

SYNTACTIC AND EURHYTHMIC CONSTRAINTS ON PHRASING DECISIONS IN CATALAN*

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Abstract. This article investigates the role of syntactic and prosodic markedness constraints on the construction of phonological phrases (ϕ - or p-phrases) in Catalan. It is shown that the construction of prosodic structure in this language cannot solely rely on syntactic information but rather also has to refer to prosodic markedness constraints which regulate the size and eurhythmicity of phrase constituents. Specifically, phonological phrasing in Catalan is determined, among other things, by the interaction of right-alignment of syntactic and phonological phrases (ALIGN-XP,R; Selkirk 1986) and the requirement that each XP is contained in a p-phrase (WRAP-XP; Truckenbrodt 1995) together with the following set of prosodic factors: 1) a maximal requirement on the length of p-phrases at the end of utterances, MAX-BIN-END, which requires that each p-phrase containing a nuclear stress should contain at most two prosodic words; 2) a minimality constraint on the prosodic parsing of utterances, MIN-UTT, which requires that each utterance contains a minimally binary p-phrase; 3) a eurhythmic condition, NO-CLASH, which does not allow the presence of two immediately adjacent stressed syllables, partly affects phrasing decisions in this language. Size and eurhythmic effects of this type are also active, though in a weaker fashion, in other Romance languages such as Italian (Ghini 1993a, 1993b), in Brazilian Portuguese (Sandalo & Truckenbrodt 2002), and in European Portuguese and Spanish (Elordieta et al. 2003, Prieto (forthcoming)).

1. Introduction

In the last two decades, work on the syntax-phonology mapping and the prediction of phonological phrases (hereafter, ϕ - or p-phrases) has highlighted the role of edge alignment to syntactic constituents or heads (Selkirk 1986, 1995, 2000, Nespor & Vogel 1986), non-branching of constituents in p-restructuring (Nespor & Vogel 1986) and the requirement that each maximal projection (XP) be contained in a phonological phrase (Truckenbrodt 1995, 1999). Yet, in some recent work it has become clear that these three basic syntactic conditions (Align/Branching/Wrap constraints) are not sufficient to account for the location of phrase boundaries in Romance (and other) languages and that length and

*I am grateful to S. Frota, J. Solà and M. Vigário for helpful comments and suggestions. Special thanks are due to G. Elordieta and H. Truckenbrodt for insightful suggestions. Which have led to a substantial improvement of the article. I also wish to thank my consultants E. Bonet, T. Cabré, P. Gifra, M-R. Lloret, N. Martí, J. Mascaró J. Mateu and X. Villalba for their time in judging (and reading) the phrasing data, and also for helpful observations on the data. This research was funded by grants 2000XT-00032, 2001SGR 00425, and 2001SGR 00150 from the Generalitat de Catalunya and BFF2003-06590 and BFF2003-09453-C02-C02 from the Ministry of Science and Technology of Spain.

uniformity constraints might play an important role in phrasing decisions. In Mirco Ghini's reanalysis of Nespov and Vogel's phrasing analysis of Italian, he suggests that the branchingness condition is not empirically adequate and that it has to be recast into conditions of binary length preference and prosodic balancing (Ghini 1993a, 1993b). Similarly, Sandalo & Truckenbrodt (2002) show that phonological phrasing in Brazilian Portuguese is determined by both right alignment of p-phrases to syntactic constituents and by a tendency which favors p-phrases of equal length. Thus, across languages, p-boundaries are related to syntactic boundaries but, depending on the language, this relationship can be quite blurred by other prosodic conditions.

The topic of this article is the influence of syntactic and prosodic factors on prosodic boundary placement. The proposal will be cast in the Generalized Alignment theory developed within Optimality Theory (McCarthy & Prince 1993a), where the notion of edge alignment from Selkirk (1984) is considered to be a ranked and violable constraint. Recently, Truckenbrodt's work has demonstrated that ALIGN-XP can be suppressed by another constraint on maximal projection's unity, WRAP-XP, and that the interaction between both constraints can explain the contrasts observed in different Bantu languages. The point of departure of our proposal will be Mirco Ghini's reanalysis of the branching requirement data into prosodic notions of balancing and maximum weight. The work presented here will demonstrate that in Catalan, eurhythmic and length constraints play a major role on phrasing decisions, many times suppressing the effects of syntactic constraints. Evidence for the prominent role played by prosodic requirements in Catalan phrasing stems from two sources. On one side, Catalan presents a clear tendency to divide utterances into phrases of similar syllabic lengths, often producing (Subject Verb)(Object) phrasings that challenge syntactic end-alignment and wrapping requirements (cf. Prieto 1997). A second eurhythmic effect, to my knowledge one that has not been observed in other languages, comes from a NO-CLASH condition which prevents the placement of a phrase boundary in between two adjacent stresses. Yet, Catalan also offers crucial evidence for the role played by ALIGN-XP,R and WRAP-XP, which comes from the behavior of local versus non-local attachment of PP-adjuncts and also from special wrapping effects on complement objects.

The article argues that phonological phrasing in Catalan is determined by the interaction of right-alignment of syntactic and phonological phrases (ALIGN-XP,R, based on Selkirk 1986), the requirement that each XP is contained in a p-phrase (WRAP-XP) and the following three prosodic constraints: 1) MAX-BIN-END: each utterance-final p-phrase should contain at most two prosodic words; 2) NO-CLASH: two immediately adjacent stressed syllables are disallowed; 3) MIN-UTT: if possible, an utterance should be phrased in a single p-phrase. The constraint MAX-BIN-END explains, among other things, the special

behavior of subjects in relation to phrasing in Catalan: long subjects are grouped together into a long phrase in examples such as (*El president de la Generalitat de Catalunya*) ϕ (*pateix*) ϕ ‘The president of the Generalitat is suffering’ where the p-phrase containing the subject is much longer than the one containing the verb phrase.

The article is organized as follows. Section 2 introduces the relevant theoretical work on syntax-prosody mapping. Section 3 offers a wide empirical coverage of the Catalan phrasing data together with a constraint-based analysis of the default patterns of p-groupings in a wide variety of structures.

2. Theoretical background: syntactic and prosodic effects on phrasing

Most of the work on the syntax-phonology interface and p-phrase prediction in the last decade has foregrounded the role syntactic information plays on prosodic phrasing. The influential *end-based theory* of the syntax-prosody relationship proposed by Selkirk (1986) specifies a set of mapping parameters, which, depending on the language, predict the ‘anchor points’ where prosodic and syntactic structure must coincide. (1) shows the four parameter settings specified by Selkirk (1986:389) for the position of p-phrases: that is, edges of p-phrases can be either right or left aligned with maximal projections (i.e.,]Xmax, Xmax[) or with syntactic heads (]Xhead, Xhead[).¹

- (1) a.]Xhead b. Xhead [
 a'.]Xmax b'. Xmax [

The notion of alignment to prosodic and morphological edges has been very influential in phonology and morphology and has been recast in the Generalized Alignment family of well-formedness constraints within Optimality Theory (McCarthy & Prince 1993a:80). Within the syntax/phonology interface work, alignment constraints require alignment of left or right edges of XPs (maximal projections) with edges of ϕ or p-phrases (see Selkirk 2000, Truckenbrodt 1995, 1999, among others):

- (2) a. ALIGN-XP,R: ALIGN (XP, R; ϕ , R)
 Align right edge of XP to right edge of ϕ
 b. ALIGN-XP,L: ALIGN (XP, L; ϕ , L)
 Align left edge of XP to left edge of ϕ

Recently, Truckenbrodt’s work (Truckenbrodt 1995, 1999) has convincingly shown that ALIGN-XP can be at times suppressed by another syntax-mapping constraint on maximal projection’s unity, WRAP-XP, and that the interaction between both constraints is able to explain the

¹ The four logical possibilities have been exemplified by Selkirk (1986) and others, except for the left edge of Xhead (see also Bickmore 1990).

language-particular differences observed in different Bantu languages. As stated in (3), WRAP-XP requires that each maximal projection (XP) should be contained in a phonological phrase, with no prosodic phrases breaking it. An XP is thus ‘wrapped’ when there is a p-phrase (the same size or a larger size) that contains the XP. It is not ‘wrapped’ when the XP is split up across more than one p-phrase.

(3) WRAP-XP (Truckenbrodt 1995, 1999:228)

Each XP is contained in a phonological phrase

In this extension of the theory of edge alignment, WRAP-XP and ALIGN-XP are in conflict with each other. Truckenbrodt (1999) demonstrates that the contrast between Chi Mwi:ni and Chizigula/Chicheŵa VP phrasing strategies can be successfully explained by resorting to different orderings between ALIGN-XP and WRAP-XP. While Chi Mwi:ni breaks the higher VP maximal projection after the first NP (V NP)ϕ (NP)ϕ, Chizigula phrases the whole lexical projection VP in a single p-phrase (V NP NP)ϕ. This argues for a different ordering of these constraints: while in Chi Mwi:ni ALIGN-XP is ranked higher than WRAP-XP (that is, a p-boundary is placed after every XP; see (4a)), in Chizigula WRAP-XP neutralizes the effects of ALIGN-XP (that is, the maximal projection is forced to be phrased together; see (4b)):

(4) a. ALIGN-XP R >> WRAP-XP (Chi Mwi:ni)

[verb [noun] _{NP} [noun] _{NP}] VP	ALIGN-XP	WRAP-XP
a. ⚡ (verb noun)ϕ (noun)ϕ		* (VP not wrapped)
b. (verb noun noun)ϕ	*!	

b. WRAP-XP >> ALIGN-XP, R (Chicheŵa, Chizigula)

[verb [noun] _{NP} [noun] _{NP}] VP	WRAP-XP	ALIGN-XP
a. (verb noun)ϕ (noun)ϕ	*! (VP not wrapped)	
b. ⚡ (verb noun noun)ϕ		*

Nowadays, the most widely accepted theory of the syntax-phonology interface is based on Selkirk’s proposal that p-boundaries make reference to syntactic edges and heads together with Truckenbrodt’s cohesive constraint WRAP-XP (which makes reference to the unity of maximal projection constituents). Recent work has demonstrated that prosodic markedness constraints also play a major role in sentence phonology. For example, Mirco Ghini’s analysis of phrasing in Italian convincingly argues that Nespor & Vogel’s branching conditions can be successfully reanalyzed in terms of average weight and balance of phonological

phrases, a suggestion that has also been recently adopted in work by Selkirk (2000) or Sandalo & Truckenbrodt (2002).²

The following examples from Italian (Ghini 1993a:49, Ghini 1993b:51) show how the head of the object complement phrases together with the preceding V. As Ghini (1993a, b) points out, Stress Retraction and Radoppiamento Sintattico only apply within the first p-phrase domain. Thus, there is a contrast between *(Ho mangiato)ϕ (dei pasticini ripieni)ϕ* 'I have eaten filled cakes' vs *(Ho mangiato dei pasticini)ϕ (ripieni di cioccolata)ϕ* 'I have eaten cakes filled with chocolate'. This difference would go unaccounted for by invoking branchingness, as the object complements of V are all branching:

- (5) [V [N [P NP]_{PP}]_{NP}]_{VP}
 (V N) ϕ (PP) ϕ
- a. (Prenderà granchi) ϕ (di ogni specie) ϕ
 'He will catch every kind of crab.'
 - b. (Comprerà mappe) ϕ (di città molto antiche) ϕ
 'He will buy maps of very old towns.'
 - c. (Soffrirà pene) ϕ (incredibilmente dure) ϕ
 'He will feel a lot of pain.'
 - d. (Osserverà stelle) ϕ (di ogni dimensione) ϕ
 'He will observe stars of any dimension.'
- Data from Ghini (1993a:49)

Ghini (1993a, b) argues that this dramatic lack of isomorphism between prosodic phrasing and syntax can be explained by considerations of balance and weight distribution. The idea is that phonological phrases can undergo restructuring in a number of ways following the principles of uniformity and average weight. (6) shows Ghini's formulation of the ϕ -formation algorithm in Italian:

- (6) ϕ -Formation (Ghini 1993a:96)
- i. ϕ -domain formation. The domain of ϕ -formation is delimited by right-edge X_{max}-boundaries
 - ii. ϕ -formation. Phonological words included in a string delimited by ϕ -domain formation are distributed according to the principles of
 - a. uniformity and average weight
 - b. symmetry
 - c. increasing units

² Nespor & Vogel (1986:185) themselves suggested that the branching condition could be reflecting a minimal length requirement: "It should be noted that the restructured ϕ is the first constituent of prosodic structure that reflects the idea that length plays a role in the determination of prosodic categories. That is, since nonbranching complements are generally shorter than branching ones, the relative length of nonbranching vs. branching complements appears to be a crucial factor in determining the possibility of restructuring in certain languages. That is, there may be a general tendency to avoid forming particularly short (i.e., nonbranching) phonological phrases."

Thus, within the ϕ -domain (that is, within XP boundaries) phonological words are distributed according to three prosodic principles. First, the *principle of uniformity* and *average weight* establishes that “average phonological phrases at a moderato tempo are formed by two phonological words (ω), the number of which supposedly increases or decreases by one unit directly connected to the increasing or decreasing of the rate of speech” (Ghini 1993a:52). Second, the *principle of symmetry* establishes that phonological phrases at both edges of the sentence have to be symmetrically distributed for weight (Ghini 1993a:52). The *principle of increasing units* establishes that, in case of an asymmetric parse, phonological phrases on the recursive side (right side in Italian) are longer than in the non-recursive side (Ghini 1993a:59–60). The phrasings in (5) are thus easily explained following Ghini’s principles. These utterances are formed by a sequence of four phonological words ω , each of which is a complement of the preceding one with no intervening XP-boundaries in between. Thus, these words can be parsed according to the main principle of average weight. The effect of ϕ -formation is as follows:

- (7) [V [N [P NP]_{PP}]_{NP}]_{VP}
 $(\omega)\phi (\omega)\phi (\omega)\phi (\omega)\phi \rightarrow (\omega\omega)\phi (\omega\omega)\phi$
 (Prenderà) ϕ (granchi) ϕ (di ogni) ϕ (specie) $\phi \rightarrow$
 (Prenderà granchi) ϕ (di ogni specie) ϕ
 ‘He will catch every kind of crab.’

Sandalo & Truckenbrodt (2002:295) for Brazilian Portuguese and Selkirk (2000:244) for English have adopted a version of the binarity constraint suggested by Ghini. The constraint MAX-BIN enforces binarity on the p-phrase and expresses the fact that the average p-phrases at a normal speech rate are formed by two prosodic words.

- (8) MAX-BIN (Sandalo & Truckenbrodt 2002:295)
 P-phrases consist of maximally two prosodic words.

Similarly, Selkirk (2000:244) for English uses a single binary constraint on phonological phrases, Binary(MaP) with some restrictions on the minimum and maximum size of prosodic constituents to predict phrasing in English.

3. The Catalan data

3.1. Materials

Evidence from phonological phrasing in Catalan comes from stress/ accent facts and intonation. Catalan speakers place a prominent stress (what we will call p-phrase prominence) and an accent on the last tonic

syllable of a p-phrase.³ Moreover, speakers can optionally produce an F0 continuation rise at the right boundary of a p-phrase, even though it is also possible to perceive a clear phrasing break with no continuation rise.⁴ Figure 1 illustrates the waveforms and F0 contours of two Catalan utterances: (*La nena mirava*) ϕ (*la melmelada meravellosa*) ϕ ‘The little girl was watching the wonderful marmalade’ and (*La boliviana de Badalona*) ϕ (*rememorava la noia*) ϕ ‘The Bolivian woman from Badalona remembered the girl’ as produced by NM, a speaker of Central Catalan. The F0 contours display an H boundary tone separating the two phrases: in the first utterance, the H tone is located after the verb, clearly indicating a (Subject Verb)(Object) grouping; in the second, the continuation rise is placed at the end of the subject phrase.

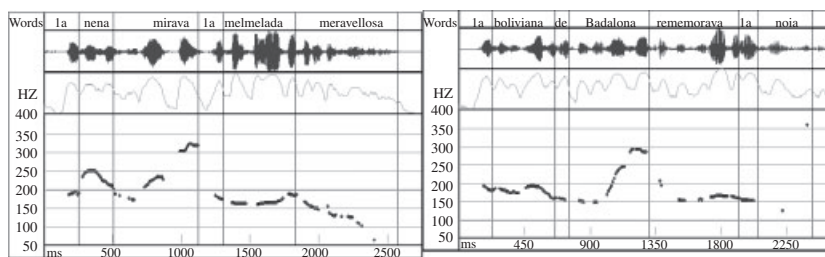


Figure 1. Waveforms and F0 contours of the utterances (*La nena mirava*) ϕ (*la melmelada meravellosa*) ϕ and (*La boliviana de Badalona*) ϕ (*rememorava la noia*) ϕ

The data reported in this article comes from two different sources. The main source of data comes from judgements of a wide variety of sentence structures. Four linguists, native speakers of Central Catalan, were asked to judge the phrasing divisions of the utterances which appear in the present article. As a native speaker of this variety, my own intuitions coincide with the results reported here. The consultants were asked to judge whether the phrasings would be grammatical at a normal rate of

³ As Ferrater (1971) and Oliva (1992) point out, “the stress contour of a Catalan utterance depends on its phrasing”.

⁴ Other Romance languages have other diagnostics to test phonological constituency, i.e., other phonological processes whose domain of application is the phonological phrase. In Florence Italian, Radoppiamento Sintattico, Final Lengthening and Stress Retraction are ϕ -level phenomena (Nespor & Vogel 1986, 1989; Ghini 1993a, 1993b). In French and in Brazilian Portuguese, Stress Retraction also applies within the ϕ -phrase domain (see Post 1999, 2000; Sandalo & Truckenbrodt 2002, respectively; cf. Port. *café quente* → *café quente* ‘hot coffee’). Even though Nespor & Vogel (1989) pointed out that Catalan also exhibits Stress Retraction, this is not the usual way to avoid stress clash in this language. The unmarked way to avoid stress clash is the deletion or weakening of the first stress involved in the clash (Oliva 1992, Prieto et al. 2001).

speech and also asked to interpret the sentences as out-of-the-blue conveying new information.⁵

A secondary source of data comes from the Catalan results from a recent crosslinguistic study conducted by M. D’Imperio, G. Elordieta, S. Frota, P. Prieto and M. Vigário (Elordieta et al. 2003, D’Imperio et al. 2005). The goal of this production experiment was to test the influence of syntactic branching and constituent length on prosodic boundary placement in three Ibero-Romance languages: Catalan, Portuguese, and Spanish. A comparable database was created, consisting of SVO (Subject Verb Object) sentences with exhaustive combinations of 2 constituent length conditions and 7 syntactic branching conditions, yielding a total of 76 utterances per language. For each language, 2 speakers of the same region read the utterances 3 times and in random order (=912 utterances) at a normal rate of speech. Speakers were asked to read the sentences as containing all new information. Results are reported in Elordieta et al. (2003) and D’Imperio et al. (2005).

Thus, unless otherwise stated, the phrasings reported in this article are default groupings in neutral information contexts, all new information, without topics or foci. Also, sentences are generally evaluated in a normal, not particularly rapid rendering of utterances, even though speech rate differences are in some cases taken into account.

3.2. Binararity and Alignment/Wrap effects in VP projections

The examples in (10) show that speakers normally phrase verbal heads together with simple objects containing a single noun (VO)φ but produce them in separate p-phrases (V)φ(O)φ when object nouns contain two prosodic words. Thus, there is a contrast between (*Comprava mapes*)φ ‘I/(s)he used to buy maps’ and (*Comprava*)φ (*mapes de Barcelona*)φ ‘I/(s)he used to buy maps of Barcelona’.⁶

- | | |
|--|---|
| (10) [V [NP] _{NP}] _{VP} → (V NP)φ | [V [N PP] _{NP}] _{VP} → (V)φ (N PP)φ
or [V [N AP] _{NP}] _{VP} → (V)φ (N AP)φ |
| a. (<i>Comprava mapes</i>)φ
‘I/(s)he used to buy maps.’ | a’. (<i>Comprava</i>)φ (<i>mapes de Barcelona</i>)φ
‘I/(s)he used to buy maps of
Barcelona.’ |
| b. (<i>Menjaré pastissos</i>)φ
‘I will eat cakes.’ | b’. (<i>Menjaré</i>)φ (<i>pastissos de xocolata</i>)φ
‘I will eat chocolate cakes.’ |

⁵ With this in mind, many of the selected sentences were extracted from headline news in newspaper articles.

⁶ Sporadically, some consultants allowed for the possibility of grouping the verbal head with the following noun, as follows: (*Comprava mapes*)φ(*de Barcelona*)φ. Similarly, a possibility at faster speech rates was (*Comprava mapes de Barcelona*)φ. As we will see in section 3.5, eurhythmic properties of sentences can influence this decision.

- | | | | |
|----|--|-----|---|
| c. | (El nomenaren professor) ϕ
'They appointed him professor.' | c'. | (El nomenaren) ϕ (professor de filologia) ϕ
'They appointed him philology professor.' |
| d. | (Sortiran els volums) ϕ
'The volumes came out.' | d'. | (Sortiran) ϕ (els volums importants) ϕ
'The important volumes came out.' |
| e. | (Rebran la felicitació) ϕ
'They will receive a greeting card.' | e'. | (Rebran) ϕ (la felicitació dels amics) ϕ
'They will receive a greeting card from their friends.' |
| f. | (He vist el circ) ϕ
'I saw the circus.' | f'. | (He vist) ϕ (el circ ple) ϕ
'I saw the circus full of people.' |
| g. | (Va treure els tigres) ϕ
'(S)he let the tigers out.' | g'. | (Va treure) ϕ (els tigres de la gàbia) ϕ
'(S)he let the tigers out of their cage.' |
| h. | (Compraré iogurts) ϕ
'I will buy yoghurts.' | h'. | (Compraré) ϕ (iogurts de la Fageda) ϕ
'I will buy la Fageda yoghurts.' |
| i. | (Va dir la veritat) ϕ
'(S)he told the truth.' | i'. | (Va dir) ϕ (veritats incontestables) ϕ
'(S)he told undisputable truths.' |

Similar data is found in Korean (Jun 2003). As Jun (2003) states "a predicate and a noun often form one prosodic phrase, but if the object noun is long, the object tends to form its own prosodic phrase." The same contrast is found in both Italian (Nespor & Vogel 1986; Ghini 1993a, 1993b), and in Brazilian Portuguese (Sandalo & Truckenbrodt 2002). The following examples are taken from Sandalo & Truckenbrodt (2002:89):

- | | |
|--|--|
| (11) (V NP) ϕ | (V) ϕ (NP PP) ϕ |
| a. (Vendeu livros) ϕ
'He sold books.' | a'. (Vendeu) ϕ (livros novos) ϕ
'He sold new books.' |
| b. (Ganhou uvas) ϕ
'He got grapes (as a present).' | b'. (Ganhou) ϕ (uvas brancas) ϕ
'He got white grapes (as a present).' |

Next consider the case whereby verbal heads are followed by a complex object containing three prosodic words (in syntactic structures such as [V [N [PP [AP]_{AP}]_{PP}]_{NP}]_{VP}). The examples in (12) show that the first object noun is phrased together with the preceding verb (V N) ϕ (PP) ϕ , due to the fact that the prepositional phrase internal to the object is longer. Thus, in Catalan there is a contrast between (*Comprava*) ϕ (*mapes de Barcelona*) ϕ 'I/(s)he used to buy maps of Barcelona' and (*Comprava mapes*) ϕ (*de la Barcelona antiga*) ϕ 'I/(s)he used to buy maps of old Barcelona'. These examples show a clear mismatch between syntactic and prosodic constituency. The addition of a complement, thus, causes a complete 'rebalance' of the distribution of the phonological weight of the

sequence in a way that the resulting p-phrases are more balanced for phonological weight or length. Finally, a potential phrasing candidate which groups 1 + 2 + 1 prosodic words such as **(Comprava)φ (mapes de la Barcelona)φ (antiga)φ* is ungrammatical.

- (12) $[[V [N [PP [AP]_{AP}]_{PP}]_{NP}]_{VP} \rightarrow (V N)\phi (PP AP)\phi$
 or $[[V [N [AP [PP]_{PP}]_{AP}]_{NP}]_{VP} \rightarrow (V N)\phi (AP PP)\phi$
- a. (Comprava mapes)φ (de la Barcelona antiga)φ
 'I/(s)he used to buy maps of old Barcelona.'
 - b. (Menjaré pastissos)φ (de xocolata amarga)φ
 'I will eat cakes of bittersweet chocolate.'
 - c. (El nomenaren professor)φ (de filologia romànica)φ
 'He was appointed professor of Romance philology.'
 - d. (Sortiran els volums)φ (importants de veritat)φ
 'The really important volumes will come out.'
 - e. (Rebran la felicitació)φ (d'amics personals)φ
 'They will receive a greeting card from his/her personal friends.'
 - f. (He vist el circ)φ (ple de zebres)φ
 'I saw the circus full of zebras.'
 - g. (Compraré iogurts)φ (de la Fageda d'en Jordà)φ
 'I will buy la Fageda d'en Jordà yoghurts.'
 - h. (Va dir veritats)φ (ben incontestables)φ
 '(S)he told very indisputable truths.'

As mentioned before, Ghini (1993a:49, 1993b) reports the same phenomenon for Italian (cf. *(Ho mangiato)φ (dei pasticini ripieni)φ* 'I have eaten filled cakes' vs. *(Ho mangiato dei pasticini)φ (ripieni di cioccolata)φ* 'I have eaten cakes filled with chocolate'). Note that the contrasts observed so far would go unaccounted for if we only took into account alignment or cohesional constraints. The ordering ALIGN-XP, R >> WRAP-XP would predict a p-boundary after the first maximal projection, and the ordering WRAP-XP >> ALIGN-XP, R would predict it at the right edge of VP. The fact is, though, that Catalan speakers place p-boundaries either after the verb or after the first noun depending on the phonological weight of the verb complement.

Evidence for the dominant role of ALIGN-XP,R in the hierarchy comes from the behavior of dative or adjunct PPs that do not depend directly on the preceding noun, that is, those that are non-locally attached to the higher node VP. In a structure like $[V [NP]_{NP} [PP]_{PP}]_{VP}$ we can detect a right p-boundary between the accusative and dative objects. The examples in (13) and (14) show that non-local PPs are typically phrased on their own and resist being phrased together with preceding units. The same holds true with

locative (13d,e) or temporal phrases (13f). Thus, there is a contrast between (*Comprava*) ϕ (*mapes de Barcelona*) ϕ ‘He used to buy Barcelona maps’ and (*Comprava mapes*) ϕ (*per a l’Anna*) ϕ ‘He used to buy maps for Anna’:

(13) [[V [NP]_{NP} [PP]_{PP}]_{VP}]_{IP/CP} \rightarrow (V NP) ϕ (PP) ϕ

- a. (*Comprava mapes*) ϕ (*per a l’Anna*) ϕ
‘I/(s)he used to buy maps for Anna.’
- b. (*Va donar el llibre*) ϕ (*a la Maria*) ϕ
‘(S)he gave the book to Mary.’
- c. (*Va enviar petonets*) ϕ (*a l’Anna*) ϕ
‘(S)he sent kisses to Anna.’
- d. (*Va tirar en Joan*) ϕ (*dintre l’aigua*) ϕ
‘(S)he pushed Joan into the water.’
- e. (*Compra les pel.lícules*) ϕ (*a Londres*) ϕ
‘(S)he buys films in London.’
- f. (*Comprarem un anell*) ϕ (*demà*) ϕ
‘Tomorrow we will buy a ring.’

Right alignment of p-phrases with XP projections is also enforced when the first p-phrase contains three prosodic words, as in (*Comprava mapes de Barcelona*) ϕ (*per a l’Anna*) ϕ . In these cases, another common phrasing option is to group the utterance as 1+2+1 prosodic words, as in (*Comprava*) ϕ (*mapes de Barcelona*) ϕ (*per a l’Anna*) ϕ . The first option is typical of somewhat faster speech rates.

(14) [[V [NP [PP]_{PP}]_{NP} [PP]_{PP}]_{VP}]_{IP/CP} \rightarrow (V NP) ϕ (PP) ϕ

- a. (*Comprava*) ϕ (*mapes de Barcelona*) ϕ (*per a l’Anna*) ϕ
(*Comprava mapes de Barcelona*) ϕ (*per a l’Anna*) ϕ
‘I/(s)he used to buy Barcelona maps for Anna.’
- b. (*Va donar*) ϕ (*el llibre de contes*) ϕ (*a la Maria*) ϕ
(*Va donar el llibre de contes*) ϕ (*a la Maria*) ϕ
‘(S)he gave the story book to Mary.’
- c. (*Va enviar*) ϕ (*petonets dolços*) ϕ (*a l’Anna*) ϕ
(*Va enviar petonets dolços*) ϕ (*a l’Anna*) ϕ
‘(S)he sent sweet kisses to Anna.’
- d. (*Va tirar*) ϕ (*en Joan petit*) ϕ (*dintre l’aigua*) ϕ
(*Va tirar en Joan petit*) ϕ (*dintre l’aigua*) ϕ
‘(S)he pushed little Joan into the water.’
- e. (*Compra*) ϕ (*les pel.lícules de por*) ϕ (*a Londres*) ϕ
(*Compra les pel.lícules de por*) ϕ (*a Londres*) ϕ
‘(S)he buys horror films in London.’

- f. (Comprarem) ϕ (un anell de plata) ϕ (demà) ϕ
 (Comprarem un anell de plata) ϕ (demà) ϕ
 ‘Tomorrow we will buy a silver ring.’

Following up on Ghini’s (1993a, 1993b) original suggestion, I claim that the binary length requirement MAX-BIN has a very prominent role in Catalan phrasing. As we will see, Catalan displays a stronger version of the constraint MAX-BIN (which will be called MAX-BIN-END) which enforces binarity on utterance-final p-phrases, as stated in (15). This explains why we find longer p-phrases in non-final positions, such as subject positions or the examples just observed in (14).

(15) MAX-BIN-END

P-phrases containing the main stress of the utterance consist of maximally two prosodic words.

In this connection, Frascarelli (2000:67ff) has shown some effects of the MIN-BIN requirement (what she terms prosodic branching) in p-phrases with sentential or emphatic stress. Also, recent literature on positional markedness has shown that output constraints can be stronger in ‘strengthened’ positions such as the ones with nuclear stress.

Reference to syntax through ALIGN-XP,R and WRAP-XP will also be needed. I claim that phrasing in verbal (and in nominal) projections in Catalan can be straightforwardly predicted by the following constraint hierarchy. Cf. the definition of the syntactic constraints in section 2.

(16) Basic hierarchy of constraints

MAX-BIN-END >> ALIGN-XP,R >> WRAP-XP

As we will see, evidence for the dominance of MAX-BIN-END over ALIGN-XP,R comes from the behavior of subject phrases (which can phrase together with verbal heads; cf. section 3.4.2). Evidence that MAX-BIN-END and ALIGN-XP,R dominate WRAP-XP will be given in this section. In the tableaux that follow I will use this hierarchy throughout, even though some tableaux do not offer crucial evidence in favor of (or against) this specific ordering of constraints.

The tableau in (17) shows the derivation of the joint phrasing of a verbal head and a single-word object *Comprava mapes* ‘I/(s)he used to buy maps’. Neither of the candidates (*Comprava mapes*) ϕ and (*Comprava*) ϕ (*mapes*) ϕ violates ALIGN-XP,R or MAX-BIN-END. Yet, the form with a separate phrasing (V) ϕ (N) ϕ crucially violates WRAP-XP because the lexical projection VP is split up into two p-phrases.⁷

⁷ In the section 3.4.1 I offer an explanation of these facts in terms of a minimality constraint on the prosodic parsing of utterances, MIN-UTT.

(17)

[Comprava [mapes] _{NP}] VP	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. φ () ϕ			
b. () ϕ () ϕ			VP!

Next consider the case of a verb followed by a longer complement in its projection such as (*Comprava*) ϕ (*mapes de Barcelona*) ϕ ‘I/(s)he used to buy maps of Barcelona’. Ghini (1993a:59) derives the default grouping (ω) ϕ ($\omega\omega$) ϕ by resorting to the principle of increasing units which explains weight asymmetries: “asymmetries are governed by the phonological component of the language (..), that is to say, in Italian right units have to be heavier than left units.” Following a suggestion by Sandalo & Truckenbrodt (2002) for the Brazilian data, I claim that this asymmetry (ω) ϕ ($\omega\omega$) ϕ is **not** governed by the tendency to have an increased weight of p-phrases in a given rightwards or leftwards direction, depending on the language, as claimed by Ghini (1993a, 1993b), but by a subordinate effect of the WRAP-XP constraint. It is thus argued that the phrasing (*Comprava*) ϕ (*mapes de Barcelona*) ϕ is preferred because of a wrapping effect on the object. In tableau (18), the dominant constraint MAX-BIN-END enforces p-phrases at the end of the utterance to be maximally binary and thus disallows a phrasing like ($\omega\omega\omega$) ϕ . Candidates (b) (ω) ϕ ($\omega\omega$) ϕ and (c) ($\omega\omega$) ϕ (ω) ϕ both satisfy MAX-BIN-END and thus the decision is passed down to the subordinate constraint WRAP-XP. Crucially, the phrasing in (c) is ruled out because of a double violation of WRAP-XP: neither VP or NP are contained in a ϕ -phrase. By contrast, candidate (b) incurs only one violation of WRAP-XP. Finally, ALIGN-XP,R is not violated by any of the candidates because there are no internal right-edge maximal projection boundaries that have to be respected:

(18)

[Comprava [mapes [de Barcelona] pp] NP] VP	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ	*!		
b. φ () ϕ () ϕ			VP
c. () ϕ () ϕ			VP! NP

By considering that the prosodic length constraint MAX-BIN-END is ranked higher than WRAP-XP, the correct grouping (*Comprava mapes*) ϕ (*de la Barcelona antiga*) ϕ is easily derived. This can be seen by inspecting the tableau in (19): candidates (a) ($\omega\omega\omega\omega$) ϕ and (b) (ω) ϕ ($\omega\omega\omega$) ϕ clearly

violate the MAX-BIN-END requirement. Among the rest, the winning candidate (d) is obtained through the subordinate effect of WRAP-XP: notice that WRAP-XP is violated twice in (d) (VP and NP are not contained in a p-phrase) and three times in (c) and (e) (VP, NP and PP are not wrapped). This example also constitutes evidence that MAX-BIN-END has to be ranked higher than WRAP-XP.

(19)

[Comprava [mapes [de la Barcelona [antiga] _{AP}] PP] NP] VP	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. ()φ	*!		
b. ()φ ()φ	*!		VP
c. ()φ ()φ			VP! NP PP
d. [⊗] ()φ ()φ			VP NP
e. ()φ ()φ ()φ			VP! NP PP

The following example constitutes evidence that MAX-BIN-END dominates WRAP-XP. Crucially, the optimal candidate (c) (*Comprava mapes*)φ (*per a l'Anna*)φ is the only one with proper end alignment and binarity, despite the fact that it violates the subordinate constraint WRAP-XP (VP is not contained in a single p-phrase).

(20)

[Comprava [mapes] _{NP}] [per a l'Anna] _{PP}] VP	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. ()φ	*!	NP	
b. ()φ ()φ		NP!	VP NP
c. [⊗] ()φ ()φ			VP

Remember that the utterance in (21) can optionally be phrased as (*Comprava*)φ (*mapes de Barcelona*)φ (*per a l'Anna*)φ or as (*Comprava mapes de Barcelona*)φ (*per a l'Anna*)φ, depending on speech rate. Both candidates are derived by the proposed ranking of the constraints. Crucially, the winning candidates (c) and (e) are the only ones that do not violate ALIGN-XP,R or MAX-BIN-END. This example constitutes crucial evidence that MAX-BIN has to be restricted to the end of the utterance to allow for longer phrases in utterance-initial positions (cf. the winning candidate (c)). As will be shown in section 3.4.2, the constraint that minimizes the number of p-phrases in faster speech rates would obtain the phrasing (*Comprava mapes de Barcelona*)φ (*per a l'Anna*)φ in a fast speech rate.

(21)

[Comprava [mapes [de Barcelona] _{PP}] _{NP} [per a l'Anna] _{PP}] _{VP}	MAX-BIN- END	ALIGN- XP,R	WRAP-XP
a. () ϕ	*!	NP	
b. () ϕ () ϕ	*!	NP	VP PP
c. \varnothing () ϕ () ϕ			VP
d. () ϕ () ϕ		NP!	VP NP
e. \varnothing () ϕ () ϕ () ϕ			VP

3.3. Binariness and Alignment/Wrap effects in NP projections

As expected, the same hierarchy of constraints reported for p-phrase construction in verbal projections is active in nominal projections. Nominal heads with following single-word PP or AP complements are typically phrased together. However, if PP or AP complements contain two prosodic words, the phrase is split up into two p-phrases and the PP complement is generally contained in one p-phrase (as predicted by the subordinate effects of WRAP-XP).

- (22) [[N [PP]_{PP}]_{NP} → (N PP) ϕ [[N [PP[PP]_{PP}]_{PP}]_{NP} →
 (N) ϕ (PP PP) ϕ
 or [[N [PP[AP]_{AP}]_{PP}]_{NP} →
 (N) ϕ (PP AP) ϕ
- a. (Una ampolla de vi) ϕ a'. (Una ampolla) ϕ (de vi rosat) ϕ
 'A bottle of wine.' 'A bottle of rosé wine.'
- b. (Una pila de mapes) ϕ b'. (Una pila) ϕ (de mapes de
 'A stack of maps.' Barcelona) ϕ
 'A stack of maps of old
 Barcelona.'
- c. (Un anell de plata) ϕ c'. (Un anell) ϕ (de plata suïssa) ϕ
 'A silver ring.' 'A ring made of Swiss silver.'
- d. (Iogurts de la Fageda) ϕ d'. (Iogurts)_v (de la Fageda d'en
 'La Fageda yoghurts.' Jordà) ϕ
 'La Fageda d'en Jordà
 yoghurts.'

Next consider the case whereby a nominal head is followed by a long locally attached PP complement in syntactic structures of the type [N [PP [PP [PP]_{AP}]_{PP}]_{NP}]_{VP}. The examples in (23) show that in this case PP internal complements are divided into two phrases (N PP) ϕ (AP) ϕ . Thus, there is a contrast between *(Una ampolla) ϕ (de vi rosat) ϕ* 'A bottle of rose wine' and *(Una ampolla de vi) ϕ (força rosat) ϕ* 'A bottle

of pretty rosé wine'. The addition of a complement thus causes a 'rebalance' of the distribution of the phonological weight of the sequence in a way that the resulting p-phrases are more balanced for phonological weight. Finally, a potential candidate which groups 1+2+1 prosodic words *(*Una pila*) ϕ (*de mapes de la Barcelona*) ϕ (*antiga*) ϕ is ungrammatical.

- (23) $[[N [PP [PP [AP]_{AP}]]_{PP}]_{NP} \rightarrow (N PP)\phi (PP) \phi$
 or $[[N [PP [Adv [AP]_{Adv}]]_{PP}]_{NP} \rightarrow (N PP)\phi (AdvP) \phi$
- (*Una pila de mapes*) ϕ (*de la Barcelona antiga*) ϕ
 'A stack of maps of old Barcelona.'
 - (*Una ampolla de vi*) ϕ (*força rosat*) ϕ
 'A bottle of pretty rosé wine.'
 - (*Un anell de plata*) ϕ (*força bonica*) ϕ
 'A ring made of very nice silver.'
 - (*Iogurts de llimones*) ϕ (*de l'Horta de València*) ϕ
 'Yoghourts made of Horta de València lemons.'

When PPs and APs are not locally attached, as in the examples in the first column of (24), they tend to form a phrase on their own. The following near-minimal pairs show a contrast in phrasing between locally vs. non-locally-attached AP or PP complements (cf. (*Una ampolla de vi*) ϕ (*rosada*) ϕ 'A pink bottle of wine' vs. (*Una ampolla*) ϕ (*de vi rosat*) ϕ 'A bottle of rosé wine'). This parsing difference provides evidence of the dominant role of ALIGN-XP,R in noun phrase groupings:

- | <u>Non-local attachment</u> | <u>Local attachment</u> |
|---|--|
| $[[N [PP]_{PP} [AP]_{AP}]_{NP}$ | $[[N [PP [AP]_{AP}]_{PP}]_{VP}$ |
| $(N PP)\phi (AP)\phi$ | $(N)\phi (PP AP)\phi$ |
| a. (<i>Una ampolla de vi</i>) ϕ (<i>rosada</i>) ϕ
'A pink bottle of wine.' | a'. (<i>Una ampolla</i>) ϕ (<i>de vi rosat</i>) ϕ
'A bottle of rosé wine.' |
| b. (<i>Un barret de nen</i>) ϕ (<i>argentí</i>) ϕ
'A boy's Argentinean hat.' | b'. (<i>Un barret</i>) ϕ (<i>de nen argentí</i>) ϕ
'A hat from an Argentinean boy.' |
| c. (<i>Un anell de plata</i>) ϕ (<i>suís</i>) ϕ
'A Swiss silver ring.' | c'. (<i>Un anell</i>) ϕ (<i>de plata suïssa</i>) ϕ
'A ring made of Swiss silver.' |

Finally, non-locally attached PPs or APs are also separated from the first p-phrase when this first p-phrase contains three prosodic words, as in (*Una ampolla de vi rosat*) ϕ (*de Londres*) ϕ 'A bottle of rosé wine from London'. In these cases, another phrasing option (typical of a slower speech rate) is to group the utterance as 1+2+1 prosodic words, as in (*Una ampolla*) ϕ (*de vi rosat*) ϕ (*de Londres*) ϕ :

- (25) a. (Una ampolla) ϕ (de vi rosat) ϕ (de Londres) ϕ
 (Una ampolla de vi rosat) ϕ (de Londres) ϕ
 ‘A bottle of rosé wine from London.’
- b. (Una pila) ϕ (de mapes antics) ϕ (per a l’Anna) ϕ
 (Una pila de mapes antics) ϕ (per a l’Anna) ϕ
 ‘A stack of old maps for Anna.’
- c. (Un anell) ϕ (de plata suïssa) ϕ (per a la meva mare) ϕ
 (Un anell de plata suïssa) ϕ (per a la meva mare) ϕ
 ‘A ring made of Swiss silver for my mother.’
- d. (Iogurts) ϕ (de la Fageda d’en Jordà) ϕ (per al meu germà) ϕ
 (Iogurts de la Fageda d’en Jordà) ϕ (per al meu germà) ϕ
 ‘La Fageda d’en Jordà yoghurts for my brother.’

(26)–(30) show the derivation of the phrasing strategies found in Catalan NP structures. As in the preceding section, the basic hierarchy of constraints in (16) successfully accounts for the data: MAX-BIN-END \gg ALIGN-XP,R \gg WRAP-XP. In the tableau in (26), candidate (b) violates the subordinate constraint WRAP-XP because the lexical projection NP is not contained in a single phonological phrase.

(26)

[Una ampolla [de vi] pp] NP	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. \varnothing () ϕ			
b. () ϕ () ϕ			NP!

When the NP structure in (27) contains three prosodic words, the first candidate ($\omega\omega\omega$) ϕ is always ruled out by MAX-BIN-END. The second (ω) ϕ ($\omega\omega$) ϕ and third candidates ($\omega\omega$) ϕ (ω) ϕ do respect both the length requirement and the alignment constraints and thus the choice between the two is passed down to the subordinate constraint WRAP-XP. The optimal phrasing (ω) ϕ ($\omega\omega$) ϕ is obtained through the subordinate effect of WRAP-XP: what rules out the phrasing of candidate (c) is the double violation of WRAP-XP of this structure (where both NP and PP are not wrapped):

(27)

[Una ampolla [de vi [rosat] AP] PP] NP	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ	*!		
b. \varnothing () ϕ () ϕ			NP
c. () ϕ () ϕ			NP! PP

When the NP contains four prosodic words, the first three candidates (a) ($\omega\omega\omega\omega$) ϕ and (b) (ω) ϕ ($\omega\omega\omega$) ϕ are ruled out by MAX-BIN-END. The decision about the rest of the candidates (c) ($\omega\omega\omega$) ϕ (ω) ϕ , (d) ($\omega\omega$) ϕ ($\omega\omega$) ϕ and (e) (ω) ϕ ($\omega\omega$) ϕ (ω) ϕ is again passed down to the subordinate constraint WRAP-XP: notice that WRAP-XP is violated twice in (d) (NP and PP are not contained in a p-phrase) and three times in (c) and (e) (NP, PP and AP are not wrapped).

(28)

[Una ampolla [de vi [bastant rosat] _{AP}] _{PP}] _{NP}	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ	*!		
b. () ϕ () ϕ	*!		NP
c. () ϕ () ϕ			NP! PP AP
d. φ () ϕ () ϕ			NP PP
e. () ϕ () ϕ () ϕ			NP! PP AP

In the syntactic structure in (29), the correct phrasing in (c) is obtained through the effect of ALIGN-XP, R. The only candidate which crucially satisfies end-alignment is candidate (c) (*Una ampolla de vi*) ϕ (*rosada*) ϕ . Thus, asymmetries of the type ($\omega\omega$) ϕ (ω) ϕ and (ω) ϕ ($\omega\omega$) ϕ (cf. tableau in (27)) are explained through syntactic constituency:

(29)

[Una ampolla [de vi] _{PP} [rosada] _{AP}] _{VP}	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ	*!	PP	
b. () ϕ () ϕ		PP!	VP AP
c. φ () ϕ () ϕ			VP

In the tableau in (30), the two phrasing options (*Una ampolla de vi rosat*) ϕ (*de Londres*) ϕ and (*Una ampolla*) ϕ (*de vi rosat*) ϕ (*de Londres*) ϕ ‘A bottle of rosé wine from London’ are obtained. The two optimal candidates in (c) and (e) are the ones that do not violate either ALIGN-XP, R or MAX-BIN-END. Crucially, MAX-BIN has to be restricted to the end of the utterance to allow for an output such as (*Una ampolla de vi rosat*) ϕ (*de Londres*) ϕ . Moreover, the use of the constraint that minimizes the number of p-phrases in faster speech rates (see section 3.4.2) would result in the phrasing (*Una ampolla de vi rosat*) ϕ (*de Londres*) ϕ in this condition.

(30)

[Una ampolla [de vi [rosat] _{AP}] _{PP} [de Londres] _{PP}] _{NP}	MAX-BIN- END	ALIGN- XPR	WRAP-XP
a. () ϕ	*!	PP	
b. () ϕ () ϕ	*!	PP	NP PP
c. \varnothing () ϕ () ϕ			NP
d. () ϕ () ϕ		PP!	NP PP AP
e. \varnothing () ϕ () ϕ () ϕ			NP

3.4. *Infl/Comp Projections*

3.4.1. *Minimality effects*

Consider the examples in (31). In utterances consisting of single word subjects plus single word verbs, speakers regularly group the two words in a single p-phrase. As noted in sections 3.2 and 3.3, this is also the case in NP and VP projections.

- (31) [[NP]_{NP} [V]_{VP}]_{IP/CP}
(NP VP) ϕ
- (La nena demana) ϕ
'The little girl wants some.'
 - (El president pateix) ϕ
'The president is suffering.'
 - (Els veïns s'enfaden) ϕ
'The neighbors get angry.'
 - (El discurs s'acabà) ϕ
'The speech was finished.'

Thus far, our present analysis does not predict the (SV) ϕ phrasings in (31). One of the dominant constraints, ALIGN-XP,R, would wrongly predict a p-phrase boundary between the subject and the verb, as it would require the right edge of the subject NP to coincide with an edge of a p-phrase.

I claim that the groupings in (31) are easily explained by a constraint on the minimum size of utterances, MIN-UTTERANCE, as stated in (32). This constraint states that speakers prefer to parse an utterance containing two prosodic words into one p-phrase (($\omega\omega$) ϕ)_U rather than in two p-phrases containing one prosodic word each ((ω) ϕ (ω) ϕ)_U. This constraint can be understood as a minimality requirement on the length of utterances. As we know, minimality requirements have been extensively used within prosodic phonology and morphology to express minimality in terms of moras, syllables or feet (cf. McCarthy & Prince 1993b, among many others).

(32) MIN-UTT

An utterance containing two prosodic words prefers to be minimally parsed into one p-phrase (that is, $((\omega\omega)\phi)_U$ is preferred to $((\omega)\phi)(\omega\phi)_U$)

The following three tableaux derive the minimality effects on utterances: IP/CP projections (33a), VP projections (33b) and NP projections (33c). As it becomes clear in the tableaux, MIN-UTT has to dominate ALIGN-XP,R in the hierarchy. Note that WRAP-XP fails to apply to higher functional projections (COMP or INFL): this means that a p-boundary after the subject does not count as a violation of WRAP-XP. As Truckenbrodt (1999) notes, “WRAP-XP is a force that wants lexical projections to be phrased together, while allowing functional projections to be split up freely.” (Truckenbrodt 1999:229)

(33)

a.

[[La nena] _{NP} [demana] _{VP}] _{IP/CP}	MIN-UTT	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ () ϕ	*!			
b. φ () ϕ			*!	

b.

[Comprava [mapes] _{NP}] _{VP}	MIN-UTT	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ () ϕ	*!			VP
b. φ () ϕ				

c.

[Una ampolla [de vi] _{pp}] _{NP}	MIN-UTT	MAX-BIN-END	ALIGN-XP,R	WRAP-XP
a. () ϕ () ϕ	*!			NP
b. φ () ϕ				

3.4.2. Asymmetry effects on Infl/Comp projections

Typically, single word subjects are phrased on their own (S) ϕ (V O) ϕ when the verbal projection is relatively short and contains two prosodic words (cf. examples in (34)).

(34) [[NP]_{NP} [V [NP]_{NP}]_{VP}]_{IP/CP}
(S) ϕ (VO) ϕ

- a. (La nena) ϕ (demana els regals) ϕ
‘The little girl asks for her gifts.’

- b. (El periodista) ϕ (comunicà la notícia) ϕ
'The journalist reported the news.'
- c. (En Joan) ϕ (va treure els tigres) ϕ
'Joan let the tigers out.'
- c. (El bisbe) ϕ (va glossar la seva personalitat) ϕ
'The bishop talked about his personality.'
- d. (En Xavier) ϕ (visitarà el País Basc) ϕ
'Xavier will visit the Basque Country.'

As the examples in (35) show, Catalan subjects display some unexpected properties. In Catalan, verbal heads can be regularly phrased together with preceding subjects when objects are long (cf. Prieto 1997, Elordieta et al. 2003).⁸ This fact is not predicted under the most common theories of syntax-phonology interface, as both ALIGN-XP and WRAP-XP constraints are violated. Another optional phrasing in normal/slow speech is given below.

- (35) [[NP]_{NP} [V [N [PP]_{NP}]_{NP}]_{VP}]_{IP/CP}
(S V) ϕ (O) ϕ

Normal/fast speech rate

- a. (La nena demana) ϕ (els regals de Reis) ϕ
'The little girl asks for her gifts for the day of the Three Kings.'
- b. (El periodista comunicà) ϕ (la notícia del dia) ϕ
'The journalist reported the news of the day.'
- c. (En Joan va treure) ϕ (els tigres de la gàbia) ϕ
'Joan let the tigers out of their cage.'
- d. (El bisbe va glossar) ϕ (una personalitat humil) ϕ
'The bishop talked about a humble personality.'
- e. (En Xavier visitarà) ϕ (el país dels seus somnis) ϕ
'Xavier will visit the country of his dreams.'

Normal/slow speech rate

- a. (La nena) ϕ (demana) ϕ (els regals de Reis) ϕ
'The little girl asks for her gifts for the day of the Three Kings.'

⁸ The Catalan results in Elordieta et al. (2003) reveal that (SV)(O) phrasings increase both when subjects are short and when objects are long (between an 8%–24% increase in the short subject and long object conditions). Finally, the fact that the same utterance was grouped differently across repetitions (even by the same speaker) indicates that there is a certain degree of freedom between different phrasings, with a tendency to produce (S)(VO) phrasings and maintain similar phrase sizes.

(37)

[[La nena] _{NP} [demana [els regals [de Reis] _{pp}] _{NP}] _{VP}] _{IP/CP}	MAX-BIN-END	ALIGN-XPR	WRAP-XP
a. () ϕ	*!	*	
b. () ϕ () ϕ	*!		
c. () ϕ () ϕ		*!	VP NP
d. () ϕ () ϕ		*!	VP
e. () ϕ () ϕ () ϕ			VP! NP
f. φ () ϕ () ϕ () ϕ			VP

How do we obtain the optimal phrasings in more rapid speech? We capture the optimal phrasings in more rapid speech (*La nena demana*) ϕ (*els regals de Reis*) ϕ by adding a constraint which reduces the number of phrases in an utterance in rapid speech (MIN-N-PHRASES = MINIMIZE NUMBER OF PHRASES).

(38) MIN-N-PHRASES (RAPID SPEECH)

Minimize the number of phrases (rapid speech).

In the following tableau, MIN-N-PHRASES penalizes the output forms with more than two p-phrases (candidates (e) and (f)). Thus, among the possible candidates with two p-phrases (a–d), the optimal candidate is (d).

(38)

[[La nena] _{NP} [demana [els regals [de Reis] _{pp}] _{NP}] _{VP}] _{IP/CP}	MIN-N-PHRASES	MAX-BIN-END	ALIGN-XPR	WRAP-XP
a. () ϕ		*!	*	
b. () ϕ () ϕ		*!		
c. () ϕ () ϕ			*	VP NP
d. φ () ϕ () ϕ			*	VP
e. () ϕ () ϕ () ϕ	*!			VP NP
f. () ϕ () ϕ () ϕ	*!			VP NP

3.4.3. Wrapping effects on subjects

Let us finally consider the set of data in (39). When the subject contains more than two prosodic words, a p-boundary is placed after the subject, even if it is composed of four/five prosodic words and the following verbal projections contain just a single word. It is highly marked, even ungrammatical, to break the subject NP into smaller p-phrases.

- (39) [[N [PP]_{PP}]_{NP} [VP]_{VP}]_{IP/CP}~ [[N [AP]_{AP}]_{NP} [VP]_{VP}]_{IP/CP}
 (S) ϕ (VO) ϕ
- a. (La casa de Pineda de Mar) ϕ (ha quedat buida) ϕ
 ‘The Pineda de Mar house is empty.’
 - b. (El president de la Generalitat de Catalunya) ϕ (pateix) ϕ
 ‘The president of the Generalitat de Catalunya is suffering.’
 - c. (Els veïns catalans de l’Ebre) ϕ (s’enfaden) ϕ
 ‘The Catalan neighbors from Ebre get angry.’
 - d. (El discurs del Secretari d’Estat Colin Powell) ϕ (s’acabà) ϕ
 ‘The speech of Secretary of State Colin Powell was finished.’
 - e. (Els veïns catalans de l’altre costat de l’Ebre) ϕ (s’enfaden) ϕ
 ‘The Catalan neighbors from the other side of Ebre get angry.’
 - f. (El discurs del Secretari d’Estat nord-americà Colin Powell) ϕ
 (s’acabà) ϕ
 ‘The speech of US Secretary of State Colin Powell was finished’
 - g. (Els caps dels inspectors de l’ONU) ϕ (llancen un ultimàtum) ϕ
 ‘The chief UN inspectors send an ultimatum.’

These data constitute further evidence in favor of a stronger restriction on the maximum size of p-phrases (MAX-BIN-END) which is restricted to the end of the utterance. In the following tableau, the only candidate that satisfies MAX-BIN-END and prevents the subject from being split up into different p-phrases (constituting a violation of WRAP-XP) is candidate (d) (*Els veïns catalans de l’Ebre*) ϕ (*s’enfaden*) ϕ .

(40)

[[Els veïns [catalans [de l’Ebre] _{PP}] _{NP} [s’enfaden] _{VP}] _{IP/CP}	MAX-BIN- END	ALIGN- XP,R	WRAP-XP
a. () ϕ () ϕ	*!	NP	
b. () ϕ () ϕ	*!	NP	NP VP
c. () ϕ () ϕ		NP!	NP VP
d. φ () ϕ () ϕ			
e. () ϕ () ϕ () ϕ			NP VP

3.5. Stress clash effects

In this section, I will briefly comment on a eurhythmic effect found in the Catalan data. An interesting fact about Catalan phrasing, initially

noted by Oliva (1992, 2002), is that stress clash resolution also plays an important role on phrasing decisions in Catalan. In his study of Catalan phrasing, Oliva (1992:131) suggests that the presence of a clash can optionally trigger p-restructuring in some cases. Previous work on Catalan phonology shows that the preferred option for resolving stress clashes in this language is the deletion (or weakening) of the first stress involved in the clash (Bonet & Lloret 1998, Oliva 1992, Prieto et al. 2001). The examples in (41) show how the stress clash situation present in the sentences (that is, between *beu* and *aigua* or between *ven* and *peres*) is resolved by placing both words within the same p-phrase and thus allowing for the deletion of the first stress (cf. 41a and 41b). By avoiding the stress clash situation, speakers state a clear preference for sentences with no clash, even though its resolution is not obligatory. By contrast, if a p-phrase boundary is placed after V (41a', 41b') the stress clash is not resolved and the output is clearly dispreferred. Stressed syllables are indicated in boldface:

(41) Stress clash resolution through phrasing
stress deletion

- a. (La Maria)φ (**beu aigua**)φ (destil.lada)φ → (beu **aigua**)φ
 a'. ??(La Maria **beu**)φ (**aigua** destil.lada)φ
 'Mary drinks distilled water.'

stress deletion

- b. (La Maria)φ (**ven peres**)φ (de Lleida)φ → (ven **peres**)φ
 b'. ??(La Maria **ven**)φ (**peres** de Lleida)φ
 'Mary sells pears from Lleida.'

(42) shows a number examples of the effects of clash on prosodic phrasing in three of the syntactic configurations reviewed in the preceding sections: VP projections (42a), NP projections (42b) and IP/CP projections (42c). While the examples in the left column exemplify cases with no clash (default phrasing), the examples in the right column exemplify cases with clash. Indeed, favored outcomes are the ones which allow the resolution of the stress clash.

(42) a. *Clash effects in VP projections*

- | | |
|--|--|
| (Menjaré)φ (pastissos de xocolata)φ
'I will eat chocolate cakes.' | (Menjaré flams)φ (de xocolata)φ
'I will eat chocolate custard.' |
| (Sortiran)φ (els volums importants)φ
'The important volumes will come out.' | (Sortiran cartes)φ (importants)φ
'The important letters will come out.' |

b. *Clash effects in NP projections*

(Un sac) ϕ (de patates d'Olot) ϕ 'A bag of Olot potatoes.'	(Un sac d'herbes) ϕ (aromàtiques) ϕ 'A bag of aromatic herbs.'
(Un barret) ϕ (de nen argentí) ϕ 'A hat from an Argentinian boy.'	(Un barret d'or) ϕ (argentí) ϕ 'A hat made of Argentinian gold.'

c. *Clash effects in IP projections*

(La Maria beu) ϕ (aigüeta destil.lada) ϕ 'Mary used to drink distilled water.'	(La Maria) ϕ (beu aigua) ϕ (destil.lada) ϕ 'Mary drinks distilled water.'
(En Joan llegeix) ϕ (novel.les d'aventures) 'Joan reads adventure novels.'	(En Joan) ϕ (llegeix llibres) ϕ (d'aventures) ϕ 'Joan reads adventure books.'

To my knowledge, the effects of NO-CLASH on phrasing have not been observed in other languages. The motivation for such an effect is to increase the eurhythmicity of the sentence (that is, to increase regularity in stress periods). It is not surprising that, given the strong links between stress/accenuation and prosodic phrasing (remember that the rightmost word in a p-phrase obligatorily receives a prominent stress), phrasing also acts as a strategy to create more eurhythmic utterances. In order to eliminate the presence of two adjacent stressed syllables, the strategy used by Catalan is to group the two syllables/words into the same p-phrase boundary and then eliminate the first stress in the clash.

(43) NO-CLASH

The presence of two immediately adjacent stressed syllables is prohibited.

As the tableaux in (44) show, NO-CLASH dominates WRAP-XP. The tableau in (44a) shows that the optimal phrasing is the one that groups the two words together and then avoids the presence of a clash through deletion of the first stress: (*Menjaré **flams***) ϕ (*de xocolata*) ϕ 'I will eat chocolate custard'. By contrast, (44b) is the optimal phrasing when NO-CLASH is not affected: (*Menjaré*) ϕ (*pastissos de xocolata*) ϕ 'I will eat chocolate cakes'.

(44)

a.

[Menjaré [flams [de xocolata] PP] NP] VP	MAX-BIN- END	ALIGN- XP,R	NO-CLASH	WRAP- XP
a. ()φ	*!			
b. ()φ ()φ			*!	VP
c. ⇐()φ ()φ				VP! NP

b.

[Menjaré [pastissos [de xocolata] PP] NP] VP	MAX-BIN- END	ALIGN- XP,R	NO-CLASH	WRAP- XP
a. ()φ	*!			
b. ⇐()φ ()φ				VP
c. ()φ ()φ				VP! NP

4. Conclusions

The work presented in this article demonstrates that prosodic markedness constraints play a major role on phrasing decisions in Catalan, many times overriding the syntactic constraints. Following up on Ghini's reanalysis of Italian phrasing, our analysis shows that the p-phrasal construction in Catalan cannot solely rely on syntactic information but rather also has to refer to three prosodic well-formedness constraints: MAX-BIN-END (a binary phonological weight preference at the end of the utterance), NO-CLASH (a condition against having two adjacent stressed syllables) and MIN-UTT (a minimality requirement on the prosodic parsing of utterances). These prosodic conditions can be understood as constraints which have the role of increasing the eurhythmic properties of sentences in the sense of creating regular and balanced stress periods. Still, the constraints that connect syntax to prosody (such as end alignment ALIGN-XP,R and constituent wrapping WRAP-XP) are relevant, though of subordinate relevance in this particular language.

The article shows that the patterns of phrasing found in Catalan would go unaccounted for by a given choice of a parameter in an end-based theory of phrasing like the one set forth by Selkirk or by the φ-construction algorithms proposed by Nespore & Vogel's relation-based theory. An optimality approach allows for a preliminary formal account of the phrasing strategies found in Catalan. In our view, an adequate theory of prosodic phrasing has to recognize the complex interaction and contribution of syntactic and prosodic (and eurhythmic) effects on phrasing together with crosslinguistic and intralinguistic variation.

References

- BONET, E. & LLORET, M.-R. 1998. *Fonologia catalana*. Barcelona: Ariel.
- BICKMORE, L. 1990. Branching nodes and prosodic categories. *The Phonology-syntax connection*. eds. S. Inkelas & D. Zec, 1–17. Chicago: University of Chicago Press.
- D'IMPERIO, M., ELORDIETA, G., FROTA, S., PRIETO, P. & VIGÁRIO, M. 2005. Intonational phrasing in Romance: The role of syntactic and prosodic structure. *Prosodies*. Selection of the Papers presented at Phonetics and Phonology in Iberia, PaPI 2003, June 11–12, 2003. eds. S. Frota, M. Vigário & M. João, 59–98. The Hague: Mouton de Gruyter.
- ELORDIETA, G., FROTA, S., PRIETO, P. & VIGÁRIO, M. 2003. Effects of constituent length and syntactic branching on intonational phrasing in Ibero-Romance. *Proceedings of the XVth International Congress of Phonetic Sciences*, Barcelona 3–9 August 2003. eds. M.-J. Solé, D. Recasens & J. Romero, Vol. 1, 487–490. Barcelona: Causal Productions.
- FOUGERON, C. & JUN, S.-A. 1998. Rate effects on French intonation: Phonetic realization and prosodic organization. *Journal of Phonetics* 26, 45–70.
- FERRATER, G. 1971. Sobre mètrica. *Serra d'Or* 27–28.
- GHINI, M. 1993a. *Phonological phrase formation in Italian*. University of Toronto, Masters Thesis.
- GHINI, M. 1993b. ϕ -formation in Italian: a new proposal. *Toronto Working Papers in Linguistics* 12, 41–77.
- HIROSE, Y. 1999. Resolving reanalysis ambiguity in Japanese relative clauses. CUNY Graduate Center, New York. PhD Diss.
- HIROSE, Y. 2003. Recycling prosodic boundaries. *Journal of Psycholinguistic Research* 32, 167–195.
- JUN, S.-A. 2003. The effect of phrase length and speech rate on prosodic phrasing. *Proceedings of the XVth International Congress of Phonetic Sciences*, Barcelona 3–9 August 2003. eds. M.-J. Solé, D. Recasens & J. Romero, Vol. 1, 483–486. Barcelona: Causal Productions.
- MCCARTHY, J. & PRINCE, A. 1993a. Generalized Alignment. *Yearbook of morphology 1993*. eds. G. Booij & J. van Marle, 79–153. Dordrecht: Kluwer.
- MCCARTHY, J. & PRINCE, A. 1993b. *Prosodic morphology I: constraint interaction and satisfaction*. New Brunswick: Center for Cognitive Science.
- NESPOR, M. & VOGEL, I. 1986. *Prosodic phonology*. Dordrecht: Foris.
- NESPOR, M. & VOGEL, I. 1989. On clashes and lapses. *Phonology* 6, 69–116.
- OLIVA, S. 1992. *La mètrica i el ritme de la prosa*. Barcelona: Quaderns Crema.
- OLIVA, S. & SERRA, P. 2002. *Accent Gramàtica del català contemporani*. eds. J. Solà, M.-R. Lloret, J. Mascaró & M. Pérez Saldanya, 345–491. Barcelona: Editorial Empúries.
- POST, B. 1999. Restructured phonological phrases in French. Evidence from clash resolution. *Linguistics* 37, 41–63.
- POST, B. 2000. *Tonal and phrasal structures in French intonation*. Katholieke Universiteit Nijmegen. PhD. Diss. (LOT series, Netherlands Graduate School of Linguistics, 34. The Hague: Thesus).
- PRIETO, P. 1997. Prosodic manifestation of syntactic structure in Catalan. *Issues in the Phonology of the Iberian Languages*. eds. F. Martínez-Gil & A. Morales-Front, 179–199. Washington D.C.: Georgetown University Press.
- PRIETO, P. forthcoming. Phonological phrasing in Spanish. *Optimality-Theoretic advances in Spanish phonology*. ed. S. Colina & F. Martínez-Gil. Amsterdam: John Benjamins.
- PRIETO, P., OLIVA, S., PALMADA, B., SERRA, P., BLECUA, B., LLACH S. & OLIVA, V. 2001. Manifestació acústica de la resolució de xocs accentuals en català. *Estudios de Fonética Experimental* 11, 11–38.

- SANDALO, F. & TRUCKENBRODT, H. 2002. Some notes on phonological phrasing in Brazilian Portuguese. *MIT Working Papers in Linguistics* 42, 285–310.
- SELKIRK, E. 1984. *Phonology and syntax. The relation between sound and structure*. Cambridge, MA: MIT Press.
- SELKIRK, E. 1986. On derived domains in sentence phonology. *Phonology Yearbook* 3, 371–405.
- SELKIRK, E. 2000. The interaction of Constraints on prosodic phrasing. *Prosody: Theory and experiment. Studies presented to Gösta Bruce*. ed. M. Horne, 231–261. Dordrecht: Kluwer.
- TRUCKENBRODT, H. 1995. *Phonological phrases: Their relation to syntax, focus, and prominence*. MIT, Cambridge, MA. PhD Diss.
- TRUCKENBRODT, H. 1999. On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30, 219–255.

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