A SPEAKING ATLAS OF THE LANGUAGES OF THE IBERIAN PENINSULA: FOCUS ON RHYTHM AND VARIETIES IN CONTACT

Philippe Boula de Mareüil & Paolo Roseano [*]

Université Paris-Saclay & CNRS, LISN / Universidad Nacional de Educación a Distancia

philippe.boula.de.mareuil@limsi.fr / paolo.roseano@flog.uned.es

ORCID: 0000-0002-8213-2693 / 0000-0002-9743-9735

Abstract

The objective of this article is twofold: on one hand, it aims to present a speaking atlas of the languages of the Iberian Peninsula; on the other hand, it seeks to analyse the rhythm of the recorded speech samples, with special attention to the Romance varieties whose rhythm had not been described until now, and to the varieties on the border between languages traditionally considered syllable-timed and stress-timed. The results of the rhythmic metrics %V, ΔV, ΔC, VnPVI, and CrPVI show that Aragonese, whose rhythm had not been studied before, is syllable-timed, like the majority of Romance languages in the Iberian Peninsula — including Gibraltar Llanito, despite English loans. The Astur-Leonese spoken in Miranda do Douro, instead of being syllable-timed like the other varieties of the same group, is stress-timed, most likely due to contact with modern Portuguese, from which it may have acquired rhythmic properties. On the contrary, the Portuguese spoken in Valverde del Fresno, instead of being stress-timed like the other varieties of modern European Portuguese, is syllable-timed, probably because it separated from Portuguese before this one transitioned from syllable-timing to stress-timing.

Keywords: linguistic atlas, Romance languages, Iberian Peninsula, prosody, rhythm

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[*] LISN, Campus universitaire, bâtiment, 507 rue du belvédère, F-91405 Orsay / Paolo Roseano. Departamento de Lengua Española y Lingüística General, Facultad de Filología, Universidad Nacional de Educación a Distancia, C/ P.º Senda del Rey, 7, 28040 Madrid.

UN ATLES SONOR DE LES LLENGÜES DE LA PENÍNSULA IBÈRICA: ENFOCAMENT EN EL RITME I LES VARIETATS EN CONTACTE

Resum

L'objectiu d'aquest article és doble: d'una banda, pretén presentar un atles sonor de les llengües de la península ibèrica; de l'altra, busca analitzar el ritme de les mostres de parla enregistrades, amb especial atenció a les varietats romàniques el ritme de les quals no havia estat descrit fins ara, així com a les varietats situades a la frontera entre llengües tradicionalment considerades de ritme sil·làbic i llengües de ritme accentual. Els resultats de les mètriques rítmiques %V, ΔV, ΔC, VnPVI i CrPVI mostren que l'aragonès, el ritme del qual no havia estat estudiat prèviament, és de ritme sil·làbic, com la majoria de llengües romàniques de la península ibèrica. L'asturlleonès parlat a Miranda do Douro, en lloc de ser de ritme sil·làbic com les altres varietats de la mateixa llengua, és de ritme accentual, molt probablement a causa del contacte amb el portuguès modern, del qual podria haver adquirit propietats rítmiques. Al contrari, el portuguès parlat a Valverde del Fresno, en lloc de ser de ritme accentual com les altres varietats del portuguès europeu modern, és de ritme sil·làbic, probablement perquè es va separar del portuguès europeu abans que aquest passés d'un ritme sil·làbic a un ritme accentual (segles XVII-XVIII).
Paraules clau: atles lingüístic, llengües romàniques, península ibèrica, prosòdia, ritme

UN ATLAS SONORO DE LAS LENGUAS DE LA PENÍNSULA IBÉRICA: ENFOQUE EN EL RITMO Y LAS VARIEDADES EN CONTACTO

Resumen

El objetivo de este artículo es doble: por un lado, pretende presentar un atlas sonoro de las lenguas de la península ibérica; por otro, busca analizar el ritmo de las muestras de habla grabadas, con especial atención a las variedades romances cuyo ritmo no había sido descrito hasta ahora, así como a las variedades situadas en la frontera entre lenguas tradicionalmente consideradas de ritmo silábico y lenguas de ritmo acentual. Los resultados de las métricas rítmicas %V, ΔV, ΔC, VnPVI y CrPVI muestran que el aragonés, cuyo ritmo no había sido estudiado previamente, es de ritmo silábico, como la mayoría de las lenguas romances de la península ibérica. El asturleonés hablado en Miranda do Douro, en lugar de ser de ritmo silábico como las demás variedades de la misma lengua, es de ritmo acentual, muy probablemente debido al contacto con el portugués moderno, del cual podría haber adquirido propiedades rítmicas. Por el contrario, el portugués hablado en Valverde del Fresno, en lugar de ser de ritmo acentual como las demás variedades del portugués europeo moderno, es de ritmo silábico, probablemente porque se separó del portugués europeo antes de que este pasara de un ritmo silábico a uno acentual (siglos XVII-XVIII)
Palabras clave: atlas lingüístico, lenguas romances, península ibérica, prosodia, ritmo

1. Introduction

The Iberian Peninsula is interesting in more ways than one for linguists. For sociolinguists, firstly, Spain in particular constitutes an exception, in the industrialised world, regarding the capital of sympathy enjoyed by its "own" languages (*lenguas propias*) such as Catalan, recognised by the Constitution since the end of Francoism and supported by the pro-active local authorities (Woolard & Frekko 2012, de Melchor

& Branchadell 2002). For dialectologists interested in linguistic atlases, secondly, contrary to what happened in other parts of Europe, the Linguistic Atlas of the Iberian Peninsula was never fully published, with only one volume appearing in print (Navarro Tomás 1962): it was one of the many casualties of the Spanish Civil War, even if a project has undertaken to publish it online (García Mouton 2017). For phoneticians more particularly interested in rhythm, thirdly, in addition to Basque (Euskara, a non-Indo-European language which will not be taken into account here), Romance languages coexist which do not belong to the same rhythm class: Castilian Spanish is traditionally considered syllable-timed (every syllable tending to be pronounced over the same duration), while European Portuguese is rather stress-timed, featuring higher durational variability between prominent and less prominent syllables (Frota et al. 2007, Cruz et al. 2017, Payne 2021).

The concept of linguistic rhythm, understood as the property of languages to organise themselves temporally according to regular patterns, was introduced by linguists such as Lloyd James (1940), Pike (1945) and Abercrombie (1967). These scholars are responsible for the claim that "rhythm classes" exist and still today the most generalised rhythmic classification is the one that distinguishes between syllable-timed languages and stress-timed languages. Linguists such as Bertinetto (1977), Roach (1982) or Dauer (1983) related rhythm to the structural phonological properties of these languages: in particular, they hypothesised that the presence of vowel reduction, complex syllabic structures and consonant clusters were characteristic of stress-timed languages, while syllable-timed languages would not present vowel reduction and would favor simple (open) syllabic structures.

Perceptual studies have been carried out, showing that rhythm classes are perceived and phonologically grounded: several authors demonstrated that the perceived linguistic rhythm is based on acoustic features that can be measured (Ramus et al. 1999, Grabe & Low 2002, Dellwo 2006, Bertinetto & Bertini 2008). Despite the limitations of the rhythm metrics proposed (Barbosa 2006, Hirst 2009, Loukina et al. 2009, Arvaniti 2009, 2012), leading to the consideration of acoustic parameters other than temporal cues (Galves et al. 2002, Barry et al. 2009, Cumming 2010, Fuchs 2014),

the quantitative and empirical approach based on duration values continues to be applied (Ferragne & Pellegrino 2004, Rouas et al. 2005, Romano 2010, Mairano 2011, Vieru et al. 2011, Prieto et al. 2012, Ordin et al. 2013, Kolly et al. 2017, among many others).

The rhythmic properties of European Portuguese and Castilian Spanish are relatively well established, as is that of Galician: a syllable-timed language (Rodríguez Vázquez & Roseano 2022), even though it is historically related to Portuguese (Carballo Calero 1979). The same holds for Catalan, even if this language features vowel reduction (Gavaldà-Ferré 2007, Prieto et al. 2012, Marsà Morales & Roseano 2019). For Mirandese, the only regional language recognised in Portugal, which belongs to the Astur-Leonese group (Oliveira et al. 2022), on the other hand, as well as for Valverdeiro, a variety of Portuguese spoken in a Spanish locality in Extremadura, there is, to our knowledge, no work on the rhythm issue. Only in Olivenza — a town also located in a border area between Spain and Portugal, 200 km north of Valverde del Fresno — has a study highlighted phenomena of convergence between Portuguese and Castilian Spanish rhythms (Kireva & Gabriel 2015). What about Llanito, an Andalusian variety of Spanish mixed with borrowings from English, spoken in Gibraltar (Vázquez Amador 2018), English being the prototype of stress-timed languages (Arvaniti 2012)? These different varieties have been taken into consideration in a speaking atlas of the languages of the Iberian Peninsula which is the basis of the present article.

This speaking atlas is in line with previous work aimed at presenting interactive maps of France, Belgium, Italy and other European countries (Boula de Mareüil et al. 2018, 2020, 2021, 2023), with hundreds of survey points that can be clicked on to listen to speech samples and read a transcription of what is said. The same Aesop fable "The North Wind and the Sun", used for more than a century by the International Phonetic Association (IPA) has been translated into Romance, Germanic, Celtic and other languages/dialects — the difference between a language and a dialect being ill-defined. This online atlas, extended to the Iberian Peninsula — directly accessible at the address <https://atlas.limsi.fr/?tab=pi> — is of course not the first of its kind. Let us cite initiatives including an audio dimension for Norway (Almberg & Skarbø 2002),

Switzerland (Glaser & Loporcaro 2012) and Germany (Pheiff et al. 2019), just to name a few. A crowdsourced project dedicated to Spain is still in progress (Herrero de Haro forthcoming).

In the following sections, the survey points and the cartography of our speaking atlas of the languages of the Iberian Peninsula will be presented. Particular attention has been paid to the fact that linguistic boundaries do not necessarily coincide with administrative borders: Catalan, for instance, is spoken not only in the autonomous communities of Catalonia, Andorra, València and the Balearic Islands, but also in a fringe of Aragon (Veny & Pons Griera 2003, Prieto & Cabré 2013). The linguistic characteristics observed in the recordings will then be analysed, from the point of view of pronunciation, grammar and lexicon. Finally, we will focus on speech rhythm: without necessarily assuming the rhythm class hypothesis, whose robustness is increasingly challenged (Bertinetto 2021), we will explain in more detail the rhythm metrics put forward by Ramus et al. (1999), Grabe & Low (2002), in particular, and we will report the results obtained on the data collected, before concluding.

2. Material, protocol and mapping

Aesop's fable "The North Wind and the Sun" (a hundred words) was recorded in 8 varieties: Catalan, Occitan (Gascon Aranese), Aragonese, Spanish (or Castilian), Basque, Astur-Leonese, Galician and Portuguese. Three official languages in Spain, Portugal and Andorra have been kept for the trilingual presentation of the web page and the legend of the map: Spanish, Portuguese and Catalan. The informants came from different towns and belonged to varied socioprofessional backgrounds and ages. Most Catalan and Galician speakers, however, were students or university staff at the University of Barcelona and the University of Santiago de Compostela, where they were recorded in a sound-treated booth. These speakers started from the Catalan and Galician translations of the fable published by the IPA, which they were asked to adapt to better reflect their own vernaculars. The other speakers recorded themselves in

their cities of residence (possibly with help), reading, adapting or translating the various versions of the fable published in Spanish and Portuguese (IPA 1989, Martínez-Celdrán et al. 2003, Coloma 2015, Barbosa & Albano 2004, among others). In particular, the Mirandese (Astur-Leonese) speaker translated a Portuguese text and the Valverdeiro (Portuguese) speaker translated a Spanish text. For the latter two varieties — and the others —, the spelling conventions established for transcribing them were used. For the Llanito variety of Gibraltar, in particular, a creole-like orthography was adopted by the speaker, with spellings such as *kwando* for *cuando* 'when'.

Besides 3 Basque speakers (representing the Biscayan, Gipuzkoan and Upper Navarrese dialects), 34 speakers were recorded and mapped (see Figure 1 and Table 1): 13 of Catalan (including two speakers from the fringe of Aragon, one from València and one from Andorra), 7 of Spanish (including one from Gibraltar), 5 of Portuguese (including one from Valverde del Fresno) 4 of Galician, 2 of Astur-Leonese (including one from Miranda do Douro, in Portugal), 2 of Aragonese and 1 of Occitan. In addition to the borders of administrative regions in Portugal and autonomous communities in Spain, we showed the limits between linguistic domains, drawing inspiration from the *Interactive Atlas of Romance Intonation* (Prieto et al. 2010-2014). To generate "choropleths", a technique based on Voronoi diagram was designed, which is described in Boula de Mareüil et al. (2021). As the Balearic Islands, Canary Islands and Madeira are displayed, the option checked by default is to show the seas and 17 survey points in Morocco, between Macaronesia and the Iberian Peninsula, in Judeo-Spanish (in Tangier), Judeo-Arabic (in Fez), dialectal Arabic and Berber (representing the Tarifi, Tamazight and Tashlhiyt dialects).
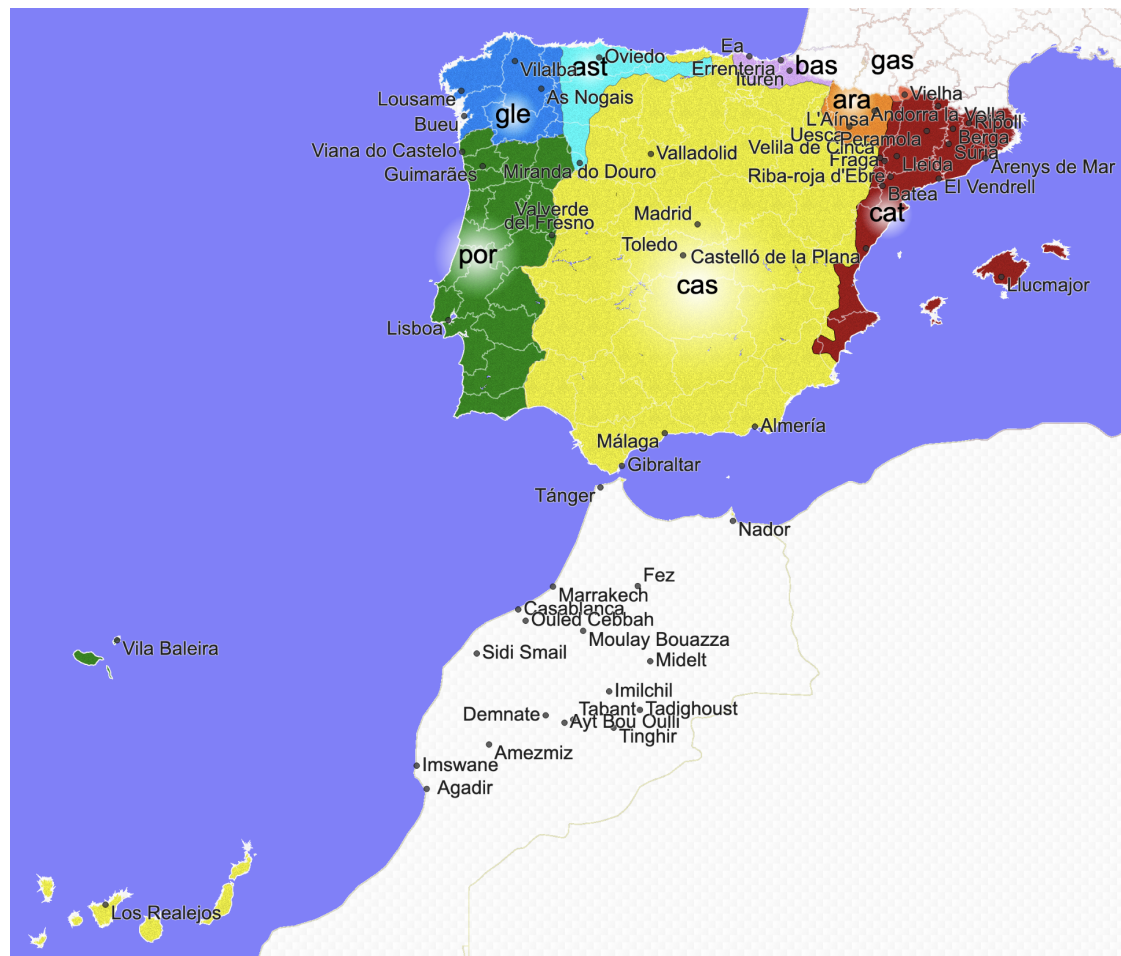
Figure 1. linguistic map of the Iberian Peninsula.

3. Linguistic description of the data

3.1 Catalan

The data collected offers the possibility of conducting comparative linguistic analyses. Let us first focus on Catalan, with some diachronic aspects. Payne (2021: 281) recalls:

Catalan has long occupied a special place in the research on speech rhythm, having famously been claimed to be an 'intermediate language' in the rhythm classification stakes, nestling somewhere between the categories of

'syllable-timing' and 'stress-timing', with properties supposedly belonging to both types. The question of how to model, or even categorise this intermediate, or mixed, percept has eluded any type of answer, plausible or not, as Prieto et al. (2012) point out.

In Catalan, we observe the conservation of the initial Latin /f/ as in FACERE > /fer/ 'to do' (vs. Spanish *hacer*). Betacism is also noted (in Central Catalan), as in VIDERE > /ˈbewɾə/ 'to see'; but not in Valencian and Balearic Catalan: VIDERE > /ˈvoɾe/ 'to see', as well as the palatalisation of the initial /l/ as in LEVARE > /ʎeˈbar/ (vs. Spanish *llevar/levantar*) 'to take off'.[1] The geminate nasals and laterals were palatalised, as in *BERILLARE > Catalan /briˈʎar/ 'to shine'. In word-final position, let us mention the elision of /n/, as in [ˈu] 'one' (vs. Spanish *un*) and the devoicing of obstruents (e.g., /ˈrɔdʒ/ → [ˈrɔtʃ] 'red'). Leaving aside the consonant system, the continuation of the Vulgar Latin stressed vowel system with 7 vowels exhibits well-documented dialectal differences: central Catalan, for example, continues */ɛ/ with /e/ (e.g., */ˈvɛntu/ > /ˈbent/ 'wind'), while Balearic Catalan continues */e/ with /ɛ/ (e.g., *PRESUM > /ˈpɾɛz/ 'taken'). Also, as a result of vowel reduction, in most eastern survey points, the unstressed vowel system is reduced to three vowels (/ˈi/ → [i]; /ˈe, ˈɛ, ˈa/ → [ə]; /ˈu, ˈo, ˈɔ/ → [u]), while in western survey points it is reduced to five vowels (/ˈi/ → [i], /ˈe, ˈɛ/ → [e]; /ˈa/ → [a]; /ˈo, ˈɔ/ → [o]; /ˈu/ → [u]) (IEC 2022).[2] This stress-related vowel reduction motivated the classification of Catalan as rhythmically intermediate (Ramus et al. 1999). However, it is only weakly marked by duration, as shown by Gavaldà-Ferré (2007) and Prieto et al. (2012) who conclude that Catalan is much closer to Spanish than English, in this respect.

At the grammatical level, determiners are different depending on the dialect: in continental varieties they almost always derive from ILLE/ILLA > *el/lo/la* 'the', while in the Balearic Islands the most typical forms derive from IPSE/IPSA > *es/sa* 'the'. Regarding

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[1] The pronunciations reported between slashes refer to the phonological level: at the phonetic level, the final <r> of infinitives is pronounced only in Valencia.
[2] Some examples of differences among dialects in the vowel reduction mechanisms are found in the 3rd person plural of the imperfect indicative of verbs of the first conjugation, pronounced [ˈaen] in western Catalan, as opposed to [ˈaβən] in central Catalan.

verb conjugation, two forms of the past tense are noticeable: a periphrastic form (*van decidir* 'they decided') and a synthetic form (*decidiren* 'they decided'). The first one is more frequent in the careful/formal/literary register, but it is also the only form traditionally used in central Valencian and other varieties. At the lexical level, noteworthy elements are *bufar* 'to blow', of onomatopoeic origin; *cos* 'body', from CORPUS; *embolicar* 'to wrap', from *INVOLVICARE, intensive from of INVŎLVERE; *esclafar* 'to heat', from CALEFAĚRE and *EXCALEFACĚRE; *barallar* 'to fight', unknown etymology, perhaps from *BARATTŬLA, in turn derived from Old Norse BARATTA 'fight' [REW, 3rd ed., 943 a].[3]

3.2 Spanish

In Spanish, the most salient pronunciation trait, compared to other Iberian varieties, is the deletion of the coda /s/ or its laryngealisation [h] in southern Spain and the Canary Islands. Coda weakening, deletion or assimilation triggers various phenomena: in some parts of Andalusia, /st/ surfaces as [ts]; this has been reported in several studies about Andalusian Spanish (Torreira 2007, Vida-Castro 2018, Villena Ponsoda et al. 2019) and is well audible in Málaga, in our corpus: e.g., *estaban* [e'tsaβan] 'were' — and even *aceptar* [aθe'tsa] 'to accept', where the affricate [ts] comes from the neutralisation of the coda consonant /p/ into the following /t/ (Del Saz 2023). The speaker from Gibraltar, who transcribed *akseptà* [aksep'ta] 'to accept', does not apply this neutralisation, but also drops the final <r>, as is common in several Andalusian varieties; in addition, he features *seseo* (leading to the pronunciation [s] for /θ/).[4] The Canarian speaker also pronounces /θ/ as [s] and clearly aspirates coda-final /s/, as in *ellos* ['eɟoh] 'them'. Coda deletion triggers vowel lowering in eastern Andalusia, particularly in Almería: e.g., *ellos* ['ɛɟɔ] 'them', where the /e/ lowering is

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[3] The source of the etymologies is <https://dcvb.iec.cat/>.
[4] Although the same phenomenon and the opposite merger /s/ → [θ], popularly known as *ceceo,* traditionally characterise several Andalusian varieties, the Andalusian speakers in our sample distinguish /s/ and /θ/.

caused by vowel harmony[5] (Herrero de Haro & Hajek 2020). By contrast, the /s/ in northern Spanish tends to be postalveolar [ʂ], which is typologically rare in the worlds' languages (Martínez-Celdrán et al. 2003). This holds true for the speaker from Valladolid who, additionally and as all our Peninsular Spanish speakers, is *yeísta*: that is, he pronounces [ʝ] for /ʎ/ — for a description of this ongoing merger in Spanish, see Rost Bagudanch (2014).

In Gibraltar Llanito, which shares most of its features with other Andalusian varieties, the spelling *tapàu* for *tapado* 'covered' also bears witness of the lenition of the intervocalic /d/. There is not much to say about grammar in this variety, but the lexical borrowings from English are worth pointing out: *nnof* 'north', *tràvola* 'traveller', *kontsìdaring* 'considering', *gìving-ap* 'giving up', *xàining* 'shining'.

3.3 Portuguese

At the level of pronunciation, the recordings from Portugal show considerable vowel reduction: unstressed vowels are extremely shortened, up to the point that they are often elided — a feature typical of stress-timing in European Portuguese (Frota & Vigário 2001). The recording in Valvardeiro features a qualitative reduction of the post-tonic vowel inventory to three units (/a, i, u/), but there does not seem to be quantitative reduction (i.e., shortening) of unstressed vowels. In this variety, moreover, vowels are not nasalised as in Portugal (see, for example, *mouta* 'a lot of'), and we note phonemes borrowed from Spanish: /x/ (e.g., *viajante* 'traveller') and /θ/ (e.g., *força* 'strength'). At the morphological and lexical level, other forms are identical to Spanish: *obligar* 'to oblige' (without the rhotacism found in Portuguese *obrigar*), *conseguira* 'would get', *tuvo* 'had', *ancha* 'wide'. Others, in the spelling, are neither Spanish nor Portuguese, but testify to the fall of the intervocalic /d/: *considerau* 'considered', *superioridai* 'superiority'. However, determiners, pronouns, their amalgams, possessives and the conjugation of verbs are essentially Portuguese.

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[5] Through this process, when word-final consonants are deleted and the previous vowel is lowered, other vowels in the word lower up to the stressed position

3.4 Galician

In Galician, at the phonetic/phonological level, the *seseo* phenomenon can be heard, as well as the pronunciation [ħ] of /g/ on the west coast (e.g., *pegou* [pe'ħow] 'blew'). On the other hand, in the East, we sometimes have a diphthongisation of *fuerte* 'strong' (as in Spanish). Let us recall that Galician, like Spanish, is considered as a syllable-timed language (Carballo Calero 1979, Rodríguez Vázquez & Roseano 2022). Other features shared by Galician and Spanish are the betacism or, at the morphological level, apocope of the adjective *grande* 'big' preceding a noun (e.g., *gran capa* 'big cape'). Other traits common to Galician and Portuguese are the reduction of the vocalic system to three unstressed vowels in final post-tonic position (Regueira 1996) or, at a more morphological level, the preservation of the final vowel of the Latin morpheme -ITATEM (e.g., *superioridade* 'superiority'), the palatalisation of GN > /ɲ/ in RECOGNOSCERE > *recoñecer* 'to recognise', possession (in the form of *o seu* or *a sua* 'his/her') and the tendency to postpone pronouns after finite verb forms (e.g., *consideraríase* 'would be considered'). Other Galician innovations are unknown in both contemporary Spanish and Portuguese: the presence of the unvoiced fricative /ʃ/ (transcribed <x>, as in *viaxeiro* 'traveller'), the reflexes of Latin QU > /k/ instead of */kw/ (e.g., QUANDO > *cando* 'when') and UNA > *unha* /uŋa/ 'a' or, at the morphological level, some amalgams (e.g., *coa* = *con* + *a* 'with the') and certain verb conjugations (e.g., *tivo* 'had').

At the lexical level, the wind takes different names: *nordés* 'northeast', *aire de norte* 'North air', *vento do norte* 'north wind'. Let us also mention *e mais* 'and more' for *e* 'and'.

3.5 Astur-Leonese

The Astur-Leonese from Oviedo (Asturias) and Miranda do Douro (Portugal) have in common to share betacism (hence the transcription *biajante* 'traveller' in

Mirandese) and to have *l* 'the' as the masculine singular definite article, even before a consonant. Vowel reduction, on the other hand, is specific to Mirandese, where, for instance, the dropping of the underlying /i/ of DISCUTEBANT has resulted in the transcription *çcutien* [tskuˈtiən] 'were discuting'.

3.6 Aragonese

Aragonese has some traits in common with Catalan: the initial F is preserved, for instance in *fer* 'to do' and the result of SC is the voiceless palatal fricative [ʃ], for instance in *reconoixer* (Catalan *reconèixer*) 'to recognise'. Aragonese shares with Spanish the interdental /θ/ — transcribed <z> no matterr the following vowel (as in *prenzipió* 'began' — as well as the diphthongisation of Latin stressed E and O: e.g., *viento* 'wind', *fuerte* 'strong', with preservation of the final vowel — [o] and [e], respectively, unlike Catalan. Aragonese shares betacism with both Catalan and Spanish, at the level of pronunciation. At the morphological level, the system of determiners and possession is closer to that of Galician and Portuguese: e.g., *o sol* 'the sun', *a suya capa* 'his cape' (Nagore Laín 1989). Nevertheless, verb conjugation presents some originalities in comparison with all these languages: e.g., *yera* (Spanish *era*) 'was', *tenió* (Spanish *tuvo*) 'had', *beniba* (Spanish *venía*) 'was coming', whereas, in the neighbouring languages, the Latin B was not maintained in the imperfect endings of the verbs of the 2nd and 3rd conjugations. At the lexical level, let us just note that both speakers from Uesca and L'Aínsa used *bufar* 'to blow' (as in Catalan) and *asinas* 'so' (which is original to Aragonese, at least in synchrony[6]).

3.7 Occitan (Gascon Aranese)

The main isogloss which distinguishes Occitan (Aranese Gascon) from Catalan has to do with pronunciation: it is the phoneme /y/, found in the recording, for example in

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[6] Of course, these observations are based on our data. A close form, *aixines* 'thus' is found in (non-standard) Catalan, we have *ansinas* in Ḥakeíia Judeo-Spanish in the translation of Aesop's fable and the form *asina* existed in Old Castilian — as in Papiamento, an Ibero-Romance-based creole also collected in the Netherlands Antilles at <https://atlas.limsi.fr/?tab=am>.

s*ua* ['sya] ''his'. The post-tonic final /a/ sounds [a] or [ɑ], unlike other varieties of Gascon (Mooney 2014): in most Occitan varieties, it is usually transcribed [ɔ]. However, the endings of the 1ˢᵗ group verbs in the imperfect are in -*e*-, as in western Catalan, and not in -*a*-: e.g., *bohaue* [βu'awe] 'was blowing'. The <h> is not pronounced, contrary to what happens in other varieties of Gascon and is even absent in *fort* (vs. Béarnais *hòrt*) 'strong'. The pronunciation *quan* [kwan] (instead of [kan]) 'when' is rather conservative, in comparison with other Occitan varieties. On the other hand, the loss of the intervocalic N and the evolution LL (or *th* in final position) gave rise to the feminine indefinite article *ua* 'a', to the feminine definite articles *era* 'the' and to the masculine definite article *eth* 'the', which are typical of the Pyrenees Occitan. To our knowledge, there is no study on the rhythm of this variety, but work on other varieties suggests that Occitan is syllable-timed (Romano 2014), whereas Meisenburg (2013) does not reach a clear rhythmic classification of the language.

At the grammatical level of verb conjugation, preterites in -*èc/-ec*, in the 3ʳᵈ person singular, are typical of Gascon (Barés Moga 2003, Carrera Baiget 2007): e.g., *comencèc* 'began', *treiguec* 'took off'. Other grammatical items are typical of Gascon, such as the neuter pronoun *ac* 'it', the preposition *damb* 'with' or the adverb *atau* 'then'. Others show a Catalan influence, such as *cadascun* (instead of *cadun* or *chascun*) 'each one', *viatgèr* (instead of *viatjaire* or *viatjador*) 'traveller'.

4. Method and hypotheses

The recordings collected were aligned into phonemes using the WebMAUS system (Kisler et al. 2017), with Castilian Spanish acoustic models: given a text file and an audio file, the system provides a Praat TextGrid with unit starts and ends. The results were corrected manually, using Praat (Boersma 2001), paying particular attention to the phonetic traits mentioned above — phonemes which do not exist in Spanish, especially —, and they were given as input to the Correlatore program (Mairano 2011), to compute and plot rhythm metrics. These measures are:

• the proportion of vocalic intervals (%V), the duration variation, in terms of standard deviation, of vocalic intervals (ΔV) and consonantal intervals (ΔC), as proposed by Ramus *et al.* (1999);

• the rate-normalised versions for ΔC and ΔV, namely Varco-C and Varco-V, as proposed by Dellwo (2006);

• the variability between successive vocalic and intervocalic intervals as proposed by Grabe & Low (2002), via so-called "Pairwise Variability Indices" (PVIs), possibly normalised to account for speech rate variation.

A consonantal interval is composed of one or more consecutive (semi-)consonantal segments delimited by vowels or pauses. Glides are considered as semi-consonants in falling diphthongs (e.g., in Gascon *finau* 'end', where the <u>, coming from a Latin L, has been transcribed [w]) and as semi-vowels in rising diphthongs (e.g., in Aranese *viatgèr* 'traveller', were the <i> has been transcribed [i]). Table 1 shows that the speaking rates are comparable across languages.

Recordings of the fable "The North Wind and the Sun" in southern British English were similarly used, for comparison with a prototypical language for stress-timing — the English recordings are the 6 ones used in Roseano (2020).

Given the diachronic evolutions briefly depicted above, one would expect a predominance of consonant-vowel (CV) syllables in some languages and more complex syllabic structures with unstressed vowel reduction in others. As far as the language varieties included in our analysis are concerned, we must mention that not all of them have been the object of rhythm-related studies. The rhythmic properties of Spanish (syllable-timed) and southern British English (stress-timed) are well known — see, among others, Ramus et al. (1999) or Grabe & Low (2002). Catalan, on the other hand, was considered an intermediate language in the first studies about rhythm, whereas more recent studies argue that it is syllable-timed (Gavaldà-Ferré 2007, Prieto et al. 2012, Marsà-Morales & Roseano 2019). The varieties of Astur-Leonese spoken in Asturias, like the one from Oviedo, have been shown to be syllable-timed, too (Muñiz-Chacón 2017). European Portuguese is described as stress-timed in traditional studies (Abaurre 1981, Cruz-Ferreira 1983, Mateus et al. 1989, Brandão de Carvalho 1989),

although Frota and Vigário (2001) suggest that it has a mixed rhythm. The few studies on the rhythm of Galician and Occitan suggest that these languages are syllable-timed (Carballo Calero 1979, Rodríguez Vázquez & Roseano 2022, Romano 2014).

Language	Survey points	Mean duration (s)	Mean speech rate (segments/second)
Catalan	Andorra la Vella, Arenys de Mar, Batea, Berga, Castelló de la Plana, El Vendrell, Fraga, Lleida, Llucmajor, Riba-roja d'Ebre, Ripoll, Velila de Cinca	31	13.8
Spanish	Almería, Gibraltar, Los Realejos, Mádrid, Málaga, Toledo, Valladolid	29	15.9
Portuguese	Guimaraes, Lisbon, Viana do Castelo, Vila Baleira, Valverde del Fresno	32	12.5
Galician	As Nogais, Bueu, Lousame, Vilalba	27	14.4
Astur-Leonese	Miranda do Douro, Oviedo	34	11.8
Aragonese	Uesca, L'Aínsa	34	12.0
Occitan	Vielha	31	12.8

Table 1. Survey points investigated, mean duration of the fable and speech rate in the languages considered

The rest of the varieties in our database have not been described from the point of view of rhythm, to our knowledge. Our hypothesis for Aragonese is that this variety shows syllable-timed properties, since it displays most of the features that, according to Dauer (1983), are typical of syllable-timing: Aragonese does not have vowel reduction and it does not display complex consonant clusters. The same can be said about Valverdeiro which, unlike other varieties of European Portuguese, does not present vowel reduction/elision — and, for the same reason, does not show complex consonant sequences. We also expect Vielha Gascon to be syllable-timed since, like the neighbouring Catalan, it does not have complex consonant clusters and does not show vowel reduction. On the other hand, the Astur-Leonese spoken in Miranda shows vowel reduction similar to European Portuguese and, for this reason, we expect it to be rhythmically similar to it. Making hypothesis for Gibraltar Llanito is more complex because, in spite of being widely based on syllable-timed Andalusian Spanish, it is

characterised by English loanwords and code-mixing with English, which is stress-timed.

5. Results

Various rhythm metrics, with different data groupings, were measured and plotted: %V, ΔC and ΔV, which were proposed by Ramus et al. (1999), as well as CrPVI and VnPVI used by Grabe & Low (2002). Dellwo's (2006) Varco-C and Varco-V measures will not be reported, because the results are not conclusive — an outcome also found by Roseano (2020).

The first pair of rhythm metrics that we consider in our analysis is %V and ΔC (Ramus et al. 1999). In the resulting graph, one would expect syllable-timed languages to display high %V and low ΔC values, whereas stress-timed languages would show the opposite properties. In other words, stress-timed languages should appear in the top left corner of the cartesian plan such as that of Figure 2, while syllable-timed varieties are expected to appear at the bottom and to the right. In Figure 2, most varieties behave in accordance with this hypothesis. Portuguese and English appear in the top left part, together with the variety of Astur-Leonese spoken in Miranda do Douro: this confirms our hypothesis that the vowel reduction observed in this variety would confer it stress-timed properties. On the other hand, most Romance varieties end up in the bottom right corner, where we find languages that have already been studied from the point of view of rhythm (Spanish, Catalan, Galician), but also Aragonese and the Gascon Occitan variety spoken in Vielha, which we had hypothesised to be syllable-timed due to its phonological properties. The data also allow us to confirm our prediction about Valverdeiro Portuguese, for which the lack of vowel reduction suggested an analysis in terms of syllable-timing.

In Figure 2, Gibraltar Llanito appears in an intermediate position. On the other hand, the location of Oviedo Astur-Leonese is problematic, because it does not seem to group with syllable-timed languages, especially in relation to the %V axis: in this

respect, it does not follow our hypothesis and seems to contradict previous studies which described it as syllable-timed (Muñiz-Chacón 2017).
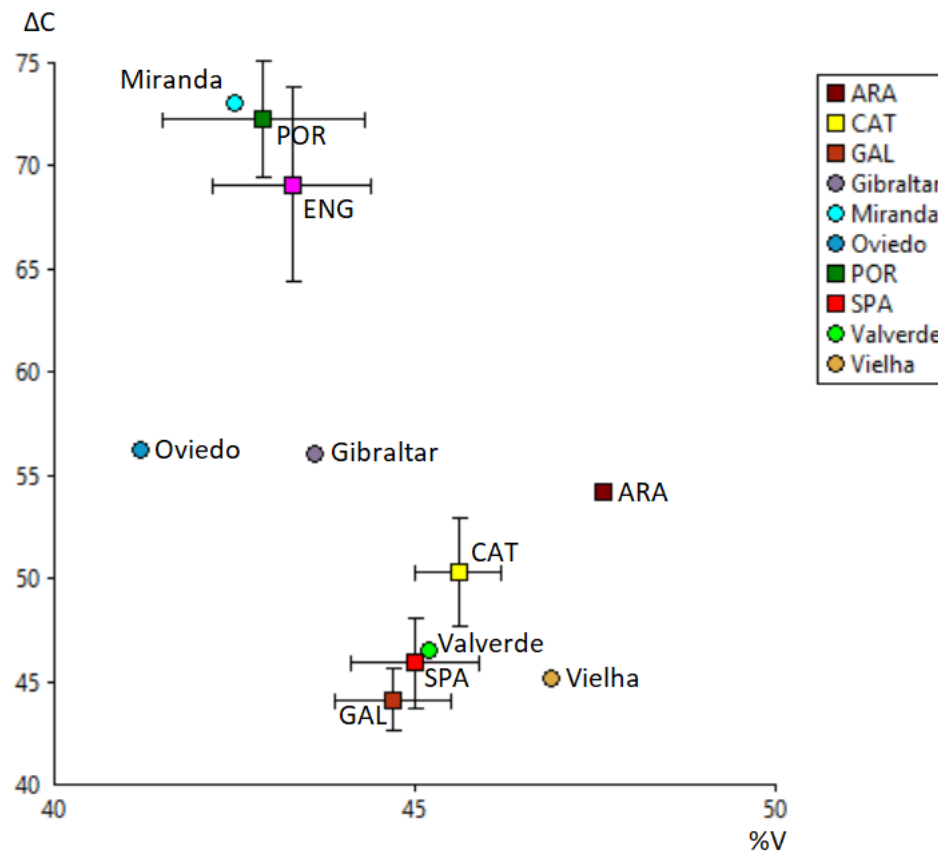

Figure 2. Standard deviation of consonant intervals (ΔC) and percentage of vocalic intervals (%V). ARA = Aragonese; CAT = Catalan; ENG = English; POR = Portuguese; SPA = Spanish. ARA, CAT, ENG, POR and SPA are shown with crosses indicating error bars (each corresponding to one standard deviation).

The results provided by the other pair of metrics used by Ramus et al. (1999), *i.e.*, ΔC and ΔV (Figure 3), are better suited. We only have two groups of languages: on the one hand, stress-timed varieties (English, Portuguese, but also the Astur-Leonese spoken in Miranda do Douro), and on the other hand syllable-timed varieties, including not only Spanish, Catalan and Galician, but also, as hypothesised, Aragonese, the Gascon Occitan spoken in Vielha, the Astur-Leonese spoken in Oviedo and Gibraltar Llanito. Thus, the presence of loanwords in the latter variety does not seem to impact the two rhythm metrics used in this analysis. Remarkably, Valverdeiro Portuguese, as

hypothesised on the basis of its phonological properties, does not group with other varieties of Portuguese, but ends up in the same group as Spanish.
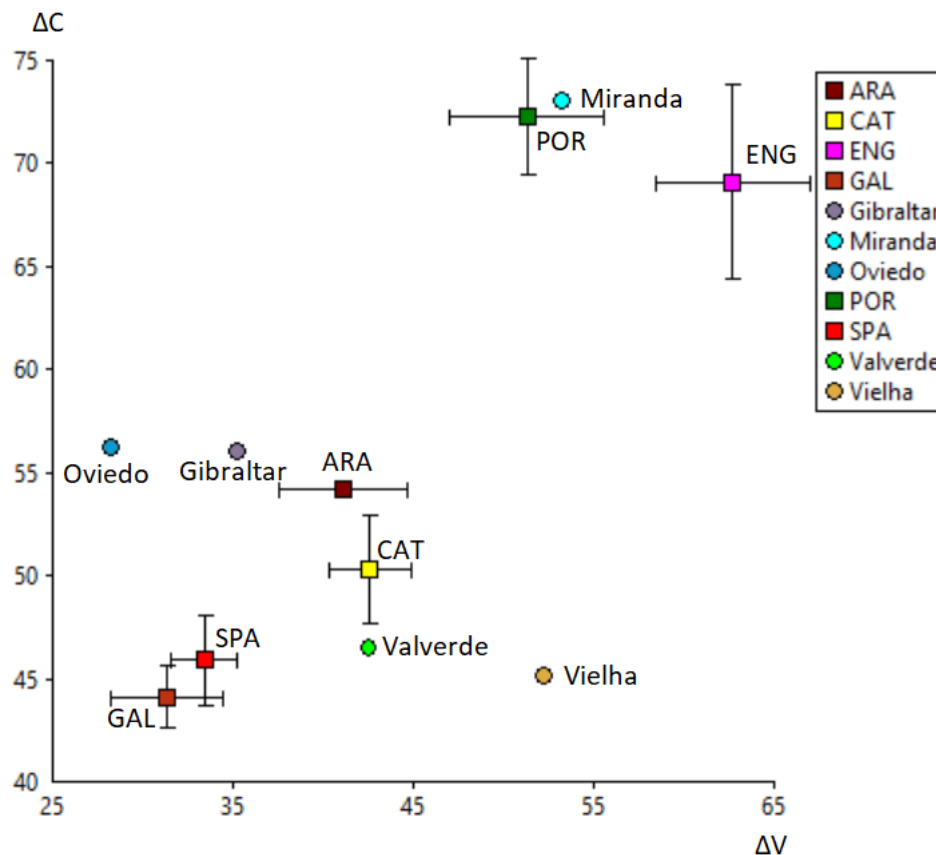

Figure 3. Standard deviation of consonant intervals (ΔC) and standard deviation of vowel intervals (ΔV). ARA = Aragonese; CAT = Catalan; ENG = English; POR = Portuguese; SPA = Spanish. ARA, CAT, ENG, POR and SPA are shown with crosses indicating error bars (each corresponding to one standard deviation).

The use of the metrics advocated by Grabe & Low (2002), i.e., the normalised PVI for vowels and the raw PVI for consonants, enhances the results obtained with ΔC and ΔV (Ramus et al. 1999). As can be seen in Figure 4, the two groups of languages are separated more clearly on both axes, while in the previous graph there was some overlap on the vocalic axis. These metrics thus confirm, among other things, that the Astur-Leonese spoken in Miranda do Douro is stress-timed, while the Portuguese variety of Valverde del Fresno is syllable-timed. In addition, Gibraltar Llanito, Aragonese and Vielha Occitan are again grouped with syllable-timed languages.
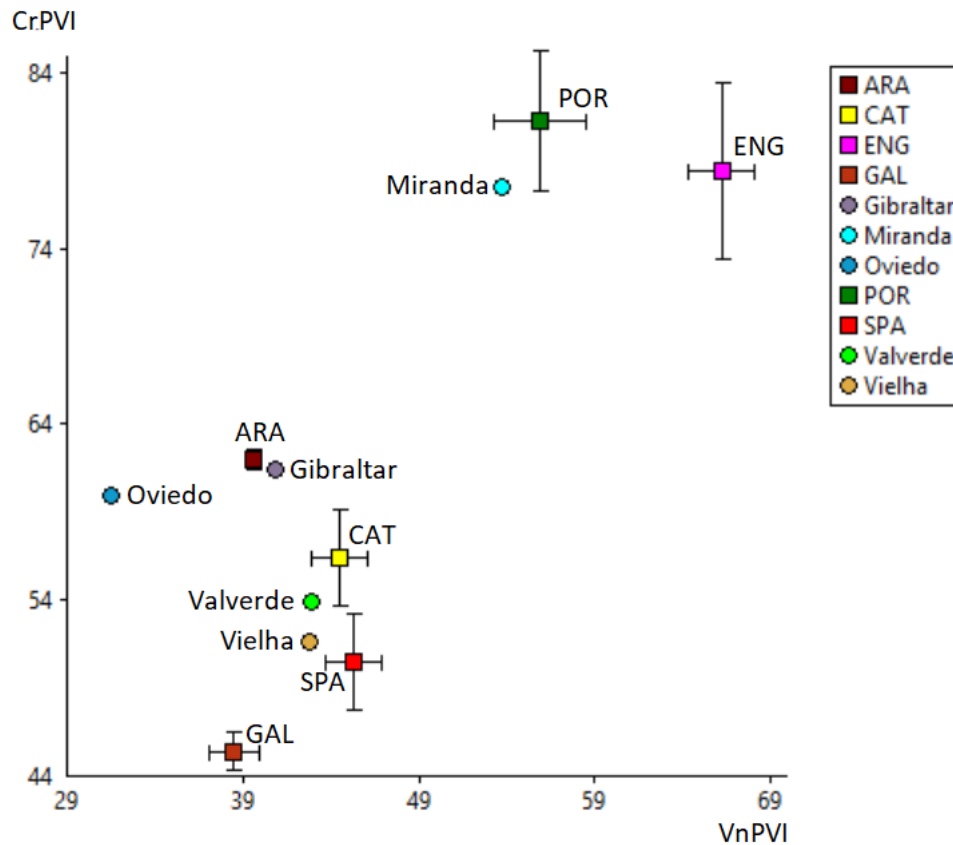
Figure 4. Normalised Pairwise Variability Index for vowel intervals (VnPVI) and Raw Pairwise Variability Index for consonant intervals (CrPVI). ARA = Aragonese; CAT = Catalan; ENG = English; POR = Portuguese; SPA = Spanish. ARA, CAT, ENG, POR and SPA are shown with crosses indicating error bars (each corresponding to one standard deviation).

6. Discussion and conclusions

The aim of this article was twofold: to present a speaking atlas of the languages of the Iberian Peninsula and to analyse the rhythm of the recorded speech samples, with a focus on the varieties at the border between languages traditionally considered as syllable-timed or stress-timed. Despite the small size of the collected corpus, and although some varieties are only represented by a single speaker — as in the Illustrations of the IPA —, a number of linguistic peculiarities have been highlighted and the overall results regarding rhythm are quite convincing. This suggests that the

IPA text, Aesop's short fable "The North Wind and the Sun", used in earlier work on rhythm (Romano 2010, 2014, Mairano 2011, Vieru et al. 2001, Roseano 2020) is a suitable basis for comparative studies. Ramus' pioneering study was also based on a small corpus of a few speakers per language (Ramus et al. 1999). The very existence of rhythm classes, with syllable-timed languages (reminiscent of a machine-gun rhythm) and stressed-timed languages (reminiscent of the Morse code) remains debated; but what interested us here was to objectify the fact that the rhythm of contact varieties is close to Spanish, for Portuguese Valverdeiro and to that of Portuguese, for Astu-Leonese Mirandese.

The analysis confirmed previous findings regarding the rhythmic properties of Spanish and southern British English, which are considered typical examples of syllable-timing and stress-timing, respectively. Catalan, initially classified as an intermediate language, was found to be syllable-timed in more recent studies, including this one. Astur-Leonese spoken in Asturias was also shown to be syllable-timed, as suggested by the literature. European Portuguese, which displays mixed rhythm properties according to Frota & Vigário (2001), seems to show clearly stress-timed properties in our data. Our research also allows confirming that Galician is syllable-timed.

Among the languages and varieties that had not been previously described from the point of view of rhythm, the hypothesis was that Aragonese, Valverdeiro Portuguese, and Aranese Gascon would exhibit syllable-timed properties, due to their phonological characteristics, while Mirandese Astur-Leonese would be stress-timed: these hypotheses have been confirmed. From a typological point of view, it is noteworthy that the variety of Astur-Leonese spoken in Miranda is stress-timed like European Portuguese, whereas other varieties of Astur-Leonese are syllable-timed. On the other hand, Valverde Portuguese is syllable-timed like Spanish and Galician, instead of being stress-timed like other varieties of Portuguese. At first sight, one might infer that the rhythmic properties of Valverdeiro and Mirandese are due to language contact, in the sense that both varieties would have acquired their prosodic properties due to the contact with Portuguese and Spanish, respectively. Nevertheless, albeit likely in the case of Mirandese, this hypothesis in the case of Valverdeiro is not

necessarily the only one and, perhaps, not the most straightforward one. This has to do with the prosodic history of Portuguese.

It has been shown (Frota et al. 2012) that classical Portuguese was syllable-timed like the neighbouring Romance languages till the early 17th century, when the language underwent a prosodic change that eventually led modern European Portuguese to incorporate stress-timed features by the late 18th century. If Valverdeiro does not share stress-timed features with other modern European Portuguese varieties, it may be due to a couple of reasons: either it has maintained the original syllable-timed rhythm of classical Portuguese, or it has first gone through the same prosodic change as modern Portuguese and has then gone back to the pre-change prosodic features. The first interpretation seems to be more likely, given the fact that the areas where Valverdeiro is spoken has belonged to Spain since the 13th century. The political separation from the rest of the Portuguese-speaking space may plausibly have prevented the prosodic change to reach these areas — while the sound change that resulted in the emergence of Spanish *jota* /x/ and *ceta* /θ/ in the 17th century (Penny 1993) impacted Valverdeiro. On the other hand, the area where Mirandese is spoken has belonged to Portugal since the late Middle Age. In this case, the political separation from the rest of the Astur-Leonese community and the consequent exposure to European Portuguese may have caused Mirandese to follow the same prosodic evolution as Portuguese.

As far as Gibraltar Llanito is concerned, it seems that the presence of loans from English is not enough to trigger a prosodic change in the Andalusian Spanish variety that is the base for Llanito. This might have to do with the fact that English loanwords represent a small percentage of the words used (only 11 out of 106 words in the fable, *i.e.*, 10%) and, thus, have a limited overall impact. In addition, some of the loanwords have clearly been adapted to the Andalusian phonology: for example, the word 'North' (pronounced [ˈnɔːθ] in British English) is pronounced [ˈnof] in Gibraltar Llanito, with a loss of vowel quantity, one of the features which may affect rhythm (Dauer 1983). Also, one should bear in mind that, unlike Valverdeiro and Mirandese which have heavily been in touch with other languages since the Middle Age, the language-contact

situation in Gibraltar is relatively recent, insofar as it dates back "only" to the 18th century (Vázquez Amador 2018).

Overall, this study contributes to the understanding of linguistic rhythm by using data from a speaking atlas, to provide empirical evidence for the rhythmic properties of various languages and dialects of the Iberian Peninsula. The most interesting findings concern three varieties whose rhythmic properties interact diachronically with those of other languages, but do so in different ways. Mirandese seems to have undergone a prosodic change due to language contact with Portuguese; Valverdeiro seems to have resisted a prosodic change thanks to its isolation from Portugal; finally, Llanito seems to resist prosodic change due to the lower impact of language contact. These three situations document how different prosodic results of language contact may appear, depending on the linguistic context.

The speech rhythm of learners of a foreign language was approached (Vieru et al. 2011, Ordin et al. 2013, Kolly et al. 2017, Rodríguez Vázquez & Roseano 2022), as well as that of varieties in a situation of contact (Gabriel & Kireva 2014). Vieru et al. (2011) addressed Italian accented French, whereas Gabriel & Kireva (2014) investigated the Judeo-Spanish variety (Judezmo) spoken in Bulgaria — Bulgarian being considered as a stress-timed language: the studies report evidence of the influence of Italian and Bulgarian, respectively, with a greater degree of vocalic variability. Grabe & Low's (2002) metrics yield clearer results than do those put forth by Ramus et al. (1999), an outcome also found by Roseano (2020). Our own findings shed new light on possible prosodic transfers. Still, studies based on more speakers are necessary to assess these different measures.

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