

## THE PHI-FEATURES OF CLITIC PRONOUNS: EVIDENCE FROM HEARING-IMPAIRED ADULTS

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### *1. Introduction*

The status of gender and number features in the nominal system is at the heart of a great linguistic debate involving different languages. Much recent cross-linguistic research is concerned with the issue on how gender and number features are processed by the human parser (for English, Nicol (1988); for Italian, De Vincenzi & Di Domenico (1999) and De Vincenzi (1999), Carminati (2005); for Spanish, Antòn-Méndez et al. (2002)) and how they are represented from a phonological and morphosyntactic point of view (for Italian, Di Domenico (1997), Ferrari (2005), Lampitelli (2008), Thornton (2001); for Spanish, Harris (1991) Picallo (1991, 2005, 2007); for Hebrew, Ritter (1995)). Although from different perspectives, all these studies converge on the conclusion that number features are computed and represented differently from gender features.

In this paper, the use of gender and number features on third person accusative clitic pronouns in Italian is analysed on a group of hearing impaired adults. Hearing impairment drastically reduces the quantity and the quality of linguistic input and strongly affects the natural process of speech development and language acquisition. Most studies concerned with hearing impairment show that although hearing impaired people come to learn the lexicon and some grammar rules of a language, they are not always able to master the oral language thoroughly. They are not able to use some components of grammar, like articles, prepositions, pronouns, nominal and verbal morphology, which are readily acquired by hearing individuals, but which represent the most frequent cause of errors in written and spoken language as well as in comprehension and production tasks of hearing impaired people (Chesi 2000, 2006, Fabbretti et al. 1998, Volterra & Bates 1989, Volterra et al. 2001). However, recent studies reveal that despite high degrees of hearing impairment and delayed access to the linguistic input, some people are nonetheless able to correctly master specific properties of the Italian language, namely the use of clitic pronouns, and gender and number morphology in left-dislocation sentences (Volpato 2002 and

2008). By analysing the performance of both orally-trained hearing impaired individuals (Volpato 2002) and LIS signers (Volpato 2008) in the different combinations of gender and number features on clitic pronouns, this paper contributes to the current debate on phi-features. Indeed, it brings further evidence that gender and number features specified on these pronouns are not on the same level in the syntactic structure.

This paper is organized as followed. Section 2 introduces the main topics by presenting some psycholinguistic research concerned with the use of gender and number features in the retrieval of pronoun antecedents. Sections 3 and 4 are offering a literature overview on recent analyses of phi-features from a syntactic, morphological and phonological point of view. Section 5 is presenting the experiment, with the relevant data from the performance of hearing impaired participants in the different combinations of gender and number features on third person accusative clitic pronouns. Section 6 discusses the experiment results opening new issues on the status of gender and number features in clause structure.

## *2. Psycholinguistic research on gender and number features*

Much psycholinguistic research is devoted to explain how gender and number features are mentally processed by the human parser. Nicol (1988) investigated the relationship between gender and number features using a cross-modal priming technique, by proposing pairs of sentences in which the only element which distinguished one item from the other was the pronoun. The two pronouns differed either in number or in gender. In each pair of sentences, the pronoun was preceded by two lexical referents and was disambiguated towards one of the two antecedents either through number or gender features. The sentences were visually presented and after the pronouns, a target word appeared on the screen for lexical decision. The following examples show two pairs of sentences in which the decision is concerned with number (1-2) and gender features (3-4):

- (1) The landlord told the janitors that the fireman with the gas-mask would protect **him** if it became necessary.
- (2) The landlord told the janitors that the fireman with the gas-mask would protect **them** if it became necessary.
- (3) The ballerina told the skier that the doctor would blame **him** for the injury.
- (4) The ballerina told the skier that the doctor would blame **her** for the injury.

Results showed that gender information, as opposed to number information, is not used to select the appropriate pronoun antecedent. The low reactivation effect in gender disambiguation is assumed to be due to a language-specific property of English, namely the fact that some English nouns (e.g. “skier”) are gender-neutral,

and consequently they might be possible antecedents for both masculine and feminine pronouns.

To test the hypothesis that there is indeed an intrinsic difference in the use of gender and number information and that gender is actually used at a later stage as opposed to number, De Vincenzi & De Domenico (1999) carried out a similar experiment for the Italian language, in which all nouns are marked by semantic or grammatical gender.

The conditions tested are shown for number information in examples (5) - (6) and for gender information in examples (7) - (8):

- (5) Lo sposo disse agli alunni che il vecchio generale in pensione voleva salutare **lui** quanto prima.  
'The bridegroom told the pupils that the old retired general wanted to greet **him** as soon as possible.'
- (6) Lo sposo disse agli alunni che il vecchio generale in pensione voleva salutare **loro** quanto prima.  
'The bridegroom told the pupils that the old retired general wanted to greet **them** as soon as possible.'
- (7) Lo zio disse alla laureanda che l'ingegnere conosciuto in vacanza poteva ricevere **lei** nel pomeriggio.  
'The uncle told the doctorand(F) that the engineer known during vacation could receive **her** in the afternoon.'
- (8) Lo zio disse alla laureanda che l'ingegnere conosciuto in vacanza poteva ricevere **lui** nel pomeriggio.  
'The uncle told the doctorand(F) that the engineer known during vacation could receive **him** in the afternoon.'

The results of this study replicated those of Nicol (1988), confirming that number constitutes the morphological information that is firstly used to select the correct pronoun antecedent. Hence, number information is available and processed at an earlier stage than gender information, proving that this property is not specific only of the English language.

The conclusions drawn by the above described studies find further corroboration in another type of experiment carried out by Carminati (2005). She reports results from some tasks manipulating gender and number features on the resolution of the null pronoun (*pro*) in Italian. The analysis of her data showed that number dominates gender on the implicational scale of the Feature Strength Hypothesis (Person > Number > Gender) and consequently the former is cognitively more

salient than the latter.<sup>1</sup> Italian listeners tend to resolve intra-sentential anaphora with *pro* by selecting as antecedent the referent introduced in the subject position. In this experimental study, *pro* was forced to select the referent in the object position through gender and number disambiguation. Two examples of the conditions tested are shown in (9) for gender disambiguation and in (10) for number disambiguation:

- (9) Quando Maria ha chiamato Mario, era contento.  
When Maria has called Mario, *pro* was (3<sup>rd</sup> person sg) happy (M.sg)  
'When Maria called Mario, he was happy'.
- (10) Quando Mario ha chiamato i Rossi, erano contenti.  
When Mario has called the Rossis, *pro* were (3<sup>rd</sup> person pl) happy (M.pl)  
'When Mario called the Rossis, they were happy'.

Like the previous ones, this study makes it possible to prove that the parser reacts to number disambiguation faster than to gender disambiguation, in support to the Feature Strength Hypothesis. This phenomenon is clear evidence that Number is more prominent and consequently more accessible than Gender during sentence comprehension. The evidence obtained thanks to these studies has had strong consequences for the development of linguistic theories representing phi-features in clause structure.

### 3. Linguistic research on gender and number features

The linguistic research raises the question of how phi-features are represented in clause structure: whether they are associated to the noun or they are relevant to a syntactic stage.

In the linguistic literature, the issue concerning the status of gender and number features is still highly debated. Some linguists argue that only number projects its own syntactic head (Ritter 1995, Di Domenico 1997, De Vincenzi & Di Domenico 1999). Some others argue instead that two distinct projections for number and gender features occur in syntactic structure (Picallo 1991, 2005, 2007, Ferrari 2005, Lampitelli 2008).

As far as the representation of nouns is concerned, Ritter (1995) and Di Domenico (1997) postulate the existence of a number projection above NP in the DP structure. Different hypotheses are instead put forward to express gender features. Di Domenico (1997) assumes the existence of two gender levels, grammatical gender and semantic gender. In nouns like "sedia" 'chair.FEM', gender is part of the lexical entry (grammatical gender), it has no semantic content and cannot be varied (\*sedio). Only if gender has semantic content (semantic gender), as in "ragazza"

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<sup>1</sup> Carminati (2005) also manipulates person features in her study, but for the sake of this paper only issues concerning gender and number features will be taken into account.

‘girl’, and can therefore be varied (*ragazzo* ‘boy’), the feature is non-intrinsic and can be represented independently in the lexicon. As opposed to singular nouns, in plural ones, number has always semantic content and can be varied (*sedie* – chairs.FEM / *ragazze-ragazzi* – girls-boys). Consequently, Number heads its own projection.

Instead Gender, by not being a syntactic head, has to be hosted under some other projection. According to Di Domenico (1997), semantic gender is projected together with Number, while grammatical gender is part of the lexical entry and consequently it is projected under N. In this respect, Di Domenico’s proposal differs from that of Ritter (1995), who suggests that in Romance languages, Gender is always projected with Number, as opposed to languages such as Hebrew, in which Gender is a feature of N.

Picallo (1991) offered a different perspective as far as the computation of gender and number features is concerned. In her proposal, gender plays a more substantial role in clause structure and, like Number, projects an independent syntactic head, which she initially labels as GenderP. Picallo justifies the existence of such a projection by arguing that in Romance languages, there is overt agreement in phi-features on past participle in particular syntactic configurations, like wh-constructions in French (11) and clitic constructions in Catalan (12):

- (11) a. *Quelle chaise as-tu repeinte?*  
Which-FEM chair-FEM have you repainted-FEM  
b. *Les chaises que Paul has repeintes*  
The-FEM-PL chairs-FEM-PL that Paul a repainted-FEM-PL
- (12) a. *(Aquesta pellicula) ja l’has vista?*  
(This movie-FEM) already it-FEM have (you) seen-FEM-SG  
‘Have you already seen this movie?’  
b. *(Aquestes pellicules) ja les has vistes?*  
(These movies-FEM) already them-FEM have (you) seen-FEM-PL  
‘Have you already seen these movies?’

As (13) shows, Italian behaves like Catalan:

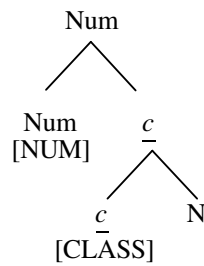
- (13) a. *La mela, l’hai già mangiata?*  
The-FEM apple-FEM, it-FEM have (you) already eaten-FEM  
‘Have you already eaten the apple?’  
b. *Le mele, le hai già mangiate?*  
The-FEM.PL apples-FEM, them-FEM have (you) already eaten-FEM.PL  
‘Have you already eaten the apples?’

Recently, much increasing research on the noun categorization of Bantu languages (Kihm 2002, 2005, Ferrari 2005) has marked an analogy between gender features of Romance languages and noun classes in Bantu languages. Both are

assumed to have identical lexical and syntactic functions and to act as elements used to assign classes to nouns. This phenomenon has led linguists to reconsider the role played by the gender feature at the representational level.

In line with these assumptions, Picallo (2005) labels the projection containing gender features as ClassP. This projection is found above N<sup>2</sup>. Gender features are thus assumed to head an autonomous projection, just as number features do. However, in Spanish and Catalan the expression of grammatical number is strongly related to the expression of grammatical gender which is a fundamental condition for the assignment of number features to syntactic categories. Number features crucially depend on the assignment of gender features.

(14)



The feature [class] and [num] are always interpreted in two distinct projections. The former implies the latter, since number assignment is not possible without classification. Hence, only gendered arguments are assigned grammatical number. Number is parasitic on gender, and therefore genderless categories are also numberless, as we can see from the following example in Spanish:

(15) Esto y aquello lo/\*los considero un error /\*errores  
 this.NEUT. and that.NEUT. it/\*them consider.PRES.1.SING a mistake/\*mistakes  
 'I consider this and that a mistake.'

Another proposal for the representation of gender and number features is offered for Italian by Ferrari (2005). According to her approach, both Number and Gender are syntactic phenomena. In line with Kihm (2005), she claims that in the Italian nominal system, gender morphemes are markers of nounhood. Gender is therefore

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<sup>2</sup> Picallo's (2005) proposal is put forward in minimalist terms. She argues that the gender inflection appearing on Spanish and Catalan nouns is the reflex of a syntactic agreement operation between class and the formal feature correlate in N, which is inherent in the lexical entry of the noun but it is not interpretable in N (Chomsky 2001). For the issue addressed in this paper, the type of framework adopted is not relevant.

sufficient to classify a lexical item as a noun (Lowensdamm 2008). Ferrari thus proposes a complex representation of the projection traditionally labeled as NP, with a larger shell, in which the stem is associated to the other features.<sup>3</sup> N combines with gender to form the feature [n], in order to categorize a root as a noun. Because the gender feature triggers syntactic agreement, it is considered to be an inflectional feature, and consequently it projects a head separately from its stem. The assignment of the categorial feature [n] automatically generates a masculine noun.

For Italian, Ferrari assumes that masculine and feminine nouns are different only with respect to the number of lexical features each has. Masculine nouns are assumed to be the default case and consequently they are marked uniquely by the feature [n]. Feminine nouns are instead marked by the feature [n] and by an additional feature, labeled as [f], which is projected under *fP*. The presence of such a feature involves a more complex structure for feminine nouns, i.e. a higher number of features realized in clause structure as opposed to those of masculine nouns. Having more structure than masculine nouns, feminine nouns are considered as the marked case.

On the basis of Ferrari's (2005) assumptions, masculine and feminine nouns are represented as shown respectively in (16a) and (16b):

- (16) a. / $\sqrt{+n}/ = [\text{stem (n)}] \quad \text{libr-}o / \text{fior-}e$   
b. / $\sqrt{+n}/+f/ = [\text{stem (n f)}] \quad \text{cas-}a$

Stems exclusively marked by [n] correspond to the unmarked noun class, that is masculine singular, where <o> and <e> are cases of morphological and phonological epenthesis, respectively, and are possible expression of unmarkedness<sup>4</sup>. Stems marked by [[n]+f] correspond to the marked class, in which the ending [a] is the morpheme expression of the feature [f], namely feminine singular.

Plural nouns are then derived through the insertion of the feature Number into the structure (NumP). Stems marked by [[n]+Num] correspond to the plural unmarked class, in which [i] is the morpheme for masculine plural (/ $\sqrt{+n}/+pl[i]/ = \text{libr-}i$ ). Stems marked by [[[n]+f]+Num] correspond to the plural marked class, in which the morpheme [e] expresses the feminine plural (/ $\sqrt{+n}/+f/+pl[e]/ = \text{cas-}e$ ). Number is projected only in the plural and not with singular features.

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<sup>3</sup> Lexicon is the place where the root combines with the categorial feature (N-V-A), while syntax is the place where the stem undergoes inflectional modification (adding of gender and number features).

<sup>4</sup> The different status of the segment <o> as a case of morphological epenthesis, with respect to the other vowels in word final position, is also stressed by Cardinaletti & Repetti (2007) for the explanation of some phenomena occurring in some Northern Italian dialects.

4. The morpho-phonological theories

Gender and number features have also been analysed cross-linguistically from morphological and phono-syntactic perspectives. For Romance languages, Harris (1991), Thornton (2001) and Kihm (2005) argue that nouns endings are not the morphological expression of gender, but they are vocalic endings without any content. For Spanish, Harris (1991) proposes that noun endings <o> and <a> are not gender morphemes expressing respectively masculine and feminine gender features. They are instead “word markers” or “class markers”, which are necessary to close off words and phonologically classify them on the basis of the final morpheme, thus allowing syllabification of otherwise impossible clusters. The reason for such a claim is that some nouns ending in <a> are masculine and some nouns ending in <o> are feminine. Accordingly, Gender does not play any categorial role<sup>5</sup>.

In line with Harris (1991), Thornton (2001) assumes the existence of six noun classes in the Italian nominal system. She argues that gender is assigned to nouns on the basis of semantic or phonological rules (Table 1) and the matching of gender and noun endings (forms) is used to assign class to nouns (Table 2):

**Table 1:** Noun classification in terms of gender (Thornton 2001)

Gender	class 1 sg. -o, pl. -i	class 2 sg. -a, pl. -e	class 3 sg. -e, pl. -i	class 4 sg. -a, pl. -i	class 5 sg. -o, pl. -a	class 6 invariable
Masc	libro 'book'	*	padre 'father'	papa 'pope'	uovo 'egg'	bar 'coffee shop'
Fem.	mano 'hand'	casa 'house'	madre 'mother'	ala 'wing'	uova 'eggs'	star 'famous person'

**Table 2:** Noun classification in terms of forms (Thornton 2001)

Gender	class 1 sg. -o, pl. -i	class 2 sg. -a, pl. -e	class 3 sg. -e, pl. -i	class 4 sg. -a, pl. -i	class 5 sg. -o, pl. -a	class 6 invariable
-a	*	casa 'house'	*	papa 'pope'	*	panda 'id.'
-o	libro 'book'	*	*	*	uovo 'egg'	moto 'motorbike'
-e	*	*	fiore 'flower'	*	*	specie 'kind'
other	*	*	*	*	*	crisi, re, bar

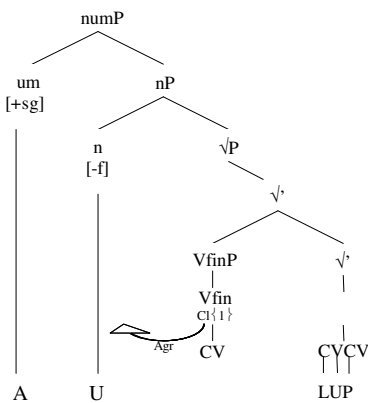
<sup>5</sup> Within the framework of Distributed Morphology, for Spanish nouns, Harris (1991) assumes that class markers are not gender inflections and they do not have any syntactic function. Nonetheless, the formation of masculine and feminine nouns is not identical, and markedness implies a more complex derivation process. Actually, two rules operate on feminine nouns: the Feminine Marker Rule, which provides stems lexically marked for the gender feature [+feminine] with the ‘class diacritic <a>’, and the Marker Realization Rule, which accounts for the insertion of the suffix <a> if the stem is marked by the class diacritic <a>; otherwise, the stem is assigned the suffix <o> as the default class marker.



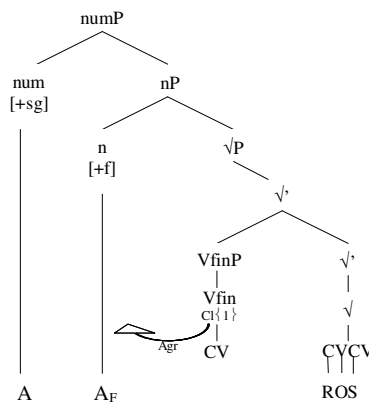
Class 1 and 2 are the most productive classes to which most nouns belong. Class 4 and 5 are closed, and also class 3 is no longer productive. Class 6 is still productive by including loans from other languages.

A nominal system as proposed by Thornton (2001) is structurally represented by Lampitelli (2008) in the following way<sup>6</sup>:

(17) *lupo* ‘wolf.MASC.SG’



*rosa* ‘rose.FEM.SG’



Following the Theory of Elements (Kaye, Lowenstamm & Vergnaud 1985, 1990), he proposes that vowel endings of Italian nouns may be decomposed into two distinct elements. The Italian vocalic system has three simple vowels [A, I, U] and two complex ones [O, E], resulting from A+U and A+I respectively. Following Kihm (2002) and Lowenstamm (2008), gender is hosted under nP, which makes it possible to spell out the correct “Root Element” through an agreement relation with VfinP (Class) (Lampitelli 2008). Therefore, U is needed to derive masculine nouns ([-f]) belonging to Class 1, Af marks feminine nouns ([+f]) belonging to Class 2, Ø is needed to derive nouns included in Class 4 and 6, and I to derive nouns in Class 3 ([±f]). Root elements (nP) combine then with NumP to derive either singular or plural vowel endings. Under the Number projection, the element [A] is needed in the structure to form singular vowels (A<sub>sg</sub>), while the element [I] is used to form plural ones (I<sub>pl</sub>). Both singular and plural features share the same structure and the difference between them rely on the value attributed to the number projection ([±sg]).

Harris’ (1991) and Thornton’s (2001) proposals have been challenged by Ferrari (2005), who argues against the existence of class markers in Italian and evidences

<sup>6</sup> The following representations are taken from Lampitelli (2008).

instead a perfect correspondence between gender features and gender forms. The singular vowel suffix is important for the prediction of gender. Apart from some words displaying an epenthetic vowel as final morpheme, most Italian nouns belong either to the masculine (nouns ending in *-o*) or to the feminine gender (nouns ending in *-a*).

In sum, the issue concerning the representation of gender and number features is still controversial and highly debated. Two main tendencies exist as far as the representation of gender and number information in clause structure, theories modelled either in terms of binary features (Lampitelli 2008) or of privative features (Ferrari 2005). A binary feature takes one of two values (it is either + or -), and consequently a feature like [number] may have the value [+singular] for singular and [-singular] for plurals. A privative feature is a property that is either present or absent in the structure. Whereas singular forms never show overt number marking and can be analyzed as not being marked with respect to number, only plurals are marked with the privative feature [number]. The same can be said for the feature [gender].

### 5. *Phi-features and pronouns*

Various proposals concerned with the pronominal system in different languages have analysed pronouns as syntactic objects with different internal structure and morpho-syntactic properties. Ritter (1995) and Di Domenico (1997, 1999) argue that pronouns are DPs lacking the NP projection. The lack of NP forces gender to be specified on and projected with number.

For Spanish and Catalan, Picallo (2005, 2007) distinguishes between strong pronouns and clitic pronouns. As far as the morphological composition is concerned, clitic pronouns are a subset of strong pronouns (see Cardinaletti and Starke 1999), as the following table shows:

**Table 3:** Pronominal system in Catalan and Spanish

	masc.sing	fem.sing	masc.plur	fem.plur	neuter
<b>STRONG PRONOUNS</b>					
Catalan	<b>ell</b>	<b>ella</b>	<b>ells</b>	<b>elles</b>	
Spanish	<b>él</b>	<b>ella</b>	<b>ellos</b>	<b>ellas</b>	<b>ello</b>
<b>CLITIC PRONOUNS</b>					
Catalan	<b>el</b>	<b>la</b>	<b>els/los</b>	<b>les</b>	<b>ho</b>
Spanish	<b>lo</b>	<b>la</b>	<b>los</b>	<b>las</b>	<b>lo</b>

Accusative clitic pronouns of the type shown in Table 3 have the property of being nominal elements, without any descriptive content (Abney 1987), as opposed to nouns. Harris (1991), Kayne (2000) and Ferrari (2005) assume that *l-* pronouns are complex elements composed of two distinct morphemes, the consonantal morpheme *l-* without any specific characterization for gender and number, and the relevant gender and number markers.

In Picallo's (2007) proposal, whereas strong pronouns are DPs, clitics are considered as NumPs not DPs, in which the segment *l-* is a morphological rescue strategy, inserted after Spell-Out, and not the realization of the syntactic category of DP. As far as nouns are concerned, section 3 illustrated that the lack of gender expression in the nominal system has a blocking effect on the expression of grammatical number. This phenomenon also reflects on the morphosyntactic structure of clitic pronouns in Spanish and Catalan, in which number features rely on the presence of gender features and therefore genderless clitics are also numberless.

## *6. The experiment*

This section is concerned with the description of two experimental studies, in which two different typologies of hearing impaired individuals are involved, namely two orally-trained and three Italian/LIS-speaking adults.

Two separate studies are offered, one for the three bilinguals (Study 1 – section 6.1) and one for the whole group of hearing impaired individuals (both orally-trained and deaf signers) (Study 2 – section 6.2). The test and the procedure are the same for both experimental studies.

### *6.1 Study 1*

In this study, the performance of three hearing impaired bilinguals Italian/LIS – Italian Sign Language is analysed in comparison with that of four hearing adults.

#### *6.1.1 Participants*

The individuals involved in this study are three hearing impaired bilinguals Italian/LIS (S1-S2-S3) (Volpato 2008). Briefly summarizing their history, by the time of the experiment they were respectively 26, 25 and 30 years old. All of them are deaf since birth and are born to deaf parents. Two of them (S2 and S3) are profoundly deaf (their hearing loss is 100 dB), while S1 has moderate to severe hearing loss (70 dB). They wore conventional hearing aids only during childhood, but not at the time of the experiment. They always attended special school for deaf people, where they also received linguistic training in Italian. At the moment, all of them are teachers of LIS at the university or in special schools for LIS learners.

The hearing group was composed of four Italian-speaking participants (VC, LM, ST and LT), who were selected on the basis of the age (respectively 26-24-24-26 at

the time of the experiment) and of the length of their school education (at least 13 years).

#### 6.1.2 Task and materials

The test adopted to assess the use of clitic pronouns in left dislocation sentences is a sentence completion task, aimed at eliciting the four third-person accusative clitic pronouns in Italian (the masculine singular *lo*, the feminine singular *la*, the masculine plural *li* and the feminine plural *le*).<sup>7</sup> The test includes 112 gaps that the participants had to fill in with the correct form of the clitic pronoun and the correct verbal form (Volpato 2002 and 2008)<sup>8</sup>. Both simple (present and imperfect) and compound tense (“passato prossimo”) sentences were used in this task. Two examples of the type of items used in the task are shown in (18):

- (18) a. Tu e tuo fratello, la luce \_\_\_\_\_ (accendere), perché la stanza era al buio.  
You and your brother, the FEM.SG light.FEM.SG \_\_\_\_\_ (to turn on), because the room was dark.  
‘You and your brother (turned on) the light, because the room was dark.’  
b. Il latte, il bambino \_\_\_\_\_ (bere) ogni mattina.  
The MASC.SG milk.MASC.SG, the MASC.SG child MASC.SG \_\_\_\_\_ (to drink) every morning.  
‘The child drinks the milk every morning.’

#### 6.1.3 Procedure

The sentence completion task was administered individually in more than one session, each lasting about thirty minutes. All participants were tested through the visual modality, by proposing them the sentences on separate strips of papers. This procedure was adopted both for the hearing and the hearing-impaired participants.

#### 6.1.4 Results

The results reveal that the hearing impaired individuals scored almost at ceiling and that no significant difference is found between them and the hearing participants (Mann Whitney test:  $U=3$   $p=.285$ ). There are few errors showing that the impairment is very selective. The errors are mainly represented by omission of the clitic pronoun and use of the unmarked form of the past participle (as in (19)) or

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<sup>7</sup> A comprehension task contained in the B.A.D.A. (Battery for the analysis of aphasic disorders) (Miceli et al. 1994) was administered prior to the elicited production test to assess the general linguistic competence of the participants (cf. Volpato 2002 and 2008).

<sup>8</sup> The test in its initial version (Volpato 2002) was composed of 90 gaps (I will adopt this version for the second study). Then, in order to carry out a more complete and interesting comparison, more items were added to the initial battery.

substitution of the correct form with the unmarked one both on the clitic and, with compound tense sentences, on the past participle (as in (20)):

- (19) \*La lezione, il professore aveva spiegato due volte, perché i ragazzi non avevano capito niente.  
The:FEM.SG lesson:FEM.SG, the teacher had explained:MASC.SG.(default) twice, because the students had not understood anything.  
'The teacher explained the lesson twice, because the students did not understand anything.'
- (20) \*La cena per i bambini, la mamma l'ha preparato prima di andare al ristorante.  
The:FEM.SG. dinner:FEM.SG. for the children, the:FEM.SG mother:FEM.SG it:CL has prepared:MASC.SG, before going to the restaurant.  
'The mother prepared dinner for the children, before going to the restaurant.'

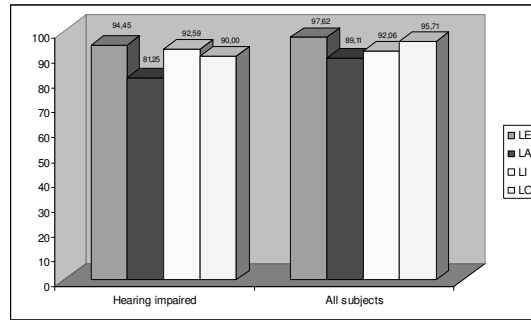
Omissions are rarely attested in simple tense sentences, the omission rate being higher in sentences requiring a compound tense. Substitution errors always occur with compound tenses. When the clitic is placed in the sentence, it always correctly agrees with the past participle. When it is omitted, the past participle is in the unmarked form. When failed agreement between the antecedent and the past participle is attested, the past participle and the clitic pronoun presumably share the same unmarked features (Volpato 2008)<sup>9</sup>. Since the participants achieved high scores, a qualitative analysis investigating the performance in the different combinations of gender and number features on clitic pronouns was possible in order to determine whether these forms are equally mastered or some forms are more preserved than others.

A within-group analysis using the Wilcoxon test was carried out in order to analyse the opposition between single clitics (*lo* vs. *la*, *lo* vs. *li*, *la* vs. *le*, *le* vs. *li*).

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<sup>9</sup> Actually, looking only at the clitic, it is not clear whether it is in the masculine or the feminine form, because with compound tenses, the gender feature is not overtly marked on the clitic pronoun and the elided form (*l-*) is correct both for the masculine and the feminine singular (*l'ha preparato/l'ha preparata*). However, since the participants always produce correct agreement between the clitic and the past participle, I assume that in this case, the clitic and the past participle also share the same gender feature (masculine singular *-o*).

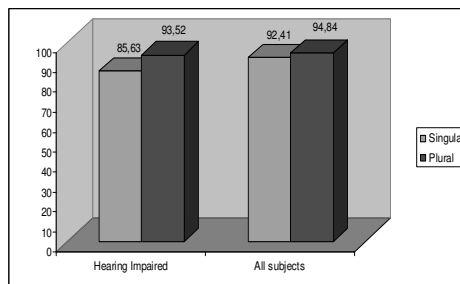
**Table 4:** opposition between single clitics



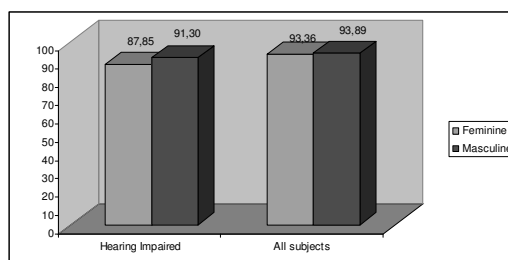
As it is possible to see from the table above, the most preserved form within the hearing impaired group is the feminine plural, while the most impaired one is the feminine singular. Even considering the total number of participants (both the hearing and the hearing impaired group), the most preserved form is the feminine plural and a significant difference is attested between the production of feminine plural features and feminine singular ones. Feminine plural is performed significantly better than feminine singular ( $Z=-2.032$   $p=0.042$ ).

A further comparison was carried out to analyse the opposition between pairs of clitics, namely between masculine and feminine (*lo+li* vs. *la+le*) and between singular and plural features (*lo+la* vs. *li+le*).

**Table 5:** opposition between pairs of clitics (singular vs. plural)



**Table 6:** oppositions between pairs of clitic (feminine vs. masculine)



From the above tables, it is evident that within the hearing impaired group, singular features have a lower percentage of correct responses as opposed to plural features, and that masculine features scores higher than feminine ones. However, in spite of these results, no significant difference is attested between feminine and masculine, while significance is attested in the opposition between plural and singular features. Plural forms are performed significantly better than singular ones ( $Z=-2.032$   $p=0.042$ ).

## 6.2 Study 2

This study is analysing the performance of three hearing impaired bilinguals Italian/LIS – Italian Sign Language and two orally trained hearing impaired adults, in comparison with that of seven hearing adults.

### 6.2.1 Participants

In this second study, the group of the three hearing impaired signers (see section 6.1.1) and two orally-trained hearing impaired adults (S4 and S5) are included (Volpato 2002).

By the time of the experiment, S4 and S5 were two university students aged respectively twenty-four and twenty-two. They are brothers born to hearing parents and have been profoundly deaf since birth (their hearing loss is above 90 dB). S4 was diagnosed as deaf when he was one year old, while S5 at birth. S4 was fitted with hearing aids as soon as his deafness was discovered and S5 when he was six months old. They were trained orally at an audiological centre from one to nineteen years. Till they were six years old, they received intensive training, by spending at the centre two hours per day every week; then they progressively reduced the attendance to three days a week (from 6 to 10 years of age), then to two (from 11 to 13) and finally to one (from 14 to 19).

At school they always attended classes with hearing children and were supported by a tutor both during school lessons and at home. They do not know the Italian

Sign Language, and for interaction with other people, they are used to lip-reading (Volpato 2002).

The control group included the four hearing subjects of the first analysis and two hearing subjects (RL and SC) matched to the orally-trained individuals on age (they were respectively 22 and 24 years old at the time of the experiment) and length of school education (13 years).

### 6.2.2 Materials and procedure

The items considered for this study include 90 gaps, which constitute a subset of those contained in the battery used for the first study. The procedure is the same as that described in the first study (cf. section 6.1.3).

### 6.2.3 Results

In many respects, the results of this study replicate those of the previous one, where exclusively the performance of the three hearing impaired signers was taken into account. The errors are the same as those described in section 6.1.4. In this study, the performance in the total amount of sentences (both compound and simple tense sentences), and the number of correct responses for each clitic form is given in the following table:

**Table 7:** percentages of correct responses for each clitic form

		LO		LA		LI		LE	
Hearing impaired Subjects	<b>S1</b>	21/25	84,00	22/30	73,33	11/15	73,33	20/20	100,00
	<b>S2</b>	24/25	96,00	27/30	90,00	15/15	100,00	19/20	95,00
	<b>S3</b>	25/25	100,00	27/30	90,00	15/15	100,00	20/20	100,00
	<b>S4</b>	24/25	96,00	25/30	83,33	14/15	93,33	20/20	100,00
	<b>S5</b>	24/25	96,00	26/30	86,67	15/15	100,00	17/20	85,00
			$\mu=94,40 \sigma=6,07$		$\mu=84,67 \sigma=6,91$		$\mu=93,33 \sigma=11,55$		$\mu=96 \sigma=6,52$
		LO		LA		LI		LE	
Hearing Subjects	<b>VC</b>	25/25	100,00	29/30	100,00	14/15	93,33	20/20	100,00
	<b>LM</b>	24/25	96,00	29/30	96,67	14/15	100,00	20/20	100,00
	<b>ST</b>	25/25	100,00	25/30	83,33	13/15	86,67	20/20	100,00
	<b>LT</b>	25/25	100,00	29/30	100,00	13/15	86,67	20/20	100,00
	<b>SC</b>	25/25	100,00	30/30	100,00	15/15	100,00	20/20	100,00
	<b>RL</b>	24/25	96,00	25/30	83,33	15/15	100,00	20/20	100,00
		$\mu=98,67 \sigma=2,07$		$\mu=93,89 \sigma=8,28$		$\mu=94,45 \sigma=6,55$		$\mu=100$	

Also in this case, both in the hearing and in the hearing impaired group, the feminine singular is the most impaired form, for which the lowest percentage of correct responses is attested (84,67% for the hearing impaired group and 93,89% for the hearing one). The feminine singular clitic *la* shows a significant difference as opposed to both the masculine singular clitic *lo* (within the hearing impaired group  $Z=-2.032$   $p=0.042$ , within the whole group of participants  $Z=-2.375$   $p=0.018$ ), and the feminine plural clitic *le* (within the hearing impaired group  $Z=-2.023$   $p=0.043$ ;



within the whole group of participants  $Z=-2.375$   $p=0.018$ ). The clitic form with the highest percentage of correct responses is instead once again the feminine plural. Although in this study, the hearing impaired group and the hearing one show an opposite pattern of performance as far as the results for masculine features are concerned, for the group of hearing impaired participants, plural features are more preserved than singular ones, replicating the pattern of performance of the group of LIS signers (cf. 6.1.4).

To summarize the results of both studies, it emerges that the hearing impaired individuals tested show high levels of linguistic competence in the Italian language. The analysis of the performance in the different combinations of gender and number features revealed that plural clitics show a higher percentage of correct responses as opposed to singular features. In particular, feminine plural features, which represent the most marked forms in Italian, proved to be significantly more preserved than feminine singular features. The most impaired form for all participants is feminine singular.

## 7. Discussion

The high level of accuracy showed by the hearing-impaired individuals in the sentence completion task shows that their linguistic competence is quite intact. The contribution of these experimental investigations to the linguistic research is therefore to supply further evidence on the asymmetry in the underlying representation of number and gender features, specifically on third person accusative clitic pronouns.

Regardless of how agreement relations between N and the functional projection associated with the nouns are realized in the different proposals in sections 3 and 4, this research demonstrates once again that gender and number features have a different status at the representational level. The data collected from the two experiments show how number plays a significant role during syntactic computation. However, also gender plays a very important role, since the most marked features (feminine plural) are those showing the highest percentage of correct responses. The most remarkable observations concern feminine singular, which is the most impaired form. Even in the case of opposition between pairs of clitics, namely between plural and singular features, the lower performance with sentences containing singular features is mainly due to the high percentage of incorrect use of the feminine singular clitic *la*. However, we cannot simply state that it is a problem of either gender or number features. Indeed, by finding significance in the comparison between *la* and *le* and between *la* and *lo*, we would expect the same results by comparing the clitics in the remaining oppositions of gender (*le* vs. *li*) and of number (*lo* vs. *li*). But this is not the case. This shows that the four accusative clitic pronouns are not all on the same level.

Solid evidence confirming the different status of gender and number features comes from a great deal of studies on phi-features from different perspectives – morphological, phonological and syntactic. As we have seen in sections 3 and 4, different proposals exist as far as only Number heads an independent projection (Ritter 1995, De Vincenzi & Di Domenico 1999) or also Gender heads its own (Ferrari 2005, Picallo 1991, 2005, 2007). Although Picallo (2005) convincingly argues that grammatical gender plays a more substantial role within syntactic computation, her proposal fails to fully explain the case of Italian, since she nonetheless denies the presence of an independent projection for number features. Gender declension is the condition for assigning number features to a category; hence, genderless categories are also numberless. In Italian, however, we have genderless categories, which are nonetheless marked for number, as we can see from the following examples, in which the adjective can be used both for masculine and feminine referents:

- (21) a. Il bambino/La bambina è felice  
The child.MASC/FEM is happy.SG  
b. I bambini/Le bambine sono felici  
The children.MASC/FEM are happy.PL

Furthermore, the default agreement for generic contexts in Italian is always marked for plural but it is underspecified for gender.

- (22) Un dottore visita nudi/\*nude/\*nudo/\*nuda.  
A doctor visits naked.MASC.PL/\*FEM.PL/\*MASC.SG/\*FEM.SG  
'A doctor examines one naked.'

#### 8. Which theory for these data?

The data collected from the present experimental studies raise a number of questions as to the way gender and number features are represented, since there seems to be an underlying asymmetry in the way these features are specified on the morpheme *l-* of accusative clitic pronouns.

Although most theories highlight the different status of gender and number feature, pointing out that both head distinct projections, the theory that best accounts for the data collected is that proposing a privative model. The most acceptable in this respect is the approach adopted by Ferrari (2005).

A first issue is concerned with the status of the *l-* morpheme. Following Ferrari's (2005) proposal for the nominal system, I assume that the accusative clitic pronouns is marked solely by the feature [n], *l-* being considered as the expression of [n]. The feature [n] implicitly generates a masculine element and alone is sufficient to express the default gender. In this case, the ending <o> is an epenthetic segment, which is the expression of unmarkedness. Since the difference between masculine

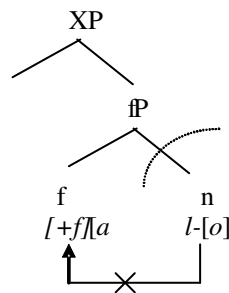
and feminine has been captured in terms of markedness conditions (Ferrari 2005), the feminine singular clitic heads an independent projection (fP), in which the marked gender feature is realized. [a] is thus the morpheme expressing feminine singular. Plural features entail the presence of the Number projection, in which [i] and [e] are the morphemes marking, respectively, the masculine and the feminine plural clitic forms. Summarizing, feminine plural *le* realizes the fP (marked gender) and NumP projections, masculine plural *li* realizes the NumP projection, feminine singular *la* realizes the fP projection and masculine singular (default) *lo* is realized on [n].

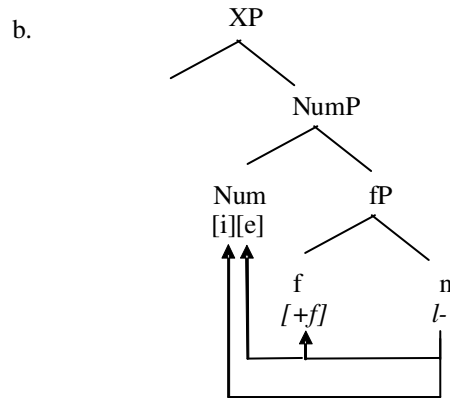
The presence of an independent projection for the marked gender feature (fP) is crucial for the description of the present data and accounts for the fact that feminine singular is more impaired than masculine singular. Indeed, a marked feature involves the activation of more structure and consequently, it is more costly in terms of computation. However, the problem does not seem to be strictly linked to markedness. Otherwise, we would also expect difficulties with the most marked clitic, namely feminine plural. On the contrary, it is far better the most preserved form.

The explanation seems to rely on the fact that the higher the number of features realized in the syntactic structure, the better the performance is. Although this accounts for the high scoring with feminine plural, it does not clarify why masculine plural and feminine singular behave differently from each other and are not equally preserved, even realizing the same number of features – NumP and fP, respectively. This phenomenon raises therefore a lot of questions and opens new issues as to how these features are computed by the human parser. One hypothesis that could be put forward, but on which further evidence and analysis will nonetheless be needed in future, is that the realization of a functional projection above Gender (fP), namely NumP, makes it possible to rescue the syntactic structure and helps to realize the functional projections below that level, thus correctly producing the plural forms of the clitic (*le – li*).

(23)

a.





In sum, data converge on the fact that when only the fP projection is realized, as in (23a), the marked gender feature might be not correctly realized; when a head exists above fP, as in (23b), the structure is rescued and the gender and number features on accusative clitics are preserved and correctly produced. The presence of a more prominent structural element, namely the Number projection, somehow facilitates linguistic performance. In this way, the importance attributed to Number is in line with previous findings provided by processing experiments in psycholinguistic research.

I conclude this paper with two questions. Why is Number so prominent? Why Gender and Number are so different from each other? I believe that these issues need further exploration, but I want to leave them open for future work.

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