51.02

Table 19: Mean correct responses by condition (control and aphasic subjects)
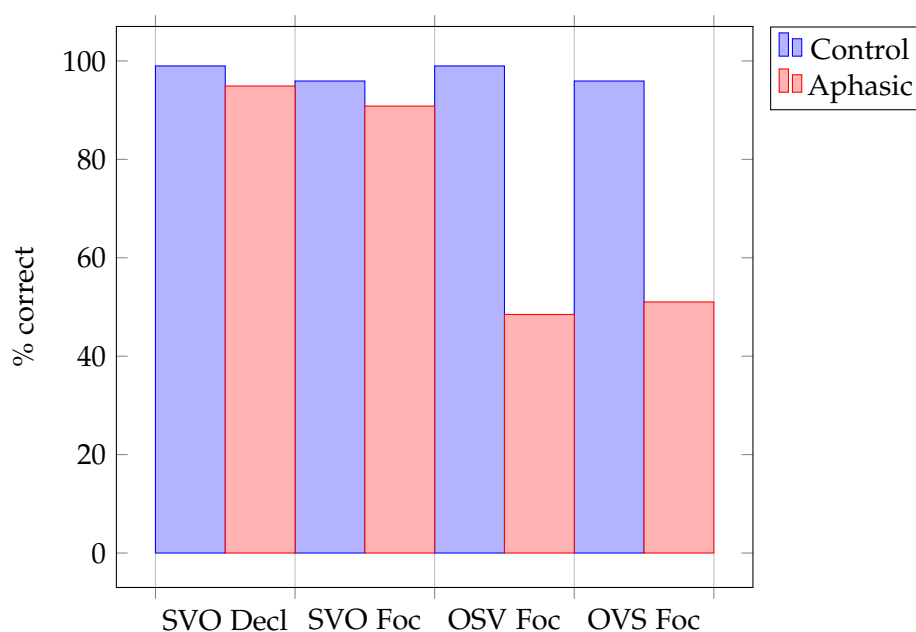
Figure 16: Mean percentages of correct responses by condition (aphasic and control subjects)

Concerning the aphasics' responses by sentence type (see Figure 16), the statistical analysis revealed that the difference in performance between the OVS and OSV focus conditions was not significant (OR = 1.09, CI (0.52,2.27)), and neither was the difference between declaratives and subject focalisations (OR = 1.88, CI (0.43,8.31)). On the other hand, the aphasics' performance on the two object focalisations differed significantly from the declarative and subject focalisation conditions, as the odds ratio indicated: OR = 17.86, CI (4.91,64.96)

for declaratives vs OVS focus, OR = 19.38, CI (5.33,79.48) for declaratives vs OSV focus, OR = 9.49, CI (3.36,26.86) for subject focus vs OVS focus, and OR = 10.30, CI (3.64,29.15) for subject focus vs OSV focus.

The individual results for aphasic participants are shown in Figure 17. The pattern of response described above is reproduced individually, except for patient A1, who showed an almost normal performance on all conditions. The other six patients performed above chance on declaratives and subject focalisations, but their performance dropped noticeably on the object focus conditions. However, the aphasics' performance on these two conditions varied considerably across subjects (from 7.14 to 64.29% of correct responses for OSV focalisations, and from 14.20 to 78.57% of correct responses for OVS focalisations). In fact, two out of the seven aphasic individuals –A1, as already mentioned, and A6– reached quite high percentages of correct responses in object focalisations with postverbal subjects (means of 85.71% and 78.57% of correct responses, respectively); whereas only one patient, A1, performed above chance in object focalisations with preverbal subjects (mean of 92.86% of correct responses).
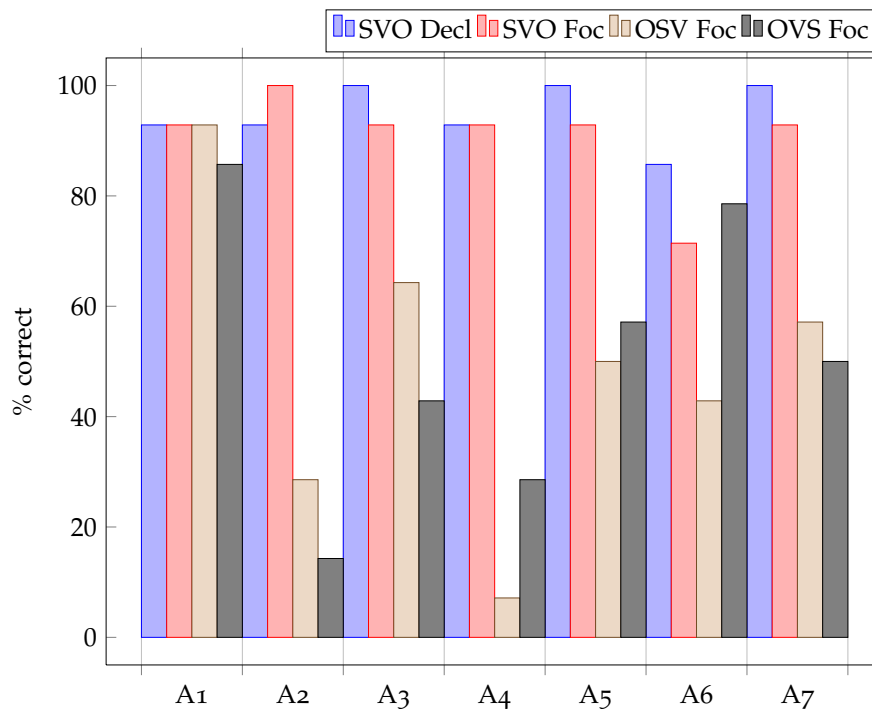
Figure 17: Individual correct responses by condition (aphasic subjects)

The results by condition and level of severity (see Table 20) also reflect the individual variability: on the one hand, the only aphasic patient suffering from a severe aphasia performed very poorly on both object focalisation conditions and, on the other hand, moderate aphasics showed an at-chance performance in the same items. The results of mild aphasics, which correspond to subjects A1 and A3, differed considerably: on average, their performance on OSV focalisations is quite high in comparison with their at-chance performance on the OVS condition. Yet patient A1 performed well above chance on all conditions, and subject A3's performance was above chance on SVO conditions and at chance on both focalisations conditions. The general patterns of response are therefore observed through different levels of severity as well.

	SVO DECL	SVO FOC	OSV FOC	OVS FOC
MILD (2)	96.34%	92.86%	78.57%	64.29%
MODERATE (4)	94.65%	89.29%	44.64%	50.00%
SEVERE (1)	92.86%	92.86%	7.14%	28.57%

Table 20: Mean percentages of correct responses by severity and item type (aphasic subjects)

In Figure 18, the overall estimated means of correct responses and their corresponding confidence intervals by condition are represented. As can be observed, the intersubject variability mainly concerned the sentence types that have been shown to be problematic for aphasic patients, i.e. object focalisations. And despite the fact that performance varied across subjects, they showed a clear pattern of response that most of them reproduced individually: the performance on declaratives and subject focalisations was above chance (0.95, CI (0.87,0.98) and 0.90, CI (0.81,0.96), respectively), whereas the performance on OSV and OVS focalisations was at chance (0.51, CI (0.36,0.66) and 0.48, CI (0.34,0.64)).
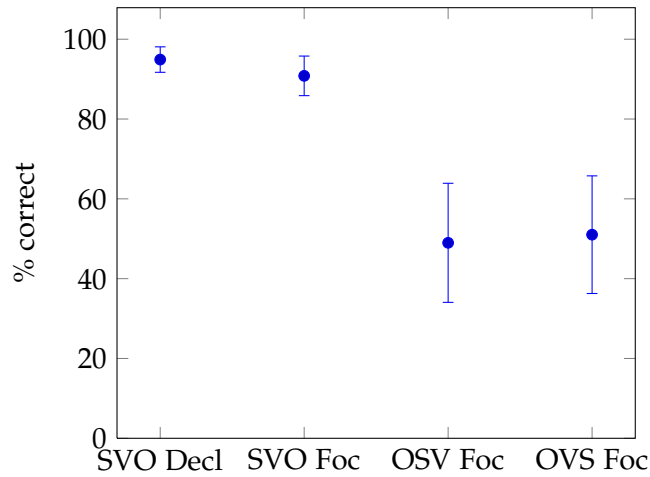
Figure 18: Estimated means of correct responses by condition (aphasic subjects)

A standard goodness of fit test was in fact carried out to learn whether the distribution of aphasics' responses was at chance or not. As the p-values represented in Figure 19 indicate, the null hypothesis that their performances on object focalisations is at chance cannot be ruled out for most patients. The only exceptions are, on the one hand, patient A1, who performed at ceiling on all conditions and, on the other hand, patient A4, whose performance on OSV focalisations was below chance, and patients A2 and A6, who performed below and above chance respectively on OVS focalisations.
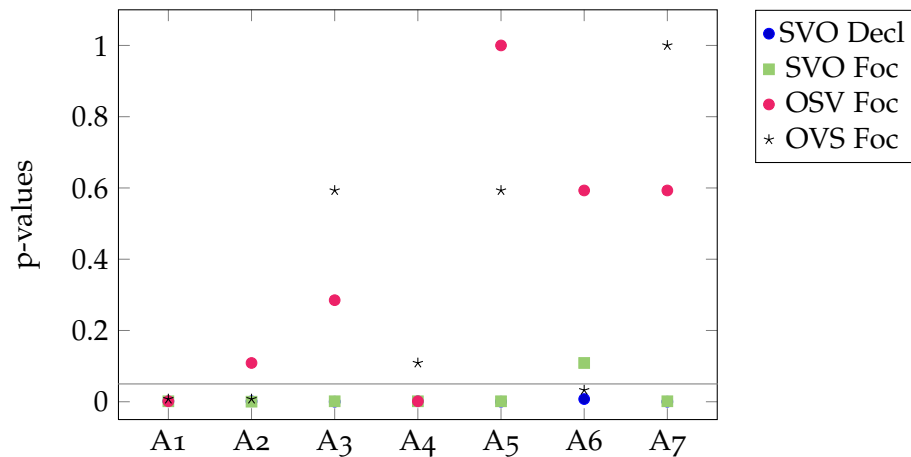
Figure 19: Individual p-values by condition from the standard goodness of fit test (aphasic subjects)

In this chapter, the literature relating to the understanding of focalisations and scrambled structures has been considered. In fact, previous studies have shown that the interpretation of movement-derived sentences is compromised in agrammatic aphasia. Here, I have reported the results from two experimental tasks on the comprehension of Catalan contrastive focus. For instance, the sentence-picture matching task was partly conceived in replication to Friedmann and colleagues' experimental work with Hebrew- and Russian-speaking aphasics (Friedmann and Shapiro, 2003; Friedmann et al., 2010), given that OSV focalisations were included, despite the fact that subjects more often appear in the postverbal position in Catalan object focalisations.

Aphasic participants understood OSV and OVS focalisations poorly, while their performance was above chance on declaratives and subject focalisations, in line with previous experimental work. There were no significant differences between the aphasics' performances on the two types of object focalisations in the sentence-picture matching task; yet their performance level varied across tasks, as patients showed an overall below-chance performance on the truth-value judgement task, but at-chance performance on the sentence-picture matching task. The analysis of the error distribution in aphasic responses revealed that the deterioration in performance was probably due to the fact that false items supposed an extra burden. These results are further discussed in Chapter 6.

5

THE COMPREHENSION OF CLITIC LEFT DISLOCATION AND CLITICS

The first section of this chapter is devoted to the discussion of previous literature on the comprehension of clitic left dislocation and clitics; whereas in the following sections, I report results from three experimental tasks on the agrammatic comprehension of clitic left dislocations and clitics in Catalan. In addition to a verification task (5.2) and a sentence-picture matching task (5.3) that replicate the experiments on contrastive focus described in the previous chapter, I have also carried out a sentence-picture matching task (5.4) including clitic left dislocations where the displaced element is the indirect object. The two sentence-picture matching tasks also includes simple sentences with direct and indirect object clitics.

5.1 ANTECEDENTS

5.1.1 *Previous studies on the comprehension of clitic left dislocation*

Clitic left dislocation is a quite productive syntactic construction in Catalan, which has properties similar to those of contrastive focus, but it is characterised by the presence of a resumptive clitic. Because this type of structure is characteristic of only certain languages such as Romance languages or Greek, there is very little experimental evidence on the comprehension of clitic left dislocation in Broca's aphasia. Beretta et al. (2001) conducted a sentence-picture matching task with two Spanish-speaking individuals diagnosed with Broca's aphasia. The experimental task contained, among other sentence types, twenty SVO declaratives (116 a), twenty OSV clitic left dislocations (116 b) and twenty SVO active sentences with clitics (116 c), in fact cases of clitic right dislocation (CLRD; Bartra, 1985; Benincà et al., 1988; Vallduví, 1990)). The syntactic analysis assumed in Beretta et al. (2001) is represented in the examples below.

(116) (a) *La mujer$_i$ t$_i$ está empujando a   la jirafa.*
           D woman AUX pushing   to-ACC D giraffe

   "The woman is pushing the giraffe."

(b) *A la jirafa$_i$, la mujer$_j$ t$_j$ la$_i$ está empujando t$_i$.*
To-ACC D giraffe D woman CL AUX pushing

"The giraffe, the woman is pushing her."

(c) *La mujer$_i$ t$_i$ la$_j$ está empujando a la jirafa$_j$.*
D woman CL AUX pushing to-ACC D giraffe

"The woman is pushing the giraffe."

CLLD in Spanish behaves like in Catalan: the object moves to the left periphery and a resumptive clitic –in agreement in number, gender and case with the dislocated constituent– occurs in the preverbal position. Despite the fact that subjects in Spanish CLLD usually appear in the postverbal position (Suñer, 1994; Ordóñez, 1998), the authors chose to test dislocations with preverbal subjects. OVS dislocations would have sounded much more natural, especially considering the fact that the items were presented to participants without any context.

The individual correct responses by condition are shown in Table 21. The two patients showed the same pattern of response in the declarative and CLRD conditions, which were well comprehended on average (mean correct percentage of 75% and 85%, respectively). Thus, there were no differences between the two conditions, regardless of the fact that CLRD involves a dislocation to the right periphery and a resumptive clitic. On the other hand, their performance on CLLD was not as consistent, given that one aphasic speaker reached a 75% of correct responses, whereas the performance of the second patient was very poor (35% of correct responses). The authors interpreted the results in relation to current syntactic theories on Romance clitic left dislocation: according to the authors, the average at-chance performance showed by the two Spanish-speaking participants favours linguistic theories under which a derivational approach of clitic left dislocation is proposed (as represented in the examples above); otherwise, clitic left dislocation would be predicted to be unimpaired.

	DECL	CLLD	CLRD
FER	70%	75%	80%
FCO	80%	35%	90%

Table 21: Individual aphasic correct percentages of responses by condition in Beretta et al. (2001)

Considering that the overall performance is at chance on the CLLD condition, Beretta et al. (2001) concluded that their results are not consistent with the TDH: according to the authors, if both the object and the subject move from their base positions, the default strategy assigns to them agent and theme respectively. If that had been the case, a below-chance performance would be expected instead. However, the posterior postulation of the theta-bridging mechanism was meant to accommodate compromising data such as the results reported by Beretta et al. (2001): the at-chance performance is predicted by the TDH if, besides the agent role that the default strategy assigns to the first moved DP (the object, in this case), an agent role is assigned to the subject via theta-bridging (Grodzinsky, 2006):

(117) *A la jirafa$_i$, la mujer$_j$ t$_j$ la$_i$ está empujando t$_i$.*
     agent   AGENT

Jovanov (2011) carried out a four-choice sentence-picture matching task with a Serbian-speaking aphasic which consisted of four right and left object dislocations ((118 a) and (118 b), respectively). These structures look similar to clitic left dislocation in Romance, as there is also a resumptive clitic that agrees in gender and number with the displaced object; however, the clitic can appear both in the preverbal and postverbal positions since, in Serbian, clitics occupy the second position in the sentence (topic aside). The author also included four dislocation structures with strong pronouns instead of clitics (which can also occur in different positions: see (118 c) and (118 d)). This phenomenon has also been attested to in Romance topicalisation, more specifically, in hanging topic dislocation structures, which are base-generated, and cannot only substitute clitics by strong pronouns (see (72 a)) but also by full DPs. Yet the author does not mention how these two Serbian structures tested are different in terms of syntax.

(118) (a) *Starac   je ŝuta,   staricu.*
       old man-NOM CL kick-3s old woman-ACC

       "The old man is kicking her, the old woman."

    (b) *Policajca,   gleda   ga devojka.*
       policeman-ACC look-3s CL girl-NOM

       "The policeman, the girl is looking at him."

    (c) *Starac   ŝuta   nju, staricu.*
       old man-NOM kick-3s pro old woman-ACC

       "The old man is kicking her, the old woman."

(d) *Policajca,* *njega gleda* *devojka.*
policeman-ACC pro look-3s girl-NOM

"The policeman, the girl is looking at him."

The results showed that the agrammatic patient produced 100% of correct responses on SVO dislocations and 0% of correct responses on OVS dislocations. The author did not specify whether the errors in noncanonical dislocated structures always corresponded to theta-role reversals; if that was the case (as in focalised items, see Chapter 4.1 for a review), the Serbian speaking-patient who participated in the study would have consistently interpreted all sentences as SVO structures. Jovanov (2011) also tested the comprehension of Greek topicalisations by two agrammatic aphasics by means of another sentence-picture matching task with four alternatives. The experimental design consisted of only four items per condition: clitic right dislocations (see example (119 a)) and clitic left dislocations (119 b). The agrammatic patients performed better on CLRD (mean of 62% of correct responses) than on the CLLD (0% correct responses); again, it is unclear whether aphasics' errors consisted of lexical foils or role reversals. Strikingly, the performance on the canonical CLRD is quite low, in line with the results reported on other canonical structures in Jovanov (2011) (see Chapter 4.1 for a review); this probably indicates that the experimental design presented some problems and influenced the results.

(119) (a) *I jaja* *tin klotsai ti jineka* *me* *tin kokini bluza.*
D old lady-NOM CL kick D woman-ACC PREP D red blouse

"The old lady is kicking her, the woman with a red blouse."

(b) *Tin jineka* *me tin kokini bluza tin klotsai i jaja.*
D woman-ACC PREP D red blouse CL kick D old lady-NOM

"The woman with a red blouse, the old lady is kicking her."

Friedmann (2008) carried out a task on the interpretation of five Hebrew-speaking agrammatic aphasics of object relatives with a resumptive pronoun (120 c), and compared it to the comprehension of subject relatives (120 a) and object relatives without a resumptive pronoun (120 b). Even though Hebrew object relatives with resumptive pronouns are syntactically and semantically different from clitic left dislocation, they also involve an element in the left periphery and a resumptive clitic. Likewise, Hebrew relatives with resumptive clitics had been traditionally argued to be base-generated (Shlonsky, 1992), in opposition to movement-derived relative clauses without

resumptive clitics. Friedmann (2008) aimed at testing the TDH, given that it predicts that only structures that undergo movement are problematic for Broca's aphasia, via a sentence-picture matching task.

(120) (a) *Tar'e   li   et   ha-kof   she-mexabek et   ha-yeled.*
          show-IMP me ACC D-monkey that-hugs   ACC D-boy

   "Show me the monkey that the boy hugs."

   (b) *Tar'e   li   et   ha-kof   she-ha-yeled mexabek.*
          show-IMP me ACC D-monkey that-D-boy   hugs

   "Show me the monkey that the boy hugs."

   (c) *Tar'e   li   et   ha-kof   she-ha-yeled mexabek oto.*
          show-IMP me ACC D-monkey that-D-boy   hugs   pro

   "Show me the monkey that the boy hugs."

The patients performed above chance on the subject relative condition (mean of 85.2% of correct responses), and at chance on the other two conditions: mean of 59.1% of correct responses on object relatives without clitics and 58.35% on object relatives with resumptive clitics. This led the author to the conclusion that the TDH's predictions are ruled out by these findings, and explained them in terms of the TPH (Friedmann, 2006): if the CP layer is pruned in Broca's aphasia, patients are expected to have problems in comprehending relative clauses both with and without resumptive pronouns. However, both structures are currently analysed as the result of a movement operation under current syntactic theories; in fact, Friedmann herself assumed it in posterior studies on the acquisition of relatives, where the author analysed the delayed acquisition of object relatives in Hebrew as an instance of generalised minimality effects, in line with the FUH (Grillo, 2008), which predicts that the subject intervenes between the displaced object and the trace in Hebrew relatives with and without resumptive pronouns (Friedmann et al., 2009; Belletti et al., 2012). Hence the data on the comprehension of Hebrew clefts with resumptive clitics reported in Friedmann (2008) does not compromise movement-based accounts on agrammatic comprehension, and replicates previous findings on the comprehension of clitic left dislocation in Greek, Spanish and Serbian; that is, that patients have problems in interpreting dislocations despite the presence of a resumptive element, in line with the data reported in focalisation studies and other noncanonical structures.

Previous studies on the comprehension of clitics in Romance languages

Studies on the comprehension of clitics in Romance are scarce. Luzzatti et al. (2001) carried out a sentence-picture matching task with eleven Italian-speaking agrammatic aphasics. The task included several sentence types (ten items per condition), among them, reversible transitive declaratives with either two full DPs (SVO, see example (121 a)) or direct object clitics (SclV, see (121 b)), which can present the masculine (*lo*) or the feminine form (*la*); and also reversible declaratives with animate indirect objects –and inanimate direct objects– either with full DPs (SVOI, see (121 c)) or with indirect object clitics (SclVO, see (121 d)), that can also be masculine (*gli*) or feminine (*le*). Some sentences presented gender mismatch, like the examples below, whereas in some stimuli the subject and the direct or indirect object were matched in gender.

(121) (a) *Mario$_i$ cerca   t$_i$ Flora.*
          Mario seek-3s   Flora

          "Mario is seeking Flora."

     (b) *Mario$_i$ la$_j$ cerca   t$_i$ t$_j$.*
          Mario CL seek-3s

          "Mario is seeking her."

     (c) *Mario$_i$ dà   t$_i$ un regalo   a Flora.*
          Mario give-3s   D present   to Flora

          "Mario is giving a present to Flora."

     (d) *Mario$_i$ le$_j$ dà   t$_i$ un regalo   t$_j$.*
          Mario CL give-3s   D present

          "Mario is giving her a present."

The participants were asked to choose the picture that matched each item among four options. The pictures represented the four possible combinations regarding gender match or mismatch: female on male, female on female, male on female, and male on male. As the authors pointed out, such design is problematic because gender-matched sentences did not have a reversed-role foil. Participants had only, therefore, to rely on their lexical knowledge to solve the task: so, for example, if the sentence involved two males, participants simply needed to point to the only drawing depicting two males. This is indeed what the results reflected, as represented in Table 22: agrammatic participants performed on average better on gender-matched sentences on

all conditions. The data on gender-mismatched sentences are much more informative: the results by sentence type show that aphasic subjects reached quite high percentages of correct responses on SVO and SVOI conditions (mean of 81.8% and 93.6% of correct responses, respectively). Concerning the comprehension of object clitics, agrammatics also showed a good performance on average (mean of 75.5% of correct responses), suggesting that aphasics were able to interpret object clitics. Yet, the aphasic performance dropped on the SclVO condition to a mean of 52.7% of correct responses. The authors do not specify whether agrammatic participants' mistakes involve role reversals or lexical foils, which would have been of special interest when it came to interpreting the patients' performance in this condition. Interestingly, the percentage of correct responses on the SclVO condition for gender-matched sentences was also worse than the correct rates on other conditions, but still above chance (mean of 70% of correct responses).

	SVO	SclV	SVOI	SclVO
MATCH	90.00%	80.90%	93.60%	70.00%
MISMATCH	81.80%	75.50%	83.60%	52.70%

Table 22: Mean percentages of correct responses by condition in Luzzatti et al. (2001)

Luzzatti et al. (2001) considered two possible alternatives to explain their findings. On the one hand, they claimed that the TDH succeeds in predicting the aphasic performance on DO clitics, given that the default strategy assigns theme to the clitic and compensates for the deficit. Yet, they pointed out, the hypothesis fails to explain the results on the SclVO condition as, in their opinion, the default strategy would assign goal to the animate DP in a nonthematic position. However, Grodzinsky (2006) later reviewed Luzzatti et al.'s (2001) results and argued that the default strategy assigns theme to the DP in the second position, which results in a sentence where the theme-role is assigned to the IO clitic by the default strategy and to the DO grammatically (see example (122)). The two roles are in conflict, triggering the observed at-chance performance:

(122) *Mario$_i$ le$_j$ dà t$_i$ un regalo t$_j$.*
       agent   theme   THEME

On the other hand, Luzzatti et al. (2001) offered an alternative explanation based on the frequency of clitics in Italian: object clitics would be less

impaired because they are much more frequent than indirect object clitics, according to a corpus analysed by Mauro et al. (1993). This could have been verified by comparing the results of feminine and masculine clitics, as the latter are three times more frequent than the former (also according to the corpus analysed by Mauro et al., 1993). According to Luzzatti and colleagues' interpretation, aphasic participants are predicted to perform better on sentences with masculine clitics.

The authors also stressed the fact that there is great variability of performance among agrammatic subjects: after a single case analysis, they observed that patients showed different patterns of performance, which led them to the conclusion that Broca's aphasia cannot be characterised as a uniform syndrome with generalised patterns of response (in line with Beretta et al., 1996 and Caramazza et al., 2001, see Chapter 1.1.1 for a review).

Finally, Luzzatti et al. (2001) claimed that the agrammatic good performance on object clitics favours linguistic theories that analyse clitics as an instance of head movement (among others, Kayne, 1989; Sportiche, 1995). Since head movement has been shown to be intact in agrammatic comprehension (Linebarger et al., 1983; Lonzi and Luzzatti, 1993; Grodzinsky and Finkel, 1998), Broca's aphasics are predicted to understand clitics. But the poor comprehension of IO clitics challenges this conclusion. Hence the agrammatic comprehension of direct and indirect object clitics needs further investigation, especially considering the fact that the experimental design in Luzzatti et al. (2001) included lexical foils and that the authors did not report the type of aphasic errors, which is relevant for the interpretation of results.

The comprehension of object clitics has also been shown to be unimpaired in other Romance languages, like Spanish and Catalan (Baauw and Cuetos, 2003; Gavarró, 2008; Martínez-Ferreiro, 2010; as already reviewed in Chapter 1). Baauw and Cuetos (2003) ran a truth-value judgement task with four agrammatic aphasics on the comprehension of Spanish object clitics in simple active sentences (123 a). The results showed that agrammatic patients succeeded in comprehending object clitics in simple active sentences, as they rejected the reflexive interpretation most of the time: mean of 87.5% of correct responses in simple sentences.

(123) (a) *La niña$_i$ la$_j$ tocó.*
        D   girl   CL   touch-PAST.3S
        "The girl touched her."

In Gavarró (2008), three agrammatic aphasics participated in a verification task that consisted of Catalan sentences with object clitics in different contexts, such

as in simple active sentences (124 a), and in sentences with clitic doubling (124 b). The aphasic subjects performed well on the two conditions (means of 81% and 95% of correct responses); thus, aphasic participants successfully rejected the coreferential interpretation of the object clitic with the subject.

(124) (a) *La nena l' eixuga.*
   D girl CL dry-3s
      AGENT THEME
   "The girl is drying her."

   (b) *La nena l' eixuga a ella.*
   D girl CL dry-3s to her
      AGENT THEME
   "The girl is drying her."

The comprehension of object clitics was also addressed in Martínez-Ferreiro (2010), who carried out a sentence-picture matching task with Catalan-, Galician- and Spanish-speaking agrammatic aphasics (five participants per language). The materials included sentences with object clitics and reflexive pronouns. Participants were asked to choose between two drawings depicting either the transitive or the reflexive interpretation. The mean percentages of responses for aphasic participants are shown in Table 23. Her findings replicated the results reported in previous studies that aphasic subjects are able to interpret object clitics (Baauw and Cuetos, 2003; Gavarró, 2008).

	CATALAN	GALICIAN	SPANISH
SclV	92.31%	81.54%	93.85%

Table 23: Mean percentages of correct responses on object clitics in Martínez-Ferreiro (2010)

   To sum up, the studies on the comprehension of object clitics in different Romance languages coincide in concluding that the interpretation of object clitics is unimpaired in Broca's aphasia. This finding is consistent with data on the comprehension of clitics in other languages, such as Greek (Nerantzini et al., 2012) or Dutch (Ruigendijk et al., 2006). By contrast, the results on the interpretation of IO clitics in Italian indicate that agrammatic individuals may present a deficit in comprehending them. As for the interpretation of clitic left dislocations, previous experimental work suggested that Broca's aphasics had problems in comprehending these structures in Greek, Serbian and Spanish

(Beretta et al., 2001; Jovanov, 2011). However, the samples were too small and the results too heterogeneous to draw any robust conclusions.

5.2 EXPERIMENT 4: DO CLLD

A truth-value judgement task, similar to the one described in the previous chapter (Experiment 2, see Chapter 4.2), was conducted with eight aphasic participants to test the comprehension of object topicalisation in Catalan, so participants were presented with some drawings and sentences, and were asked to judge the veracity of the utterances in a given representation.

5.2.1 *Participants*

Eight Catalan-speaking aphasic participants were selected from the patient pool of the *Associació Sant Pau de Trastorns de la Comunicació* (Barcelona), their individual characteristics are detailed in Table 24. They were all diagnosed with the Western Aphasia Battery (Kertesz, 1982, Catalan version based on the Spanish version by Kertesz et al., 1990); the severity of their impairment was determined by a speech therapist of the neurological board of the association. None of the participants had a history of drug abuse, hospitalisation for psychiatric disorders, speech/language disorders or learning disabilities before the stroke. None of the participants suffered from articulatory impairment. They were all right-handed. The task was also carried out with eight education- and age-matched control participants (see Table 25).

APHASIC SUBJECT	AGE	EDUCATION	LESION SITE	ETIOLOGY	TPO (YEARS)	APHASIA	SEVERITY
A1	78	1	LFT	HCVA	11	Motor	2
A2	39	2	LFT	HCVA	13	Motor	2
A3	67	1	LF	CVA	5	Motor	2
A4	59	2	LF	HCVA	3	Motor	2
A5	70	3	LMCA	ICVA	15	Motor	2
A6	59	3	MCA	ICVA	6	Motor	2
A7	53	3	LCMA	ICVA	12	Motor	2
A8	70	3	LMCA	ICVA	12	Motor	1

Education: 1, basic; 2, secondary; 3, higher; Lesion site: L, left; FT, frontotemporal area; MCA, medial cerebral artery; Etiology: H, hemorrhagic; I, ischemic; CVA, cerebrovascular accident; TPO, time post onset; Severity: 1, mild; 2, moderate; 3, severe.

Table 24: Agrammatic subjects' individual characteristics

CONTROL SUBJECT	AGE	EDUCATION	APHASIC MATCHED
C1	77	Primary	A1
C2	42	Secondary	A2
C3	65	Primary	A3
C4	58	Secondary	A4
C5	69	University	A5
C6	55	University	A6
C7	50	University	A7
C8	66	University	A8

Table 25: Control subjects' characteristics

5.2.2 *Methods*

5.2.2.1 *Materials*

The experimental task consisted of ten declaratives (125 a), twenty subject topicalisations (125 b) and twenty clitic left dislocations (125 c), that is, a total of fifty items.

(125) (a) *La   nena   pentina   a   l'àvia.*
       D-fs   girl-fs   comb-3s   ACC   D-grandmother-fs

   "The girl is combing the grandmother."

   (b) *La   nena,   pentina   a   l'àvia.*
       D   girl   comb   ACC   D-grandmother

   "The girl, she is combing the grandmother."

   (c) *A   l'àvia,   la   pentina   la   nena.*
       ACC   D-grandmother   CL   comb   D   girl

   "The grandmother, the girl is combing her."

Note that in this task objects also presented the colloquial accusative marker (preposition *a*), which typically precedes animate objects in spoken Catalan. The differential object marking is not crucial in interpreting clitic left dislocations; in fact, the presence of the clitic –in agreement in number, gender and case with the object– disambiguates any possible misinterpretations. Moreover, in Central Catalan, the masculine determiner preceded by the object marker (*al*) is pronounced the same as the masculine determiner alone (*el*); so, the marker is only noticed when it precedes a feminine determiner (*a la*). Hence, the presence of the case marker would have been of little help in some cases.

   In order to justify the use of a topicalisation, all sentences were contextualised (see the example in (126)): since topicalised elements are known entities, the speaker first introduced the characters in the picture and then uttered the topicalised sentence.

(126) *Hi ha una nena, una mare i una àvia.   La nena,   pentina   a l'àvia.*
                                                      AGENT   THEME

   "There is a girl, a mother and a grandmother. The girl, she is combing the grandmother."

In addition, some items presented match of φ-features, that is, the subject and the object had the same gender and number (125 a), whereas in some items the

subject and the object mismatched in gender (127). The number of matched and mismatched sentences was not balanced, since this was only taken into account after running the experiment: out of ten declaratives, six items were mismatched and four matched; for subject topicalisations, there were twelve mismatched and eight matched items, and for CLLD, eleven mismatched and nine matched sentences.

(127) *El   nen   persegueix a   la   nena.*
       D-ms boy-ms chase-3s   to   D-fs girl-fs

      "The boy is chasing the girl."

The items that involve subjects and objects with matching features were not ambiguous, since the resumptive clitic –in agreement with the object– only occurs in dislocated structures. Still, we will look at the impact that morphology could have on the agrammatic comprehension of clitic left dislocations when analysing the results.

5.2.2.2   *Procedure*

The experiment with agrammatic patients was run on a laptop, with loudspeakers, in a quiet room of the *Associació Sant Pau de Trastorns de la Comunicació*, while the experimental tasks with healthy subjects were conducted at locations convenient to the participants. The subjects were asked to listen carefully to sentences, look at a picture on a laptop screen, and judge whether the sentence correctly described the picture (see two examples in Figure 20). Participants answered true or false, depending on whether the sentence matched or not the picture on the screen. The number of false and true items was balanced; and all false sentences involved role reversals. So, for example, when shown a picture like the one reproduced in Figure 20a, the target answer for the token in (126) was true, whereas the expected answer for (128) was false.

(128) *Hi ha una nena, una mare i una àvia.   A la nena,   la   pentina   l'àvia.*
                                                THEME   CL.ACC   AGENT

      "There is a girl, a mother and a grandmother. The girl, the grandmother is combing her."

(a) Gender-matched   (b) Mismatch of φ-features
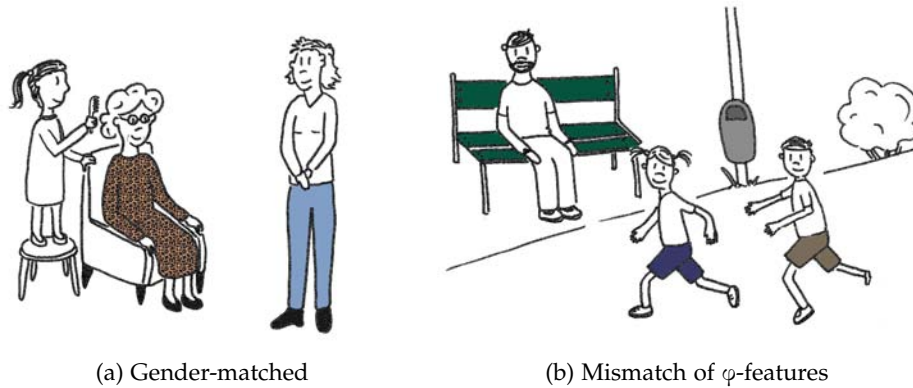
Figure 20: Examples of the pictures presented in Experiment 4 for topicalisation

All the trials were prerecorded in a studio in order to preserve the characteristic intonational contour associated with Catalan topicalisations (and explained in detail in Chapter 3.2.3). The sentences were simple and short, and they only contained very common words. The complete list of tested items appears in Appendix A.4.

Prior to the task, the experimenter interviewed all the participants to collect relevant personal information, and afterwards the task was explained. Some trials were presented as examples before running the experiment in order to ensure that the participant had understood the task. The items were presented in pseudorandom order, and there were no limitations of time to respond. Also, trials could be played more than once if required.

5.2.3 *Results*

The overall results for control and aphasic subjects are in Table 26. Agrammatic participants performed correctly in 275 of the 400 items, while control subjects failed only in 9 of the total trials. The estimated proportion of correct answers by aphasic patients differed significantly from the estimated mean of correct control responses, given that the former is much lower than the latter (0.83, CI (0.76, 0.88) versus 0.98, CI (0.95, 0.98)). The analysis of the odds ratio led us to the same conclusion: controls performed significantly better than aphasics (OR=8.95, CI (3.96, 20.22)).

	Count	Mean (%)
CONTROLS	391/400	97.75
APHASICS	275/400	68.75

Table 26: Overall correct responses (aphasic and control subjects)

The overall results are not descriptive enough, as the results reported in Table 27 make evident: agrammatics' performance on declarative and subject topic conditions was very similar to controls' performance. Actually, no statistically significant differences were found between groups' performances in these two conditions. Yet, the aphasic performance on CLLD contrasts sharply with the controls' performance: agrammatics only reached a 30.63% of correct responses, whereas control participants performed at ceiling. A significant difference is observed in the CLLD condition between groups, as the estimated mean of correct responses is higher for controls than for aphasics (0.98, CI (0.93, 0.99) versus 0.31 CI (0.24, 0.38)).

	SVO DECLARATIVE		SVO TOPIC		OVS TOPIC	
	Count	Mean (%)	Count	Mean (%)	Count	Mean(%)
CONTROLS	78/80	97.50	157/160	98.13	156/160	97.50
APHASICS	75/80	93.75	151/160	94.38	49/160	30.63

Table 27: Mean correct responses by condition (control and aphasic subjects)

The individual results obtained showed that the eight patients presented similar patterns of performance (see Figure 21): all the agrammatic participants performed above chance –and similar to healthy subjects– on the declarative and subject topicalisation conditions. Regarding the comprehension of CLLD, the performance varied slightly among subjects: mean percentages of correct responses from agrammatic patients went from 0% to 55%, but all participants showed poor comprehension.
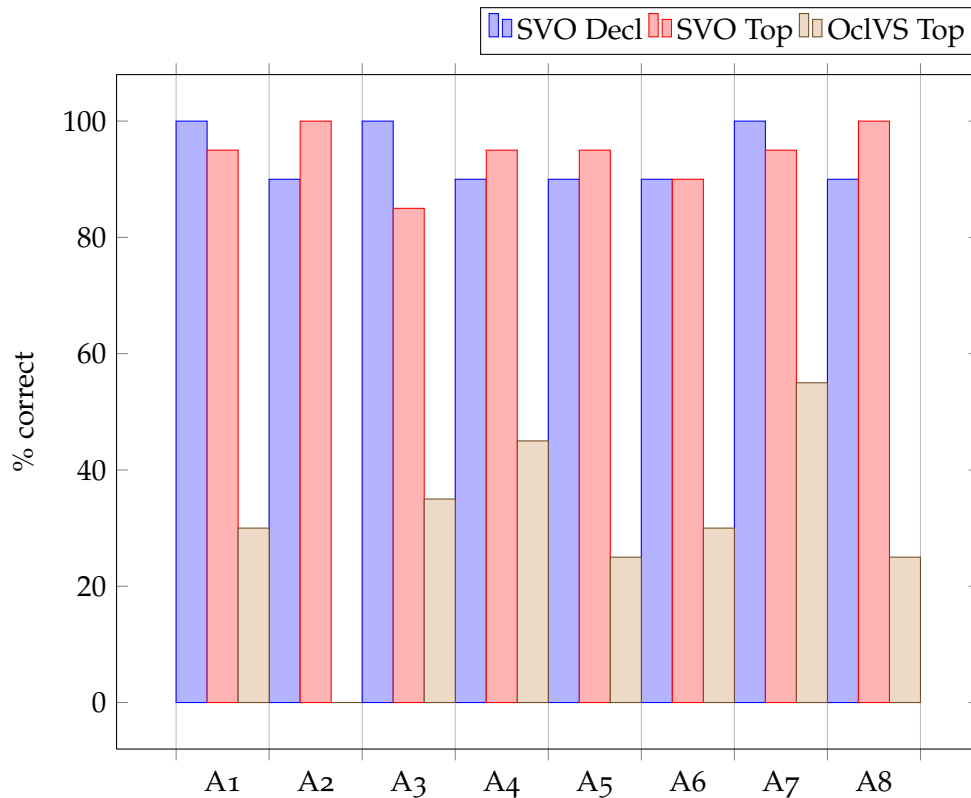
Figure 21: Individual mean percentages of correct responses (aphasic subjects)

The p-values from the goodness of fit test are represented in Figure 22. The test revealed that the performance of five out of the eight aphasic participants was at chance on the OclVS condition, whereas the other three performed below chance. All participants performed above chance on the two SVO conditions. Hence, in spite of the differences within the aphasic performance, the results support the claim that the comprehension of CLLD is impaired in agrammatic aphasia.
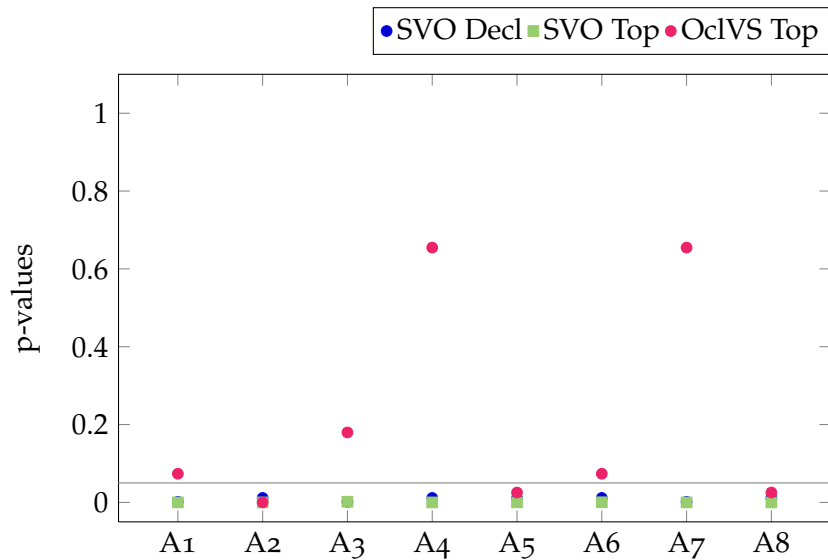
Figure 22: Individual p-values by condition from the standard goodness of fit test (aphasic subjects)

As a group, the agrammatics showed an above-chance performance on declaratives and subject topicalisations, and a below-chance performance on CLLDs, as evidenced by the estimated means of performance which, in fact, is much lower for CLLD (0.31, CI (0.24, 0.38)) than for declarative (0.94, CI (0.86, 0.97)) and subject topicalisation (0.94, CI (0.89, 0.97)). Furthermore, significant differences were only found between declaratives and CLLDs (OR=33.98, CI (7.80, 147.906)), and subject topicalisations and CLLDs (OR=38.01, CI (12.09, 119.45)).

The results by severity and sentence type are shown in Table 28. Most of the aphasics individuals who participated in the study suffered from a moderate aphasia; in fact, only one participant presented a mild aphasia. Both moderate and mild aphasics showed the same pattern of responses as described above: their performance was very high on the SVO conditions, and below chance on object topicalisations.

	SVO DECL	SVO TOP	OCLVS TOP
MILD (1)	90.00%	100.00%	25.00%
MODERATE (7)	94.29%	93.58%	31.43%

Table 28: Mean percentages of correct responses by severity and condition (aphasic subjects)

For CLLD, I examined the impact that the resumptive clitic –in agreement with the object– could have had on the results, comparing the comprehension of those sentences where the subject and the object had the same gender (125 a) to the comprehension of those sentences where there was a gender mismatch (127). Agrammatics' performance did not depend on the match/mismatch factor (see Figure 23): no significant differences were found between matched and mismatched items in any of the three conditions. For instance, the estimated proportions of correct responses for the clitic left dislocation conditions were 0.33, CI (0.23, 0.44) and 0.28, CI (0.18, 0.40) for mismatched and matched items, respectively.
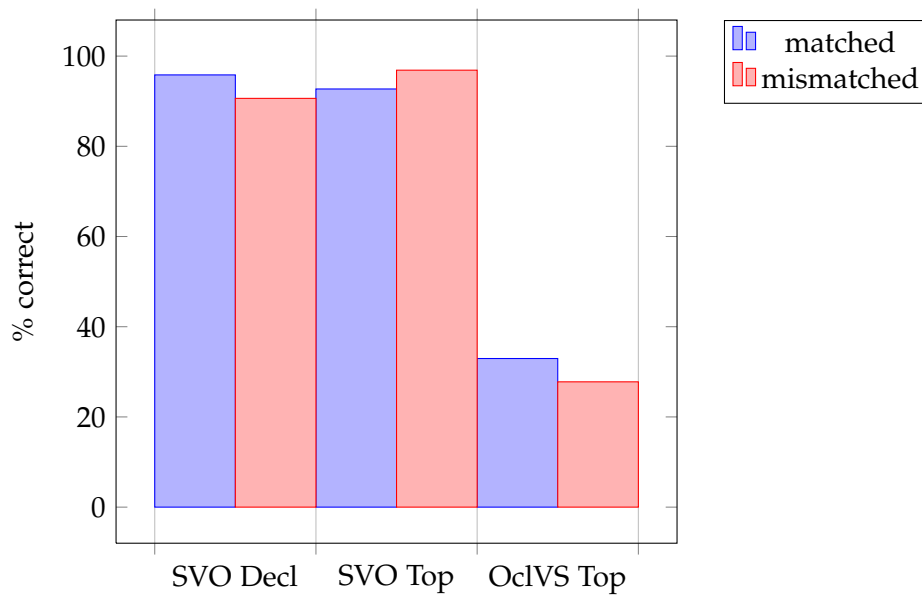
Figure 23: Mean percentages of correct responses by condition (aphasic subjects)

The distribution of the aphasics' incorrect responses depending on the truth of items appears in Figure 24. Despite the fact that the same patterns of

performance described above were reproduced through true and false items, the latter seemed to be slightly more problematic for Broca's aphasics than the former. This is observable in the CLLD condition, in which there was a greater number of mistakes: out of 111 incorrect responses, 63 corresponded to misses –that is, false items that were misinterpreted as correct items–, and 48 to false alarms –true items that were incorrectly rejected–. Still, the difference between true and false items is not statistically significant. A similar pattern was observed in SVO conditions, despite that the number of errors is much lower. This indicates that the poor performance did not depend only on the experimental design, as it was not the result of a yes bias, but that it rather was structure-dependent.
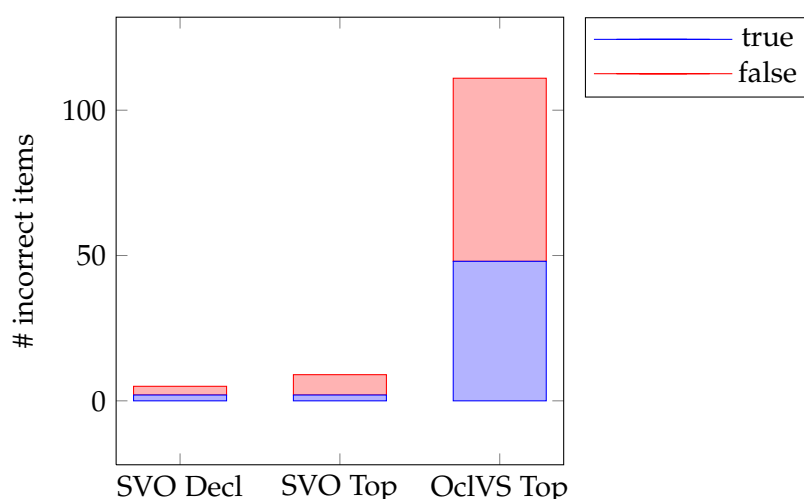
Figure 24: Error distribution in the aphasic performance

5.3 EXPERIMENT 5: DO CLITICS AND CLLD

The interpretation of clitic left dislocation was also assessed by means of a sentence-picture matching task, which allowed us to check whether the below-chance performance on CLLD observed in the previous experiment was partly due to the experimental design. Patients were therefore required to choose between the SVO or the OVS interpretation of the sentence by pointing to the matching picture. The present study also contains clitic left dislocations with preverbal subjects (like in Beretta et al., 2001), and direct object clitics (already tested in Luzzatti et al., 2001; Gavarró, 2008; Martínez-Ferreiro, 2010).

5.3.1 *Participants*

Nine agrammatic and nine matched control subjects participated in the task, whose characteristics are described in Tables 29 and 30. All aphasic participants were native speakers of Catalan and right-handed. The aphasic subjects were selected from the patient pool of the *Associació Sant Pau de Trastorns de la Comunicació*, in Barcelona. They were all diagnosed via the Catalan or Spanish version of the Western Aphasia Battery (Kertesz, 1982; Kertesz et al., 1990). None of the participants had a history of drug abuse, hospitalisation for psychiatric disorders, speech/language disorders or learning disabilities before the stroke.

APHASIC SUBJECT	AGE	EDUCATION	LESION SITE	ETIOLOGY	TPO (YEARS)	APHASIA	SEVERITY
A1	38	2	FT	HCVA	8	Motor	2
A2	37	3	LF	CVA	12	Motor	2
A3	71	3	LMCA	ICVA	14	Motor	2
A4	71	3	LMCA	ICVA	13	Motor	1
A5	60	2	LF	ICVA	4	Motor	2
A6	68	1	LF	ICVA	6	Motor	3
A7	69	1	LF	CVA	6	Motor	3
A8	48	2	LCMA	ICVA	15	Motor	3
A9	78	3	LMCA	ICVA	15	Motor	3

Education: 1, basic; 2, secondary; 3, higher; Lesion site: L, left; FT, frontotemporal area; MCA, medial cerebral artery; Etiology: H, hemorrhagic; I, ischemic; CVA, cerebrovascular accident; TPO, time post onset; Severity: 1, mild; 2, moderate; 3, severe.

Table 29: Agrammatic subjects' individual characteristics

CONTROL SUBJECT	AGE	EDUCATION	APHASIC MATCHED
C1	40	Secondary	A1
C2	36	University	A2
C3	73	University	A3
C4	75	University	A4
C5	57	Secondary	A5
C6	66	Primary	A6
C7	71	Primary	A7
C8	51	Secondary	A8
C9	82	University	A9

Table 30: Control subjects' characteristics

5.3.2 *Methods*

5.3.2.1 *Materials*

The task consisted of five different conditions containing twenty items each: declaratives (129 a), subject topicalisations (129 b), clitic left dislocations with preverbal subjects (129 c), clitic left dislocations with postverbal subjects (129 d) and active sentences with direct object clitics (129 e).

(129) (a) *El policia va mullar a les*
D-ms policeman-ms AUX.PAST-3S wet-INF ACC+D-fp soldier-fp
soldats.

"The policeman wetted the soldiers."

(b) *El policia, va mullar a les soldats.*
D policeman AUX wet-INF ACC+D soldiers

"The policeman, he wetted the soldiers."

(c) *A les soldats, el policia les va mullar.*
ACC+D soldiers D policeman CL-fp AUX wet

"The soldiers, the policeman wetted them."

(d) *A les soldats, les va mullar el policia.*
ACC+D soldiers CL-fp AUX wet D policeman

"The soldiers, the policeman wetted them."

(e) *El policia   les   va   mullar.*
D   policeman   CL-fp   AUX   wet-INF

"The policeman wetted them."

As in previous experiments, direct objects were preceded by the colloquial accusative marker (preposition *a*), although it is not indispensable for the interpretation of CLLD. In fact, the preposition *a* is undistinguishable when followed by the masculine article *el* in Central Catalan, a both vowels are pronounced the same ([ə]). Also, the subject and object did not match in gender and number in half of the items such as example (129 a), whereas the other half presented a match of φ-features (130). The presence of the clitic alone suffices to disambiguate dislocations, hence, the matching and mismatching variables were introduced to see whether morphological information could have had any impact on aphasic performance.

(130) *El   mico   va   colpejar   al   cocodril.*
D-ms   monkey-ms   AUX   hit   ACC+D-ms   crocodile-ms

"The monkey hit the crocodile."

All sentences contained common nouns and verbs, and were simple and short (see the complete list of items in Appendix A.5).

5.3.2.2 *Procedure*

The task contained a total of 100 tokens presented in pseudorandom order, and each participant started the task from a different item. The experimental design consisted of a sentence-picture matching task: participants were asked to choose the matching picture between two alternatives printed on a sheet (see two examples in Figure 25). Agent characters were placed both on the left and on the right to make allowance for any bias resulting from picture paralleling the order of mention of subjects and objects.

Each token was introduced by a contextualising sentence (see (131 a) and (131 b), which exemplify the contextualisation of a clitic construction and a clitic left dislocation) in order to make sure that the use these constructions made sense; they consisted of a sentence introducing the characters depicted and a short sentence displaying the same word order as the target sentence. This latter sentence is meant to justify the position of the subject in the target sentence and hence avoid further problems with dislocations with preverbal subjects, which would easily sound unnatural otherwise.

(131) (a) *Ahir vaig veure el policia i les soldats.   Jo   no vaig fer   res*
                                                        AGENT   **THEME**

   al policia.   En canvi,   les soldats   el   van mullar.
   GOAL   **AGENT**   **CL.ACC-THEME**

   "Yesterday, I saw the policeman and the soldiers. I didn't do
   anything to the policeman. Yet, the soldiers wetted him."

(b) *[...]   A mi,   no   em   va fer   res   ningú.   Al policia,   en canvi,*
           GOAL   **CL.DAT**   **THEME** **AGENT** **THEME**

   el   van mullar   les soldats.
   CL.ACC   **AGENT**

   "[...] Nobody did anything to me. The policeman, though, the
   soldiers wetted him."

(a) Mismatch of φ-features
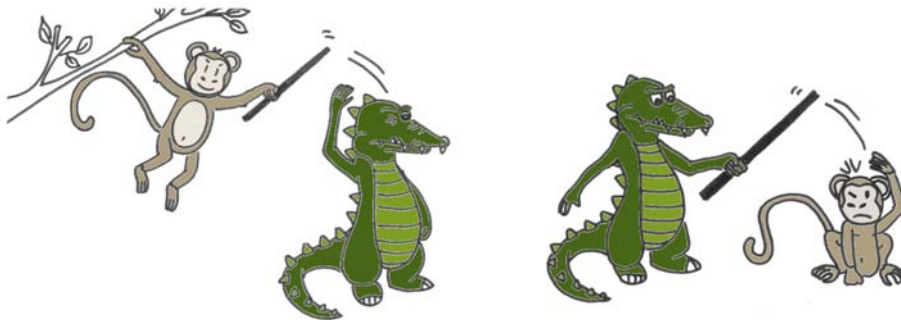
(b) Match of φ-features

Figure 25: Examples of the pictures presented in Experiment 5

Prior to the task, the experimenter interviewed all the participants to collect relevant personal information, and then the task was explained. Some trials were presented as examples before running the experiment to ensure that the participant had understood the task. Sentences were prerecorded in a studio in order to preserve the intonational contour and were reproduced through loudspeakers; also, tokens could be played more than once if requested.

5.3.3 *Results*

The overall correct responses of aphasic and control subjects appear in Table 31. Control participants performed correctly in 98.22% of the items, whereas aphasic patients only reached a 73.22% of correct responses. The odds ratio analysis revealed a statistically significant difference between the two groups' performances (OR=18.58, CI (10.86, 31.77)), which can also be observed by looking at the estimated proportions of correct responses of aphasic and control subjects (0.98, CI (0.97, 0.99) and 0.75, CI (0.69, 0.81), respectively).

	Count	Mean (%)
Controls	884/900	98.22
Aphasics	658/900	73.11

Table 31: Overall correct responses (aphasic and control subjects)

The overall correct responses by condition for control and aphasic participants are represented in Table 32 and Figure 26. Control participants performed at ceiling on all sentence types, whereas the aphasic performance varied across conditions. On the one hand, agrammatic subjects showed a good comprehension of control items, that is, declaratives and subject topicalisations. The statistical analysis determined that the performance of control and aphasic participants on these two conditions differed significantly (OR=6.56, CI (1.89, 22.77) for declaratives and OR=46.32, CI (4.92, 54.13) for subject topicalisations), despite the fact that patients performed above chance on both conditions (mean of 90% of correct responses). Regarding the comprehension of direct object clitics, aphasic participants reached a 80.56% of correct responses; hence, object clitics were well interpreted, though their comprehension was significantly poorer than controls' performance (OR=21.48, CI (5.06, 91.28) for controls vs aphasics). On the other hand, agrammatic

aphasics reached lower percentages of correct responses in the two dislocation conditions: patients showed a mean percentage of 48.89% of correct responses on CLLDs with postverbal subjects, whereas their performance on CLLDs with preverbal subjects was much better (mean of 67.78% of correct responses). The performance between control and aphasic participants also differed in these two conditions, as evidenced by the odds ratio analysis: OR=20.92, CI (7.37, 59.35) for dislocations with postverbal subject and OR=46.00, CI (46.31, 129.73) for dislocations with preverbal subjects.

	SVO decl	SVO top	OSclV top	OclVS top	SclV cl
Controls	177/180	177/180	176/180	176/180	178/180
Aphasics	162/180	141/180	122/180	88/180	145/180

Table 32: Correct responses by condition (control and aphasic subjects)

Even though the aphasic performance was on average slightly worse than the controls' performance through all conditions, patients performed above chance on declaratives, subject topicalisations and object clitics (estimated means of correct responses: 0.90, CI (0.83, 0.94); 0.78, CI (0.69, 0.85) and 0.81, CI (0.72, 0.87), respectively). Regarding the comprehension of dislocations, as the estimated proportions of correct responses show, the aphasic performance on dislocations with preverbal subjects differed significantly from their performance on CLLDs with postverbal subjects (0.68, CI (0.58,0.76) and 0.49, CI (0.39, 0.59), respectively), as the former were better comprehended than the latter. This was also confirmed by the odds ratio analysis: OR=2.20, CI (1.43, 3.38). Nevertheless, the comprehension of CLLDs with preverbal subjects was significantly worse than the comprehension of declaratives (OR=0.23, CI (0.13, 0.42)), object clitics (OR=0.46, CI (0.25, 0.85)), and subject topicalisations (OR for SVO vs OSclV topicalisations=1.72, CI (1.07, 2.76)).
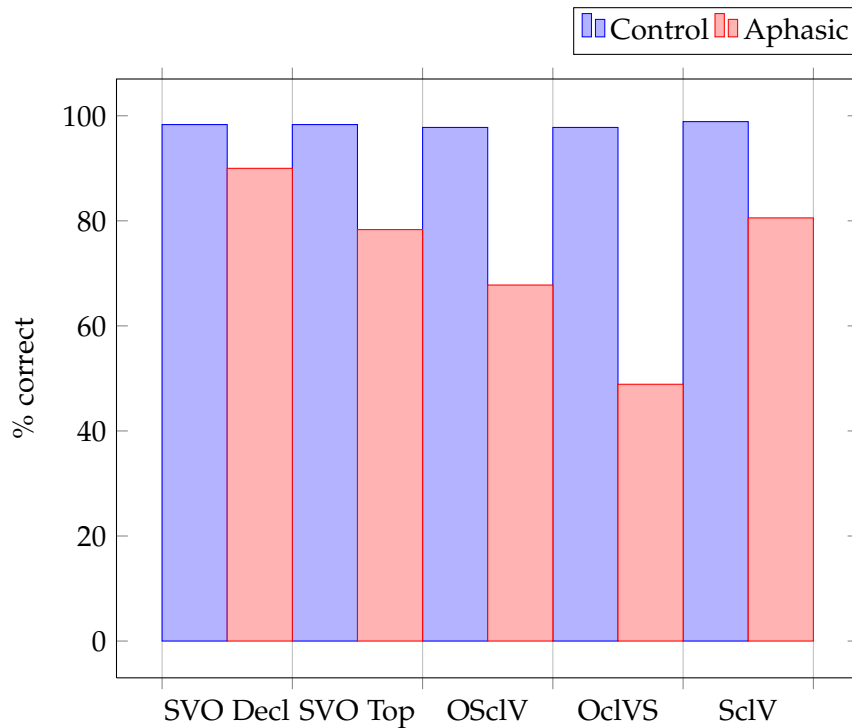
Figure 26: Mean percentages of correct responses by condition (control and aphasic subjects)

The mean percentages of correct responses for aphasic individuals are represented in Figure 27. As in previous experiments, the aphasic performance varied across subjects. Still, declaratives were consistently understood above chance by all patients (mean individual percentage of correct responses from 75% to 100%). Regarding the comprehension of subject topicalisations, seven out of nine patients showed an above-chance performance (from 75% to 100% of correct responses), while the other two patients, A8 and A9, only reached a 55% and a 60% of correct responses respectively. Direct object clitics were also well-understood by most patients (from 70% to 100% of correct responses), except for aphasic participants A3 and A8, whose performance decreased to a 65% and 50% of correct responses. The aphasic performance on both dislocation conditions involved greater intersubject variability: on the OSclV condition, four patients reached very high percentages of correct responses (A2, A3, A4 and A6), whereas the other five patients' performances went from 50% to 60% of correct responses. The performance on OclVS dislocations was worse in general: two patients reached a 70% of correct responses, whereas the

other seven performed either at chance or below chance (from 25% to 60% of correct responses).
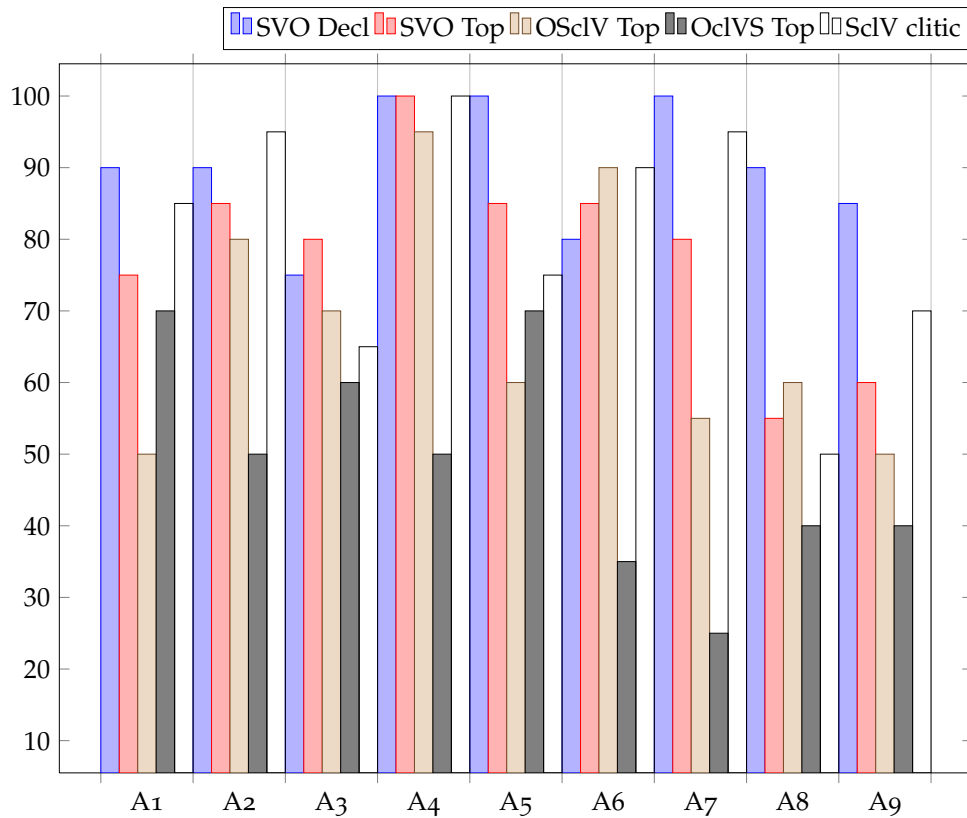
Figure 27: Individual mean percentages of correct responses (aphasic subjects)

In Figure 28, the p-values from the goodness of fit test are represented. At-chance performance cannot be ruled out for those patients whose p-values are higher than 0.05. In this task, eight out of nine patients performed at chance in the OclVS condition (and the other one below chance), and five showed an at-chance performance in OSclV dislocations (while the other four performed above chance).
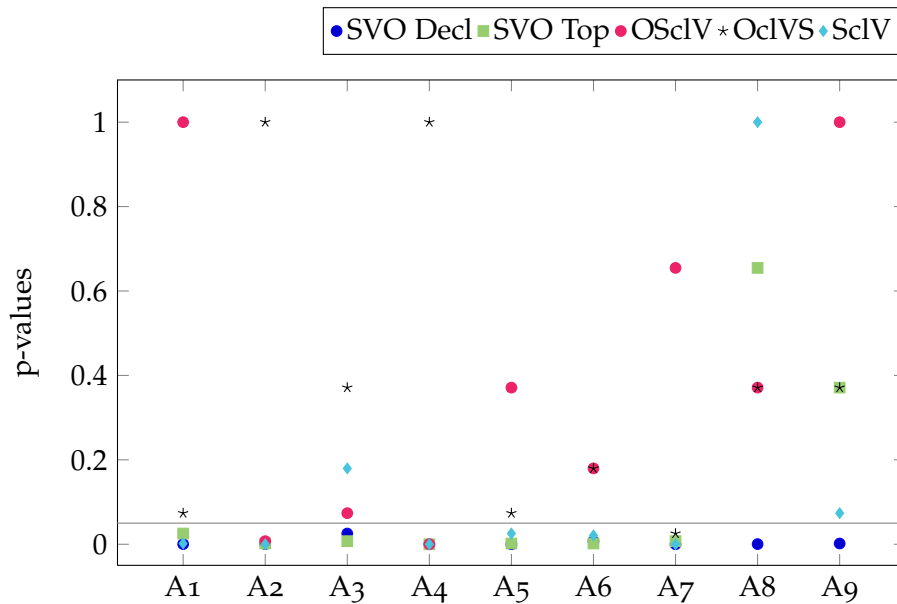
Figure 28: Individual p-values by condition from the goodness of fit test (aphasic subjects)

The mean percentages of correct responses by supposed severity and condition are shown in Table 33. The performance of moderate and severe aphasics is at chance on topicalisations with postverbal subjects. Dislocations with preverbal subjects are slightly better comprehended than OclVS sentences, even though the performance level is not as high as in the other control conditions. This dissociation is more evident in the case of the only aphasic participant with mild aphasia, who achieved 95% of correct responses on the OSclV condition, but performed at chance on the OclVS dislocations.

	SVO DECL	SVO TOP	OSclV TOP	OclVS TOP	SclV CLITIC
MILD (1)	100.00%	100.00%	95.00%	50.00%	100.00%
MODERATE (4)	88.75%	81.25%	65.00%	62.00%	80.00%
SEVERE (4)	90.00%	73.33%	68.33%	33.33%	78.33%

Table 33: Mean percentages of correct responses by severity and condition (aphasic subjects)

The overall estimated means of correct responses by condition and their corresponding confidence intervals are represented in Figure 29: as already observed in the task on the comprehension of focalisation, problematic structures present greater variability among subjects.
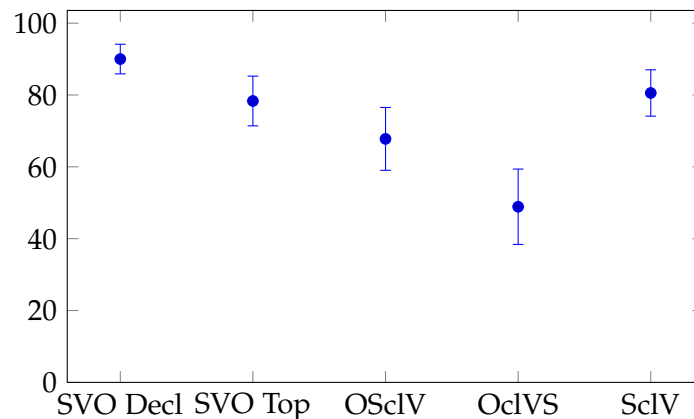
Figure 29: Estimated means of correct responses by condition (aphasic subjects)

Concerning the impact of mismatch of φ-features between the subject and the object in comparison with the comprehension of matched sentences, the overall results showed that there were no statistically significant differences between matched and mismatched sentences (estimated means of correct responses: 0.72, CI (0.64, 0.79) and 0.79, CI (0.72, 0.85), respectively). The correct percentages by sentence type are represented in Figure 30; the odds ratio analysis revealed that significant differences between matched and mismatched sentences are only found in the object clitic condition (OR=0.45, CI (0.21, 0.97)), despite the fact that the aphasic performance on this condition is above chance (estimated means of 0.75, CI (0.62, 0.84) for matched sentences and 0.87, CI (0.77, 0.93) for mismatched sentences). No statistically significant differences were found between matched and mismatched sentences in dislocation conditions (OR=0.74, CI (0.39, 1.38) for OSclV and OR=0.59, CI (0.32, 1.06) for OclVS); thus, the presence of the clitic and the gender mismatch did not prevent aphasic participants from performing poorly in the task.
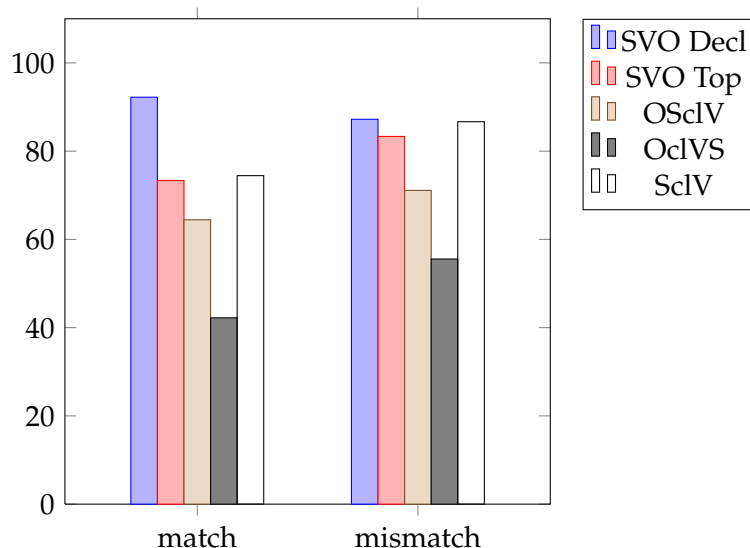
Figure 30: Mean percentages of correct responses by match/mismatch (aphasic subjects)

5.4 EXPERIMENT 6: IO CLITICS AND CLLD

The last experimental task was designed to assess the comprehension of more complex thematic configurations: the procedure of the present experiment is the same as in the previous one, though here materials involve movement of indirect objects, which receive the goal role, instead of direct objects. The task also includes active sentences with indirect objects clitics as control items, which were already tested in Italian by Luzzatti et al. (2001).

5.4.1 *Participants*

The task was conducted with eight Catalan-speaking Broca's aphasics and eight control subjects, whose individual characteristics are specified in more detail in Tables 34 and 35. The aphasic subjects were selected from the patient pool of the *Associació Sant Pau de Trastorns de la Comunicació*, in Barcelona. They were all diagnosed via the Catalan or Spanish version of the Western Aphasia Battery (Kertesz, 1982; Kertesz et al., 1990). None of the participants had a history of drug abuse, hospitalisation for psychiatric disorders, speech/language disorders or learning disabilities before the stroke.

Aphasic Subject	Age	Education	Lesion Site	Etiology	TPO (years)	Aphasia	Severity
A1	41	2	LFT	HCVA	15	Motor	2
A2	72	3	LCMA	ICVA	15	Motor	2
A3	72	3	LCMA	ICVA	14	Motor	3
A4	38	2	FT	HCVA	9	Motor	2
A5	69	1	LF	CVA	7	Motor	1
A6	61	2	LF	ICVA	14	Motor	2
A7	70	3	LCMA	CVA	3	Motor	2
A8	41	3	LCMA	CVA	5	Motor	2

Education: 1, basic; 2, secondary; 3, higher; Lesion site: L, left; FT, frontotemporal area; MCA, medial cerebral artery; Etiology: H, hemorrhagic; I, ischemic; CVA, cerebrovascular accident; TPO, time post onset; Severity: 1, mild; 2, moderate; 3, severe.

Table 34: Agrammatic subjects' individual characteristics

Control Subject	Age	Education	Aphasic Matched
C1	37	Secondary	A1
C2	76	University	A2
C3	73	University	A3
C4	36	Secondary	A4
C5	67	Primary	A5
C6	59	Secondary	A6
C7	68	University	A7
C8	43	University	A8

Table 35: Control subjects' characteristics

5.4.2 *Methods*

5.4.2.1 *Materials*

The task comprised five conditions as follows (containing twelve tokens each): declaratives (132 a), subject topicalisations (132 b), clitic left dislocations with

preverbal subjects (132 c), clitic left dislocations with postverbal subjects (132 d), and declaratives with indirect object clitics (132 e).

(132) (a) *El   metge   va   treure   l'abric   al*
          D-m   doctor-m   AUX.PAST   take off-INF.3s   D+coat   DAT+D-m
                AGENT   THEME

          senyor.
          man-m
          GOAL

          "The doctor took off the man's coat."

      (b) *El metge, va   treure   l'abric   al   senyor.*
          D   doctor AUX   take off   D+coat   DAT+D   man

          "The doctor, he took off the man's coat."

      (c) *Al   senyor, el metge   li   va   treure   l'abric.*
          DAT+D   man   D   doctor CL   AUX   take off   D+coat

          "The man, the doctor took off his coat."

      (d) *Al   senyor, li   va   treure   l'abric   el metge.*
          DAT+D   man   CL   AUX   take off   D+coat   D   doctor

          "The man, the doctor took off his coat."

      (e) *El metge   li   va   treure   l'abric.*
          D   doctor CL   AUX   take off   D+coat

          "The doctor took off his coat."

All the sentences were simple and contained common words, in order not to overcomplicate the task. Yet, they involved three arguments: agent, theme and goal (see example (132 a)). The theme role is always assigned to the inanimate direct object; thus, sentences were semantically reversible with respect to the agent and goal roles. Indirect objects require the presence of a dative marker, the preposition *a,* whereas inanimate objects are not preceded by the accusative marker either in colloquial or standard Catalan. The dative marker is unaccented and uttered as *schwa* in Central Catalan; hence, when conjoined with the masculine article (*al*), its pronunciation is indistinguishable from the masculine determiner *el.* However, sentences were not ambiguous given the presence of the IO clitic.

In half of the items, the subject and indirect object matched in gender (see example (132 a)), whereas the other half presented mismatch of φ-features (133). Note that the indirect object clitic *li* is the same for masculine and feminine. The only difference between matched and mismatched items was that in the latter

the dative marker ([ə]) was clearly distinguishable if pronounced before the feminine article. Despite the fact that agrammatics aphasics' interpretations have been shown not to benefit from overt case markers in this study and in previous research, I will look at the impact that gender-mismatch could have had on their comprehension in this task.

(133) *A   la   mecànica,   li   va   portar un pastís el   lladre.*
      DAT D-f mechanic-f CL.DAT AUX bring D   cake D-m thief-m

      "To the mechanic, the thief brought her a cake."

5.4.2.2 *Procedure*

The task contained a total of sixty trials presented in a pseudorandom order (see the complete list in Appendix A.6). The participants were asked to listen carefully to sentences played through loudspeakers, and point to the matching picture in a printed sheet. They were shown two alternatives: the target picture and the role reversal (see two examples in Figure 31). Agent characters were placed both on the left and on the right to control for any bias resulting from picture paralleling the order of mention of subjects and objects. Prior to the task, the experimenter interviewed all the participants to collect relevant personal information, and afterwards the task was explained. Then, some trials were presented as examples before running the experiment in order to ensure that the participant had understood the task. There were no limitations of time to respond. As in all experimental tasks reported in the present study, sentences were prerecorded in order to preserve the intonational contour; also, items could be played more than once if required.

As in the previous experiment, each item was contextualised by a preceding sentence that introduced the two characters in the picture and the word order configuration: (134 a) for subject topicalisations, (134 b) for dislocations with postverbal subjects, and (134 c) for dislocations with preverbal subjects. The context rendered the sentences pragmatically felicitous, and justified the use of preverbal subjects in the ISclVO condition, given that subjects typically appear in the postverbal position in Catalan CLLD. Also, it avoided the possibility that matched sentences such as (134 b) and (134 c) were misinterpreted as constructions with clitic doubling.

(134) (a) *Ahir vaig veure el senyor i el metge. Ningú no em   va fer*
                                                  AGENT   CL.DAT

       res   a mi. El senyor, en canvi, va treure l'abric al metge.
       THEME GOAL AGENT   THEME GOAL

"Yesterday, I saw the man and the doctor. Nobody did anything to me. Yet, the man took the doctor's coat off."

(b) *[...] A mi,   no   em   va fer   res   ningú. Al metge,   en canvi,*
       GOAL   CL.DAT   THEME AGENT GOAL

    li   va treure l'abric   el senyor.
    CL.DAT   THEME AGENT

"Yesterday, I saw the man and the doctor. Nobody did anything to me. Yet, the doctor, the man took his coat off."

(c) *[...] A mi,   ningú   no   em   va fer   res.   Al metge,   en canvi,*
       GOAL   AGENT   CL.DAT   THEME GOAL

    el senyor li   va treure l'abric.
    AGENT   CL.DAT   THEME

(a) Mismatch of φ-features

(b) Match of φ-features

Figure 31: Examples of the pictures presented in Experiment 6

The overall results of control and aphasic subjects appear in Table 36. Aphasic participants erred in 93 out of 480 items, which constitutes a 19.37% of incorrect answers. The control participants, in contrast, reached a 97.28% of correct responses in the task. The statistical analysis revealed that the difference in performance between control and aphasic individuals is significant (OR=5.47, CI (2.45, 12.21)).

	Items	Mean (%)
Controls	465/480	97.28%
Aphasics	387/480	80.63%

Table 36: Overall correct responses (aphasic and control subjects)

As can be observed in Table 37, controls performed at ceiling on all conditions. The aphasic patients' performance varied across conditions. On the one hand, they showed very good comprehension of declaratives, subject topicalisations and indirect object clitics (mean of 96.88%, 94.79% and 91.67% of correct responses, respectively). In fact, the odds ratio analysis revealed that there were no statistically significant differences between the control and aphasic groups' performances in these three sentence types: OR=1.52, CI (0.23, 9.01) for declaratives, OR=1.26, CI (0.31, 5.22) for subject topicalisations and OR=4.27, CI (0.83, 22.00) for IO clitics. On the other hand, aphasic participants performed worse in the two dislocation conditions. In fact, control subjects' performance is significantly better in both conditions: OR=15.67, CI (3.36, 73.15) for dislocations with preverbal subjects and OR=38.21, CI (10.45, 139.73) for dislocations with postverbal subjects.

	SVO decl	SVO top	ISclVO top	IclVOS top	SclVO cl
Controls	93/96	92/96	94/96	92/96	94/96
Aphasics	93/96	91/96	72/96	43/96	88/96

Table 37: Correct responses by condition (control and aphasic subjects)

This can also be observed in Figure 32, in which the mean correct percentages of control and aphasic subjects are represented. There were

no statistical differences within the aphasic performance among the three conditions in which patients performed above chance, as evidenced by the estimated means of correct responses: 0.97, CI (0.90, 0.99) for declaratives, 0.95, CI (0.88, 0.98) for subject topicalisations and 0.92, CI (0.83, 0.96) for actives with IO clitics. The aphasic performance on ISclVO dislocations was significantly worse than for subject topicalisations and IO clitics (OR=0.17, CI (0.04, 0.68) and OR=0.27, CI (0.08, 0.90)); also, their performance on declaratives was significantly better than their performance on dislocations with preverbal subjects (OR=10.33, CI (1.84, 58.16)). Still, aphasic patients achieved 75% of correct responses on ISclVO dislocations and thus performing above chance on average (estimated mean of correct responses of 0.75, CI (0.63, 0.84)). By contrast, the aphasic performance in CLLDs with postverbal subjects was at chance (mean estimate of correct responses of 0.45, CI (0.33, 0.57)); and also indicated significantly poorer comprehension than the other four conditions, as evidenced by the odds ratios for declaratives vs IclVOS (38.21, CI (6.99, 208.84)), IclVOS vs ISclVO (0.27, CI (0.12, 0.64)), IclVOS vs subject topicalisation (0.05, CI (0.01, 0.18)), and IclVOS vs SclVO (0.07, CI (0.02, 0.23)).
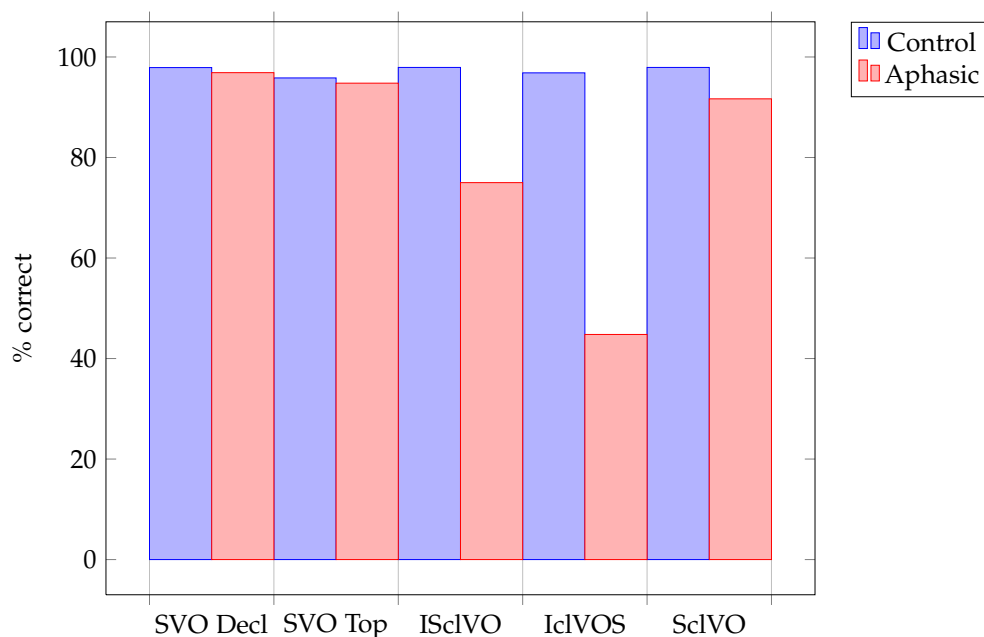
Figure 32: Mean percentages of correct responses by condition

The individual mean percentages of correct responses for aphasic patients appear in Figure 33. All patients performed above chance on declaratives

(from 83.33% to 100% correct). Their results on subject topicalisations are also quite homogeneous: patients performed from 91.67% to 100% of correct responses, except for A4 who only reached a 66.67% of correct responses. Regarding the comprehension of IO clitics, all aphasic participants showed an above-chance performance (from 75% to 100% of correct responses). Likewise, all participants showed a poor performance on IclVOS dislocations quite uniformly: from 33.33% to 58.33% of correct responses. Concerning dislocations with preverbal subjects, the aphasic performance is on average better than the performance on the IclVOS condition: four patients achieved very high percentages of correct responses (from 75% to 100%), whereas the other four produced from 50% to 66.67% correct.
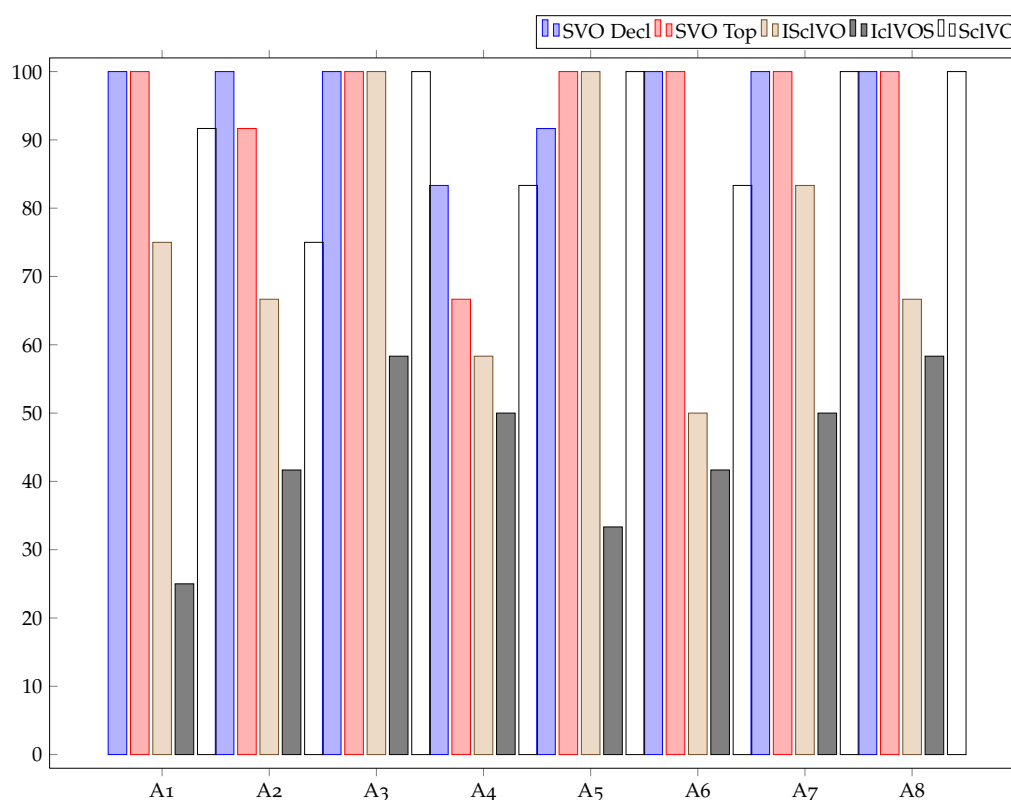
Figure 33: Mean individual percentages of correct responses by condition (aphasic subjects)

In Figure 34, the p-values from the goodness of fit test are represented. The test revealed that at-chance performance for IclVOS sentences cannot be ruled out for any of the eight aphasic participants. As already pointed out, the

aphasics' level of performance on ISclVO varied across patients: the at-chance performance can only be ruled out for four patients –A3, A5, A7 and A8–, the remaining aphasic individuals performed above chance.
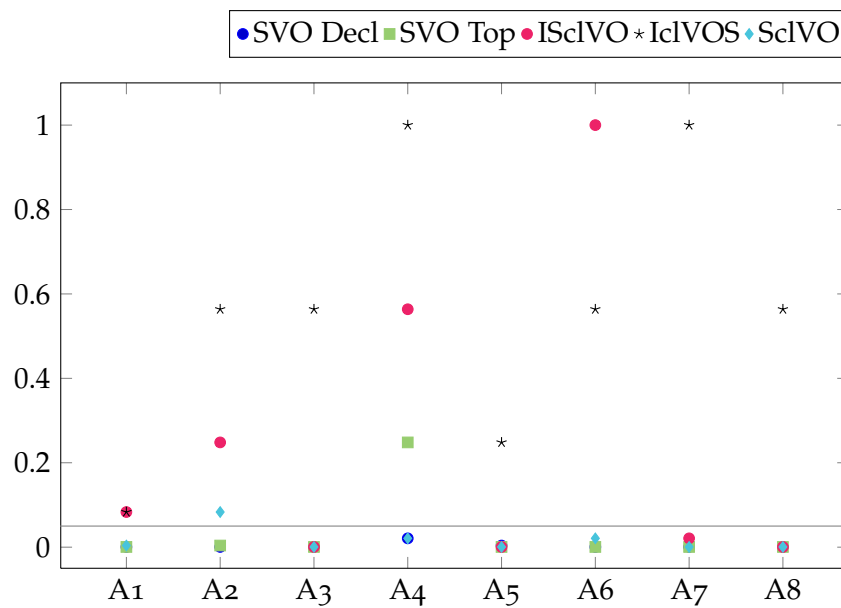
Figure 34: Individual p-values by sentence type from a randomness test (aphasic patients)
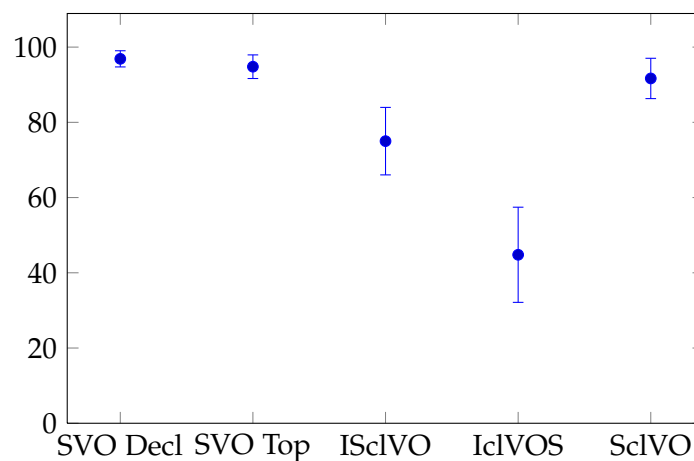
Figure 35: Estimated means of correct responses by condition (aphasic subjects)

The estimated means of correct responses and their corresponding confidence intervals are represented in Figure 35. As in previous tasks, greater variability is mostly observed in those conditions that were poor understood by agrammatic aphasics: in this case, the two object topicalisation conditions.

The results by condition and severity appear in Table 38. The overall patterns of performance were replicated through different levels of severity, though the results from mild and severe aphasics are only descriptive as the sample is too small. On average, the comprehension of clitic left dislocations with postverbal subjects showed to be compromised, whereas the performance significantly improved on dislocations with preverbal subjects through severity levels. Yet, the only patient suffering from a severe aphasia showed an at-chance performance on clitic left dislocations with preverbal subjects and, as argued above, this was also the case for four moderate aphasics, despite the fact that all of them showed better comprehension on this condition than on IclVOS. Hence, even though there is a general tendency –also observed in Experiment 5– to perform better on dislocations with preverbal subjects than with postverbal subjects, we cannot conclude that the comprehension of the former is spared.

| | SVOI | SVOI | ISclVO | IclVOS | SclVO |
	DECL	TOP	TOP	TOP	CLITIC
MILD (1)	100.00%	100.00%	91.67%	54.17%	100.00%
MODERATE (6)	95.00%	91.67%	70.00%	38.33%	86.67%
SEVERE (1)	100.00%	100.00%	66.67%	13.73%	100.00%

Table 38: Mean percentages of correct responses by severity and condition (aphasic subjects)

If we look at the aphasic performance by sentence type on gender-matched and mismatched sentences (Figure 36), statistically significant differences are only found in the IclVOS condition, as matched items are slightly better comprehended (OR=2.16, CI (0.95, 4.90)). Thus, mismatch of φ-features did not influence agrammatics' performance. These results also show that the poor performance on matched clitic left dislocations cannot be attributed to a misinterpretation of these sentences as constructions with clitic doubling: if that had been the case, the results on mismatched sentences would have significantly improved. However, the main prove that CLLDs were contextualised as such and were not ambiguous in the present tasks is that

control participants performed at ceiling regardless of the match/mismatch feature.
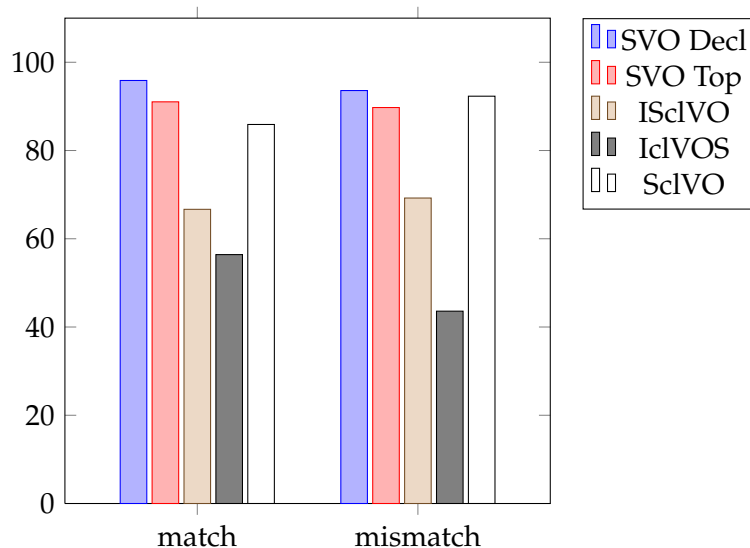
Figure 36: Mean percentages of correct responses by match/mismatch (aphasic subjects)

5.5 SUMMARY

In the first section of the present chapter I have reviewed and discussed previous experimental work on the interpretation of clitic left dislocation and clitics in Romance languages and, in the following sections, I have presented the results of Catalan-speaking agrammatic aphasics on the comprehension of topicalised structures and sentences with object clitics. The patients who participated in the present study showed a good performance on declaratives and subject topicalisations, whereas their performance declined on the two object topicalisation conditions. These results are in line with the data on the comprehension of focalisations (see Chapter 4). However, CLLD with preverbal subjects involved greater intersubject variability, as half of the patients performed above chance on this condition. On the other hand, the comprehension of direct and indirect object clitics has shown to be spared in Catalan agrammatism.

6

DISCUSSION AND CONCLUSIONS

This chapter discusses the findings of the present study. The aims of the research, as introduced in Chapter 1.2, are revisited and addressed here. The conclusions that can be drawn, as well as the study's limitations and directions for future investigations, are also discussed in the last section.

6.1 DISCUSSION

The present study aims at investigating the agrammatic comprehension of Catalan contrastive focus and clitic left dislocation, which involve several properties that make them suitable for evaluating current hypotheses on the deficit in agrammatic comprehension. Since these structures are associated with specific intonational contours, I first carried out a discrimination task to test patient's phonological abilities (Chapter 3). The comprehension of contrastive focus was assessed through two experimental tasks: a truth-value judgement task (see Chapter 4.2) and a sentence-picture matching task (Chapter 4.3); whereas the interpretation of clitic left dislocation and clitics was tested through another truth-value judgement task (Chapter 5.2), and two sentence-picture matching tasks, one containing direct object dislocations (Chapter 5.3), and the other indirect object dislocations (Chapter 5.4). All tasks included declaratives, subject topicalisations and subject focalisations as control items. The agrammatic aphasics' results and other relevant information on the comprehension tasks conducted in the present study, such as the methodology –sentence-picture matching task (SPMT) or truth-value judgement task (TVJT)– or the number of subjects are summarised in Table 39. Aphasic participants showed high percentages of correct responses on declaratives, subject topicalisations, subject focalisations, and clitic constructions through tasks; whereas their performance on object focalisations and topicalisations was less uniform: on average, focalisations and CLLDs with postverbal subjects were understood poorly, but the aphasics' performance improved on CLLDs with preverbal subjects (though great intersubject variability was observed in this condition).

| Construction type | | Results | | Methodology |
Item type	WO	Count	Mean (%)	(participants)
Declarative	SVO	45/50	90.00	TVJT (5)
		93/98	94.90	SPMT (7)
		75/80	93.75	TVJT (8)
		162/180	90.00	SPMT (9)
		93/96	96.88	SPMT (8)
Subject Focus	SVO	90/100	90.00	TVJT (5)
		89/98	90.82	SPMT (7)
Subject Topic	SVO	151/160	94.38	TVJT (8)
		141/180	78.33	SPMT (9)
		91/96	94.79	SPMT (8)
Object Focus	OVS	25/100	25.00	TVJT (5)
	OVS	48/98	48.98	SPMT (7)
	OSV	50/98	51.02	SPMT (7)
CLLD	OclVS	49/160	30.63	TVJT (8)
	OclVS	88/180	48.89	SPMT (9)
	IclVOS	43/96	44.79	SPMT (8)
	OSclV	122/180	67.78	SPMT (9)
	ISclVO	72/96	75.00	SPMT (8)
Clitics	SclV	145/180	80.56	SPMT (9)
	SclVO	88/96	91.67	SPMT (8)

Table 39: Summary of the mean correct responses in the comprehension tasks conducted in the present study (aphasic subjects)

6.1.1 *The discrimination of intonational patterns*

Prosody plays a crucial role in the interpretation of focalisations and topicalisations: on the one hand, the sentential meaning is partly built on the

information provided by intonation and, on the other hand, the intonational pattern is one of the distinctive features that characterise these constructions. In agrammatic literature it is tacitly assumed that Broca's aphasics preserve their ability to perceive and identify prosodic patterns, and that the deficit in comprehension is due to an impairment of syntactic representations or processes. Here, I have conducted an experimental task in order to establish that Broca's aphasics have access to the information provided by intonation to rule out the hypothesis that their comprehension deficits are due to a misperception of prosodical contours.

From the results in the discrimination task carried out with ten agrammatic individuals, we can conclude that patients are able to identify and discriminate different intonational patterns and, hence, that Broca's aphasics are sensitive to prosody. These results are in line with previous studies in German and English; yet, Catalan is more suited for testing the agrammatics' phonological abilities, as it allows for intonation to be the only variable in different structures displaying the same word order. The finding that agrammatic aphasics preserve their phonological skills indicates that the deficit shown in comprehension tasks must be placed somewhere else in the grammar.

6.1.2 *The interpretation of SVO constructions: declaratives, subject focalisations and subject topicalisations*

As expected, all agrammatic patients performed above chance on the declarative, subject focalisation and subject topicalisation conditions throughout the tasks; all of them display the superficial word order SVO and thematic roles are assigned canonically. The comprehension of subject focalised or topicalised structures has only been previously tested in Burchert et al. (2003) and Gavarró (2005), and both studies reported high percentages of correct responses by Broca's aphasics, which is in line with the findings from the present study.

The interesting feature of subject focalisations and topicalisations is that they share the same pragmatics and prosody as their object counterparts. In the present study, these properties have been taken into account in the experimental design: as already mentioned, all items were prosodically marked and introduced by a contextualising sentence to justify the use of a focalisation or a topicalisation. Hence, the introduction of subject topicalisations and focalisations acted as a control for these variables.

Concerning the accounts on the comprehension deficit both the TDH and the FUH predict good performance by Broca's aphasics on SVO constructions, despite the fact that both subject topicalisations and focalisations are derived by movement, as represented in (135a)-(135c) respectively (verb movement is ignored for reasons of clarity). According to these two hypotheses, the movement of the subject is irrelevant as it does not cross any potential intervener. On the contrary, they are predicted to be problematic under the DDH and the DOP-H, given that the three syntactic constructions contain more than one dependency relation, and none of their constituents appears in their base positions, even though their superficial word order is canonical. Finally, the TPH's predictions are compatible with the data, even if the subject undergoes movement to the CP layer, since Friedmann (2006) argued that subject movement is avoided for interpretative reasons.

(135) (a) *Les soldats$_i$ van mullar <...>$_i$ al policia$_j$ <...>$_j$.*
     D soldiers AUX wet   ACC+D policeman
     AGENT   THEME

     "The soldiers wetted the policeman."

   (b) *LES SOLDATS$_i$, <...>$_i$ van mullar <...>$_i$ al policia$_j$ <...>$_j$.*
     D soldiers   AUX wet   ACC+D policeman
     AGENT   THEME

     "THE SOLDIERS, wetted the policeman."

   (c) *El metge$_i$, <...>$_i$, va treure <...>$_i$ l'abric$_j$ <...>$_j$ al senyor.*
     D doctor   AUX take off   D+coat   DAT+D man
     AGENT   THEME   GOAL

     "The doctor, he took off the man's coat."

In conclusion, aphasic participants' good comprehension of SVO structures indicates that they understood the task, and that we can therefore rule out the possibility that the guessing performance on object topicalised or focalised conditions was caused by problems with the experimental design such as an overdemanding task. Likewise, it also confirmed that the inclusion of the pragmatics and the intonational contours associated with topic and focus did not worsen the patients' comprehension which, in turn, demonstrates that the prosodical contour does not signify a noncanonical assignment of thematic roles, and cannot be a cue to noncanonical thematic interpretations, as mistakenly assumed in previous experiments (Burchert et al., 2005b). Finally, the testing of these structures allowed us to isolate syntactic movement in their object counterparts.

6.1.3 *The comprehension of direct and indirect object clitics*

Since Catalan clitic left dislocation contains a resumptive clitic in agreement with the displaced object, sentences with direct and indirect object clitics were included to investigate whether the presence of the clitic alone is problematic for Broca's aphasics. The results showed that Catalan-speaking aphasic participants performed individually and on average above chance on both DO and IO clitic conditions (see Table 39 for a summary of the results).

Data from previous studies on the comprehension of clitics in Romance languages are summarised in Table 40, in which the type of task –truth-value judgement task or sentence-picture matching task– and the number of aphasic participants –in parentheses– are specified in the "methodology" column.

Language	WO	Results	Methodology	source
Italian	SclV	75.50%	SPMT (11)	Luzzatti et al. (2001)
	SclVO	52.70%	SPMT (11)	
Spanish	SclV	87.5%	TVJT (4)	Baauw and Cuetos (2003)
		93.85%	SPMT (5)	Martínez-Ferreiro (2010)
Catalan	SclV	81.00%	TVJT (3)	Gavarró (2008)
		92.31%	SPMT (5)	Martínez-Ferreiro (2010)
Galician	SclV	81.54%	SPMT (5)	Martínez-Ferreiro (2010)

Table 40: Summary of agrammatic aphasics' results on the comprehension of clitics in Romance languages

The focus of interest of the referred studies (except for Luzzatti et al., 2001) lay rather on whether aphasic individuals interpreted clitics correctly or as reflexive pronouns; for this reason, the experimental designs did not include role-reversals. By contrast, in the present study subjects were asked to choose between two pictures representing the target interpretation of the sentence and a thematic foil; hence, unlike previous studies, the focus of the research is on the thematic interpretation by Broca's aphasics. In previous research, Broca's aphasics successfully rejected the coreferential reading of object clitics with the subject in simple active sentences in different Romance languages and through different methodologies (Baauw and Cuetos, 2003; Gavarró, 2008; Martínez-Ferreiro, 2010). This finding has also been replicated in another

clitic-type language such as Greek (Nerantzini et al., 2012; see Chapter 1 for a review). However, it still remained unclear whether agrammatics' assignment of theta-roles was correct.

Luzzatti et al. (2001) tested the comprehension of direct and indirect object clitics in Italian through a sentence-picture matching task, which included a role-reversal foil in its experimental design. Their results showed that Broca's aphasics comprehended direct object clitics, in line with the findings reported in the present study and in previous work. However, Luzzatti et al. (2001) claimed that the eleven Italian-speaking aphasics who participated in their experiment performed at chance on active sentences with indirect object clitics, in contrast with my results. As already discussed in Chapter 5, Grodzinsky (2006) analysed Luzzati et al.'s (2001) data and concluded that the at-chance performance on IO clitics is compatible with the TDH: the default strategy assigns agent to the subject and theme to the clitic, whereas the theme role is also assigned grammatically or via theta-bridging to the DO, as exemplified in (136). Under this interpretation, the guessing behaviour is triggered by the conflict between the two theme-roles assigned to the IO clitic and the DO.

(136) *Mario$_i$ t$_i$*   *le$_j$*   *dà un regalo t$_j$.*
    agent   theme   THEME
    [+ANIMATE] [+ANIMATE] [-ANIMATE]
    "Mario gives her a present."

However, it is very unlikely that a two-theme representation such as the one in (136) takes places in aphasia grammar, as the DO and the IO clitic are not semantically reversible. The guessing performance predicted by Grodzinsky (2006) is derived from the supposition that aphasic participants would have interpreted both the DO and the IO clitic as themes interchangeably. Yet patients' heuristics would have avoided an interpretation in which a human (*her*) is literally given to someone (*Mario*), especially when paired to pictures in which any of the depicted characters assume the patient role. Therefore, this explanation is rather implausible.

Due to the experimental design in Luzzatti et al. (2001) –a four-choice sentence-picture matching task with two lexical foils, a thematic foil and the target picture for gender-mismatched sentences; and three lexical foils and the target picture for gender-matched sentences–, it is difficult to interpret the poor performance on sentences with IO clitics without a proper analysis of the aphasic error distribution. If we compare the results on IO clitics in gender-mismatched sentences (mean of 52.7% of correct responses) to the performance on the same condition in gender-matched sentences (mean of 70%

of correct responses), it seems that the introduction of a foil representing the reversed roles situation caused the aphasics' performance to deteriorate. This suggests that the deficit lies in the assignment of thematic roles. However, the experimental design should be taken into consideration here: on the one hand, an overall performance of 52.7% of correct responses may not correspond to a guessing performance, since the experimental design contained four choices and the response was not binomial. And, on the other hand, the aphasic performance on gender-matched SclVO sentences is better than their performance on their mismatched counterparts, but still significantly worse than their results on the gender-matched declaratives (mean of 93.6% of correct responses). By contrast, aphasics' lexical knowledge sufficed to successfully complete the task when patients were presented with gender-matched passives (mean of 91.8% of correct responses), as the picture set did not include a role reversal.[1] However, gender-mismatched passives were significantly worse understood (mean performance of 64.5% of correct responses), indicating that aphasic patients had more difficulties when the reversed role was introduced in the experimental design. All these factors, that is, the fact that (a) SclVO matched sentences were worse understood than the other matched conditions, and (b) the pattern of performance on matched and mismatched IO clitics constructions does not parallel the contrast observed between matched and mismatched items involving other problematic constructions, such as passives, indicate that the comprehension deficit observed in SclVO might not concern the assignment of thematic roles. Luzzatti et al. (2001) argued that frequency played a relevant role in the aphasic performance, as DO clitics are much more frequent than IO clitics (Mauro et al., 1993). As I have already pointed out in Chapter 5.1, if that had been the case, the comprehension of feminine clitics would have been significantly more impaired than masculine clitics, given that they are less frequent. Unfortunately, Luzzatti et al. (2001) did not report an analysis of the error distribution to further test this hypothesis. Likewise, the effect of frequency should have also been observed in the interpretation of SVOI sentences with full-DPs with respect to SVO sentences, as IOs are less frequent than DOs; however, the former are slightly better comprehended than the latter (means of 93.6% and 81% of correct responses, respectively). It is therefore very unlikely that frequency alone explained the aphasic performance on the SclVO condition.

---

[1] There is wide evidence that Broca's aphasics preserve their lexical knowledge. For example, the landmark study by Caramazza and Zurif (1976) demonstrated that Broca's aphasics were able to interpret irreversible object relatives, whereas they failed in comprehending their semantically reversible counterparts.

The dissociation in performance between DO and IO clitics observed in Luzzatti et al. (2001) is not predicted by current accounts on the comprehension deficit either. Under the analysis of clitics as an instance of head movement (Kayne, 1989, among others), Broca's aphasics are not hypothesised to have problems in comprehending direct or indirect object clitics by movement-based hypotheses –the TDH and the FUH–, as it has been proved that head movement is intact in agrammatic syntax (Linebarger et al., 1983; Grodzinsky and Finkel, 1998). On the other hand, according to the TPH, clitics are only hypothesised to be impaired in moderate and severe aphasia, as they belong to the IP layer, and in that case, both direct and indirect object clitics' comprehension should be compromised. Likewise, under the DOP-H, Broca's aphasics are also expected to perform poorly on both structures, as it predicts that aphasic individuals will have problems in interpreting any sentence where the constituents do not appear in their base position, regardless of the type of movement. If we assume that clitics first move as maximal projections (Sportiche, 1988; Belletti, 1999) and leave a phrasal trace in their base positions, the resulting structure will contain two dependency relations which, according to the DDH, is predicted to trigger problems in agrammatic comprehension. This first movement is not relevant for the TDH and the FUH because DO clitics do not cross any potential intervener and the thematic role is transmitted to its antecedent. Regarding IO clitics, as argued previously (136), the object that stands between the displaced element and the trace cannot act as an intervener given the use of heuristics and the inanimate feature associated with it. Therefore, movement-based accounts for the deficit in agrammatic comprehension –the TDH and the FUH– predict that the interpretation of clitic constructions is preserved, which is consistent with my results.

To sum up, the data reported in the present study corroborates the observations in previous agrammatic literature, namely, that patients preserve their syntactic abilities intact with respect to the comprehension of object clitics. The finding that the comprehension of IO clitics is also good is inconsistent with the data reported by Luzzatti et al. (2001); yet the Catalan-speaking aphasics' good performance on IO clitics was replicated individually without exception and was thus quite uniform. The inclusion of tokens with clitics also allows us to rule out the possibility that the presence of the clitic is responsible for the poor comprehension on clitic left dislocations and, crucially, to evaluate current theories on the comprehension deficit in agrammatism.

6.1.4 *The comprehension of contrastive focus and clitic left dislocation*

In previous literature the agrammatic comprehension of object focalisations has been proved to be impaired through different methodologies and across languages (see Table 41). The experimental work (Burchert et al., 2003, 2005b) on the comprehension of German focalisations, though, presents great variability among subjects and higher overall rates of correct responses, probably due to the patient selection and the experimental design as discussed in Chapter 4.1. The results on the comprehension of OVS and OSV Hebrew and Russian focalisations are much more homogeneous (Friedmann and Shapiro, 2003; Friedmann et al., 2010); yet, unlike focalisations in Catalan, arguments are overtly case-marked in both languages. Finally, the Catalan focalisations included in Gavarró (2005) were ambiguous.

CONSTRUCTION TYPE			RESULTS	METHODOLOGY	SOURCE
Item type	Language	WO		(PARTICIPANTS)	
Object focus	Catalan	OVS	50.00%	TVJT (2)	Gavarró (2005)
	German	OVS	63.57%	TVJT (7)	Burchert et al. (2003)
		OVS	68.25%	TVJT (4)	Burchert et al. (2005b)
	Hebrew	OSV	52.00%	SPMT (7)	Friedmann and Shapiro (2003)
		OVS	46.00%	SPMT (7)	
	Russian	OSV	54.00%	SPMT (3)	Friedmann et al. (2010)
		OVS	58.00%	SPMT (3)	
CLLD	Spanish	OSclV	55.00%	SPMT (2)	Beretta et al. (2001)
	Serbian	OclVS	0.00%	SPMT (1)	Jovanov (2011)
		OproVS	0.00%	SPMT (1)	
	Greek	OclVS	0.00%	SPMT (2)	
CLRD	Spanish	SclVO	85.00%	SPMT (2)	Beretta et al. (2001)
	Serbian	SclVO	100.00%	SPMT (1)	Jovanov (2011)
		SVproO	100.00%	SPMT (1)	
	Greek	SclVO	62.00%	SPMT (2)	
Object relatives	Hebrew	OVS	59.10%	SPMT (5)	Friedmann (2008)
		OSVpro	58.35%	SPMT (5)	

Table 41: Summary of results on the comprehension of focalised and topicalised sentences reported in agrammatic literature

The findings in the present study are in line with previous crosslinguistic results in showing that the aphasics' comprehension of object focalisations is disrupted. Concerning the comprehension of clitic left dislocations, the results reported in the present study are not consistent with the only antecedent in Romance, given that the Catalan-speaking aphasic individuals showed a higher level of performance in OSclV dislocations than the two Spanish-speaking patients who participated in Beretta et al. (2001). Jovanov (2011) also claimed that the comprehension of Serbian and Greek object dislocations –with postverbal subjects– with clitics and pronouns is compromised; but the experimental design presents several problems, as a result of which we are unable to draw any robust conclusions (small sample, insufficient number of items, unclear results, etc.; see Chapter 5.1 for a discussion). In the present study, I have attempted to overcome some of the problems in previous research by increasing the number of participants and items tested; also, the experimental tasks included CLLDs with the subject both in the preverbal and the postverbal positions, even though clitic left dislocation typically displays an OclVS word order in Catalan, such as object focalisations.

Subjects in Catalan left-peripheral constructions

Catalan contrastive focus and clitic left dislocation constructions typically show the subject-object inversion (as already argued in Chapter 2). But as null-subject languages like Catalan are relatively permissive regarding the position of the subject, focalisations and topicalisations with preverbal subjects were included to replicate previous empirical studies on the agrammatic comprehension of left-peripheral structures (Beretta et al., 2001; Friedmann and Shapiro, 2003; Friedmann et al., 2010). Despite the fact that subjects can appear in the preverbal position in Catalan, the resulting structures are less natural and consequently extra marked with respect to OVS sentences. This is why the contextualisation of these items is relevant, as it not only justifies the use of a topicalisation or focalisation, but also the word order configuration so as to avert the overcomplication of tokens or pictures. Thus each sentence type in topicalisation experiments was preceded by a sentence displaying the same word order to introduce the discourse-related properties associated with postverbal and preverbal subjects, as exemplified in (137a) and (137b) for OclVS and OSclV topicalisations respectively. The target sentence replicated its configuration, given the contrastive property of CLLD (Bianchi and Frascarelli, 2010; see Chapter 2.2).

(137) (a) *[...] A mi, no em va fer res ningú. Al metge, en canvi,*
      GOAL   CL.DAT   THEME AGENT GOAL

      li va treure l'abric el senyor.
      CL.DAT   THEME AGENT

      "Yesterday, I saw the man and the doctor. Nobody did anything to me. Yet, the man took the doctor's coat off."

(b) *[...] A mi, ningú no em va fer res. Al metge, en canvi,*
      GOAL AGENT   CL.DAT   THEME GOAL

      el senyor li va treure l'abric.
      AGENT   CL.DAT   THEME

Both contexts for OVS and OSV focalisations consisted of a brief conversation between two speakers: the first one uttered a declarative containing the presupposition negated by the second speaker, who produced the focalised sentence (see examples (138a) and (138b)). Focalisations showing the subject-object inversion did not need any specific introduction, as this is the most common word order configuration for this structure. Object focalisations with preverbal subjects, though, sound less natural. The presence of a declarative displaying the SV order was needed not only to introduce the erroneous presupposition and create the situation in which the use of a contrastive focus was justified, but also to normalise the OSV word order in the target sentence that, in this case, echoes the configuration in the previous sentence.

(138) (a) *A: La nena va banyar als infermers.*
        AGENT   THEME

      "The girl bathed the nurses."

      B: No. ALS PALLASSOS, va banyar la nena.
            THEME   AGENT

      "No. THE CLOWNS, the girl bathed."

(b) *A: La nena va banyar als infermers.*
        AGENT   THEME

      B: No. ALS PALLASSOS, la nena va banyar.
            THEME   AGENT

The predictions on the agrammatic comprehension of object focalisations and topicalisations depend on the their underlying syntactic structure. As for sentences with postverbal subjects, under the analysis proposed by Ordóñez (2007), the subject moves from the the VP-internal subject position to the FocP

(see Chapter 2). Therefore, the resulting sentence presents all the properties that, according to the hypotheses taken into consideration, are predicted to trigger comprehension problems: on the one hand, it contains more than one dependency relation and its constituents appear in derived positions, and one of them –either the DO or the IO– in the CP layer. On the other hand, the subject intervenes between the object and its copy, hence disrupting the transmission of the theme role. The comprehension of topicalisations and focalisations with preverbal subjects are equally hypothesised to be poorly understood for the same reasons, as the subject also appears in a derived position.

Concerning the level of performance, the TDH predicts that both conditions –with postverbal and preverbal subjects– will be understood at chance, given that the agent role is assigned via theta-bridging to the subject, and by the default strategy to the direct object in transitive sentences (see the example in (139 a)) and to the indirect object in sentences with three thematic roles (139 b).

(139) (a) *Al policia$_i$, les soldats$_j$ el$_i$ van mullar <...>$_j$ <...>$_i$.*
          agent   AGENT

          "The policeman, the soldiers wetted him."

      (b) *Al senyor$_i$, li$_i$ va treure l'abric el metge$_j$ <...>$_j$ <...>$_i$.*
          agent   AGENT

          "The man, the doctor took off his coat."

Note that, as in simple sentences with indirect object clitics, the direct object in ISclVO (140) cannot give rise to intervention effects –with respect to the assignment of agent to the subject– due to the inanimate feature associated with it according to the FUH. Under the TDH, preverbal subjects in SclVO constructions and ISclVO topicalisations should therefore be able to receive the agent role by means of the theta-bridging mechanism, as an inanimate DP cannot receive an agent role and, hence, cannot block the bridging of the agent role (Grodzinsky, 1990). If it had been the case that the default strategy assigned agent to the dislocated IO and theme to the preverbal subject in a sentence such as the one in example (140), the prediction would have also been that patients would show guessing behaviour. However, such an interpretation implies that the subject *el metge* and the DO *l'abric* would be interpreted as themes interchangeably –despite that fact that they are not semantically reversible– and the IO as the agent: considering that the type of task required participants to choose between the target picture and the thematic foil, the prediction would follow that aphasic patients would always

point to the situation representing the SVO interpretation of CLLDs. This pattern of performance, however, has not been attested here or in previous studies.

(140) *Al senyor$_i$, el metge$_j$ li$_i$ va treure l'abric   <...>$_j$ <...>$_i$.*
     agent   theme   THEME
     "The man, the doctor took off his coat."

Thus, under the TDH, ISclVO sentences are predicted to be understood at chance by patients as the result of an interpretation such as the one represented in (141), in which the subject assigned agent via theta-bridging will be in conflict with the agent role assigned by the default strategy to the dislocated item triggering the guessing performance.

(141) *Al senyor$_i$, el metge$_j$ li$_i$ va treure l'abric   <...>$_j$ <...>$_i$.*
     agent   AGENT   THEME
     "The man, the doctor took off his coat."

The predictions of all hypotheses on sentences with postverbal subjects are consistent with the results from Catalan-speaking agrammatics, as they showed poor comprehension of these structures. Likewise, the prediction that constructions with preverbal subjects are compromised in Broca's aphasia is consistent with the results on the comprehension of OSV focalisations reported in Experiment 3. However, Catalan-speaking agrammatics performed significantly better on CLLDs with preverbal subjects: half of the patients understood OSclV and ISclVO dislocations above chance, whereas the other half understood them at chance. In fact, these results are also consistent with the overall at-chance performance previously reported on the comprehension of Spanish clitic left dislocations (Beretta et al., 2001), given that the results were also very heterogeneous: the two aphasic participants' performances contrasted sharply as one patient reached a mean of 75% of correct responses, while the other one only performed a 35% of correct responses. Interestingly, their performance was much more homogeneous on the other tested conditions (including passives, which were understood at chance).

The better performance on OSV clitic left dislocations in comparison with the results on OVS structures and OSV focalisations, despite the variability among aphasic participants, is robustly observed both in direct and indirect object dislocations in Experiments 5 and 6, respectively. Furthermore, clitic left dislocations with preverbal subjects are consistently better understood at an individual level than their OVS counterparts. Hagiwara and Caplan (1990)

argued that the position of the arguments can interact with the comprehension deficit; for instance, they claimed that aphasics' good comprehension on Japanese right and left dislocated structures was due to the fact that they preserved their ability to assign the theme role to the preverbal position, in which the object occurs canonically in Japanese. However, this does not hold for Catalan dislocations with preverbal subjects, given that the position of the subject was not decisive to comprehend them. If that had been the case, the same effect would have been observed in OSV focalisations; however, they were understood poorly in spite of the subject's preverbal position. Similarly, the position of the subject was proven not to be relevant in Spanish actives and adjectival passives with preverbal and postverbal subjects in Beretta et al. (1996). The fact that, unlike CLLDs, object focalisations were comprehended at chance regardless of the word order configuration might suggest that they differ in their underlying syntactic structures or that the presence of the resumptive clitic improved the aphasics' performance. If this were the case, agrammatic individuals would have shown a similar pattern of response on CLLDs with postverbal subjects, as they share the same syntactic properties; instead, aphasic participants failed to comprehend them. Most probably, aphasic participants who understood OSclV above chance assimilated them to clitic constructions. Several factors probably emphasised the SclV configuration of dislocations with preverbal subjects and favoured this interpretation: on the one hand, these structures are not as productive as their OVS counterparts, and most likely sounded less natural. On the other hand, the items tested contained an adverbial phrase to stress the contrastive feature of CLLD that stood between the dislocate and the matrix clause (*en canvi*, see example (142)), and, finally, the topic and the comment belonged to two different units prosodically differentiated as represented in (142), hence highlighting the SclV configuration of the comment.

(142) $[_\iota$ $[_\phi$ *Al policia,]* *en canvi,* $[_\phi$ *les soldats* *el van mullar]].*
           L+H* H%   L+H* L%

       "The policeman, the soldiers wetted him."

Still, the performance on CLLDs with preverbal subjects was not as good as in sentences with clitics: either because the contextualisation of the latter was the appropriate one for SclV sentences (see (143)), whereas the former were contextualised as topicalisations; or because assimilating these sentences to a known construction was an alternative way to reach an interpretation and compensate for the deficit not available to all patients (see Section 6.1.6 for further discussion). This latter explanation is more feasible if we take into

consideration the fact that greater intersubject variability was observed in this condition and, hence, that the results are not robust enough to conclude that the comprehension of clitic left dislocation with preverbal subjects is preserved in agrammatic aphasia.

(143) *Ahir vaig veure al metge i al senyor.   Jo   no li vaig fer res*
                                      AGENT   THEME

       al metge.   En canvi, el senyor li   va treure l'abric.
       GOAL   AGENT   CL.DAT   THEME

       "Yesterday, I saw the doctor and the man. I didn't do anything to the doctor. Yet, the man took his coat off."

Overt morphosyntactic features

The main difference between Catalan and the previously tested languages –such as German in Burchert et al. (2003, 2005a), Hebrew in Friedmann and Shapiro (2003) and Russian in Friedmann et al. (2010)– is that the latter contain overt case markers for nominative and accusative, whereas in Central Catalan only animate DO are preceded by the accusative marker, and their pronunciation is only distinguishable when it is followed by the feminine article. Broca's aphasics had shown sensitivity to case morphology in previous literature (Lukatela et al., 1988; Crain et al., 1989); so the first studies on the comprehension of object focalisations examined whether case morphology could influence agrammatics' performance and reached different conclusions. On the one hand, Friedmann and colleagues interpreted the at-chance performance on both case-marked OVS and OSV focalisations in Hebrew and Russian as evidence that aphasics are sensitive to case markers, otherwise the expected pattern of performance would have been below chance. Yet this interpretation is inconsistent with their account on the agrammatic comprehension as discussed in Chapter 5.1, and also with a wide range of structures understood at chance from languages without overt case markers, such as Catalan in the present study. On the other hand, Burchert et al. (2003) concluded that agrammatic aphasics who participated in their study did not benefit from overt case morphology, as their overall performance on case-marked structures did not significantly differ from their performance on OVS sentences without case markers. However, contrary to what it is assumed in Burchert, Friedmann and colleagues' studies, case markers cannot be used as cues to comprehension because they are not responsible for the assignment of thematic roles. As described in Chapter 2, thematic roles are assigned to specific positions in the syntactic tree, and constituents are often forced

to move to another position in order to receive case. Specific cases do not always correspond to specific theta-roles, as the assignment of theta-roles is not mediated by case markers. Therefore, the fact that Broca's aphasics are sensitive to case markers does not entail a correct thematic assignment, as demonstrated by crosslinguistic data on the comprehension of passives, for example, in which the subject receives the theme role instead of the agent role.

In the present study, the case marker –the preposition *a*– preceding direct and indirect objects did not prevent Catalan-speaking aphasics from failing to comprehend object-derived structures. The presence of a resumptive clitic in clitic left dislocations in agreement with the object in number, gender and case did not improve their comprehension either, as evidenced by their results on dislocations with postverbal subjects. In addition, aphasic participants showed a good performance on direct and indirect object clitics (both case-marked) in simple sentences, which indicates that their poor comprehension on CLLDs cannot be attributed to the misinterpretation of the resumptive clitic.

In order to avoid ambiguities, the materials in the present study involved other morphological features: in focalisations, the subject and object did not match in number; whereas in dislocations, only half of the items presented mismatch of φ-features, as the presence of the clitic alone sufficed to exclude any possible misinterpretations. The results on the comprehension of focalised structures, which presented number mismatch, are shown in Table 39, and the results on the interpretation of clitic left dislocations by match or mismatch of φ-features are summarised in Table 42; some items presented mismatch of gender, whereas others involved gender and number mismatch (specified within parentheses). The findings in the present study showed that number-mismatch in Experiments 2, 3 and 5 and gender-mismatch in Experiments 4 and 6 did not prevent aphasics from failing in interpreting object-derived constructions, and that their performance did not significantly improve on mismatched sentences over their matched counterparts in any of the comprehension tasks.

Construction type		Results		Methodology
Item type	WO	match	mismatch	(participants)
CLLD	OclVS	32.95%	27.78% (g)	TVJT (8)
	OclVS	42.22%	55.56% (g/n)	SPMT (9)
	IclVOS	56.41%	43.59% (g)	SPMT (8)
	OSclV	64.44%	71.11% (g/n)	SPMT (9)
	ISclVO	66.67%	69.23% (g)	SPMT (8)
Clitics	SclV	74.44%	86.67% (g/n)	SPMT (9)
	SclVO	85.90%	92.31% (g)	SPMT (8)

Table 42: Summary of the agrammatic correct responses by match/mismatch in Experiments 4, 5 and 6

Interestingly, the presence of mismatched φ-features can contribute to testing the FUH, under which only scope-discourse features are predicted to be underspecified in Broca's aphasia as the result of a slow-down in processing. The hypothesis is motivated by Abel's (2007) hierarchy (represented in (52) on page 41), according to which morphosyntactic features are processed earlier than scope-discourse features. Hence, the selective processing impairment affects only those features that are accessed at a later stage; from which it follows that aphasic individuals are able to represent morphosyntactic features such as gender, number and case. The presence of discrepant morphosyntactic features should suffice to link moved constituents to their copies. The example in (144) reproduces the agrammatic representation of a topicalisation tested in the present study: the asterisk represents the underspecification of the topic feature, and the capital letter *A* stands for the class to which elements belong: in this case, since the discourse-related feature is underspecified, the topicalised element belongs to the argumental class and, such as, it is undistinguishable from the intervening subject.

(144) *A la nena$_i$,   la$_i$ persegueix el nen   <...>?.*
     $(\text{ACC},\theta_?,\phi_{fs},*)_A$ $(\text{NOM},\theta_1,\phi_{ms})_A$ $(\text{ACC},\theta_2,\phi_{ms},*)_A$
     "The girl, the boy is chasing her."

It seems natural to assume that aphasic individuals can benefit from the fact that the φ-features associated with the displaced object and the subject differ, and are able to recover the link between the dislocate and its copy. However,

as already reviewed, in the present study aphasic participants did not show better comprehension on gender-mismatched sentences than on their matched counterparts.

Grillo (2009) was aware of the fact that a mismatch of φ-features does not improve aphasics' comprehension, and explicitly stated that a gender or number mismatch alone "is not enough to avoid a minimality effect unless that feature introduces a change of class" (2009:1433). The relevant features are those that can act as attractors of syntactic movement, which is not the case for gender in Catalan. Thus the FUH is not challenged by the findings from the present study on the comprehension of gender-mismatched sentences. However, this does not hold for number-mismatched structures, as number is overtly expressed in the inflected verb in Catalan and is part of the φ-complex that can function as an attractor and trigger the movement of the subject; therefore, it is a distinctive feature that determines class and should block the emergence of minimality effects in sentences like the one in (145).

(145) *Al policia$_i$,*   *el$_i$ van mullar les soldats*   <...>$_i$.
       ($\textsc{acc}$,$\theta_?$,ϕ_s,*)$_A$ v-3p   ($\textsc{nom}$,θ_1,ϕ_p)$_A$ ($\textsc{acc}$,θ_2,ϕ_s,*)$_A$
       "The policeman, the soldiers wetted him."

The results on object focalisations and topicalisations in the present study, though, did not improve when the subject and the object mismatched in number and, hence, brought the FUH into question.

Still, Grillo (2008;2009) could argue that the number feature does not suffice to avoid minimality effects, as the featural class that it introduces –argumental– is no different from the intervener's class (see example (145)). However, in a similar situation, the presence of the distinctive feature NP –which also introduces argumental class– is claimed to be one of the alternatives to explain the poor performance of aphasic individuals on object *which*-questions in contrast to object *who*-questions, which are well comprehended. Therefore, generalised minimality effects should not be expected in (145), given that a perfect match between the set of features associated with the dislocate and the potentially intervening subject is not obtained due to the number mismatch.

Further support for the relevance of the presence of certain features to avoid generalised minimality effects comes from some experimental work in acquisition studies, in which the poor comprehension of object relatives is also analysed as an instance of generalised minimality effects. For instance, Adani (2010) and Belletti et al. (2012) claimed that the comprehension of Italian-speaking children significantly improved in number-mismatched object relatives in comparison with their matched counterparts. Likewise, Hebrew

object relatives were better comprehended if the arguments mismatched in gender (Belletti et al., 2012), as gender is part of the inflectional verb. It is unclear why generalised minimality effects do not apply in the same way in children and aphasic grammars, especially if we assume that the processing deficit in Broca's aphasia selectively affects the representation of scope-discourse features but the remaining language is preserved. If the representation of morphosyntactic features that function as movement attractors cannot avoid the emergence of minimality effects, the FUH is indistinguishable from the TDH with regard to the impossibility of using the information associated with copies and their antecedents. Hence, my findings challenge the FUH, as they suggest that the agrammatics' featural representations are either much more impoverished than expected under the FUH or, in line with the TDH, inexistent as the result of copy deletion.

6.1.5 *Performance levels across methodologies*

If we look closer at the results on OVS sentences, the patients who participated in the sentence-picture matching tasks performed slightly better than the participants that carried out the truth-value judgement tasks: the former were at chance, whereas the latter showed below-chance performance, which indicates that the experimental design probably had an impact on the patients' performance. Hickok et al. (1993) already pointed out that the differences in methodologies and, more specifically, between truth-value judgement tasks and sentence-picture matching tasks, interacted with the aphasics' performance. According to them, patients reject any interpretation of structures that are difficult to comprehend, whenever they are not forced to give an interpretation by choosing among two or more pictures. Hence, they reinterpreted the typical guessing performance observed in sentence-picture matching tasks as the result of their inability to reach an interpretation at all, rather than the result of a two-agent interpretation after resorting to a repair strategy as predicted by the TDH. This explanation was later pursued by Grillo (2008, 2009), given that the FUH is less precise in its predictions and only distinguishes between two levels of performance –good or poor–.

For the purpose of evaluating the predictions of the TDH and the FUH with regard to different performance leveles, I examined whether the differences in performance reported in the present study were due to the experimental design –in line with Hickok et al.'s (1993) interpretation– or to a specific interpretation –as hypothesised by the TDH–. The analysis of the error

distribution revealed that aphasics' responses in truth-value judgement tasks were partly influenced by the truth or falsity of items, as patients made more mistakes when sentences did not match the pictures shown. Therefore, false items supposed an extra burden for patients in these tasks, where the below-chance performance seems to reflect a tendency to interpret object focalisations and topicalisations as SVO sentences: aphasic participants accepted the SVO reading of object focalisations and topicalisations in 82% and 78.75% of the time in false items, respectively. However, the SVO interpretation was not so consistent when OVS sentences involved true items: in such case, patients rejected the target interpretation of object focalisations and topicalisations 68% and 60% of the time. These results from the truth-value judgement tasks contradict Hickok et al.'s (1993) claims: since the number of true and false items was balanced, the expected aphasics' performance level would have been at chance or, in other words, patients would have been expected to show a no bias through all OVS sentences. On the contrary, they showed a yes bias in false OVS items and at-chance performance on true OVS sentences. In conclusion, the results from the truth-judgement tasks carried out in the present study are inconsistent with Hickok et al.'s (1993) interpretation, and evidence that the guessing performance is also replicated in true items and, hence, that the at-chance performance in sentence-picture matching tasks cannot be attributed to the type of task as it is replicated when the problems with the experimental design (in this case, false items) are removed.

Grillo (2009) also argued that the below-chance performance shown by Broca's aphasics on passives with psychological verbs reflects the greater processing cost that the complex predicate of a *psych*-verb requires. This explanation is misleading, as it assumes that the below-chance performance level corresponds to a greater level of difficulty. Yet, a forced-choice task designed to assess the thematic interpretation of aphasics cannot tell us whether a structure is more or less demanding in processing terms, but it rather allows us (a) to establish whether the agrammatic comprehension is disrupted with regard to the syntactic constructions under examination –good or poor performance–, and (b) to learn whether aphasic individuals are unable to assign a consistent thematic interpretation to problematic structures –guessing performance–, or whether they interpret them in a particular way, that is, as SVO sentences –below-chance performance in object-derived structures–.

The findings in the present dissertation are in line with the TDH, as they confirm that aphasic performance is consistent through methodologies when we examine the error distribution.

6.1.6 *Intersubject variability*

It has often been observed in the agrammatic literature that there is great variability in performance among subjects through different types of structures. This has led some researchers to claim that agrammatic aphasia is too broad to be associated with specific patterns of disruption (Beretta et al., 1996; Caramazza et al., 2001), and has given rise to a debate on the legitimacy of group studies and hypotheses that attempt to characterise Broca's aphasia as a uniform syndrome (see Chapter 1.1.1 for a brief review). Still, there is wide evidence that agrammatic aphasics tend to reproduce general patterns of performance across methodologies and languages (see Grodzinsky et al., 1999; Drai, 2006; Drai and Grodzinsky, 2006a,b for a discussion), and the accounts on the comprehension deficit have been shown to be useful to explain most of the data reported in aphasia literature, in spite of the variability among subjects.

The criticism focuses on the fact that an overall guessing performance may reflect different distributions of individual performance, as it could correspond to contradictory patters of response rather than a consistent at-chance performance through individuals. This is the case for the two aphasic patients in Beretta et al.'s (2001) study, whose overall at-chance performance on the OSclV condition corresponds to opposite individual performances: one patient showed an above-chance performance, whereas the other performed below chance. This observation is groundless because the robustness of the overall results of a group of aphasics depends on the size of the sample. The smaller the sample, the greater the possibility to register extreme scores. This was already stressed by Grodzinsky et al. (1999:137):

> Guessing behaviour [...] should be binomially distributed around the mean of 50% correct level. We can now see why results from multiple subjects are so important in this context: in such a response-type, each subject flips a coin and uses it for responding to each experimental question. A single subject, then, cannot be used to discern the pattern, if there are experimental conditions that might result in chance performance. This is so because the score of this particular subject may be located anywhere on a binomial curve.

Likewise, the accounts on the deficit in agrammatic comprehension cannot be tested against individual performances without taking into account the number of items sampled. The probability of registering extreme scores which, in fact, correspond to a guessing performance is significantly reduced if the

trial sample contains at least forty items, and very unlikely if it is even greater (Caramazza et al., 2001). Unfortunately, most aphasiology studies –including this dissertation– rely on small samples of participants and items and, hence, they are likely to contain higher intersubject variability.

There are also several external factors that interact with agrammatic comprehension and cannot be –or have not been– controlled in agrammatic studies. In fact, brain-damaged individuals diagnosed as Broca's aphasics may differ significantly one from each other. In addition to individual anatomical differences in human brains, patients present heterogenous lesions with regard to the size and locus of the damaged area, etiology, and the severity of their condition. For instance, the level of severity –mild, moderate or severe– has been proved to play a role in comprehension tasks carried out in the present study: patients suffering from a less severe aphasia performed slightly better; still, the same patterns of response are replicated regardless of the level of severity. The only conditions in which the level of severity seemed to crucially interact with the level of performance were dislocated structures with preverbal subjects (in Experiments 5 and 6): even though all participants showed better performance on these structures than on their OVS counterparts, aphasics with mild aphasia performed significantly better than patients with more severe aphasias. Most probably, the fact that aphasics with mild aphasia showed a better performance on OSclV and ISclVO sentences reflects the possibility to rely on the remaining linguistic knowledge to try to compensate for the deficit –such as interpreting the referred structures as simple sentences with clitics, in line with what I have already argued above–.

Some of the accounts on the comprehension deficit considered in the present study try to accommodate any possible variability that may be observed in aphasia studies: on the one hand, both the TPH and the FUH rely on hierarchical processes that can be more or less impaired depending on the level of severity. On the other hand, the TDH does not predict that different levels of performance will correspond to different levels of severity, but that general patterns of response are observed in agrammatic studies in spite of the intersubject variability (Grodzinsky et al., 1999; Drai and Grodzinsky, 2006a,b). The results in the present study cannot shed any light in this respect, however the results showed that problematic structures involved more heterogenous responses than well-comprehended sentences: between-subject variability increased on poorly understood constructions, which probably reflected the aphasics' guessing behaviour in experimental tasks. Therefore, there can be observed consistent patterns of variability that are structure-dependent, and that are an indicator of the underlying deficit,

172

and its interaction with the remaining linguistic knowledge and compensatory resources available.

6.1.7 *The derivational approach to Romance clitic left dislocation*

As agrammatism is an acquired language pathology, the studies on healthy grammar play a crucial role in aphasia studies. Theoretical issues in linguistics have been useful to account for the data reported in agrammatic literature and have helped to shift attention from general aspects to specific linguistic phenomena, giving rise to more accurate accounts on the agrammatic deficit in comprehension. Likewise, the study of aphasia has provided insightful evidence about the structure of language and its functioning. For example, the aphasics' poor performance in short passives (Balogh and Grodzinsky, 2000; Gavarró and Dotti, 2014) favoured Jaeggli's (1986) analysis, according to which the agent role is absorbed by passive morphology and hence implicitly active in short passives or, in Beretta et al. (1996), the aphasics' performance on Spanish sentences with postverbal subjects strongly suggested that the derivational analysis of postverbal subjects was preferred over a base-generated analysis.

The experimental tasks on the comprehension of clitic left dislocations carried out in the present study can also be useful to test current grammatical theories on the derivation of CLLD in Romance (see Chapter 2 for a review). CLLD, unlike focalisation, has traditionally been argued to be base-generated (Cinque, 1990). However, several researchers have recently proposed a new analysis under which dislocations undergo movement to the left-periphery (López, 2009; Rubio, 2014, among others). Since syntactic movement is hypothesised to be impaired, the prediction follows that agrammatic individuals will only show comprehension difficulties in CLLD if it is derived by movement. Alternative analyses of the agrammatic representation and thematic assignment of CLLD under the TDH and the FUH are represented in examples (146 a) and (146 b) (subject and verb movement has been ignored for reasons of clarity).

(146) (a) $[_{CP}$ *Al policia$_i$,* $[_{TP}$ *el$_i$* *van mullar* $[_{vP}$ *les soldats.* $]$ $]$ $]$
$\quad$ $\quad$ $(\text{ACC},\theta_2,\phi_s,*)_A$ $\quad\quad$ v-3p $\quad\quad\quad$ $(\text{NOM},\theta_1,\phi_p)_A$
$\quad$ $\quad$ **THEME** $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ **AGENT**

$\quad$ "The policeman, the soldiers wetted him."

(b) $[_{CP}$ *Al policia$_i$,* $[_{TP}$ *el$_i$*   *van mullar* $[_{vP}$ *les soldats* $[_{VP}$
      $(\textsc{acc},\theta_?,\phi_s,^*)_A$ v-3p $(\textsc{nom},\theta_1,\phi_p)_A$
      agent   AGENT
   $<...>_i.]]]]$
   $(\textsc{acc},\theta_2,\phi_s,^*)_A$

The TDH and the FUH predict that aphasic individuals will understand CLLDs above chance if the dislocate is base-generated (146 a), given that the thematic role is directly assigned to the dislocated element without the mediation of a copy. Otherwise, patients are expected to perform poorly if movement takes places (146 b), as the subject would intervene between the copy and the dislocate disrupting the transmission of the theme role.

Concerning the DDH, the DOP-H and the TPH, they cannot distinguish between the two approaches. On the one hand, the DDH postulates that agrammatics have problems in comprehending structures with more than one dependency, and both analyses involve more than one dependency relation (the subject and the clitic). On the other hand, even if the dislocate is generated in the CP, both the clitic and the verb appear in derived positions, which is predicted to be problematic in Broca's aphasia by the DOP-H and, finally, the TPH claims that the deficit in comprehension affects the representation of the upper layers in the syntactic tree regardless of the analysis assumed. This is summarised in Table 43, in which inaccurate predictions are italicised. There is enough empirical evidence that base-generated sentences displaying a noncanonical word order are well comprehended by agrammatic aphasics across languages (Grodzinsky et al., 1991; Hagiwara, 1993; Beretta et al., 1996); so the fact that these hypotheses are unable to distinguish between the two syntactic analyses highlights their inadequacy on both theoretical and empirical grounds.

	DDH	DOP-H	TPH	FUH	TDH
MOVEMENT-DERIVED	poor	poor	poor	poor	at chance
BASE-GENERATED	poor	poor	poor	*good*	*above chance*

Table 43: Predictions on the performance level of Broca's aphasics in comprehending OclVS and IclVOS dislocations

Therefore, the finding that Catalan-speaking agrammatic aphasics present a deficit in comprehending clitic left dislocations gives further evidence to the derivational approach: should the CLLDed element have been base-generated, the aphasic comprehension of this structure would have been shown to be preserved. In fact, the performance level shown by aphasic participants on OclVS dislocations is not different from their performance on OVS focalisations, which are widely assumed to be derived by movement. I only take into consideration CLLDs with postverbal subjects because (a) they are more productive and sound more natural than OSclV dislocations, whose contextualisation and similarity to clitic constructions probably influenced the aphasics' interpretation, as argued before, and (b) the results on OclVS were more robust as they presented less intersubject variability.

In a similar way, the study of aphasia was useful to distinguish between two competing analyses on the derivation of structures with resumptive elements in Hebrew. For instance, Friedmann (2008) conducted an experimental task to assess the comprehension of object relatives with and without resumptive pronouns. Like Romance CLLD, Hebrew relatives with resumptive pronouns had been argued to be base-generated, in contrast with object relatives without resumption, which were assumed to be derived by movement. Yet, in more recent times, relatives with resumptive pronouns have been reanalysed as movement-derived constructions. The Hebrew-speaking agrammatic participants performed at chance on both conditions, which gave support to the derivational analysis of Hebrew object relatives with resumptive pronouns.

6.1.8 *Current theories on agrammatic comprehension and intervention effects*

Here I have considered five linguistic-based accounts of the comprehension deficit in Broca's aphasia (see Chapter 2), which localise the deficit in the movement operation –with the exception of the TPH–. In the previous sections I have tested and discussed their predictions against the results of the experimental tasks reported in the present study. The performance on noncanonical sentences with direct and indirect object clitics is quite informative in that respect: the finding that Broca's aphasics are able to understand clitics, in which all the constituents occur in derived positions, challenges the DOP-H, on the one hand, because all derived word orders are expected to be impaired and, on the other hand, they challenge the TPH, given that the referred structure is consistently well understood by aphasics suffering

from different levels of severity. Under the TPH, patients with moderate and severe aphasias are predicted to have problems in representing the IP layer as well, which implies that the comprehension of object clitics is hypothesised to be impaired, contrary to fact. Likewise, the DDH is also inconsistent with the performance of Catalan-speaking aphasic participants on clitic constructions because they contain more than one dependency relation. Thus, as argued in Section 6.1.3, the good comprehension of DO and IO clitics shown in the present study is only predicted by the TDH and the FUH.

Furthermore, the data reported in agrammatic literature has revealed a selective impairment in the comprehension of aphasic individuals concerning specific syntactic processes, and cannot be explained in general terms. The accounts on the comprehension deficit in agrammatism need to take in consideration the syntactic properties of problematic structures to achieve an accurate description of the impairment, and cannot be too general if they aim to be precise in their predictions, which makes them more suitable for being tested. The TDH and the FUH propose highly-detailed explanations of the deficit that take into account linguistic theory, and also manage to accommodate most contrasts in performance reported in previous literature and in the present study. In addition, they have been proved to be useful to test current hypothesis in linguistic theory. The other three hypotheses –the DDH, the DOP-H and the TPH– offer a more general explanation, less adequate in terms of suitability to linguistic theory. Under the TPH, aphasics are predicted to be unable to represent the upper nodes of syntactic trees; however, the explanation is too general: for example, it fails to capture the distinction between phrasal and verb movement held in linguistic theory, which is crucial in explaining the patients' behaviour in agrammatic studies. The DDH relies on the number of movement operations, and the DOP-H on the canonicity of constituents. Both number of movement operations and canonicity are irrelevant in linguistic theory with regard to syntactic movement: as already discussed in Chapter 2, most syntactic constructions are argued to involve movement, even if they display a canonical superficial word order. Similarly, the total number of dependencies does not suffice to explain the contrasts in performance observed in agrammatic data.

On the other hand, both the TDH and the FUH incorporate the linguistic notion of intervention as a crucial element to account for the agrammatic deficit in comprehension: in the TDH, it has been introduced under the theta-bridging mechanism, while the FUH has been postulated as an instance of generalised minimality effects. The notion of intervention is relevant in linguistic theory in order to explain the formation and blocking of syntactic chains, and it has also

been shown to be useful to explain the aphasics' poor performance in specific movement-derived sentences, given that canonicity or movement alone do not suffice to account for the comprehension deficit. Even though Grodzinsky did not propose the theta-bridging mechanism explicitly as a property of locality, it implies it, as it works in the same way, according to Rizzi's (2004:224) description:

> [Locality] is the kind of principle that we may expect to hold across cognitive domains: if locality is relevant at all for other kinds of mental computation, we may well expect it to hold in a similar form: you must go for the closest potential bearer of a given local relation.

At this juncture, it should be pointed out that the TDH and the FUH crucially differ in that, according to the former, the transmission of theta-roles is only fulfilled if another condition is met: that is, if the role is assigned in the same direction as movement takes place. For instance, the at-chance performance on English passives is explained by the fact that the theta-bridging mechanism does not suffice to compensate for the deficit, as the theme-role is assigned in the opposite direction to the subject movement. On the other hand, Grillo (2008) gave a more economical explanation for the guessing performance on passives: based on Gehrke and Grillo's (2008) analysis, the movement of the subject is driven by a topic-like feature which is underspecified in agrammatic grammar and, as such, indistinguishable from the *by*-phrase it crosses. However, it remains unclear how the FUH accounts for the above-performance of Dutch- and German-speaking aphasics on passives, such as the one in (147). Under the TDH, the *by*-phrase is not hypothesised to give rise to intervention effects due to their quasi-adjunct condition.

(147) *Der Gaul_i wird   vom Esel   <...>_i getreten.*
      d   horse AUX-PAST.3s by donkey   kick-PART

      "The horse was kicked by the donkey."

The FUH, unlike the TDH, can account for the aphasics' above-chance performance on unaccusatives (see example (148) from Piñango, 1999), as the direction of the thematic assignment is not a crucial property to establish a syntactic chain between underspecified copies and displaced elements.

(148) *The girl_i fell <the girl>_i because of the boy.*
      THEME

Despite the apparent differences between the TDH and the FUH, they share some properties and make similar, although not identical, predictions regarding the type of sentences that are problematic in agrammatism: aphasic individuals are hypothesised to be unable to establish syntactic dependencies between antecedents and copies whenever an intervening DP stands between the displaced constituent and its copy –as the result of either the deletion of copies or the impoverishment of morphological features–. The TDH in combination with the default strategy, though, is more precise in its predictions, since it distinguishes between performance levels, thus offering an explanation of aphasics' interpretation of problematic structures, which also makes it easier to test. The FUH has managed to integrate different traditions into one hypothesis by postulating a syntactic impairment as the result of a more general processing deficit that can account for the intersubject variability; however, it does not involve any compensatory strategies interacting with the deficit, and only distinguishes between two levels of performance (either good or poor performance).

The battery of experiments conducted in the present study can shed light on which piece of agrammatic grammar –copies or discourse-related features– is affected. As already discussed in the previous sections, the two hypotheses make the same predictions on the comprehension of the structures tested. However, unlike the TDH, the FUH assumes that agrammatic aphasics are able to represent part of the featural set associated with constituents and copies, as the underspecification only concerns discourse-related features. Hence, it entails that aphasics' comprehension should improve when the relevant morphosyntactic features of moved constituents do not match. To this purpose, I examined the impact that φ-features could have had on the comprehension of Catalan-speaking aphasics. The results showed that the mismatch of relevant φ-features did not prevent patients from failing in comprehending the sentences (see Section 6.1.4). The fact that aphasics are proven to be unable to rely on morphosyntactic features that by hypothesis are intact in their representations suggests that the whole copy is deleted, in line with the TDH approach.

The study of the nature of the comprehension deficit in agrammatic aphasia has achieved considerable progress over the last few decades: the characterisation of the deficit has developed from a channel-based model to highly detailed linguistic descriptions. The first attempts to describe the comprehension deficit from the point of view of linguistics postulated a general deficit in syntax. Later on, the testing of syntactic minimal pairs that allowed researchers to examine the comprehension of specific linguistic

phenomena led several authors to postulate that the superficial word order was decisive in explaining the impairment. However, this view was brought into question on the grounds of new empirical evidence that showed that Broca's aphasics comprehended base-generated sentences in spite of their superficial noncanonical word order. Furthermore, the distinction between canonical and noncanonical word orders proved to be futile in linguistic theory, as it fails to capture the relevant syntactic processes underlying different structures. More recent accounts highlight the emergence of intervention effects in movement-derived constructions which are poorly comprehended by aphasics. The results in the present study provide further evidence that the agrammatics' comprehension deficit can be explained in terms of intervention or locality effects. In Table 44, the factors under consideration are marked with a "+" or a "-" sign depending on whether they are present or absent in the four word order configurations tested. The critical test to that effect is the comprehension of clitics in comparison with the interpretation of object focalisations and topicalisations: even though active sentences with clitics undergo movement and display a noncanonical word order, aphasics showed an above-chance performance on these items in Experiments 5 and 6. The reason is that the clitic does not act as an intervener because it adjoins the T node; likewise, the direct object in SclVO sentences does not intervene due to the semantic property of inanimacy associated with it. On the contrary, the subject intervenes and disrupts the theta-role transmission in object focalisations and topicalisations, which were poorly understood by patients. Thus, the results obtained provide support in favour of movement-based accounts that take into consideration the locality constraints regulating the formation of syntactic chains in healthy grammar: the TDH and the FUH.

STRUCTURES	FACTORS			PERFORMANCE
	noncanonical	movement	intervention	LEVEL
SVO - SVOI	-	+	-	good
SclV - SclVO	+	+	-	
OVS - IVOS	+	+	+	poor
OSV - ISVO	+	+	+	

Table 44: Factors that interact with the word order configurations tested and performance levels shown by aphasic subjects

The focus of this dissertation has been on the agrammatic comprehension of contrastive focus and clitic left dislocation in Catalan. The study of these structures has some relevant implications, as discussed in previous sections. The research questions addressed in this research were formulated in Chapter 1.2, and are outlined below:

- To test the assumption that agrammatic aphasics' perception of intonational contours is intact.

- To determine the crucial properties in explaining the impairment, and to evaluate accounts on comprehension deficit.

- To investigate the role of φ-features in the formation or blocking of syntactic chains in the underlying aphasics' syntactic representations.

- To examine whether different aphasic performance levels correspond to differences in the experimental tasks, or to different interpretations.

- To test the two alternative approaches to the analysis of clitic left dislocation in Romance.

The first aim was to test the assumption that Broca's aphasics preserve their phonological abilities, and to rule out the possibility that poor comprehension of the structures under examination is partially or totally due to misperception of intonational patterns. The Catalan-speaking participants showed good performance in discriminating the four prosodic patterns tested. Thus, we can conclude from these findings that the perception of intonation is preserved in agrammatism, and that any deficit in comprehending contrastive focus and clitic left dislocation must be placed somewhere else in the grammar.

The thesis has presented the research results obtained from five comprehension tasks, which have shown that agrammatic individuals' interpretation of declaratives, subject focalisations and topicalisations, and clitics is preserved, whereas their performance on object topicalisations and focalisations is compromised. The findings of this research prove that the notions of movement and intervention are useful in explaining the patterns of loss in agrammatic comprehension and, thus, provide further support for accounts based on these notions, namely, the Trace-Deletion Hypothesis (Grodzinsky, 2000a, 2006) and the Feature Underspecification Hypothesis (Grillo, 2008). For the purpose of evaluating these two hypotheses, I have

examined two of their assumptions concerning (a) the element of grammar affected in agrammatic comprehension and (b) whether different levels of performance correspond to different interpretations, or to different types of experimental tasks. The finding that a mismatch of number between the displaced object and the subject does not improve the aphasics' performance on focalisations and topicalisations demonstrates that agrammatic aphasics do not avoid intervention effects when morphosyntactic features are distinct, contra the predictions of the FUH, and thereby it strengthens the TDH's assumption that traces are deleted from aphasics' representations. On the other hand, I compared the results on topicalisations and focalisations from two truth-value judgement tasks to the results on the same structures from the sentence-picture matching tasks which seemed to indicate that the level of performance followed from the type of task. Yet a closer examination of the results and the experimental design revealed that the below-chance performance on the truth-value judgements tasks did not correspond to a no bias, as hypothesised by Hickok et al. (1993). If that had been the case, the performance would have rather been at chance, as the number of yes and no answers was balanced. This finding therefore rules out the hypothesis that a below-chance performance in truth-value judgement tasks can be explained in Hickok et al.'s terms (1993).

In the present study, the poorer performance in these tasks is due to a yes bias in the overdemanding stimuli involving false conditions. Even though the results are inconclusive given the problems caused by false items, the aphasics' responses on true items clearly indicate that aphasic participants did not consistently reject object focalisations and topicalisations, but showed a tendency to guess the responses. This finding confirms that aphasic performance is consistent through methodologies and that the guessing performance cannot be attributed to the type of task, in line with the TDH.

This study is also of theoretical significance because the results on the agrammatic comprehension offer a new insight into syntactic analysis of clitic left dislocations: the poor comprehension of aphasic participants on these sentences favours linguistic analyses under which clitic left dislocation is argued to be derived by movement (López, 2009; Rubio, 2014) to the detriment of base-generated approaches (Cinque, 1990).

Findings from this study corroborate that, in spite of the intersubject variability, general response patterns associated with syntactic types are observed throughout tasks. Moreover, the variability in performance is concentrated in those conditions involving sentence types that are poorly understood by patients, which indicates that the variability among patients is

structure-dependent, and suggests that their interpretations interact with the remaining linguistic knowledge and compensatory strategies available. This is evidenced by the fact that greater intersubject variability is observed in clitic left dislocations with preverbal subjects, which could easily be assimilated to active sentences with clitics due to the stimuli's characteristics.

Although it has not been the explicit purpose of this thesis to discuss the agrammatic comprehension of head movement, the aphasics' good performance on sentences with direct and indirect object clitics provide further evidence that this type of movement is preserved in aphasic grammar. Likewise, the fact that the results on sentences with three arguments replicated the results on transitive sentences indicates that other psychological measures such as complexity (e.g. number of arguments) are not relevant to comprehension deficit in agrammatism. Therefore, though in a secondary manner, this research also contributes to highlighting the fact that the impairment selectively affects certain linguistic operations, and the need for a theory in consonance with current linguistic thinking able to account for the different linguistic distinctions tested.

It should be mentioned that the findings and analysis of this study are based on a limited number of participants and trials. I attempted to overcome this limitation by carrying out several tasks with different methodologies to provide sufficient evidence to establish whether the aphasic comprehension of the structures at hand was compromised. Nonetheless, a more substantial number of participants would allow for a more refined analysis of the results by severity, which here are limited to a descriptive level.

Many issues are kept open for further research. Half of the aphasic individuals who participated in the present study showed good comprehension of CLLDs with preverbal subjects; however, this pattern of response was not replicated in OSV focalisations, which were understood at chance. Testing this alternation in other syntactic structures would allow us to corroborate that the good performance on OSV dislocations is the result of assimilating the second prosodic phrase to a sentence with clitics, as I have argued in the previous section. Given that Catalan is a nullsubject language, this alternation is found in other left-peripheral structures, such as relatives:

(149) *El Joan és la persona amb qui ha parlat la Maria / la*
       D   Joan   is D person   with REL AUX talk-PART D Maria / D
       Maria ha parlat.
       Maria AUX talk-PART

"Joan is the person who Maria talked to."

The study contributes to a more fine-grained picture of agrammatic comprehension of contrastive focus and clitic left dislocation with regard to the thematic interpretation reached when aphasic individuals are forced to rely solely on syntactic cues. However, it does not tell us on whether their semantic interpretation of the referred structures is preserved or compromised. Even though Broca's aphasics have been shown to be able to use semantic cues to compensate the deficit, there is also evidence that their semantic interpretations might differ from those of healthy speakers: for example, Saddy (1995) and Philip and Avrutin (1998) reported results which indicated that aphasics' interpretations of quantifiers fell over events, rather than over individuals. Should discourse-related features be underspecified as hypothesised by the FUH, the prediction would follow that agrammatics' interpretations of these features are abnormal. Additional study on the semantic interpretation of agrammatic aphasics of contrastive focus and clitic left dislocation could shed some light on this issue.

The present study is limited to one type of topicalisation, namely, clitic left dislocation. The work begun here can be further explored by investigating the interpretation of hanging topic left dislocations (HTLD), which shares some properties with CLLDs –such as the dislocate in the left periphery and a resumptive element in agreement with it–, but it is pragmatically structurally different. For instance, there is wide agreement that HTLD, unlike CLLD, is base-generated (see Chapter 2.2). It would therefore constitute a critical test for the movement-based accounts on agrammatic comprehension.

Notwithstanding these limitations and issues for further research, this thesis has explorer the agrammatic comprehension of largely underresearched left-peripheral structures. The experimental tasks demonstrate that agrammatic aphasics present a deficit in comprehending contrastive focus and clitic left dislocation in Catalan, and corroborate that the impairment cannot be attributed to misperception of intonational contours. All the studied structures support the TDH and the FUH, and are inconsistent with the other discussed accounts. The examination of the role of morphological features in agrammatic comprehension brings into question the FUH, and provides further evidence in favour of the TDH. In addition, the tasks conducted in the present study have shown that the assumption of the TDH that at-chance performance follows from a two-agent interpretation cannot be ruled out on the basis of method of research. Finally, the agrammatic data on the comprehension of Catalan clitic left dislocations indicates that such structures are derived by movement.

APPENDIX

A

EXPERIMENTAL ITEMS

A.1 EXPERIMENT 1

(D = declarative; I = interrogative; F = focalisation; T = topicalisation)

1. ID - *La mare veu el pare.*
   "The mother sees the father."

2. DF - *El senyor compra el diari.*
   "The man is buying the newspaper."

3. TD - *La veïna pentina el fill.*
   "The neighbour is combing the son."

4. DD - *El senyor compra el diari.*
   "The man is buying the newspaper."

5. FF - *La mare veu el pare.*
   "The mother sees the father."

6. ID - *La veïna pentina el fill.*
   "The neighbour is combing the son."

7. DT - *La mare veu el pare.*
   "The mother sees the father."

8. FT - *El senyor compra el diari.*
   "The man is buying the newspaper."

9. DD - *La mare veu el pare.*
   "The mother sees the father."

10. DD - *La veïna pentina el fill.*
    "The neighbour is combing the son."

11. FD - *En Pere toca el piano.*
    "Pere is playing the piano."

12. TT - *En Pere toca el piano.*
    "Pere is playing the piano."

13. DI - *El barret tapa el gerro.*
    "The hat is covering the jar."

14. TF - *En Pere toca el piano.*
    "Pere is playing the piano."

15. FF - *El senyor compra el diari.*
    "The man is buying the newspaper."

16. FF - *En Pere toca el piano.*
    "Pere is playing the piano."

17. DI - *La Rosa crida el Joan.*
    "Rosa is calling Joan."

18. DT - *En Pere toca el piano.*
    "Pere is playing the piano."

19. TT - *La veïna pentina el fill.*
    "The neighbour is combing the son."

20. FT - *La veïna pentina el fill.*
    "The neighbour is combing the son."

21. ID - *En Pere toca el piano.*
    "Pere is playing the piano."

22. FD - *La mare veu el pare.*
    "The mother sees the father."

23. DD - *En Pere toca el piano.*
    "Pere is playing the piano."

24. TD - *El senyor compra el diari.*
    "The man is buying the newspaper."

25. ID - *El senyor compra el diari.*
    "The man is buying the newspaper."

26. TT - *La mare veu el pare.*
    "The mother sees the father."

27. DF - *La veïna pentina el fill.*
    "The neighbour is combing the son."

28. DI - *La nena menja patates.*
    "The girl is eating potatoes."

29. FF - *La veïna pentina el fill.*
    "The neighbour is combing the son."

30. TF - *La mare veu el pare.*
    "The mother sees the father."

31. ID - *El nen fa deures.*
    "The child is doing the homework."

32. TT - *El senyor compra el diari.*
    "The man is buying the newspaper."

A.2 EXPERIMENT 2

(D = declarative; SF = subject focalisation; OF = object focalisation)

1. SF - *LA NENA, pentina a l'àvia.*
   "It is the girl who is combing the grandmother."

2. OF - *AL PARE, abracen les nenes.*
   "It is the father who the girls are hugging."

3. D - *L'àvia pentina a les nenes.*
   "The grandmother is combing the girls."

4. SF - *L'ÀVIA, fotografia als pares.*
   "It is the grandmother who is taking a picture of the parents."

5. OF - *ALS NENS, mossega la nena.*
   "It is the boys that the girl is biting."

6. OF - *ALS NENS, paga l'àvia.*
   "It is the boys that the grandmother is giving money to."

7. SF - *ELS PARES, truquen a l'àvia.*
   "It is the parents who are calling (by phone) the grandmother."

8. SF - *LA NENA, assenyala als avis.*
   "It is the girl who is pointing the finger at the grandfathers."

9. OF - *A làvia, acaricien les nenes.*
   "It is the grandmother who the girls are caressing."

10. D - *L'avi toca als pares.*
    "The grandfather is touching the parents."

11. SF - *LA NENA, persegueix als nens.*
    "It is the girl that is chasing the boys."

12. OF - *AL PARE, escridassen els nens.*
    "It is the father who the children are shouting at."

13. SF - *ELS NENS, arrosseguen a la nena.*
    "It is the boys who are dragging the girl."

14. SF - *L'ÀVIA, cura als nens.*
    "It is the grandmother who is healing the boys."

15. OF - *A LA MARE, miren els nens.*
    "It is the mother who the boys are looking at."

16. D - *Els nens dibuixen a la mare.*
    "The children are drawing the mother."

17. SF - *ELS PARES, criden al nen.*
    "It is the parents who are calling the boy."

18. OF - A *LA NENA, persegueixen els nens.*
    "It is the girl who the boys are chasing."

19. OF - *A LA NENA, assenyalen els avis.*
    "It is the girl who the grandparents are pointing at."

20. SF - *EL PARE, escridassa als nens.*
    "It is the father who is shouting at the children."

21. D - *Els nens arrosseguen a la nena.*
    "The boys are dragging the girl."

22. OF - *ALS PARES, eixuga el fill.*
    "It is the parents who the son is drying."

23. SF - *L'AVI, toca als pares.*
    "It is the grandfather who is touching the parents."

24. OF - *A L'ÀVIA, fotografien els pares.*
    "It is the grandmother that the parents are taking a picture of."

25. SF - *LA MARE, mira als nens.*
    "It is the mother who is looking at the children."

26. OF - *ALS PARES, crida el nen.*
    "It is the parents who the boy is calling."

27. SF - *EL PARE, abraça a les nenes.*
    "It is the father who is hugging the girls."

28. D - *El pare escridassa als nens.*
    "The father is shouting at the children."

29. SF - *L'ÀVIA, saluda als pares.*
    "It is the grandmother who is saying hi to the parents."

30. OF - *ALS NENS, arrossega la nena.*
    "It is the boys that the girl is dragging."

31. SF - *ELS NENS, mosseguen a la nena.*
    "It is the boys that are biting the girl."

32. OF - *A L'ÀVIA, pentinen les nenes.*
    "It is the grandmother that the girls are combing."

33. D - *Els avis assenyalen a la nena.*
    "The grandparents are pointing at the girl."

34. OF - *A L'ÀVIA, curen els nens.*
    "It is the grandmother that the boys are healing."

35. SF - *LA MARE, dibuixa als nens.*
    "It is the mother who is drawing the children."

36. SF - *LA NENA, empeny als nens.*
    "It is the girl that is pushing the boys."

37. D - *L'àvia paga als nens.*
    "The grandmother is giving money to the boys."

38. D - *Els pares truquen a l'àvia.*
    "The parents are calling (by phone) the grandmother."

39. OF - *A LA NENA, empenyen els nens.*
    "It is the girl who the boys are pushing."

40. OF - *A LA MARE, agafen els nens.*
    "It is the mother that the children are grabbing."

41. SF - *L'ÀVIA, pentina a les nenes.*
    "It is the grandmother who is combing the girls."

42. D - *Les nenes acaricien a l'àvia.*
    "The girls are caressing the grandmother."

43. OF - *A L'AVI, toquen els pares.*
    "It is the grandfather who the parents are touching."

44. OF - *A L'ÀVIA, saluden els pares.*
    "It is the grandmother who the parents are saying hi to."

45. SF - *ELS PARES, eixugen al fill.*
    "It is the parents who are drying the son."

46. SF - *LA MARE, agafa als nens.*
    "It is the mother who is grabbing the children."

47. OF - *ALS PARES, truca l'àvia.*
    "It is the parents that the grandmother is calling (by phone)."

48. SF - *LA MARE, agafa als nens.*
    "It is the mother who is grabbing the children."

49. OF - *A LA MARE, dibuixen els nens.*
    "It is the mother who the children are drawing."

50. SF - *ELS NENS, paguen a l'àvia.*
    "It is the children that are giving money to the grandmother."

A.3 EXPERIMENT 3

(D = declarative; SF = subject focalisation; OF_Post = OVS focalisation; OF_Pre = OSV focalisation)

1. D - *La doctora va saludar als mariners.*
   "The doctor said hi to the sailors."

2. SF - *L'AVI, va pentinar a les nenes.*
   "It is the grandfather who combed the girls."

3. D - *El policia va mullar a les soldats.*
   "The policeman wetted the soldiers."

4. OF_Post - *A L'ÀVIA, van curar els nens.*
   "It is the grandmother that the boys healed."

5. OF_Pre - *A LES NENES, el pallasso va pintar.*
   "It is the girls that the clown painted their faces."

6. OF_Post - *A LES SENYORES, va fotografiar el mecànic.*
   "It is the women that the mechanic took a picture of."

7. SF - *LA NENA, va perseguir als mariners.*
   "It is the girl who chased the sailors."

8. SF - *EL NEN, va dibuixar a les infermeres.*
   "It is the boy who drew the nurses."

9. OF_Post - *ALS NENS, va arrossegar la nena.*
   "It is the boys who the girl dragged."

10. OF_Pre - *ALS PALLASSOS, la nena va banyar.*
    "It is the clowns who the girl bathed."

11. OF_Post - *A LA LLADRE, van lligar els pallassos.*
    "It is the thief that the clowns tied."

12. SF - *ELS MARINERS, van assenyalar a la nena.*
    "It is the sailors who pointed at the girl."

13. SF - *ELS NENS, van amagar a la pallasso.*
    "It is the boys who hid the clown."

14. D - *Els policies van disparar a la lladre.*
    "The policemen shot the thief."

15. D - *El pallasso va pintar a les nenes.*
    "The clown painted the girls' faces."

16. OF_Pre - *ALS MARINERS, la nena va assenyalar*.
    "It is the sailors that the girl pointed at."

17. SF - *ELS PALLASSOS, van banyar a la nena*.
    "It is the clowns that bathed the girl."

18. OF_Post - *A LA LLADRE, van disparar els policies*.
    "It is the thief who the policemen shot."

19. OF_Post - *A L'AVI, van pentinar les nenes*.
    "It is the grandfather who the girls combed."

20. SF - *LA LLADRE, va lligar als pallassos*.
    "It is the thief who tied the clowns."

21. OF_Pre - *ALS NENS, la nena va arrossegar*.
    "It is the boys who the girl dragged."

22. D - *El mecànic va fotografiar a les senyores*.
    "The mechanic took a picture of the women."

23. OF_Post - *A LES SOLDATS, va mullar el policia*.
    "It is the soldiers that the policeman wetted."

24. OF_Pre - *A L'ÀVIA, els nens van curar*.
    "It is the grandmother who the boys healed."

25. OF_Pre - *A LA NENA, els mariners van perseguir*.
    "It is the girl who the sailors chased."

26. D - *Els nens van amagar a la pallasso*.
    "The boys hid the clown."

27. OF_Pre - *ALS MARINERS, la doctora va saludar*.
    "It is the sailors who the doctor said hi to."

28. D - *Les infermeres van dibuixar al nen*.
    "The nurses drew the boy."

29. D - *Les nenes van pentinar a l'avi*.
    "The girls combed the grandfather."

30. SF - *L'ÀVIA, va curar als nens*.
    "It is the grandmother that healed the boys."

31. OF_Post - *ALS PALLASSOS, va banyar la nena.*
"It is the clowns who the girl bathed."

32. OF_Pre - *A LA LLADRE, els policies van disparar.*
"It is the thief who the policemen shot."

33. SF - *ELS MARINERS, van saludar a la doctora.*
"It is the sailors that said hi to the doctor."

34. SF - *LES SENYORES, van fotografiar al mecànic.*
"It is the women that took a picture of the mechanic."

35. OF_Post - *ALS NENS, va amagar la pallasso.*
"It is the boys who the clown hid."

36. OF_Pre - *A LA LLADRE, els pallassos van lligar.*
"It is the thief who the clowns tied."

37. D - *La nena va perseguir als mariners.*
"The girl chased the sailors."

38. D - *La nena va assenyalar als mariners.*
"The girl pointed at the sailors."

39. SF - *LES SOLDATS, van mullar al policia.*
"It is the soldiers who wetted the policeman."

40. SF - *ELS NENS, van arrossegar a la nena.*
"It is the boys who dragged the girl."

41. OF_Post - *A LES NENES, va pintar el pallasso.*
"It is the girls who painted the clown's face."

42. OF_Pre - *AL NEN, les infermeres van dibuixar.*
"It is the boy who the nurses drew."

43. OF_Post - *A LA NENA, van perseguir els mariners.*
"It is the girl who the sailors chased."

44. OF_Pre - *A LES SENYORES, el mecànic va fotografiar.*
"It is the women who the mechanic took a picture of."

45. D - *La lladre va lligar als pallassos.*
"The thief tied the clowns."

46. OF_Post - *ALS MARINERS, va assenyalar la nena.*
"It is the sailors who pointed at the girl."

47. D - *Els nens van curar a l'àvia.*
"The boys healed the grandmother."

48. SF - *LA LLADRE, va disparar als policies.*
"It is the thief who shot the policemen."

49. OF_Post - *AL NEN, van dibuixar les infermeres.*
"It is the boy who the nurses drew."

50. OF_Pre - *A L'AVI, les nenes van pentinar.*
"It is the grandfather who the girls combed."

51. OF_Post - *ALS MARINERS, va saludar la doctora.*
"It is the sailors who the doctor said hi to."

52. D - *Els nens van arrossegar a la nena.*
"The boys dragged the girl."

53. OF_Pre - *ALS NENS, la pallasso va amagar.*
"It is the boys who the clown hid."

54. D - *La nena va banyar als pallassos.*
"The girl bathed the clowns."

55. SF - *EL PALLASSO, va pintar a les nenes.*
"It is the clown who painted the girls' faces."

56. OF_Pre - *A LES SOLDATS, el policia va mullar.*
"It is the soldiers who the policeman wetted."

A.4 EXPERIMENT 4

(D = declarative; ST = subject topicalisation; OT = object topicalisation)

1. ST - *La mare, agafa al nens.*
"The mother, she is grabbing the children."

2. ST - *La mare, saluda al pare.*
"The mother, she is saying hi to the father."

3. OT - *A la nena, l'assenyala l'avi.*
"The girl, the grandfather is pointing at her."

4. ST - *El nen, arrossega a la nena.*
"The boy, he is dragging the girl."

5. OT - *A la nena, la persegueix el nen.*
"The girl, the boy is chasing her."

6. D - *El fill eixuga al pare.*
"The son is drying the father."

7. ST - *L'àvia, acaricia a la nena.*
"The grandmother, she is caressing the girl."

8. D - *El nen empeny a la nena.*
"The boy is pushing the girl."

9. OT - *A l'àvia, la pentina la nena.*
"The grandmother, the girl is combing her."

10. OT - *Al nen, el paga l'àvia.*
"The boy, the grandmother is giving money to him."

11. ST - *El pare, crida al nen.*
"The father, he is calling the boy."

12. OT - *A la mare, l'agafa el nen.*
"The mother, the boy is grabbing her."

13. OT - *Al pare, l'escridassa la mare.*
"The father, the mother is shouting at him."

14. OT - *Al nen, l'arrossega la nena.*
"The boy, the girl is dragging him."

15. D - *La nena mossega al nen.*
"The girl is biting the boy."

16. ST - *La nena, dibuixa a la mare.*
"The girl, she is drawing the mother."

17. OT - *A l'àvia, la fotografia la mare.*
"The grandmother, the mother is taking a picture of her."

18. D - *El nen mira a la mare.*
    "The boy is looking at the mother."

19. ST - *La mare, truca a l'àvia.*
    "The mother, she is calling (by phone) the grandmother."

20. OT - *A l'avi, el toca el pare.*
    "The grandfather, the father is touching him."

21. OT - *A l'avi, l'abraça el pare.*
    "The grandfather, the father is hugging him."

22. ST - *La nena, empeny al nen.*
    "The girl, the boy is pushing her."

23. D - *La mare fotografia a l'àvia.*
    "The mother is taking a picture of the grandmother."

24. ST - *El nen, mossega a la nena.*
    "The boy, he is biting the girl."

25. OT - *A l'àvia, la cura el nen.*
    "The grandmother, the boy is healing her."

26. OT - *Al pare, l'eixuga el fill.*
    "The father, the son is drying him."

27. ST - *El pare, escridassa a la mare.*
    "The father, he is shouting at the mother."

28. OT - *A l'àvia, l'acaricia la nena.*
    "The grandmother, the girl is caressing her."

29. ST - *L'àvia, cura al nen.*
    "The grandmother, she is healing the boy."

30. D - *El pare abraça a l'avi.*
    "The father is hugging the grandfather."

31. ST - *La mare, mira al nen.*
    "The mother, she is looking at the boy."

32. OT - *A la mare, la truca l'àvia.*
    "The mother, the grandmother is calling (by phone) her."

33. ST - *La nena, persegueix al nen.*
"The mother, she is chasing the boy."

34. ST - *L'avi, abraça al pare.*
"The grandfather, he is hugging the father."

35. D - *El nen persegueix a la nena.*
"The boy is chasing the girl."

36. OT - *A la nena, la dibuixa la mare.*
"The girl, the mother is drawing her."

37. ST - *L'àvia, fotografia a la mare.*
"The grandmother, she is taking a picture of the mother."

38. ST - *El nen, paga a l'àvia.*
"The boy, he is giving money to the grandmother."

39. OT - *Al pare, el crida el nen.*
"The father, the boy is calling him."

40. D - *El pare saluda a la mare.*
"The father is saying hi to the mother."

41. ST - *La nena, assenyala a l'avi.*
"The girl, she is pointing at the grandfather."

42. ST - *L'àvia, pentina a la nena.*
"The grandmother, she is combing the girl."

43. OT - *Al nen, el mossega la nena.*
"The boy, the girl is biting him."

44. D - *El nen crida al pare.*
"The boy is calling the father."

45. ST - *L'avi, toca al pare.*
"The grandfather, he is touching the father."

46. OT - *A la nena, l'empeny el nen.*
"The girl, the boy is pushing her."

47. OT - *A la mare, la saluda el pare.*
"The mother, the father is saying hi to her."

48. ST - *El pare, eixuga al fill.*
    "The father, he is drying the son."

49. D - *El nen cura a l'àvia.*
    "The boy is healing the grandmother."

50. OT - *A la mare, la mira el nen.*
    "The mother, the boy is looking at her."

A.5 EXPERIMENT 5

(D = declarative; ST = subject topicalisation; CL = object clitic; OT_Post = OclVS topicalisation; OT_Pre = OSclV topicalisation)

1. ST - *L'elefant, va portar a les tortugues.*
   "The elephant, it carried the turtles."

2. ST - *El pallasso, va banyar al nen.*
   "The clown, he bathed the boy."

3. OT_Post - *Al mecànic, el van fotografiar les mestres.*
   "The mechanic, the teachers took a picture of him."

4. OT_Post - *A la lladre, la van lligar els pallassos.*
   "The thief, the clowns tied her."

5. ST - *Els infermers, van dibuixar als avis.*
   "The nurses, they drew the grandparents."

6. OT_Pre - *A les nenes, les senyores les van espiar.*
   "The girls, the women spied them."

7. D - *La nena va perseguir als mariners.*
   "The girl chased the sailors."

8. ST - *Els policies, van mossegar a la nena.*
   "The policemen, they bit the girl."

9. OT_Post - *Al senyor, el van trucar les monges.*
   "The man, the nuns called him."

10. OT_Post - *Al policia, el va observar l'avi.*
    "The policeman, the grandfather observed him."

11. CL - *Les doctores les van carregar.*
    "The doctors carried them."

12. OT_Pre - *Als nens, la pallasso els va amagar.*
    "The children, the clown hid them."

13. OT_Post - *Als mariners, els van assenyalar els nens.*
    "The sailors, the boys pointed at them."

14. D - *Les senyores van espiar a les nenes.*
    "The women spied the girls."

15. D - *Les gosses van passejar a les tortugues.*
    "The dogs walked the turtles."

16. OT_Post - *Als infermers, els van dibuixar els avis.*
    "The nurses, the grandparents drew them."

17. ST - *El mecànic, va fotografiar a les mestres.*
    "The mechanic, he took a picture of the teachers."

18. CL - *La gata el va sacsejar.*
    "The cat shook him."

19. ST - *El mico el va colpejar.*
    "The monkey hit him."

20. OT_Pre - *Als mariners, la nena els va perseguir.*
    "The sailors, the girl chased them."

21. OT_Post - *Als policies, els van mossegar els nens.*
    "The policemen, the boys bit them."

22. CL - *Les gosses les van passejar.*
    "The dogs walked them."

23. OT_Post - *A la doctora, la van saludar els mariners.*
    "The doctor, the sailors said hi to them."

24. D - *La gata va sacsejar al gos.*
    "The cat shook the dog."

25. OT_Pre - *A les policies, les doctores les van carregar.*
    "The policewomen, the doctors carried them."

26. OT_Post - *Al pallasso, el va banyar el nen.*
    "The clown, the boy bathed him."

27. ST - *El senyor, va trucar a les monges.*
    "The man, he called the nuns."

28. ST - *La doctora, va saludar als mariners.*
    "The doctor, she said hi to the sailors."

29. OT_Post - *A la rata, la van atrapar els micos.*
    "The rat, the monkeys caught it."

30. CL - *Les senyores les van espiar.*
    "The women spied them."

31. OT_Post - *A l'elefant, el van portar les tortugues.*
    "The elephant, the turtles carried it."

32. ST - *El policia, va observar a l'avi.*
    "The policeman, he observed the grandfather."

33. OT_Post - *Al mico, el va colpejar el cocodril.*
    "The monkey, the crocodile hit him."

34. OT_Pre - *Al gos, el va sacsejar la gata.*
    "The dog, the cat shook him."

35. CL - *La nena els va perseguir.*
    "The girl chased them."

36. D - *El pallasso va amagar als nens.*
    "The clown hid the children."

37. ST - *La rata, va atrapar als micos.*
    "The rat, it caught the monkeys."

38. D - *Les doctores van carregar a les policies.*
    "The doctors carried the policewomen."

39. OT_Pre - *A les tortugues, les gosses les van passejar.*
    "The turtles, the dogs walked them."

40. ST - *Els mariners, van assenyalar als nens.*
    "The sailors, they pointed at the boys."

41. CL - *El pallasso els va amagar.*
    "The clown hid them."

42. ST - *La lladre, va lligar als pallassos.*
    "The thief, she tied the clowns."

43. D - *El cocodril va colpejar al mico.*
    "The crocodile hit the monkey."

44. OT_Pre - *A les soldats, el policia les va mullar.*
    "The soldiers, the policeman wetted them."

45. D - *Les tortugues van portar a l'elefant.*
    "The turtles carried the elephant."

46. ST - *Les nenes, van espiar a les senyores.*
    "The girls, they spied the women."

47. OT_Pre - *A la lladre, els pallassos la van lligar.*
    "The thief, the clowns tied her."

48. OT_Post - *Als mariners, els va perseguir la nena.*
    "The sailors, the girl chased them."

49. D - *Els micos van atrapar a la rata.*
    "The monkeys caught the rat."

50. OT_Post - *A les policies, les van carregar les doctores.*
    "The policewomen, the doctors carried them."

51. OT_Pre - *Als mariners, els nens els van assenyalar.*
    "The sailors, the boys pointed at them."

52. ST - *La nena, va arrossegar als nens.*
    "The girl, she dragged the boys."

53. CL - *Els micos la van atrapar.*
    "The monkeys caught her."

54. OT_Post - *A la gata, la gossa la va sacsejar.*
    "The cat, the dog shook her."

55. OT_Pre - *Al mecànic, les mestres el van fotografiar.*
    "The mechanic, the teachers took a picture of him."

56. D - *Els nens van assenyalar als mariners.*
    "The boys pointed at the sailors."

57. OT_Post - *Al policia, el van mullar les soldats.*
    "The policeman, the soldiers wetted him."

58. D - *El nen va banyar al pallasso.*
    "The boy bathed the clown."

59. OT_Pre - *A l'elefant, les tortugues el van portar.*
    "The elephant, the turtles carried him."

60. ST - *Els mariners, van perseguir a la nena.*
    "The sailors, they chased the girl."

61. CL - *Els pallassos la van lligar.*
    "The clowns tied her."

62. D - *Els avis van dibuixar als infermers.*
    "The grandparents drew the nurses."

63. OT_Post - *A les nenes, les van espiar les senyores.*
    "The girls, the women spied them."

64. OT_Pre - *Als policies, els nens els van mossegar.*
    "The policemen, the boys bit them."

65. D - *Les monges van trucar al senyor.*
    "The nuns called the man."

66. CL - *Els mariners la van saludar.*
    "The sailors said hi to her."

67. OT_Pre - *A la nena, els nens la van arrossegar.*
    "The girl, the boys dragged her."

68. D - *L'avi va observar al policia.*
    "The grandfather observed the policeman."

69. CL - *El cocodril el va colpejar.*
    "The crocodile hit him."

70. D - *Les mestres van fotografiar al mecànic.*
    "The teachers took a picture of the mechanic."

71. OT_Post - *A les tortugues, les van passejar les gosses.*
    "The turtles, the dogs walked them."

72. CL - *Les soldats el van mullar.*
    "The soldiers wetted him."

73. CL - *El nen el va banyar.*
    "The boy bathed him."

74. OT_Post - *Als nens, els va amagar el pallasso.*
    "The children, the clown hid them."

75. CL - *L'avi el va observar.*
    "The grandfather observed him."

76. D - *Els nens van mossegar als policies.*
    "The children bit the policemen."

77. CL - *Els avis els van dibuixar.*
    "The grandparents drew them."

78. D - *Els mariners van saludar a la doctora.*
    "The sailors said hi to the doctor."

79. OT_Pre - *Al senyor, les monges el van trucar.*
    "The man, the nuns called him."

80. ST - *Les policies, van carregar a les doctores.*
    "The policewomen, they carried the doctors."

81. CL - *Els nens els van assenyalar.*
    "The boys pointed at them."

82. CL - *Les mestres el van fotografiar.*
    "The teacher took a picture of him"

83. ST - *Les soldats, van mullar al policia.*
    "The soldiers, they wetted the policeman."

84. OT_Pre - *Al policia, l'avi el va observar.*
    "The policeman, the grandfather observed him."

85. OT_Pre - *A la rata, els micos la van atrapar.*
    "The rat, the monkeys caught it."

86. D - *La nena va arrossegar als nens.*
"The girl dragged the boys."

87. OT_Pre - *Al pallasso, el nen el va banyar.*
"The clown, the boy bathed him."

88. D - *Les soldats van mullar al policia.*
"The soldiers wetted the policeman."

89. ST - *La gata, va sacsejar al gos.*
"The cat, it shook the dog."

90. OT_Pre - *Als infermers, els avis els van dibuixar.*
"The nurses, the grandparents drew them."

91. ST - *Els nens, van amagar al pallasso.*
"The boys, they hid the clown."

92. OT_Pre - *Als mariners, la doctora els va saludar.*
"The sailors, the doctor said hi to them."

93. OT_Post - *A la nena, la van arrossegar els nens.*
"The girl, the boys dragged her."

94. CL - *Les monges el van trucar.*
"The nuns called him."

95. D - *Els pallassos van lligar a la lladre.*
"The clows tied the thief."

96. CL - *Els nens els van mossegar.*
"The children bit them."

97. ST - *Les tortugues, van passejar a les gosses.*
"The turtles, they walked the dogs."

98. CL - *La nena els va arrossegar.*
"The girl dragged them."

99. CL - *Les tortugues els van portar.*
"The turtles carried them."

100. OT_Pre - *Al mico, el cocodril el va colpejar.*
"The monkey, the crocodile hit him."

(D = declarative; ST = subject topicalisation; CL = indirect object clitic; OT_Post = IclVOS topicalisation; OT_Pre = ISclVO topicalisation)

1. D - *La senyora va arreglar la televisió al senyor.*
   "The woman repaired the man's TV."

2. OT_Post - *Al soldat, li va tocar una cançó el mariner.*
   "The soldier, the sailor sang him a song."

3. OT_Pre - *A la lladre, el pallasso li va donar un cop.*
   "The thief, the clown hit her".

4. ST - *L'àvia va eixugar el cabell a l'infermer.*
   "The grandmother dried the nurse's hair".

5. CL - *El senyor li va embenar el braç.*
   "The man wrapped a bandage around her arm".

6. ST - *La núvia, va fer una foto a l'àvia.*
   "The bride, she took a picture of the grandmother".

7. D - *La mecànica va portar un pastís al lladre.*
   "The mechanic gave the thief a cake".

8. CL - *El senyor li va treure l'abric.*
   "The man took off his coat".

9. OT_Post - *Al policia, li va regalar una flor la nena.*
   "The policeman, the girl gave him a flower".

10. OT_Pre - *Al lladre, el capellà li va rentar els peus.*
    "The thief, the priest washed his feet".

11. ST - *La senyora, va servir la sopa a la soldat.*
    "The woman, she served soup to the soldier".

12. CL - *La infermera li va tallar el cabell.*
    "The nurse cut her hair".

13. ST - *El lladre, va portar un pastís a la mecànica.*
    "The thief, he gave the mechanic a cake".

14. D - *El soldat va tocar una cançó al mariner.*
"The soldier sang a song to the sailor".

15. OT_Pre - *A la infermera, la núvia li va tallar el cabell.*
"The nurse, the bride cut her hair".

16. D - *El pallasso va donar un cop a la lladre.*
"The clown hit the thief".

17. OT_Post - *A la soldat, li va servir la sopa la senyora.*
"The soldier, she served soup to the woman".

18. D - *El capellà va rentar els peus al lladre.*
"The priest washed the thief's feet".

19. OT_Post - *A l'àvia, li va fer una foto la núvia.*
"The grandmother, she took a picture of the bride".

20. CL - *L'àvia li eixugar el cabell.*
"The grandmother dried his her".

21. ST - *La nena, va regalar una flor al policia.*
"The girl, she gave a flower to the policeman".

22. D - *El metge va treure l'abric al senyor.*
"The doctor took off the man's coat".

23. OT_Pre - *Al senyor, la senyora li va embenar el braç.*
"The man, the woman wrapped a bandage around his arm".

24. CL - *El senyor li va arreglar la tele.*
"The man repaired her TV".

25. CL - *La lladre li va donar un cop.*
"The thief hit him".

26. OT_Post - *Al capellà, li va rentar els peus el lladre.*
"The priest, he washed the thief's feet".

27. D - *La soldat va servir la sopa a la senyora.*
"The soldier served soup to the woman".

28. OT_Pre - *A la núvia, l'àvia li va fer una foto.*
"The bride, the grandmother took a picture of her".

29. ST - *El senyor, va arreglar la televisió a la senyora.*
    "The man, he repaired the woman's TV".

30. CL - *El lladre li va portar un pastís.*
    "The thief gave her a cake".

31. OT_Post - *A la núvia, li va tallar el cabell la infermera.*
    "The bride, the nurse cut her hair".

32. OT_Pre - *Al mariner, el soldat li va tocar una cançó.*
    "The soldier, the sailor sang him a song".

33. ST - *El senyor, va treure l'abric al metge.*
    "The man, he took off the doctor's coat".

34. OT_Post - *A la senyora, li va embenar el braç el senyor.*
    "The woman, the man wrapped a bandage around her arm".

35. D - *L'infermer va eixugar el cabell a l'àvia.*
    "The nurse dried the grandmother's hair".

36. CL - *La nena li va regalar una flor.*
    "The girl gave him a flower".

37. ST - *El lladre, va rentar els peus al capellà.*
    "The thief, he washed the priest's feet".

38. CL - *El mariner li va tocar una cançó.*
    "The sailor sang him a song".

39. OT_Pre - *Al senyor, la senyora li va arreglar la televisió.*
    "The man, the woman repaired his TV".

40. D - *La senyora va embenar el braç al senyor.*
    "The woman wrapped a bandage around the man's arm".

41. OT_Post - *Al metge, li va treure l'abric el senyor.*
    "The doctor, the man took off his coat".

42. D - *La núvia va tallar el cabell a la infermera.*
    "The bride cut the nurse's hair".

43. ST - *La lladre, va donar un cop al pallasso.*
    "The thief, she hit the clown".

44. CL - *La núvia li va fer una foto.*
    "The bride took a picture of her".

45. OT_Pre - *A la senyora, la soldat li va servir la sopa.*
    "The woman, the soldier served her soup".

46. OT_Pre - *A la nena, el policia li va regalar una flor.*
    "The girl, the policeman gave her a flower".

47. OT_Post - *A l'infermer, li va eixugar el cabell l'àvia.*
    "The nurse, he dried the grandmother's hair".

48. OT_Pre - *Al lladre, la mecànica li va portar un pastís.*
    "The thief, the mechanic gave him a cake".

49. ST - *El mariner, va tocar una cançó al soldat.*
    "The sailor, he sang the soldier a song".

50. ST - *La infermera, va tallar el cabell a la núvia.*
    "The nurse, she cut the bride's hair".

51. ST - *El senyor, va embenar el braç a la senyora.*
    "The man, he wrapped a bandage around the woman's arm".

52. D - *El policia va regalar una flor a la nena.*
    "The policeman gave the girl a flower".

53. OT_Pre - *A l'àvia, l'infermer li va eixugar el cabell.*
    "The grandmother, the nurse dried her hair".

54. CL - *El lladre li va rentar els peus.*
    "The thief washed his feet".

55. OT_Pre - *Al senyor, el metge li va treure l'abric.*
    "The man, the doctor took of his coat".

56. OT_Post - *Al pallasso, li va donar un cop la lladre.*
    "The clown, he hit the thief".

57. OT_Post - *A la senyora, li va arreglar la televisió el senyor.*
    "The woman, she repaired the man's TV".

58. OT_Post - *A la mecànica, li va portar un pastís el lladre.*
    "The mechanic, gave the thief a cake".

59. D - *L'àvia va fer una foto a la núvia.*
    "The grandmother took a picture of the bride".

60. CL - *La senyora li va servir la sopa.*
    "The woman served her soup".

BIBLIOGRAPHY

Abels, K. (2007). Towards a restrictive theory of (remnant) movement. In Craenenbroeck, J. V., editor, *Linguistic Variation Yearbook*, pages 53–120. John Benjamins Publishing, Amsterdam.

Aboh, E. (2004). Topic and Focus within D. In Comips, L. and Doetjes, J., editors, *Linguistics in the Netherlands*, volume 21, pages 1–12. John Benjamins Publishing, Amsterdam.

Adani, F. (2010). Rethinking the acquisition of relative clauses in Italian: towards a grammatically based account. *Jounal of Child Language*, 38:141–165.

Aissen, J. (2003). Differential object marking: iconicity vs. economy. *Natural Language and Linguistic Theory*, 21:435–483.

Alexiadou, A. and Anagnostopoulou, E. (1998). Parameterizing AGR: word order, V-movement and EPP-checking. *Natural Language and Linguistic Theory*, 16:491–539.

Anagnostopoulou, E. (1997). Clitic left dislocation and contrastive left dislocation. In Anagnosopoulou, E., van Riemsdijk, H., and Zwarts, F., editors, *Materials on Left Dislocation*, pages 151–192. John Benjamins Publishing, Amsterdam.

Avrutin, S. (2006). Weak syntax. In Grodzinsky, Y. and Amunts, K., editors, *Broca's Region*, pages 49–62. Oxford University Press, New York.

Avrutin, S., Lubarsky, S., and Greene, J. (1999). Comprehension of contrastive stress by agrammatic Broca's aphasics. *Brain and Language*, 70:163–186.

Baauw, S. and Cuetos, F. (2003). The interpretation of pronouns in Spanish language acquisition and breakdown: evidence for the "Principle B Delay" as a non-unitary phenomenon. *Language Acquisition*, 11:214–275.

Badia, A. (1994). *Gramàtica de la llengua catalana*. Proa, Barcelona.

Baker, M., Johnson, K., and Roberts, I. (1989). Passive arguments raised. *Linguistic Inquiry*, 20:219–252.

Balogh, J. and Grodzinsky, Y. (2000). Levels of linguistic representation in Broca's aphasia: implicitness and referentiality of arguments. In Bastiaanse, R. and Grodzinsky, Y., editors, *Grammatical disorders in aphasia: a neurolinguistic perspective*, pages 88–104. Whurr Publishers, London.

Bartra, A. (1985). *Qüestions de la sintaxi d'ordre en català*. PhD thesis, Universitat Autònoma de Barcelona, Bellaterra.

Bastiaanse, R. and Edwards, S. (2004). Word order and finiteness in Dutch and English Broca's and Wernicke's aphasia. *Brain and Language*, 89:91–107.

Bastiaanse, R., Koekkoek, J., and van Zonneveld, R. (2003). Object scrambling in Dutch Broca's aphasia. *Brain and Language*, 86:287–299.

Bastiaanse, R., Rispens, J., Ruigendijk, E., Rabadaan, O., and Thompson, C. (2012). Verbs: some properties and their consequences for agrammatic Broca's aphasia. *Journal of Neurolinguistics*, 15:239–264.

Bastiaanse, R., Rispens, J., and van Zonneveld, R. (2000). Verb retrieval, verb inflection and negation in agrammatic aphasia. In Bastiaanse, R. and Grodzinsky, Y., editors, *Grammatical disorders in aphasia: a neurolinguistic perspective*, pages 171–190. Whurr Publishers, London.

Bastiaanse, R. and van Zonneveld, R. (2005). Sentence production with verbs of alternating transitivity in agrammatic Broca's aphasia. *Journal of Neurolinguistics*, 18:57–66.

Baum, S., Daniloff, J., and Daniloff, R. (1982). Sentence comprehension by Broca's aphasics: effects of some suprasegmental variables. *Brain and Language*, 17:261–271.

Beckman, M., Díaz-Campos, M., McGory, J., and Morgan, T. (2002). Intonation across Spanish, in the Tones and Break Indices framework. *Probus*, 14:9–36.

Beckman, M. and Hirschberg, J. (1993). *The ToBI Annotation Conventions*. Ohio State University, Ohio.

Beckman, M. and Pierrehumbert, J. (1986). Intonational structure in Japanese and English. *Phonology Yearbook*, 3:15–70.

Belletti, A. (1999). Italian/Romance clitics: structure and derivation. In van Riemsdijk, H., Bosong, G., and Comrie, B., editors, *Clitics in the languages of Europe*, pages 543–579. Mouton de Gruyter, Berlin.

Belletti, A. (2001). "Inversion" as focalization. In Hukl, A. and Pollock, J.-Y., editors, *Subject Inversion in Romance and the Theory of Universal Grammar*, pages 60–90. Oxford University Press, New York.

Belletti, A. (2004). Aspects of the low IP area. In Rizzi, L., editor, *The Structure of CP and IP*, pages 16–51. Oxford University Press, New York.

Belletti, A., Friedmann, N., Brunato, D., and Rizzi, L. (2012). Does gender make a difference? Comparing the effect of gender on children's comprehension of relative clauses in Hebrew and Italian. *Lingua*, 122:1053–1069.

Belletti, A. and Rizzi, L. (1988). Psych-verbs and Theta Theory. *Natural Language and Linguistic Theory*, 6:291–352.

Benedet, M. J., Christiansen, J. A., and Goodglass, H. (1998). A cross-linguistic study of grammatical morphology in Spanish- and English-speaking agrammatic patients. *Cortex*, 34:309–336.

Benincà, P., Salvi, G., and Frison, L. (1988). L'ordine delle parole e le costruzioni marcate. In Lorenzo, R., editor, *Grande grammatica italiana di consultazione*, volume 1, pages 115–225. Il Mulino, Bologna.

Beretta, A. (2001). Linear and structural accounts of theta-role assignment in agrammatic aphasia. *Aphasiology*, 15:515–531.

Beretta, A. (2008). Disorders of syntax. In Stemmer, B. and Whitaker, H., editors, *Handbook of the neuroscience of language*, pages 155–163. Elsevier, London.

Beretta, A., Harford, C., Patterson, J., and Piñango, M. (1996). The derivation of postverbal subjects: evidence from agrammatic aphasia. *Natural Language and Linguistic Theory*, 14:725–748.

Beretta, A. and Munn, A. (1998). Double-agents and trace-deletion in agrammatism. *Brain and Language*, 65:404–421.

Beretta, A., Schmitt, C., Halliwell, J., Munn, A., Cuetos, F., and Kim, S. (2001). The effects of scrambling on Spanish and Korean agrammatic interpretation: why linear models fail and structural models survive. *Brain and Language*, 79:407–425.

Berndt, R. and Caramazza, A. (1980). A redefinition of the syndrome of Broca's aphasia: implications for a neuropsychological model of language. *Applied Psycholinguistics*, 1:225–278.

Berndt, R. S., Mitchum, C. C., and Haendiges, A. N. (1996). Comprehension of reversible sentences in "agrammatism": a meta-analysis. *Cognition*, 58:289–308.

Bianchi, V. and Frascarelli, M. (2010). Is topic a root phenomenon? *Iberia*, 2:43–88.

Boeckx, C. (2003). *Island and Chains. Resumption as Stranding.* John Benjamins Publishing, Amsterdam.

Bonet, E. (1984). Aproximació a l'entonació del català. Master's thesis, Universitat Autònoma de Barcelona, Barcelona.

Bonet, E. (1989). Postverval subjects in Catalan. *MIT Working papers in Linguistics*, 11.

Bonet, E. (1990). Subjects in Catalan. *MIT Working papers in Linguistics*, 13:1–26.

Bonet, E. and Lloret, M. (1998). *Fonologia Catalana*. Ariel Lingüística, Barcelona.

Borer, H. (1984). *Parametric Syntax*. Foris Publications, Dordrecht.

Bouillaud, M.-J. (1825). *Traité clinique et physiologique de l'encéphalite, ou inflammation du cerveau*. J.-B. Baillière, Paris.

Broca, P. (1861). Comments regarding the seat of the faculty of spoken language, followed by an observation of aphemia (loss of speech). In Grodzinsky, Y. and Amunts, K., editors, *Broca's Region*, pages 291–304. Oxford University Press, New York.

Brown, J. W. and Chobor, K. L. (1992). Phrenological studies of aphasia before Broca: Broca's aphasia or Gall's aphasia? *Brain and Language*, 43(475-486).

Burchert, F. and de Bleser, R. (2004). Passives in agrammatic sentence comprehension. *Aphasiology*, 18:29–45.

Burchert, F., de Bleser, R., and Sonntag, K. (2001). Does case make the difference? Agrammatic comprehension of case-inflected sentences in German. *Cortex*, 37:700–703.

Burchert, F., de Bleser, R., and Sonntag, K. (2003). Does morphology make the difference? Agrammatic sentence comprehension in German. *Brain and Language*, 87:323–342.

Burchert, F., Swoboda-Moll, M., and de Bleser, R. (2005a). The left periphery in agrammatic clausal representations: evidence from German. *Journal of Neurolinguistics*, 18:67–88.

Burchert, F., Weidlich, C., and de Bleser, R. (2005b). Focus in the left periphery: a cue to agrammatic sentence comprehension? *Brain and Language*, 95:115–116.

Burkhardt, P., Avrutin, S., Piñango, M., and Ruigendijk, E. (2008). Slower-than-normal syntactic processing in agrammatic Broca's aphasia: evidece from Dutch. *Journal of Neurolinguistics*, 21:120–137.

Caplan, D. (1983). A note on the "word-order problem" in agrammatism. *Brain and Language*, 20:155–165.

Caplan, D. and Futter, C. (1986). Assignment of thematic roles to nouns in sentence comprehension by an agrammatic patient. *Brain and Language*, 27:117–134.

Caplan, D., Matthei, E., and Gigley, H. (1981). Comprehension of gerundive constructions by Broca's aphasics. *Brain and Language*, 13:145–169.

Caramazza, A., Capasso, R., Capitani, E., and Miceli, G. (2005). Patterns of comprehension performance in agrammatic Broca's aphasia: a test of the Trace Deletion Hypothesis. *Brain and Language*, 94:43–53.

Caramazza, A., Capitani, E., Rey, A., and Berndt, R. S. (2001). Agrammatic Broca's aphasia is not associated with a single pattern of comprehension performance. *Brain and Language*, 76:158–184.

Caramazza, A. and Zurif, E. B. (1976). Dissociation of algorithmic and heuristic processes in language comprehension: evidence from aphasia. *Brain and Language*, 3:573–582.

Celdrán, E. M., Planas, A. F., and Sabaté, J. C. (2005). Diferències dialectals del català a partir de les oracions interrogatives absolutes amb "que". *Estudios de Fonética Experimental*, 15:327–353.

Chomsky, N. (1965). *Aspects of the Theory of Syntax*. The MIT Press, Cambridge.

Chomsky, N. (1981). *Lectures on Government and Binding*. Foris Publications, Dordrecht.

Chomsky, N. (1993). A Minimalist Program for linguistic theory. In Hale, K. and Keyser, S., editors, *The View From Building 20: Essays In Honor of Sylvain Bromberger*, volume 20, pages 1–52. The MIT Press, Cambridge.

Chomsky, N. (1995). *The Minimalist Program*. The MIT Press, Cambridge.

Chomsky, N. and Halle, M. (1968). *The Sound Pattern of English*. The MIT Press, Boston.

Cinque, G. (1983). "Topic" constructions in some European languages and "connectedness". In Enlich, K. and van Riemsdijk, H., editors, *Connectedness in Sentence, Discourse and Text*, pages 7–41. Katholieke Hogeschool, Tilburg.

Cinque, G. (1990). *Types of A'-dependencies*. The MIT Press, Cambridge.

Cinque, G. (1999). *Adverbs and Functional Heads. A Cross-Linguistic Perspective*. Oxford University Press, New York.

Crain, S., Shankweiler, D., Gorrell, P., and Tuller, B. (1989). Reception of language in Broca's aphasia. *Language and Cognitive Processes*, 4:1–33.

Demonte, V. and Fernández-Soriano, O. (2009). Force and finiteness in the Spanish complementizer system. *Probus*, 21:23–49.

Drai, D. (2006). Evaluating deficit patterns of Broca's aphasics in the presence of high intersubject variability. In Grodzinsky, Y. and Amunts, K., editors, *Broca's Region*, pages 108–118. Oxford University Press, New York.

Drai, D. and Grodzinsky, Y. (2006a). A new empirical angle on the variability debate: quantitative neurosyntactic analyses of a large data set from Broca's aphasia. *Brain and Language*, 96:117–128.

Drai, D. and Grodzinsky, Y. (2006b). The variability debate: more statistics, more linguistics. *Brain and Language*, 96:157–170.

Dronkers, N. F., Plaisant, O., Iba-Zizen, M., and Cabanis, E. (2007). Paul Broca's historic cases: high resolution MR imaging of the brains of Leborgne and Lelong. *Brain*, 130:1432–1441.

Edwards, S. and Salis, C. (2005). Discourse linking, canonicity and comprehension of wh-questions in agrammatism. *Brain and Language*, pages 86–87.

Fabra, P. (1918). *Gramàtica catalana*. Institut d'Estudis Catalans, Barcelona.

Fernández-Soriano, O. (1995). Pronombres reasuntivos y doblado de clíticos. In Goenaga, P., editor, *De Grammatica Generativa*, pages 109–128. Universidad del País Vasco, Vitoria.

Font, D. (2007). *L'entonació del català*. Publicacions de l'Abadia de Montserrat, Barcelona.

Frazier, L. (1998). Getting there (slowly). *Journal of Applied Psycholinguistics*, 27:123–146.

Friederici, A. and Graetz, P. (1987). Processing passive sentences in aphasia: deficits and strategies. *Brain and Language*, 30:93–105.

Friedmann, N. (2006). Generalizations on variations in comprehension and production: a further source of variation and a possible account. *Brain and Language*, 96:151–153.

Friedmann, N. (2008). Traceless relatives: agrammatic comprehension of relative clauses with resumptive pronouns. *Journal of Neurolinguistics*, 21:138–149.

Friedmann, N., Belletti, A., and Rizzi, L. (2009). Relativized relatives: types of intervention in the acquisition of A-bar dependencies. *Lingua*, 119:67–88.

Friedmann, N. and Grodzinsky, Y. (1997). Tense and agreement in agrammatic production: pruning the syntactic tree. *Brain and Language*, 56:397–425.

Friedmann, N. and Gvion, A. (2003). Sentence comprehension and working memory limitation in aphasia: a dissociation between semantic-syntactic and phonological reactivation. *Brain and Language*, 83:23–39.

Friedmann, N., Reznick, J., Dolinski-Nuger, D., and Soboleva, K. (2010). Comprehension and production of movement-derived sentences by Russian speakers with agrammatic aphasia. *Journal of Neurolinguistics*, 23:44–65.

Friedmann, N. and Shapiro, L. (2003). Agrammatic comprehension of simple active sentences with moved constituents: Hebrew OSV and OVS structures. *Journal of Speech, Language, and Hearing Research*, 46:288–297.

Fyndanis, V., Varlokosta, S., and Tsapkini, K. (2010). Exploring wh-questions in agrammatism: evidence from Greek. *Journal of Neurolinguistics*, 23:644–662.

Gall, F. and Spurtzheim, G. (1810). *Recherches sur le système nerveux en général et sur celui de cerveau en particulier*. F. Schoell, Paris.

Garraffa, M. and Grillo, N. (2008). Canonicity effects as grammatical phenomena. *Journal of Neurolinguistics*, 21:177–197.

Gavarró, A. (2005). The interpretation of ambiguous dislocations in Broca's aphasia. *Brain and Language*, 95(1):117–118.

Gavarró, A. (2008). Binding and coreference in Catalan agrammatism. In *The Academy of Aphasia Meeting*, Turku.

Gavarró, A. and Dotti, H. (2014). Long and short passives in Catalan and Spanish. *Aphasiology*, 28(1):82–98.

Gavarró, A. and Salmons, I. (2013). The discrimination of intonational contours in Broca's aphasia. *Clinical Linguistics and Phonetics*, pages 1–15.

Gehrke, B. and Grillo, N. (2008). How to become passive. In Grohmann, K., editor, *Explorations of Phase Theory: Features, Arguments, and Interpretation at the Interfaces*, pages 231–267. Interface Explorations, Berlin and New York.

Geschwind, N. (1970). The organization of language and the brain. In Grodzinsky, Y. and Amunts, K., editors, *Broca's Region*, pages 376–383. Oxford University Press, New York.

Goodall, G. (2001). The EPP in Spanish. In Davies, W. and Dubinsky, S., editors, *Objects and Other Subjects: Grammatical Functions, Functional Categories, and Configurationality*, pages 193–223. Kluwer, Dordrecht.

Goodglass, H., Blumstein, S. E., Gleason, J. B., Hyde, M. R., Green, E., and Statlender, S. (1979). The effect of syntactic encoding on sentence comprehension in aphasia. *Brain and Language*, 7:201–209.

Grillo, N. (2008). *Generalized Minimality: Syntactic underspecification in Broca's aphasia*. PhD thesis, Utrecht University and Università degli Studi di Siena.

Grillo, N. (2009). Generalized minimality: Feature impoverishment and comprehension deficits in agrammatism. *Lingua*, 119:1426–1443.

Grimshaw, J. (1990). *Argument Structure*. The MIT Press, Cambridge.

Grodzinsky, Y. (1986). Language deficits and the theory of syntax. *Brain and Language*, 27:135–159.

Grodzinsky, Y. (1990). *Theoretical Perspectives on Language Deficits*. The MIT Press, Cambridge.

Grodzinsky, Y. (1995). Trace deletion, theta-roles, and cognitive strategies. *Brain and Language*, 51:467–497.

Grodzinsky, Y. (2000a). The neurology of syntax: language use without Broca's area. *Behavioral and Brain Sciences*, 23:1–71.

Grodzinsky, Y. (2000b). Overarching agrammatism. In Grodzinsky, Y., Shapiro, L., and Swinney, D., editors, *Language and the brain: representation and processing - Studies presented to Edgar Zurif on his 60th birthday*, pages 73–86. Academic Press, London.

Grodzinsky, Y. (2006). A blueprint for brain map of syntax. In Grodzinsky, Y. and Amunts, K., editors, *Broca's Region*, pages 83–107. Oxford University Press, New York.

Grodzinsky, Y. and Finkel, L. (1998). The neurology of empty categories: aphasics' failure to detect ungrammaticality. *Journal of Cognitive Neuroscience*, 10:281–292.

Grodzinsky, Y., Pierce, A., and Marakovitz, S. (1991). Neuropsychological reasons for a transformational analysis of verbal passive. *Natural Language and Linguistic Theory*, 9:431–453.

Grodzinsky, Y., Piñango, M., Zurif, E., and Drai, D. (1999). The critical role of group studies in neuropsychology: comprehension regularities in Broca's aphasia. *Brain and Language*, 67:134–147.

Grodzinsky, Y. and Reinhart, T. (1993). The innateness of binding and coreference: a reply to Grimshaw and Rosen. *Linguistic Inquiry*, 24:69–101.

Grodzinsky, Y., Wexler, K., Chien, Y.-C., Marakovitz, S., and Solomon, J. (1993). The breakdown of binding relations. *Brain and Language*, 45:396–422.

Hagiwara, H. (1993). The breakdown of Japanese passives and theta-role assignment principle by Broca's aphasics. *Brain and Language*, 45:318–339.

Hagiwara, H. and Caplan, D. (1990). Syntactic comprehension in Japanese aphasics: effects of category and thematic role order. *Brain and Language*, 38:159–170.

Heilman, K. and Scholes, R. (1976). The nature of comprehension errors in Broca's, conduction and Wernicke's aphasics. *Brain and Language*, 15:82–91.

Hernanz, M. and Brucart, J. (1987). *La sintaxis*. Crítica, Barcelona.

Hickok, G. (1992). Agrammatic comprehension and the trace-deletion hypothesis. *MIT Department of Brain and Cognitive Sciences Occasional Paper*, 45.

Hickok, G. and Avrutin, S. (1996). Comprehension of wh-questions in two Broca's aphasics. *Brain and Language*, 52:314–327.

Hickok, G., Zurif, E., and Casenco-Gonzalez, E. (1993). Structural description of agrammatic comprehension. *Brain and Language*, 45:371–395.

Hualde, J. (1992). *Catalan*. Routledge, London.

Jackendoff, R. (1972). *Semantic Interpretation in Generative Grammar*. The MIT Press, Cambridge.

Jaeggli, O. (1982). *Topics in Romance syntax*. Foris Publications, Dordrecht.

Jaeggli, O. (1986). Passive. *Linguistic Inquiry*, 17:587–621.

Jovanov, N. (2011). *A morpho-syntactic study of patients with Broca's aphasia: a comparative study of Serbian- and Greek-speaking patients*. PhD thesis, Aristotle University of Thessaloniki.

Kayne, R. S. (1975). *French syntax*. The MIT Press, Cambridge.

Kayne, R. S. (1989). Null subjects and clitic climbing. In Jaeggli, O. and Safir, K., editors, *The Null Subject Parameter*, pages 239–261. Kluwer, Dordrecht.

Kertesz, A. (1982). *Western Aphasia Battery*. Grune and Stratton, New York.

Kertesz, A., Pascual-Leone-Pascual, A., and Pascual-Leone-García, A. (1990). Batería de afasias "Western" (Spanish version of "Western Aphasia Battery"). *Nau Llibres*.

Kolk, H. and van Grunsven, M. (1985). Agrammatism as a variable phenomenon. *Cognitive Neuropsychology*, 2:347–384.

Kolk, H., van Grunsven, M., and de Keyser, A. (1985). On parallelism in agrammatism. In Kean, M. L., editor, *Agrammatism*, pages 165–208. Academic Press, London.

Koopman, H. and Sportiche, D. (1991). The position of subjects. *Lingua*, 85:211–58.

Law, S.-P. and Leung, M.-T. (1998). Sentence comprehension in Cantonese Chinese aphasic patients. *Aphasiology*, 12(1):49–63.

Law, S.-P. and Leung, M.-T. (2000). Sentence processing deficits in two Cantonese aphasic patients. *Brain and Language*, 72:310–342.

Lesser, R. (1974). Verbal comprehension in aphasia: an English version of three Italian tests. *Cortex*, 10:247–263.

Levin, B. and Rappaport, M. (1986). The formation of adjectival passive. *Linguistic Inquiry*, 17:623–661.

Lichtheim, L. (1885). On aphasia. In Grodzinsky, Y. and Amunts, K., editors, *Broca's Region*, pages 318–333. Oxford University Press, New York.

Linebarger, M. (1989). Neuropsychological evidence for linguistic modularity. In Carlson, G. and Tanehaus, M., editors, *Linguistic structure in language processing*, pages 197–238. Kluwer, Dordrecht.

Linebarger, M., Schwartz, M., and Saffran, E. (1983). Grammatical sensitivity in so-called agrammatic aphasics. *Cognition*, 13:361–392.

Lonzi, L. and Luzzatti, C. (1993). Relevance of adverb distribution for the analysis of sentence representation in agrammatic patients. *Brain and Language*, 45:306–317.

López, L. (2009). *A derivational syntax for information structure*. Oxford University Press, Oxford.

López, L. (2012). El movimiento-A'. In Brucart, J. and Gallego, A., editors, *El movimiento de constituyentes*, pages 71–93. Visor, Madrid.

Love, T., Nicol, J., Swinney, D., Hickok, G., and Zurif, E. (1998). The nature of aberrant understanding and processing pro-forms by brain-damaged populations. *Brain and Language*, 65:9–62.

Lukatela, K., Crain, S., and Shankweiler, D. (1988). Sensitivity to closed-class items in Serbo-Croat agrammatics. *Brain and Language*, 13:1–15.

Luzzatti, C., Toraldo, A., Guasti, M. T., Ghirardi, G., Lorenzi, L., and Guarnaschelli, C. (2001). Comprehension of reversible active and passive sentences in agrammatism. *Aphasiology*, 15(5):419–441.

Mann, T. (1957). Freud and the future (1937). In Lowe-Porter, H., editor, *Three essays by Thomas Mann*, page 307. Kessinger Pub Co, Whitefish.

Martínez-Ferreiro, S. (2010). *Towards a Characterization of Agrammatism in Ibero-Romance*. PhD thesis, Universitat Autònoma de Barcelona, Bellaterra.

Mascaró-Pons, I. (1986). Introducció a l'entonació dialectal catalana. *Randa*, 22:5–38.

Masullo, P. (1992). *Incorporation and Case Theory in Spanish: a Crosslinguistic Perspective*. PhD thesis, University of Washington, Washington.

Mauner, G., Fromkin, V. A., and Cornell, T. L. (1993). Comprehension and acceptability judgments in agrammatism: disruptions in the syntax of referential dependency. *Brain and Language*, 45(340-370).

Mauro, T. D., Mancini, F., Vedovelli, M., and Voghera, M. (1993). *Lessico di frequenza dell'italiano parlato (LIP)*. Etaslibri, Milan.

Meyer, A., Mack, J., and Thompson, C. (2012). Tracking passive sentence comprehension in agrammatic aphasia. *Journal of Neurolinguistics*, 25:31–43.

Nerantzini, M., Varlokosta, S., Papadopoulou, D., and Gavarró, A. (2012). Pronominal and anaphoric reference in agrammatic aphasia: evidence from Catalan and Greek. In *NPL Aphasia*.

Ordóñez, F. (1998). Postverbal asymmetries in Spanish. *Natural Language and Linguistic Theory*, 16:313–345.

Ordóñez, F. (2007). Cartography of postverbal subjects in Spanish and Catalan. In Baauw, S., Drijkoningen, F., and Pinto, M., editors, *Romance Languages and Linguistic Theory 2005*, pages 259–280. John Benjamins Publishing, Amsterdam.

Ordóñez, F. and Treviño, E. (1999). Left dislocated subjects and the pro-drop parameter. *Lingua*, 107:39–68.

Paradis, M. (1989). *Bilingual Aphasia Test (Catalan version)*. Lawrence Erlbaum, Hillsdale, NJ.

Parisi, D. and Pizzamiglio, L. (1970). Syntactic comprehension in aphasia. *Cortex*, 6:204–215.

Peña-Casanova, J. (1990). *Programa integrado de exploración neuropsicológica "Test Barcelona"*. Masson, Barcelona.

Peña-Casanova, J., Diéguez-Vide, F., Lluent, R., and Böhm, P. (2001). On manifestations of aphasia in Catalan: a case study of Broca's aphasia. *Journal of Neurolinguistics*, 14:159–177.

Pesetsky, D. (1989). Wh- in situ: movement and unselective binding. In Reuland, E. and ter Meulen, A., editors, *The representation of (in)definiteness.*, pages 98–129. The MIT Press, Cambridge.

Pesetsky, D. and Torrego, E. (2011). Case. In Boeckx, C., editor, *The Oxford Handbook of Linguistic Minimalism*, pages 355–426. Oxford University Press, Cambridge.

Philip, W. and Avrutin, S. (1998). Quantification in agrammatic aphasia. In Sauerland, U. and Percus, O., editors, *The Interpretative Tract*, pages 63–72. The MIT Press, Cambridge.

Phillips, C. (2012). Parser-grammar relations: we don't understand everything twice. In Sanz, M., Laka, I., and Tanenhaus, M., editors, *Language down the garden path: the cognitive and biological basis for linguistic structure (Papers in honor of Thomas G. Bever)*, pages 294–315. Oxford University Press, Oxford.

Phillips, C. and Wagers, M. (2007). Relating structure and time in linguistics and psycholinguistics. In Gaskell, G., editor, *Oxford Handbook of Psycholinguistics*, pages 739–756. Oxford University Press, Oxford.

Pierrehumbert, J. (1980). *The phonetics and phonology of English intonation.* PhD thesis, Massachusetts Institut of Technology, New York.

Pierrehumbert, J. (1999). Prosody and intonation. In Wilson, R. and Keil, F., editors, *The MIT encyclopedia of cognitive sciences*, pages 679–682. The MIT Press, Cambridge.

Piñango, M. (1999). Syntactic displacement in Broca's aphasia comprehension. In Grodzinsky, Y. and Bastiaanse, R., editors, *Grammatical disorders in aphasia: a neurolinguistic perspective*, pages 75–87. Whurr Publishers, London.

Piñango, M. (2000). Canonicity in Broca's sentence comprehension: the case of psychological verbs. In Grodzinsky, Y., Shapiro, L., and Swinney, D., editors, *Language and the brain*, pages 327–350. Academic Press, London.

Piñango, M. and Burkhardt, P. (2001). Pronominals in Broca's aphasia comprehension: the consequences of syntactic delay. *Brain and Language*, (167-168).

Pitrelli, J., Beckman, M., and Hirschberg, J. (1994). Evaluation of prosodic transcription labeling reliability in the ToBI framework. In *Proceedings of the Third International Conference on Spoken Language Processing*, volume 2, pages 123–126.

Pollock, J.-Y. (1989). Verb movement, universal grammar and the structure of IP. *Linguistic Inquiry*, 20:365–424.

Prieto, P. (1995). Aproximació als contorns entonatius del català central. *Caplletra. Revista Internacional de Filologia.*, 19:161–186.

Prieto, P. (2002). *Entonació. Models, teoria, mètodes.* Ariel Lingüística, Barcelona.

Prieto, P. (2007). El model mètric i autosegmental aplicat al català. In Carrera, J. and Pons, C., editors, *Aplicacions de la fonètica. XIV Col.loqui Lingüístic de la Universitat de Barcelona (CLUB-14)*, pages 173–187, Barcelona.

Prieto, P. (2014). The intonational phonology of Catalan. In Jun, S.-A., editor, *Prosody Typology 2*, pages 43–80. Oxford University Press, Oxford.

Prieto, P., Aguilar, L., Mascaró, J., Torres, F., and Vanrell, M. (2009). L'etiquetatge prosòdic CatToBI. *EFE*, 18:287–309.

Raithel, V. (2005). *The perception of intonation contours and focus by aphasic and healthy individuals.* Gunter Narr Verlag, Wien.

Rivero, M. (1980). Theoretical implications of the syntax of left branch condition modifiers in Spanish. *Linguistic Analysis*, 6:407–461.

Rivero, M. and Terzi, A. (1995). Imperatives, V-movement, and logical mood. *Journal of Linguistics*, 31:301–332.

Rizzi, L. (1982). *Issues in Italian syntax*. Foris Publications, Dordrecht.

Rizzi, L. (1990). *Relativized Minimality*. The MIT Press, Cambridge.

Rizzi, L. (1997). The fine structure of the left periphery. In Haegeman, L., editor, *Elements of Grammar*, pages 281–337. Kluwer, Dordrecht.

Rizzi, L. (2004). Locality and left periphery. In Belletti, A., editor, *Structures and Beyond: the Cartography of Syntactic Structures*, volume 3, pages 104–131. Oxford University Press, Oxford.

Roberts, I. (2004). The C-system in Brythonic Celtic languages, V2 and EPP. In Rizzi, L., editor, *The Structure of CP and IP*, volume 2, pages 297–328. Oxford University Press, Oxford.

Rosselló, J. (1986). *Gramàtica, configuracions i referència. Per una teoria alternativa del PRO-drop romànic*. PhD thesis, Universitat de Barcelona, Barcelona.

Rubio, C. (2014). *Syntactic constraints on topicalization phenomena*. PhD thesis, Universitat Autònoma de Barcelona, Bellaterra.

Ruigendijk, E., Vasic, N., and Avrutin, S. (2006). Reference assignment: using language breakdown to choose between theoretical approchaes. *Brain and Language*, 96:302–317.

Saddy, J. (1995). Variables and events in the syntax of agrammatic speech. *Brain and Language*, 50:135–150.

Salis, C. and Edwards, S. (2008). Comprehension of wh-questions and declarative sentences in agrammatic aphasia: the set partition hypothesis. *Journal of Neurolinguistics*, 21:375–399.

Schwartz, M., Saffran, E., and Marin, O. (1980). The word-order problem in agrammatism: I. Comprehension. *Brain and Language*, 10:249–262.

Seddoh, S. (2006). Basis of intonation disturbance in aphasia: perception. *Journal of Neurolinguistics*, 19:270–290.

Shlonsky, U. (1992). Resumptive pronouns as a last resort. *Linguistic Inquiry*, 23:443–468.

Silverman, K., Beckman, M., Pitrelli, J., Ostendorf, M., Wightman, C., Price, P., Pierrehumbert, J., and Hirschberg, J. (1992). ToBI: a standard for labelling English prosody. In *Proceedings of ICSLP92*, volume 2, pages 867–870.

Solà, J. (1992). *Agreement and subjects*. PhD thesis, Universitat Autònoma de Barcelona, Bellaterra.

Solà, J. (1994). *Sintaxi normativa: estat de la qüestió*. Empúries, Barcelona.

Sportiche, D. (1988). A theory of floating quantifiers and its corollaries for constituent structure. *Linguistic Inquiry*, 19:425–451.

Sportiche, D. (1995). *Phrase structure and the lexicon*, chapter Clitic constructions. IUCL Press.

Sportiche, D. (1996). Clitic constructions. In Rooryck, J. and Zaring, L., editors, *Phase Structure and the Lexicon*, pages 213–236. IULC, Bloomington.

Sportiche, D. (1998). *Partitions and Atoms of Clause Structure: Subjects, Agreement, Case and Clitics*. Routledge, London.

Starke, M. (2001). *Move dissolves into Merge: a theory of Locality*. PhD thesis, University of Geneva, Geneva.

Stowell, T. (1981). *Origins of phrase structure*. PhD thesis, Massachusetts Institut of Technology, Cambridge.

Su, Y.-C., Lee, S.-E., and Chung, Y.-M. (2007). Asyntactic thematic role assignment by Mandarin aphasics: a test of the Trace-Deletion Hypothesis and the Double Dependency Hypothesis. *Brain and Language*, 101(1):1–18.

Suñer, M. (1994). V-movement and the licensing of argumental wh-phrases in Spanish. *Natural Language and Linguistic Theory*, 12:335–372.

Suñer, M. (2000). Object shift: comparing a Romance language to Germanic. *Probus*, 12:261–289.

Suñer, M. (2003). The lexical preverbal subject in a Romance null subject language: where art thou? In Núñez-Cedeño, R., López, L., and Cameron, R., editors, *A romance perspective on language knowledge and use*, pages 341–357. John Benjamins Publishing, Amsterdam.

Swinney, D. and Zurif, E. B. (1995). Syntactic processing in aphasia. *Brain and Language*, 50:225–239.

Tait, M., Thompson, C., and Ballard, K. (1995). Subject-object asymmetries in agrammatic comprehension of four types of wh-questions. *Brain and Language*, 51:77–79.

Thompson, C., Tait, M., Ballard, K., and Fix, S. (1999). Agrammatic aphasic subjects' comprehension of subject and object extracted wh-questions. *Brain and Language*, pages 169–187.

Torrego, E. (1984). On inversion in Spanish and some of its effects. *Linguistic Inquiry*, 15:103–129.

Travis, L. (1984). *Parameters and effects of word order variation*. PhD thesis, Massachusetts Institut of Technology.

Uriagereka, J. (1995). Aspects of clitic placement in Western Romance. *Linguistic Inquiry*, 26:79–123.

Vallduví, E. (1990). *The informational component*. PhD thesis, University of Pennsylvania.

Vallduví, E. (1993). Catalan as VOS: evidence from information packaging. In Ashby, W., Mithun, M., and Perissinotto, G., editors, *Linguistics Perspective in Romance Languages*, pages 335–350. John Benjamins Publishing, Amsterdam.

Vasic, N., Avrutin, S., and Ruigendijk, E. (2006). Interpretation of pronouns in VP-ellipsis constructions in Dutch Broca's and Wernicke's aphasia. *Brain and Language*, 96:191–206.

Villa-García, J. (2013). On the status of preverbal subjects in Spanish: evidence for a dedicated subject position. In Keine, S. and Sloggett, S., editors, *NELS 42*, pages 245–256. GLSA Publications, Toronto.

Villalba, X. (2000). *The syntax of sentence periphery*. PhD thesis, Universitat Autònoma de Barcelona, Bellaterra.

Wernicke, C. (1874). *Der aphasische Symptomenkomplex: Eine psychologische Studie auf anatomischer Basis*. Max Cohn und Weigert, Breslau.

Zubizarreta, M. (1998). *Prosody, Focus and Word Order*. The MIT Press, Cambridge.

Zubizarreta, M. (1999). Word order in Spanish and the nature of nominative Case. In Johnson, K. and Roberts, I., editors, *Beyond Principles and Parameters*, pages 223–250. Kluwer, London.

Zurif, E. B. (1995). Brain regions of relevance to syntactic processing. In Geitman, L. and Liberman, M., editors, *An invitation to cognitive science*, volume 1, pages 381–397. The MIT Press, Cambridge.

Zurif, E. B. and Caramazza, A. (1976). Psycholinguistic structures in aphasia: studies in syntax and semantics. In Whitaker, H. and Whitaker, H.,

editors, *Studies in Neurolinguistics*, volume 2, pages 261–292. Academic Press, London.

Zurif, E. B., Caramazza, A., and Myerson, R. (1972). Grammatical judgments of agrammatic aphasics. *Neuropsychologia*, 10:405–417.

Zurif, E. B., Caramazza, A., Myerson, R., and Galvin, J. (1974). Semantic feature representations for normal and aphasic language. *Brain and Language*, 1:167–187.