

Central, epenthetic, unmarked vowels and schwas: A brief outline of some essential differences ^(*)

João Veloso

jveloso@letras.up.pt

Faculdade de Letras da Universidade do Porto,

Centro de Linguística da Universidade do Porto (Portugal)

ABSTRACT. In this study, we examine the nature and content of some phonetic/phonological designations to refer to central vowels. Bearing in mind that epenthetic vowels and unmarked vowels are not always central vowels, we will argue in favour of a thorough distinction between these designations and propose the use of: 1. 'Central vowels' to label vowels articulated along the central axis of the oral cavity, 2. 'epenthetic vowels' to refer to postlexically inserted vowels in order to regularize exceptional consonant strings, 3. 'unmarked vowels' to indicate the most frequent epenthetic vowels of a language. Additionally, the term 'schwa' is judged not strictly necessary to phonetic and phonological description, since it does not clearly separate the different meanings associated with more transparent designations such as 'central' or 'epenthetic vowels'.

KEY-WORDS. Central vowels; epenthetic vowels; epenthesis; unmarked vowels; schwa.

0 – Preliminary remarks

The fact that, in many languages, central vowels act as epenthetic vowels has led to a terminological equivalence between labels such as *central vowel*, *schwa*, *epenthetic vowel*, *default vowel* and *unmarked vowel*, as it will be seen subsequently in this paper. Although it is undeniable that such overlap exists very often cross-linguistically, it

Linguística - Revista de Estudos Linguísticos da Universidade do Porto - Vol. 5 - 2010, pp. 191-213

^(*) ACKNOWLEDGMENTS. I thank Prof. Maria da Graça Pinto (University of Porto) for her suggestion and encouragement to publish these notes. Pedro Tiago Martins (FLUP/CLUP) helped me with a previous English version of this text. Part of this research is funded by *Fundação para a Ciência e a Tecnologia/Centro de Linguística da Universidade do Porto* (FCT, FEDER/POCTI, U0022/2003).

is our aim to demonstrate (i) that such labels do not name always the same linguistic entities, and, consequently, (ii) that in certain languages at least it is necessary to distinguish very carefully among them to refer to different objects.

As for the necessity which is mentioned in (ii), two main arguments must be taken into consideration:

- by the one hand, as it is demonstrated by examples of Brazilian Portuguese (Camara Jr. 1971: 27), Japanese (Cohn 2001: 196-197) and Tunisian Arabic (Angoujard 2006: 83), for instance, languages can epenthesize vowels which are not central¹ ([i] in Brazilian Portuguese and Tunisian Arabic; [u] in Japanese);
- by the other hand, central vowels may have linguistic functions other than epenthesis (see, e.g., section 4.3 of this text).

Therefore, we will argue in favour of the necessity of establishing some terminological (and ontological) distinctions among these different terms and concepts. It is our aim to analyse such terminological coincidences as a case of incidental, extrinsic (even though very frequent) overlap, rather than as an essential, intrinsic co-identity.

In the first part of our paper (sections 1 to 3), we will gather some basic information about the notions of *epenthetic vowel*, *central vowel* and *schwa*. This preliminary discussion will be carried out in separate sections and will concentrate mainly on phonetic aspects. Section 4 will pay attention to some key phonological aspects of the central question of our study: the postlexical nature of epenthetic vowels, the relation between epenthetic vowels and unmarked vowels, and the types of different “schwas” (postlexical **and** lexical) according to their phonological behaviour in several languages will be dealt with then. In section 5, we will return to the terminological debate: on the basis of the arguments reviewed in sections 1-4, we will try to clarify the distinction between all the supposedly overlapped categories that have been mentioned before.

¹ More seldom, languages can even epenthesize consonants. See Lombardi (2002) for a study on the epenthesis of coronal and glottal consonants in several languages.

For the sake of etymology, “epenthesis” should be used to refer to consonant-insertion only, whereas “svarabhakti” or “anaptyxis” should be used to describe vowel-insertion exclusively (see Nunes’ (1956) quotation in footnote 2).

1 – Epenthetic vowels

The phonology of each language comprehends a set of “phonotactic constraints” that rule out which consonant combinations are allowed or disallowed within a syllable. If a given sound sequence which is a candidate for becoming a word in a specific language (e.g., a lexical borrowing) does contain any sound combination which is not in accordance with such phonotactic constraints, it is very often subject to a “regularization procedure” (see, a. o., Blevins 1995: 218, 220, 228). Among such regularization procedures, epenthesis – the insertion of a sound segment not contained in the theoretical, original form of the word (Van Oostendorp 1998: 4) – is found very frequently. If a language, say, does not admit any word ending with a consonant, adding a final vowel to a lexical borrowing ending with a consonant may be one way of making a “regular” word of an “irregular” form.

The vowel which is inserted to accomplish such regularization instances is called then “epenthetic”.

As Spencer (1996) puts it,

It is extremely common to find that a language inserts a segment (usually a vowel, less commonly a consonant) into a string of segments which would otherwise violate the syllable structure principles of the language [...].

(Spencer 1996: 63)

Sanskrit grammar coined a specific term to name this epenthetic insertion of a vowel whose main purpose is to make regular sound strings of irregular ones: *svrabhakti*, literally meaning “to separate by means of a vowel” (IAHLP 2003: VI, 3393). Greek grammar designated the same concept as *anaptyxis*².

² The Sanskrit term was also adopted by some Western, modern authors. Nunes (1956), the author of a history of Portuguese, distinguishes *svrabhakti* (giving also the Greek correspondent term: “anaptyxis” – see also Matthews 1997: 18, 364) from *epenthesis*, as the former adds vowels to a phoneme string, whilst consonants are added by the latter: “Dentro da palavra acrescentam-se já vogais (svrabacti ou anaptixe), em geral idênticas à que imediatamente as precede ou segue, com o fim de desfazer grupos consonânticos, já consoantes (epêtese), que produzem resultado inverso.” (Nunes 1956: 156).

According to Williams’ (1877) description of Sanskrit, the svarabhakti vowel of this language corresponds to a low, central, unrounded [a]-type vowel: “The short vowel [...] a is never written unless it begin a word, because it is supposed to be inherent in every consonant. [...]” (Williams 1877: 3).

Throughout this paper, we will use the term *epenthesis* to refer to the insertion of any sound (regardless of whether such sound is a consonant or a vowel) whose aim is to regularize a phonotactically irregular sequence.

Epenthesis, as a regularization procedure, occurs phonetically (*i.e.*, postlexically, in the sense of Lexical Phonology – see Mohanan 1986: 7 ff.)³. This explains that in many cases epenthetic vowels may be not included in the theoretical inventory of the phonological segments of a given language. That is to say, they can violate the Structure Preservation Principle (SPP) (Kiparsky 1985)⁴.

The phonetic quality of this epenthetic vowel is not necessarily the same cross-linguistically. The comparison with several languages shows us how epenthetic vowels can vary, ranging from [i] (found in Brazilian Portuguese (Camara Jr. 1971: 27) and Tunisian Arabic – Angoujard 2006: 83) to [u] (as in Japanese, according to Cohn's (2001: 196-197) examples) and Sanskrit [a] (Williams 1877: 3), to mention again but a few cases that were referred to before.

2 – Central vowels

The phonetic characterization of central vowels in general raises a number of problems, as it is illustrated by the following words of Spencer (1996).

[...] it is possible to produce infinitely many gradations of frontness or backness. However, for most purposes the simple front/back dimension is sufficient in the description of a given language. This is because a vowel pronounced with a central articulation will generally behave either as though it were really a back vowel or really a front vowel. [...] *This, however, is a rather controversial area*, and phonologists are not yet decided on how best to approach the question of central vowels. The two central vowels most commonly encountered are the high central unrounded [ɨ] and the mid central unrounded schwa [ə]. In addition, there is the high central rounded [ɯ] and the rounded schwa [ø], together with a low central unrounded vowel, found, for instance, in Portuguese, [ɐ].

(Spencer 1996: 29; italics ours)

³ In a way, epenthetic vowels seem to be the contrary of the Slavonic *yers*, which are found in languages such as Russian and Bulgarian. These are vowels which are assumed to exist phonologically, occupying defined slots of the words' phonological representations, completely lacking, however, phonological specification and well-defined phonetic substance (although they can be phonetically realized, under certain circumstances, as central vowels as well). For details, see, for instance, Hristovskiy (2003).

⁴ SPP states that segments not included in the phoneme inventory of a language are necessarily the result of "postlexical rules", since no lexical rule could generate any structure containing such "non-phonological" units. Indeed, observation or violation of SPP is generally accepted as a basic criterion to distinguish lexical from postlexical rules and processes (Mohanan 1986: 174; Carr 1993: 179; Kenstowicz 1994: 221; Gussenhoven & Jacobs 1998: 121).

Perhaps this explains why the primary Cardinal Vowels set does not include any central vowels, as it may be seen in Jones (1972: 36).

Among the difficulties related to central vowels' characterization, we underline, for the moment present, the following ones, which will be dealt with in the next sections of our text: phonetically, their exact configuration is not completely established in most languages; there is no consensus about the appropriate symbols for their transcription; in many languages, namely in the so-called "stress-timed languages" (Pike 1945; Major 1985; Pamies Bertrán 1999; P. A. Barbosa 2000), they are very often subject to phenomena such as reduction and/or deletion (Padgett & Tabain 2005; Davidson 2006; Barry & Trouvain 2008)

2.1 – Vowel quality and IPA symbols for the central vowels

The current IPA Chart version⁵ splits the vowels of the world's languages into three different sets according to tongue position along the horizontal dimension: front vowels, articulated with a fronting of tongue body in relation to its central position within the oral cavity; back vowels, with a clear movement of tongue body towards the velar and pharyngeal regions; central vowels, with the tongue body moving vertically along the central axis of the oral cavity profile (International Phonetic Association 1999: 10-13).

The IPA set of central vowels includes 8 vowels: high [ɨ] (unrounded) and [ɥ] (rounded); close-mid [ɘ] (unrounded) and [ɵ] (rounded); [ə], an unrounded vowel intermediate between close-mid and open-mid; open-mid [ɜ] (unrounded) and [ɞ] (rounded); [ɐ], an unrounded vowel slightly lower than [ɜ] and [ɞ]⁶.

⁵ *Journal of the International Phonetic Association*. **36(1)**: 135. [2006].

⁶ [a], which is described in many languages as a central, low, unrounded vowel, appears at the IPA Chart as a front, unrounded, open vowel. This is the main reason why, in our presentation of the phonetic symbols used to transcribe Portuguese (Veloso 1999: 27), Portuguese [a] is presented as such, too. Cruz-Ferreira (1999: 127) classifies European Portuguese (EP) [a] as low, slightly heightened, central. See details in the text about the on-going discussion about either reclassifying [a] as a low, *central*, unrounded vowel or transcribing such a vowel by means of a new phonetic symbol (Barry & Trouvain 2008; 2009; Recasens 2009; Ball 2009).

“*Central vowels*”, in fact, labels a wide variety of vowels that can be produced with different degrees/gestures concerning tongue height, jaw opening and lip-rounding. The difficulty of finding the appropriate IPA symbols to describe some of them is thoroughly analysed in a recent paper by Barry & Trouvain (2008) (see also the debate which followed: Recasens 2009; Ball 2009; Barry & Trouvain 2009). Discussing the lack of a low, central vowel in the IPA Chart, Barry & Trouvain (2008) admit either (i) “moving” [a] into the central vowels’ set, or (ii) creating a new symbol for the low, central, rounded vowel which is commonly transcribed as [a] in several languages (new symbols, such as [A], [ǣ] and [ɶ], are then suggested by Barry & Trouvain 2008)⁷.

2.2 – Phonetic instability: the “shiftiness” and “targetlessness” of central vowels

Central vowels are acoustically ill-defined sounds (Adda-Decker, Boula de Mareüil & Lamel 1999; Davidson 2006). Moreover, especially when unstressed and in languages that admit vowel reduction, central vowels tend to be deleted in colloquial speech. Phonetic studies about Danish (Thorsen 1982; Jensen 2001), English (Davidson 2006), European Portuguese (henceforth: EP) (Mateus & Delgado-Martins 1982; A. Andrade 1994; Mateus 1996; Mateus & E. D’Andrade 2000: 134; Veloso 2003; 2007), French (Dell 1992: 219 ff.; Adda-Decker *et al.* 1999; Abecassis 2004; Angoujard 2006: 79 ff.), German (Mooshammer & Geng 2008) and Russian (Padgett & Tabain 2005) demonstrate this tendency.

Central vowels, being also the most common result of vowel reduction across languages, are very prone to suffer undershooting of vocalic spaces and formant-space shrinkage, as it is clearly put by Padgett & Tabain (2005):

‘Phonetic’ vowel reduction [which the authors oppose to “phonological vowel reduction] refers to undershoot of vowel targets, due either to coarticulation or a tendency to centralize, or both. It is a gradient, subphonemic process, dependent on (at least) speech rate and register, stress, and segmental context. The result is a shrinkage of the overall vowel space.

(Padgett & Tabain 2005: 14)

⁷ The same question is also addressed by Pullum & Ladusaw (1986: 44-45, 75, a.o.)

Additionally, studies about the phonetic realization of central, non-low vowels in languages like French or Portuguese, for instance, underline that no contexts are known making their production or deletion completely predictable, mandatory, or forbidden (see above references on these two languages).

So, central vowels can be characterized as highly variable, unstable, ill-defined vocoids⁸. This brings Adda-Decker *et al.* (1999) into classifying their nature as “*shifty*”⁹:

The schwa /ə/ vowel The orthographic [French] *e*, which is called *mute* (but also *decaying*, *unstable*, *feminine*, *dull*, *obscure*, *middle*, *neutral* or *schwa*) because it is more often that not omitted in conversational speech and, when maintained[,] is somewhere (according to opinions), between the open /œ/ and the closed /ø/. But even if these phonemes are its closest neighbors, and even if the pronunciation /œ/ appears to be preferred, the realization of schwa does not merge exactly into the archiphoneme /œ/, probably owing to the absence of lips rounding in the case of /ə/. The multiplicity of denominations, as well as the doubts concerning its timbre[,] support the *shifty* nature of this *e*.

(Adda-Decker *et al.* 1999: 2239; authors’ italics)¹⁰

Other designations underlining central vowels’ “*shiftiness*” are found in the literature. Examples of such “multiplicity of denominations” (Adda-Decker *et al.* 1999: 2239), mostly different from those that are found in these authors’ quotation above, are as follows: *unmarked vowel* (Van Oostendorp 1998), *targetless vowel* (Barry 1998; Van Oostendorp 1998), *featureless vowel* (Spencer 1996), *zero vowel* (Miguel 1993; Delgado-Martins 1994), *colourless vowel* (Polgárdi 1996), *cold vowel* (Miguel 1993; Delgado-Martins 1994), *fugitive vowel* (J. M. Barbosa 1965; Catford 1988), *unstable vowel* (A. Andrade 1996: 303), *obscure vowel* (Catford 1988), ...

⁸ Angoujard (2006: 79) clearly assumes that transcribing a central vowel with a phonetic symbol like [ə] is mainly a matter of convention: “(...) nous retiendrons, par souci de clarté, la seule transcription [ə] pour tous les schwas réalisés, indépendamment de leurs articulations effectives (plus ou moins proches, selon les locuteurs et les contextes, des voyelles labiales [ø] et [œ]).” (Angoujard 2006: 79).

⁹ Adda-Decker *et al.* (1999), as well as other authors quoted in this section, refer indistinctly to central vowels as “*schwas*”, following the terminological tradition which is discussed in this study.

¹⁰ See also the following words by Pullum & Ladusaw (1986): “There is a wide range of variation in the articulatory descriptions given to schwa by American phoneticians. Bloch and Trager (1942, 22) define it as mean-mid central. Pike (1947, 5) gives it as upper-mid central. Smalley (1963, 363) shows it as lower-mid central. Gleason (1955, 8) does not distinguish [ə] from [ɘ] and describes [ə] as mid central or back. [...]” (Pullum & Ladusaw 1986: 44).

3 – Schwas

The equivalence between **“non-low central vowel”** (regardless of other phonetic properties, such as jaw opening or lip rounding), **“ill-defined vowel”** and **“schwa”** is currently found in the literature (see, a.o.: Tranel 1987: 86; Catford 1988: 158; Dell 1992: *passim*; Spencer 1996: 29, 63, 227; Cruz-Ferreira 1999: 127; Angoujard 2006: 83 ff.; Barry & Trouvain 2008: 350 ff.).

This equivalence is clearly assumed, for instance, in formulations such as the following:

The symbol [ə], traditionally known as *schwa*, which is the German spelling of the name of a Hebrew letter representing a vowel of this type, **is used for any mid-central vowel, i.e. a vowel of the central type between half-close and half-open**. It is often used for any obscure-sounding, unstressed vowel of this general type. For example, it is commonly used for the most weakly stressed vowel in such English words and phrases as *potato*, *back again*, *sofa*, [pə'tetəʊ], ['bækəɡən], ['səʊfə], even though the [ə] of *back again* is very close and rather back (resembling [ɪ]), and the [ə] of *sofa* is a very open central vowel perhaps accurately represented by [ɐ]. The symbol [ə] is also used very often to represent the 'e-muet' or unstressed and fugitive [ə] of French, although this vowel is usually slightly advanced from the central zone and slightly rounded.

(Catford 1988: 158; authors' italics, boldface ours)

One of the problems of representation left unresolved in chapter 4 was that of the schwa or 'reduced vowel'. Now, in many languages the schwa vowel seems to disappear under certain conditions, especially when it is unstressed. In addition, it is difficult to know how best to characterize the schwa in terms of features, since it is neither high nor low, front nor back. A number of linguists have argued that, in many cases at least, the simplest solutions to say that the schwa effectively has no articulatory features. What this means is that we can represent the schwa as a vowel slot (so that it has major class features), which simply lacks any supralaryngeal features. Thus, the schwa is the vowel equivalent of a glottal consonant.

(Spencer 1996: 227)

The identification of schwa with *any* mid central, reduced, ill-defined vowel also explains that different vowel sounds seem acceptable, at least cross-linguistically or even in different varieties of the same language, as different types of schwa¹¹. Pullum & Ladusaw

¹¹ See again Angoujard's (2006: 79) quotation in footnote 8.

(1986: 44-45, 75), Spencer (1996: 29) and Barry & Trouvain (2008), among others, explicitly admit at least the following “schwas”:

- high, unrounded [i] (Pullum & Ladusaw 1986: 75¹²; Spencer 1996: 29);
- close-mid, rounded [ø] (Pullum & Ladusaw 1986: 113¹³; Spencer 1996: 29);
- close-mid/open-mid, unrounded [ə] (Pullum & Ladusaw 1986: 44-45¹⁴; Spencer 1996: 29; Barry & Trouvain 2008: 350);
- open-mid/open, unrounded [ɐ] (Spencer 1996: 29; Barry & Trouvain 2008: 350).

Finally, this could also explain, at least partially, why different symbols are found in the literature to transcribe schwas in different languages:

- [ə] (the most usual symbol to transcribe the French schwa – see, for instance, Catford (1988: 158), Dell (1992), Adda-Decker *et al.* (1999) and Angoujard (2006); see also less recent texts of Portuguese phonetics and phonology, where [ə] is also used to transcribe the Portuguese schwa – see, for example: Herculano de Carvalho (s/d), Lacerda & Hammarströmm (1952), Lüdtke (1953), Companys (1954), Louro (1954), Strevens (1954), J. M. Barbosa (1965; 1994), Delgado-Martins (1975), Mateus (1975), Mateus & Delgado-Martins (1982); it is also used, for instance, for English (Catford 1988; Davidson 2006), Russian (Padgett & Tabain 2005), Danish (Thorsen 1982; Jensen 2001), German (Mooshammer & Geng 2008) and some Southern Italian dialects – Guarnerio 1918: 46);

¹² “Barred *i* [[ī]] has often been used by American scholars in the transcription of English, for words with a schwa that is pronounced somewhat higher than the mid line: for example, the word *just* has been transcribed [jɪst].” (Pullum & Ladusaw 1986: 75).

¹³ “Rounded mid central vowel, i. e., rounded schwa; “intermediate between ø and o.”” (Pullum & Ladusaw 1986: 113).

¹⁴ Pullum & Ladusaw (1986) retain that [ə] is a rather versatile (perhaps ambiguous) symbol, which is “Used for a range of distinguishable non-peripheral vowels for which other symbols could also be used; thus [ə] may represent in broad transcriptions a retracted and only slightly rounded [ɐ] in French, [ɐ] in word-final position in British English, [ɜ] in stressed positions in British English, [i] in many American dialects, and so on.” (Pullum & Ladusaw 1986: 44).

- [i] (as it is the case of EP¹⁵ – see A. Andrade (1994), A. Andrade & Viana (1996), Veloso (1999; 2003; 2005; 2007), Barroso (1999), Mateus & E. D’Andrade (2000), Mateus, Brito, Duarte, Faria, Frota, Matos, Oliveira, Vigário & Villalva (2003)¹⁶ – and certain American English dialects – see Pullum & Ladusaw 1986: 44).

The term *schwa* originates, as it has been mentioned before (see Catford’s (1988) quotation above), in the Hebrew alphabet. This word, originally meaning “empty” in Hebrew (IAHLP 2003: II, 905), indicates the letter marking a facultative, ill-defined, central vowel. According to etymology, it should refer to vowels occurring in empty prosodic positions – that is to say, it should be regarded as a synonymous of “epenthetic”. Nonetheless, as it has been seen so far, it is very often used among phoneticians as an equivalent of “central vowel”, especially of non-low, central vowels, regardless of any other criteria. Phonologists, as it will be seen in section 4, use this term to refer, quite indistinctly, to central or reduced vowels which show some particularities at the level of phonological behaviour, such as lack of stress, the result of epenthesis, absence from the phoneme inventory, a.s.o. Thus, “schwa”, in addition to referring to an ill-defined vowel, also corresponds to an ill-defined term: by the one hand, from a phonetic point of view, it labels a particular set of vowels mainly characterized by their centralness; by the other hand, it can refer to

¹⁵ Bearing in mind that EP admits at least three central vowels, [i] and [e], non-low, plus [a], low – establishing surface distinctions (in the Standard dialect) such as “*cante*” ‘[he/she] sing (Present Subjunctive, 1st/3rd person, singular)’ [kãti] vs. “*canta*” ‘[he/she] sings (Present Indicative, 3rd person, singular)’ [kãte], and “*paramos*” ‘[we] stop (Present Indicative, 1st person, plural)’ [pãrãmu] vs. “*parãmos*” ‘[we] stopped (Simple Past, 1st person, plural)’ [pãrãmu] –, we could accept the existence of more than one single schwa in this language. Let us recall that [e] is explicitly mentioned as a schwa by Barry & Trouvain (2008: 350). If, IPA Chart permitting, a central, low vowel happens to be added to the official list of phonetic symbols, it might be even possible to accept a third schwa (the [a]-like vowel which is heard in EP as the stressed vowel of “*gato*” ‘cat’ [gãtu]), provided low, central vowels become recognized as “schwas” too (see footnote 6).

¹⁶ In phonetic and/or phonological descriptions of EP, the vowel that may be heard as the last segment of words like “*base*” is generally described as a high, central, unrounded vowel (J. M. Barbosa 1965: 106, 1994: 53, 78; Barroso 1999: 67; Veloso 1999: 27). Therefore, [i] would be the most appropriate IPA symbol for its transcription, according to such description and confronting it with the IPA Chart.

Differently from this current interpretation, Cruz-Ferreira (1999: 127), transcribing this vowel as [tɰ], accepts it as a slightly fronted, slightly lowered, back, high, unrounded vowel.

such vowels provided they behave in a very particular, sometimes unclear and contradictory, manner at the phonological level.

4 – Phonological behaviour of epenthetic and central vowels

In the previous sections, we focused on the phonetic properties of central vowels and tried to disentangle the current association between central vowels (a rather phonetic label¹⁷) and epenthetic vowels (a phonological designation).

Some basic facts related to the phonological behaviour of these vowels in a number of languages of the world will be considered now.

As underlined by Van Oostendorp (1998), schwas' phonological behaviour has some non-negligible particularities:

If a language has schwa in its vowel inventory, this segment usually has a special role to play in the phonology of the language. It can only occur in a simple type of syllable; or it is invisible for the stress system; or it is epenthetic; or it is the result of reduction; etc. Linguistic theory has to explain this special behaviour of schwa: why is it exactly this segment which behaves in exactly this way in so many languages?

(Van Oostendorp 1998: 3).

4.1 – Postlexical epenthesis, empty prosodic positions and unmarked vowels

As it was said at the beginning of this text, epenthesis is one of the main regularization procedures in order to avoid irregular consonant strings (Fikkert 1994: 5-6; Blevins 1995: 218, 220, 228; Spencer 1996: 63; Cohn 2001: 196 ff.; Stites, Demuth & Kirk 2004).

As a rule, every language has *one* preferred epenthetic vowel. Indeed, in a language with several vowels in its vowel phoneme inventory, one of these vowels will act as its most frequent epenthetic vowel. That is to say, very seldom do languages admit more than one epenthetic vowel or is its choice dependent on random or context¹⁸.

¹⁷ Indeed, from a strictly phonological point of view, central vowels do not behave as a natural class of its own (see Spencer's (1996) quotation in section 2). This is why distinctive feature systems, like Chomsky & Halle's (1968), do not include a [central] feature for vowels (which are distinguished on the basis of [±back] to describe their articulation along the horizontal axis of the oral cavity).

¹⁸ In EP, [i] is assumed to be the default epenthetic vowel; however, a few examples of epenthesis of [ɐ] may be also found in colloquial speech ("*cancro*" 'cancer': standard realization, [kʰɛkru]; colloquial realization with [ɐ]-epenthesis, [kʰɛkɐru]; "*craveiro*" 'carnation-flower': standard realization, [krɐ'vɛjru]; colloquial realization with [ɐ]-epenthesis, [krɐ'vɛjɐru]) (see Mateus & D'Andrade 2000: 32).

The vowel which acts as the basic epenthetic vowel of a given language, regardless of its actual phonetic quality, is then interpreted as its “default” vowel, as underlined by Angoujard (2006):

De nombreuses langues font usage d’une voyelle «par défaut». Cette voyelle peut être un [i], comme en arabe tunisien ; la voyelle centrale haute [ɨ], comme dans certains dialectes marocains ; un schwa [ə], comme en français. Les réalisations effectives sont variables (dans les limites de l’espace articulatoire accessible), susceptibles de centralisation et d’arrondissement [...].

(Angoujard 2006: 83)

It is true that in most languages the default epenthetic vowel is very often a central vowel¹⁹ – but it should always be borne in mind that epenthesis may admit the insertion of other vowels, or even the insertion of consonants (see examples above; see also the abovementioned distinction, from an etymological point of view, between vocalic anaptyxis and consonantal epenthesis).

This vowel is not intended to maintain a lexical distinction. To put it very simply, a very “basic”, “unsophisticated” vowel suffices: the simplest vowel of the language. That is to say, what language needs in the segmental slots where an epenthetic vowel is inserted is just a minimum amount of vocalic substance capable of introducing a regular string in the place of a formerly irregular one. That’s why the vowel which appears in this position is commonly named a “neutral”, “default” or “basic” vowel (see above). The same fact explains that this vowel is also accepted as the “unmarked vowel” of the language (Fikkert 1994: 5-6; Blevins 1995: 218, 220, 228; Cohn 2001: 196 ff.; Stites, Demuth & Kirk 2004)²⁰.

As it was seen in section 2.2, central vowels are commonly referred to as “targetless vowels”, suggesting that for their production vocal organs do not seem to respect a rigid shape, contrarily to

¹⁹ Depending on each language, this vowel can be either present at or absent from the phoneme inventory.

²⁰ For a broader presentation of the concept of markedness and its epistemological motivation in the history of linguistics, see, among others, Greenberg (1966), Martinet (Dir., 1969: 240-243), Basbøll (1981), Kean (1981) and Kenstowicz (1994: 62-65).

what happens with other vowels which are fully specified in order to preserve the integrity and distinctiveness of lexical items. From a rather naïf perspective, we could imagine the default vowel as the vocoid produced with vocal folds vibrating into a vocal tract without any well-defined configuration (according to Spencer's (1996: 227) words that were quoted before, it corresponds to a vowel "lack[ing] any supralaryngeal features", "the vowel equivalent of a glottal consonant").

This may be one of the main reasons why central vowels are the most frequent epenthetic vowels cross-linguistically, leading to the current (**albeit not universal**) terminological assimilation between epenthetic vowels and schwas.

According to the model of Lexical Phonology, epenthesis takes place in the postlexical module, since it adds phonetic segments to theoretical representations which do not include any vowels in the segmental points where epenthetic vowels phonetically occur. One of the main arguments showing the postlexical nature of epenthesis is the fact that epenthesis may (but doesn't have to) surface segments which do not belong to the phonological segment inventory of the language, *i.e.*, it may violate, as said before, Kiparsky's (1985) Structure Preservation Principle²¹.

4.3 – Types of "schwa": Van Oostendorp's (1998) proposal

In many languages, in addition to the fact that the epenthetic default vowel is a central vowel, another important phonological regularity exists: the same phonetic vowel is also quite often the result of vowel reduction. Therefore, a phonetic "schwa" may correspond, at the phonological level, to two different conditions: a "zero" (if it

²¹ See footnote 4.

Epenthetic [i] of EP illustrates this: according to current phonological descriptions of this language, this vowel is but a "purely phonetic segment" (Mateus 1975: 16, 26; 1996: 189, 195, 197; 1997: 203; Mateus & Delgado-Martins 1982: 174; Delgado-Martins 1994: 273; Mateus & D'Andrade 2000: 18, 20, 30; Mateus *et al.* 2003: 991-992, 1001, 1009), always corresponding to a phonological unstressed /e/ or /e/ or to a phonological zero (*i.e.*, a point of the phonological representation lacking a fully specified vowel). As it will be mentioned later, we do not agree entirely with this proposal, since, based on Van Oostendorp (1998), we accept a third kind of EP [i] – corresponding to an "underlying /i/" whenever this vowel is neither the result of epenthesis or vowel reduction in this language (see section 4.3).

occurs phonetically at an empty slot of phonological representation, as the result of epenthesis); or a vowel whose phonological feature-specification differs from the phonetic specification that is found at the surface level. In both cases, the (same) vowel that is found at the surface level may be absent from the phoneme inventory of the language, *i.e.*, it may be the result of a postlexical process violating the SPP²². This array of different phonological properties and statuses does not seem properly reflected in one single, not absolutely transparent term like *schwa*.

In an effort towards clarification – distinguishing different linguistic conditions “hidden” by the same phonetic manifestation –, Van Oostendorp (1998) distinguishes three categories of “schwas”, according to strict phonological criteria. Van Oostendorp (1998) explicitly admits that, in a given language, schwas may correspond, from the point of view of phonological status, to three different cases:

- EPENTHETIC SCHWAS (“e-schwas”): these result from epenthesis, *i.e.*, they correspond to “default” vowels which are inserted in problematic points of marked segmental strings in order to obtain unmarked sound combinations; they occupy “empty prosodic slots”;

- VOWEL REDUCTION SCHWAS (“r-schwas”): these occupy prosodic slots which are phonologically filled with fully specified vowels that are subject to vowel-reduction processes, being then surfaced very often, when unstressed, as central (“schwa-like”) vowels; being so, they alternate with the full vowels they phonetically realise in many contexts;

- STABLE SCHWAS (“s-schwas”): they are neither the result of epenthesis nor of vowel reduction; according to Van Oostendorp’s (1998) proposal, they are present as central vowels underlyingly (French phonologists, for example, accept the presence of a “schwa sous-jacent” whenever [ə] is not the result of epenthesis – see, *a. o.*, Dell (1992: 197, 220, *passim*) and Angoujard 2006: 80).

²² Another striking phonological property of these vowels that is found very often in many languages is their inherent lack of stress, as they never occur in stressed syllables.

Van Oostendorp's (1998) proposal is worth two main remarks at this moment:

- firstly, it underlines that what is commonly called a schwa corresponds to a wide range of different realities not only from a phonetic point of view; phonologically, too, it can realize different functions and correspond to different theoretical entities;
- secondly, it clearly admits the possibility of schwa's being a "phoneme" of a language, not always a purely phonetic segment absent from the language phonological inventory²³.

5 – Final summary

The main purpose of these research notes dwells at analysing different designations for a specific set of vowels in the world's languages and at identifying some convenient clarifications and distinctions underlying such designations. Namely, we purported to see to what extent designations such as *central vowel*, *epenthetic vowel*, *unmarked vowel* and *schwa* could be used interchangeably.

At this point of our analysis, we propose, for the sake of clarity and precision, the split of these designations into two distinct categories:

- phonetic designations, based on phonetic (acoustic, articulatory) properties. These include the label *central vowel*, which may be applied to any vowel produced in the central axis of the oral cavity, regardless of any other criteria, either phonetic (tongue height, jaw opening, lip rounding) or phonological (phonological status);
- phonological designations, based on linguistic behaviour (mainly on the segments' prosodic status). These designations include

²³ In a previous study (Velooso 2007), we accepted Van Oostendorp's (1998) classification as relevant for the description of EP [i]. Namely, it was proposed that the existence of a phonological /i/ be accepted. Indeed, EP [i] may correspond to: (i) an epenthetic vowel regularizing exceptional consonant strings; (ii) the result of /e/- or /ɛ/-reduction; (iii) neither (i) or (ii), occurring as a stable, full vowel (as it happens, for example, when final [i] corresponds to a noun class marker, not alternating with any other vowel).

The acceptance of this vowel as an item of the phoneme inventory of EP allows its acceptance as the "unmarked vowel" of the language as well, contrarily to the interpretation which is found in Mateus & D'Andrade (2000: 33-35) and Mateus *et al.* (2003: 1008). According to this interpretation, EP unmarked vowel is [i]: one of the arguments to refuse epenthetic [i] such status lies on its alleged absence from the phoneme inventory of the language (Mateus & D'Andrade 2000: 33).

the labels *epenthetic vowel* (referring to vowels inserted at empty slots as regularization procedures of exceptional consonant strings) and *unmarked vowel* (referring to default vowels which automatically act as epenthetic in a given language).

These three labels should not be seen as equivalent: by the one hand, they stem from different criteria (phonetic vs. phonological); by the other hand, as it was demonstrated, they do not always cover the same segments necessarily, since central vowels can behave as epenthetic or non-epenthetic (and be either non-lexical or lexical) in different languages – whereas, concomitantly, epenthetic vowels may not be central in many languages. Van Oostendorp's (1998) schwa-typology clearly demonstrates how the same surface (phonetic) vowel may correspond to quite different underlying (phonological) conditions, emphasizing the need for distinguishing among these labels. As for the distinction between epenthetic vowels and unmarked vowels, we underline that the term *epenthetic* should apply to any postlexically inserted vowel. In one given language, more than one epenthetic vowel may coexist²⁴. However, normally, one of them is the most frequent – the automatic or “default” vowel; if, in a given language, it is possible to recognise such vowel, this has to be assigned the status of the language's unmarked vowel. That is to say, in a given language not all epenthetic vowels are unmarked vowels, but the unmarked vowel of a language always behaves as its epenthetic vowel or, at least, as one of its most frequent epenthetic vowels²⁵.

Labels such as *central vowel*, *epenthetic vowel* and *unmarked vowel* seem quite transparent and – if we accept terminological specifications like the ones we have just formulated – avoid any confusion between the different criteria underlying the exact meaning of each.

As for the term *schwa*, it should be said that this traditional designation does not seem, in fact, very necessary or pertinent, in spite of its widespread use in the literature. Firstly, it is not a transparent designation, contrarily to “central vowel”, for instance.

²⁴ See again the examples of EP that are referred to in footnote 18.

²⁵ See footnote 23 for the proposal of [ɨ] (/i/) as the unmarked vowel of EP.

Secondly, it is not a completely unambiguous label, since it may refer quite indistinctly to a phonetic property (centralness and/or ill-definedness) and/or to a special kind of phonological behaviour. On purely etymological grounds, *schwa* (meaning, in Hebrew, “empty”) should refer to a vowel occurring in *empty* slots only (that is to say, it should label any epenthetic vowels, regardless of their phonetic nature). However, it is commonly used in phonetic terminology to designate non-low, central vowels, often regardless of whether they are epenthetic or not. In phonological terminology, it may name in a rather ambiguous way any central vowel that behaves as epenthetic or is confined to the phonetic inventory only. Since centralness and epenthesis are not mandatorily intertwined in all languages, as we have seen so far, such terminological confusion, in our opinion, should be avoided. We propose then the use of other, more explicit, more transparent terms (*central vowel*, when referring to phonetic quality; *epenthetic vowel*, *unmarked vowel*, when referring to phonological status or behaviour) as more adequate, less ambiguous labels.

REFERENCES

- Abecassis, M. 2004. Schwa-deletion in the Dialogues of 1930s French Films. *SKY Journal of Linguistics*. **17**: 9-34. <http://www.ling.helsinki.fi/sky/julkaisut/sky2004/Abecassis.pdf>. Retrieved May 14th, 2007.
- Adda-Decker, M.; Boula de Mareüil, P.; Lamel, L. 1999. Pronunciation variants in French: Schwa & Liaison. *Proceedings of the XIVth International Congress of Phonetic Sciences (ICPhS 99)*, 2239-2242.
- Andrade, A. 1994. Estudo Acústico de Sequências de Oclusivas em Português Europeu. *Actas do IX Encontro Nacional da Associação Portuguesa de Linguística*. Lisboa: APL/Colibri, 1-15.
- Andrade, A. 1996. Reflexões sobre o ‘E mudo’ em português europeu. *Actas do Congresso Internacional sobre o Português*. Lisboa: Colibri/APL, II, 303-344.
- Andrade, A.; Viana, M. C. 1996. Fonética. In: I. H. Faria; E. R. Pedro; I. Duarte; C. A. M. Gouveia (Orgs.). *Introdução à Linguística Geral e Portuguesa*. Lisboa: Caminho, 115-167.
- Angoujard, J.-P. 2006. *Phonologie déclarative*. Paris: CNRS.
- Ball, M. J. 2009. Response to W. J. Barry & J. Trouvain, Do we need a symbol for a central open vowel? *JIPA* 38 (2008), 349-357. *Journal of the International Phonetic Association*. **39(2)**: 233-234.

- Barbosa, J. M. 1965. *Etudes de Phonologie Portugaise*. Lisboa: Junta de Investigações Científicas do Ultramar [2.ème ed. Évora: Universidade de Évora, 1983].
- Barbosa, J. M. 1994. *Introdução ao Estudo da Fonologia e Morfologia do Português*. Coimbra: Almedina.
- Barbosa, P. A. 2000. "Syllable-Timing in Brazilian Portuguese": Uma crítica a Roy Major. *DELTA*. **16(2)**: 369-402.
- Barroso, H. 1999. *Forma e Substância da Expressão da Língua Portuguesa*. Coimbra: Almedina.
- Barry, W. J. 1998. Time as a factor in the acoustic variation of schwa. *5th International Conference on Spoken Language Processing*. Sydney, Australia, Novembre 30 – December 4, 1998.
- Barry, W. J.; Trouvain, J. 2008. Do we need a symbol for a central open vowel?. *Journal of the International Phonetic Association*. **38(3)**: 349-357.
- Barry, W. J.; Trouvain, J. 2009. Do we need a symbol for a central open vowel? The discussion so far and a reply to Daniel Recasens and Martin Ball. *Journal of the International Phonetic Association*. **39(3)**: 365-366.
- Basbøl, H. 1981. Remarks on Distinctive Features and Markedness in Generative Phonology. In: A. Belletti; L. Brandi; L. Rizzi (Eds.). *Theory of Markedness in Generative Grammar*. Pisa: Scuola Normale Superiore di Pisa, 25-64.
- Blevins, J. 1995. The Syllable in Phonological Theory. In: J. A. Goldsmith (Ed.). *The Handbook of Phonological Theory*. Oxford: Blackwell, 206-244.
- Bloch, B.; Trager, G. L. 1942. *Outline of Linguistic Analysis*. Baltimore: Linguistic Society of America. Quoted by Pullum & Ladusaw (1986).
- Camara Jr., J. M. 1971. *Problemas de Lingüística Descritiva*. 13ª ed. Petrópolis RJ: Vozes.
- Carr, P. 1993. *Phonology*. London: Macmillan.
- Catford, J. C. 1988. *A Practical Introduction to Phonetics*. Oxford: Clarendon.
- Chomsky, N.; Halle, M. 1968. *The Sound Pattern of English*. New York: Harper & Row.
- Cohn, A. 2001. Phonology. In: M. Aronoff; J. Rees-Miller (Eds.). *The Handbook of Linguistics*. Oxford: Blackwell, 180-212.
- Company, M. 1954. Notes sur les finales atones portugaises après consonne sourde. *Revista do Laboratório de Fonética Experimental* [Faculdade de Letras, Universidade de Coimbra]. **II**: 105-127.
- Cruz-Ferreira, M. 1999. Portuguese (European). In: International Phonetic Association. *Handbook of the International Phonetic Association. A Guide to the Use of the International Phonetic Alphabet*. Cambridge: Cambridge University Press, 126-130.
- Davidson, L. 2006. Schwa Elision in Fast Speech: Segmental Duration or Gestural Overlap?. *Phonetica*. **63**: 79-112.
- Delgado-Martins, M. R. 1975. Vogais e Consoantes do Português: Estatística de Ocorrência, Duração e Intensidade. *Boletim de Filologia*. **XXIV(1-4)**: 1-11.

- Delgado-Martins, M. R. 1994. Relação fonética-fonologia: a propósito do sistema vocálico do português. *Actas do Congresso Internacional sobre o Português*. Lisboa: APL/Colibri. In: M. R. Delgado-Martins. 2002. *Fonética do Português. Trinta anos de investigação*. Lisboa: Caminho, 271-282.
- Dell, F. 1992. *Les règles et les sons. Introduction à la phonologie générative*. 2^{ème} éd. Paris: Hermann.
- Fikkert, P. 1994. *On the Acquisition of Prosodic Structure*. The Hague: Holland Institute of Generative Linguistics.
- Gleason, H. A. 1955. *Workbook in Descriptive Linguistics*. New York: Holt, Rinehart and Winston. Quoted by Pullum & Ladusaw (1986).
- Greenberg, J. H. 1966. *Language Universals*. The Hague/Paris: Mouton.
- Guarnerio, P. E. 1918. *Fonologia romanza*. Milano: Ulrico Hoepli.
- Gussenhoven, C.; Jacobs, H. 1998. *Understanding Phonology*. London: Arnold.
- Herculano de Carvalho, J. G. s/d. *Fonética Portuguesa*. Coimbra: Cursos de Férias da Faculdade de Letras da Universidade de Coimbra.
- Hristovsky, G. 2003. As vogais-fantasma do búlgaro: a sua vocalização condicionada pela estrutura silábica. In: I. Castro; I. Duarte (Orgs.). *Razões e Emoção. Miscelânea de estudos em homenagem a Maria Helena Mira Mateus*. Lisboa: Imprensa Nacional – Casa da Moeda, I, 379-394.
- IAHLP [Instituto Antônio Houaiss de Lexicografia – Portugal]. 2003. *Dicionário Houaiss da Língua Portuguesa*. Lisboa: Círculo de Leitores. 6 volumes.
- International Phonetic Association. 1999. *Handbook of the International Phonetic Association. A Guide to the Use of the International Phonetic Alphabet*. Cambridge: Cambridge University Press.
- Jensen, C. 2001. Schwa-assimilation in Danish Synthetic Speech. *Proceedings of EUROSPEECH 2001*, 341-344.
- Jones, D. 1972. *An Outline of English Phonetics*. 9th ed. [reprint]. Cambridge: Cambridge University Press.
- Kean, M. L. 1981. On a Theory of Markedness: Some General Considerations and a Case in Point. In: A. Belletti; L. Brandi; L. Rizzi (Eds.). *Theory of Markedness in Generative Grammar*. Pisa: Scuola Normale Superiore di Pisa, 559-604.
- Kenstowicz, M. 1994. *Phonology in Generative Grammar*. Cambridge: Blackwell.
- Kiparsky, P. 1985. Some consequences of lexical phonology. *Phonology Yearbook*. **2**: 82-138.
- Lacerda, A. de; Hammarströmm, G. 1952. Transcrição fonética do Português normal. *Revista do Laboratório de Fonética Experimental* [Faculdade de Letras, Universidade de Coimbra]. **I**: 119-135.
- Lombardi, L. 2002. Coronal epenthesis and markedness. *Phonology*. **19**: 219-251.
- Louro, J. I. 1954. Estudo e Classificação das Vogais. *Boletim de Filologia*. **XV(3-4)**: 215-248.
- Lüdtke, H. 1953. Fonemática Portuguesa. II – Vocalismo. *Boletim de Filologia*. **XIV(3-4)**: 197-217.

- Major, R. C. 1985. Stress and Rhythm in Brazilian Portuguese. *Language*. **61(2)**: 259-282.
- Martinet, A. (Dir.). 1969. *La linguistique. Guide alphabétique*. Paris: Denoël.
- Mateus, M. H. M. 1975. *Aspectos da Fonologia Portuguesa*. Lisboa: Centro de Estudos Filológicos.
- Mateus, M. H. M. 1996. Redundâncias lexicais e subespecificação: o sistema do português. In: M. H. M. Mateus. 2003. *A Face Exposta da Língua Portuguesa*. Lisboa: Imprensa Nacional – Casa da Moeda, 189-201.
- Mateus, M. H. M. 1997. Ainda a subespecificação na fonologia do português. In: M. H. M. Mateus. 2003. *A Face Exposta da Língua Portuguesa*. Lisboa: Imprensa Nacional – Casa da Moeda, 203-214.
- Mateus, M. H. M.; Brito, A. M.; Duarte, I.; Faria, I. H.; Frota, S.; Matos, G.; Oliveira, F.; Vigário, M.; Villalva, A. 2003. *Gramática da Língua Portuguesa*. 5ª ed. Lisboa: Caminho.
- Mateus, M. H. M.; Delgado-Martins, M. R. 1982. Contribuição para o estudo das vogais átonas [ə] e [u] do português europeu. *Biblos*. **LVIII**: 111-128. In: M. R. Delgado-Martins. 2002. *Fonética do Português. Trinta anos de investigação*. Lisboa: Caminho, 169-186.
- Mateus, M. H.; D'Andrade, E. 2000. *The Phonology of Portuguese*. Oxford: Oxford University Press.
- Matthews, P. H. 1997. *Oxford Concise Dictionary of Linguistics*. Oxford/New York: Oxford University Press.
- Miguel, M. A. C. 1993. *Os Padrões das Alternâncias Vocálicas e da Vogal Zero na Fonologia Portuguesa*. PhD dissertation. Universidade dos Açores.
- Mohanan, K. P. 1986. *The theory of lexical phonology*. Dordrecht: Reidel.
- Mooshammer, C.; Geng, C. 2008. Acoustic and articulatory manifestations of vowel reduction in German. *Journal of the International Phonetic Association*. **38(2)**: 117-136.
- Nunes, J. J. 1956. *Compêndio de Gramática Histórica Portuguesa (Fonética e Morfologia)*. 5ª ed. Lisboa: Livraria Clássica.
- Padgett, J.; Tabain, M. 2005. Adaptive Dispersion Theory and Phonological Vowel Reduction in Russian. *Phonetica*. **62**: 14-54.
- Pamies Bertrán, A. 1999. Prosodic Typology: On the Dichotomy between *Stress-Timed* and *Syllable-Timed* Languages. *Language Design*. **2**: 103-130.
- Pike, K. 1945. *The Intonation of American English*. Ann Arbor: The University of Michigan Press.
- Pike, K. L. 1947. *Phonemics. A Technique for Reducing Languages to Writing*. Ann Arbor: The University of Michigan Press. Quoted by Pullum & Ladusaw (1986).
- Polgárdi, K. 1996. Constraint ranking, Government Licensing and the fate of final empty nuclei. *UCL Working Papers in Linguistics*. **8**: 1-22.
- Pullum, G. K.; Ladusaw, W. A. 1986. *Phonetic Symbol Guide*. Chicago: The University of Chicago Press.

- Recasens, D. 2009. Response to W. J. Barry & J. Trouvain, Do we need a symbol for a central open vowel? *JIPA* 38 (2008), 349-357. *Journal of the International Phonetic Association*. **39(2)**: 231-232.
- Smalley, W. A. 1963. *Manual of Articulatory Phonetics*. Rev. ed. Tarrytown NY: Practical Anthropology. Quoted by Pullum & Ladusaw (1986).
- Spencer, A. 1996. *Phonology. Theory and Description*. Oxford: Blackwell.
- Stites, J.; Demuth, K.; Kirk, C. 2004. Markedness vs. Frequency Effects in Coda Acquisition. In: A. Burgos; L. Micciulla; C. E. Smith (Eds.). *Proceedings of the 28th Annual Boston University Conference on Language Development*. Somerville PA: Cascadilla Press, 565-576.
- Stevens, P. D. 1954. Some Observations on the Phonetics and Pronunciation of Modern Portuguese. *Revista do Laboratório de Fonética Experimental* [Faculdade de Letras, Universidade de Coimbra]. **II**: 5-29.
- Thorsen, N. 1982. Selected Problems in the Tonal Manifestation of Words Containing Assimilated or Elided Schwa. *ARIPUC*. **16**: 37-100.
- Tranel, B. 1987. *The Sounds of French. An introduction*. Cambridge: Cambridge University Press.
- Van Oostendorp, M. 1998. Schwa in Phonological Theory. *Glott International*. **3(5)**: 3-8.
- Veloso, J. 1999. *Na ponta da língua. Exercícios de fonética do português*. Porto: Granito.
- Veloso, J. 2003. A distinção entre palavras terminadas em consoante e palavras terminadas na sequência ortográfica “consoante+«-e»” num grupo de crianças falantes do português europeu em idade pré-escolar. In: F. I. Fonseca; A. M. Brito; I. M. Duarte; J. Guimarães (Orgs.). *Língua Portuguesa: Estruturas, Usos e Contrastes*. Porto: Centro de Linguística da Universidade do Porto, 259-288.
- Veloso, J. 2005. Considerações sobre o estatuto fonológico de [i] em português. *Revista da Faculdade de Letras da Universidade do Porto. Línguas e Literaturas*. **XXII**: 621-632.
- Veloso, J. 2007. Schwa in European Portuguese: The Phonological Status of [i]. In: O. Crouzet ; J.-P. Angoujard (Eds.). *Actes des/Proceedings of JEL'2007. Schwa(s). 5.èmes Journées d'Etudes Linguistiques*. Nantes: Université de Nantes, 55-60.
- Williams, M. 1877. *A Practical Grammar of the Sanskrit Language*. Oxford: Clarendon.