Weight, backness, phonotactics and sonority reversals in Catalan reversible binomials

1. Introduction. The potential role of weight in the order the binomial's constituents adopt has extensively been explored in English (e.g. the precursor work by Malkiel 1959, Bolinger 1962, Cooper & Ross 1975, Pinker & Birdsong 1979, or the more recent ones of Benor & Levy 2006, Molin 2013, Ryan 2019), and to a lesser extent in French (Pinker & Birdsong 1979), German (Müller 1997), Japanese (Lohmann and Takada 2014), and more recently in Greek (Kikiopoulou & Topintzi 2022). Most of these studies conclude that, once semantic factors are controlled, weight (expressed through a larger number of syllables, vowels with more sonority, longer vowels, presence of onsets and codas, complex onsets and codas, less sonorous onsets and more sonorous codas) "decides" which order the components of the binomial adopt: the component in the binomial that contains heavier elements tends to occur in second position (see, esp., Ryan 2019). Despite of their phonological relevance, to our knowledge there are no studies devoted to binomials in Catalan, from any perspective.
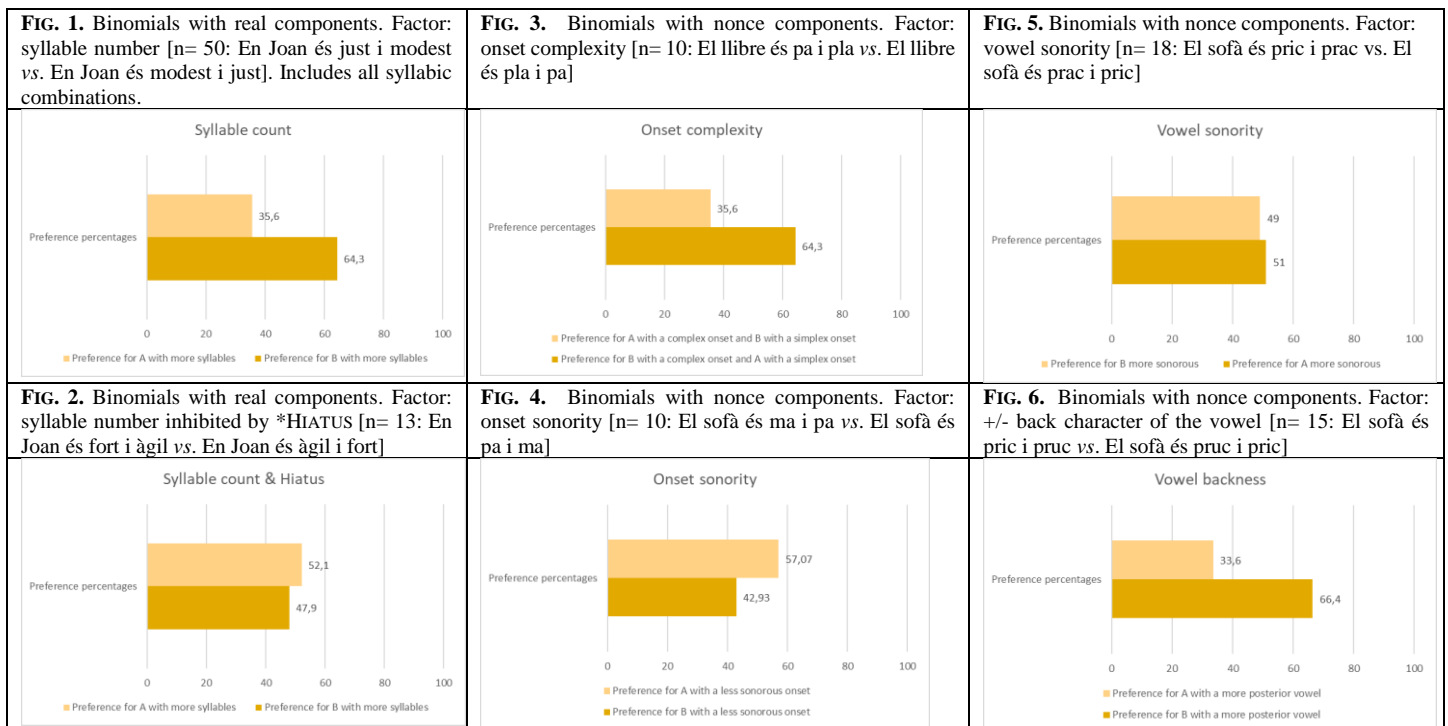
2. Goal. The purpose of this talk is to present part of the results of an ongoing project in which the phonological properties of Catalan (and also Spanish) irreversible (frozen) and reversible binomials are considered. Here, we specifically discuss the main results of an experimental test focused on reversible binomials in Catalan, which we describe below.

3. Experimental tests. 33 speakers with Catalan as L1 had to pick, in a two-alternative forced-choice task administered online, between pairs of sentences each one containing the two possible combinations of: ***a***) reversible binomials made up of two coordinated real adjectival components differing in the following parameters: *i*) syllable number (*i.e. En Joan és llest i valent* 'John is smart and brave'; *En Joan és valent i llest*), with all possible combinations in terms of the number of syllables (1+2, 2+1; 1+3, 3+1; 2+3, 3+2, etc.) (n = 50); *ii*) presence vs. absence of a word-initial onset (*i.e. El llibre és àgil i fàcil* 'The book is quick and easy' *vs. El llibre és fàcil i àgil* (n = 10); *iii*) complexity of the onsets (*i.e. El sofà és beix i blau* 'The sofa is beige and blue' *vs. El sofà és blau i beix*) (n = 10) [total: n = 70 sentences x 2 combinations: 140 stimuli in total]. Other parameters, such as differences with respect to the presence or absence of *iv*) word-final codas (n = 10) were also inquired, although these have not yet been analyzed because some additional issues, such as the re-syllabification of the final consonant as the onset of the next vowel might have interfered in the speakers' choices (*i.e. En Joan és vell i sa* 'John is old and sane'; cf. *ve*[ʎ.], *ve*[.ʎi] *sa*). ***b***) reversible binomials made up of two coordinated nonce adjectival components, all monosyllabic and differing by only one of the following properties: *i*) onset sonority (*El sofà és ma i pa* vs. *El sofà és pa i ma*) (n = 10); *ii*) onset complexity (*El sofà és pa i pra* vs. *El sofà és pra i pa*) (n = 10); *iii*) vowel sonority (*El sofà és pric i prac* vs. *El sofà és prac i pric*) (n = 18) (n = 38 sentences x 2 combinations; 76 stimuli in total). Other factors, such as differences with respect to the presence or absence of *iv*) codas (n = 10); *v*) the sonority of codas (n = 10), or *vi*) the complexity of the codas (n = 10) were also inquired, although these have not been analyzed yet because, as said, some additional issues, such as re-syllabification, along with the application of postlexical processes, such as voicing (*En Joan és ros i bo*; cf. *ro*[s]; *ro* [.zi] *bo*) might have interfered in the speakers' choices. This task with nonce adjectival monosyllabic components differing in just one parameter was essential to obtain data not biased by the potential interposition of non-prosodic factors (*i.e.* semantic or frequential), as well as without the distortion occasioned by the accumulation of factors in the same binomial component (*i.e.* syllable number, vowel sonority, complexity of the onsets, etc.). (See Bolinger 1962, for a roughly similar experiment applied to English.)

4. Results and discussion. The main findings for binomials with real adjectives is that the expected tendency to prefer binomials in which the second component has a larger number of syllables (see the results in this direction in Fig. 1, where it can be seen that sentences of the type "En Joan és just i modest" are preferred over sentences of the type "En Joan és modest i just") is clearly inhibited in order to avoid the formation of a hiatus (*i.e.* sentences of the type "En Joan és àgil i fort" are significantly more preferred over sentences of the type "En Joan és fort i àgil", with the formation of a hiatus ([i.á]) (see Fig. 2); "En Joan és atrevit i fort" is preferred to "En Joan és fort i atrevit", although in this latter cases regular speech allows the formation of a diphthong ([.jə])). The tendency for a second component with a larger number of syllables is boosted if the non-preferred combination (*i.e.*

long + short) also shows a violation of *HIATUS (*i.e.* a sentence of the type "En Joan és <u>alt i morè</u>" is preferred over a sentence of the type "En Joan és <u>morè i alt</u>" to a greater extent than the counterparts without the *HIATUS condition). The main findings for binomials with nonce adjectives are the expected tendency to prefer those in which the second component is the one with a complex onset (*i.e.* C- & CC-: "El llibre és <u>pa i pla</u>" is preferred to "El llibre és <u>pla i pa</u>"; see, e.g., Fig. 3), but an unexpected tendency for second components with a more sonorous onset (*i.e.* "El sofà és <u>pa i ma</u>" is preferred to "El sofà és <u>ma i pa</u>"; see Fig. 4), or with a less sonorous vowel (*i.e.* "El sofà és <u>prac i pric</u>" is preferred to "El sofà és pric i prac"), in this later case, though, with no significant differences between the two options, and with the bias of the backness parameter (see below). That is, there are reversals in relation to the expected sonority distribution (less + more) of these elements in the binomials. The results with respect the onsets might indicate that in Catalan a complex onset might be a latent "weight bearer", a condition not detected in any other side of Catalan phonology, whereas the sonority of the onsets is irrelevant in this respect. As for the vowel reversals, the explanation to our unexpected results might come from the need to obtain a monotonic decrease in the second formant frequency (see Cooper & Ross 1975: 75-76, and below). Another striking tendency detected in our experiment is the preference for second components with back vowels (*i.e.* "El sofà és <u>pric i pruc</u>" is preferred to "El sofà és <u>pruc i pric</u>"; "El sofà és <u>prac i pruc</u>" is preferred to "El sofà és <u>pruc i prac</u>"; see Fig. 6), along the lines of the observations of Cooper & Ross (1975: 75-76) (cf. coordinated freezes: *it's raining c**a**ts and d**o**gs*, and non-coordinate freezes, such as *cr**i**ss cr**o**ss*, *K**i**ng K**o**ng*, *t**i**ck t**o**ck*, *fl**i**p fl**o**p*, *d**i**ng d**o**ng*, *p**i**ng p**o**ng*), and more subtly along the lines of what we find in other areas of Catalan phonology, such as reduplication (cf. *ny**i**gui~ny**o**gui*; *bal·l**i**qui~bal·l**o**qui*, as reported by Cabré 1993: 66 or Lleó 1995: 199), although in these cases the most productive combination is *i~a* (*baliga~balaga*; Cabré 1993: 65-66). The reasons for this distribution with the back vowel at the end of the phonological phrase are still unknown, since, compared to the rest of vowels in Catalan, [u] is a short vowel with low intensity (Recasens 1996: 141); this behavior might be due to the inherent articulatory complexity of these vowels (labialization + dorsovelar constriction), as well as to the inclination for a monotonic decrease in the second formant frequency (see Cooper & Rose 1975: 73, after a Morris Halle p.c.).

5. Final remarks. Overall, this line of research is relevant not only because of the lack of literature focused on this topic in Catalan, but also because, as seen in § the structural distributions detected in the binomials are a window into the role of each of the factors adduced as "weight bearers" in the phonology of Catalan, a window that would otherwise remain (at least) half closed.

FIG. 1. Binomials with real components. Factor: syllable number [n= 50: En Joan és just i modest *vs*. En Joan és modest i just]. Includes all syllabic combinations.	**FIG. 3.** Binomials with nonce components. Factor: onset complexity [n= 10: El llibre és pa i pla *vs*. El llibre és pla i pa]	**FIG. 5.** Binomials with nonce components. Factor: vowel sonority [n= 18: El sofà és pric i prac vs. El sofà és prac i pric]

Syllable count — Preference percentages: 35,6 (Preference for A with more syllables); 64,3 (Preference for B with more syllables)

Onset complexity — Preference percentages: 35,6 (Preference for A with a complex onset and B with a simplex onset); 64,3 (Preference for B with a complex onset and A with a simplex onset)

Vowel sonority — Preference percentages: 49 (Preference for B more sonorous); 51 (Preference for A more sonorous)

FIG. 2. Binomials with real components. Factor: syllable number inhibited by *HIATUS [n= 13: En Joan és fort i àgil *vs*. En Joan és àgil i fort]	**FIG. 4.** Binomials with nonce components. Factor: onset sonority [n= 10: El sofà és ma i pa *vs*. El sofà és pa i ma]	**FIG. 6.** Binomials with nonce components. Factor: +/- back character of the vowel [n= 15: El sofà és pric i pruc *vs*. El sofà és pruc i pric]

Syllable count & Hiatus — Preference percentages: 52,1 (Preference for A with more syllables); 47,9 (Preference for B with more syllables)

Onset sonority — Preference percentages: 57,07 (Preference for A with a less sonorous onset); 42,93 (Preference for B with a less sonorous onset)

Vowel backness — Preference percentages: 33,6 (Preference for A with a more posterior vowel); 66,4 (Preference for B with a more posterior vowel)

A = First component of the binomial; B = Second component of the binomial