Some Chimeras of Traditional Spanish Phonetics

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1. Introduction

Even at the end of the 20th century and the beginning of the present one several traditional claims concerning the issues that will be addressed in this paper continue to be wrongly upheld (e.g. Quilis 1993, Núñez and Morales 1999, Torrejón 2000, Guitart 2004, and Hualde 2005).

The title of this paper contains the word ‘chimera’ understood as “an unrealistic idea you have about something” (Collins Cobuild English Language Dictionary) or “lo que se propone a la imaginación como posible o verdadero, no siéndolo” ‘what is suggested to the imagination as feasible or realistic but in fact is not’ (DRAE “Dictionary of the Spanish Academy”). Given the available space, only three chimeras will be examined. Firstly, I will consider the phonetic analyses of the traditionally so-called voiced fricatives of Spanish, which have been analyzed as allophonic variants of stops, which share the same place of articulation; I will offer evidence in support of their classification as spirant approximants. Secondly, I will look at the relevance of voicing to Spanish phonology in addition to showing its phonetic instability across Spanish dialects. Lastly, I will attempt to determine whether [t,d] are indeed apico-dental, as all handbooks have claimed to date.

2. First chimera: stops-fricatives-approximants

As far back as 1620, Juan Pablo Bonet wrote a handbook for teaching mute people how to speak. Although the book was based on spelling, it explained how letters should be pronounced so that instructors could teach mute people satisfactorily. As far as the first chimera of this paper is concerned, Bonet noticed the difference in the manner of articulation between voiceless and voiced stops, as well as that between stops and approximants. In summary, he noted that voiced stops had a weaker burst, if they had any: “Para pronunciar esta letra <b> se han de pegar los labios y entreabrirlos suavemente quando llegare a herir la respiración en ellos”, “In order to pronounce the letter <b> press the lips together and carefully open them half-way when the airflow touches the lips” (cited in Navarro Tomás (N.T.) 1920:138). In contemporary phonetics, this corresponds to an approximant articulation. Earlier in the handbook (p. 95, as cited in N.T. 1920), Bonet had stated that “esta letra <p> tiene por nombre el sonido que haze una respiración muy parecida a la de la <b>, difiriendo la una de la otra en que en aquélla (<b>), como queda dicho en su lugar, se entreabren los labios para dexar salir con suavidad la respiración, y en ésta (<p>) está retenida en la boca, y assí sale después con violencia, pareciendo que ella abre los labios por fuerça, que por estar pegados no la dexarian salir voluntariamente”, “the letter <p> takes as its name the sound made by an act of breathing very similar to that of <b>, though differing in that in <b>, as mentioned before, the lips open half-way to let air out carefully, while in <p> the air is retained in the mouth and is then expelled violently, when it seems to force its way out by opening the lips, which would not let air out voluntarily as they are pressed together”. Based on this description, there is clearly a different way of pronouncing both sounds with Bonet perceiving the different strength with which these two sounds are pronounced. The difference between stops and approximants is more obvious in the passage on <d>: “suena con más suavidad y blandura, como quando dezimos piedad, humildad, que no tiene en estas ocasiones la <d> la fortaleza de quando se
comienza la palabra por ella” (p. 301) “it sounds smoother and softer, as when we say piedad ‘piety’, humildad ‘humility’, in which <d> does not have the same strength as when it is in word-initial position”. Thus, Bonet (1620) presents the two allophones of the phoneme /d/ as being involved in a strength relationship.

As for fricatives, he points out that “la respiración sale apremiada por entre los órganos de la articulación” (N.T. 170), “the air is squeezed out between the speech organs”, so there exists no confusion between approximants and fricatives. In turn, Bonet differentiates approximants from their corresponding stops, based on the fact that the organs are half-open in the former and are characterized by a softer pronunciation. On the other hand, fricatives have to be “pressed out”, which to a certain extent entails a phonological view based on letters, as it is evident that the stop and approximant articulations refer to the very same letters, <b> and <d>.

At the beginning of the 20th century, Gonçalvez Vianna (1906) highlighted the fact that speakers were not aware of the difference between the stops [b,d,g] and their corresponding fricative variants. He commented on this impression to an Andalusian friend of his who was learning English: Vianna had noticed that the pronunciation of English <th> in words such as that, though, and breathe, was distinct from that of Spanish <d> in intervocalic position. Vianna observed that “las fricativas sonoras se aproximan mucho más a sus oclusivas homorgánicas que las fricativas sordas lo hacen de las oclusivas de su mismo punto de articulación” (p.852), “voiced fricatives are closer to their homorganic stops than are voiceless fricatives to stops sharing the same place of articulation”. Although the identification of the non-stop variants of /b,d,g/ with fricatives precludes a phonetically accurate classification of these sounds, this remark shows that there are doubts as to the classification of these sounds as fricatives.

It is well-known that Navarro Tomás (1918) followed standard practice at the end of the 19th century and beginning of the 20th century in classifying the present-day so-called spirant approximants as fricatives. However, such a taxonomy poses several problems. Take, for instance, the lack of a clear difference in his Manual between the two types of fricatives that share a set of features – namely, both are laminal, interdental, fricative and voiced: [θ] (which could also be transcribed as [ð]) deriving from the voicing of /θ/ as in jazmin ‘jasmine’, and [ð] from the stop /d/ as in admirar ‘admire’. In 1934 Navarro Tomás published his article “Rehilamiento”, where he stated that both sounds share a number of place and manner features: “sin embargo, en la pronunciación normal castellana son dos sonidos diferentes que se producen en correspondencia con dos fonemas distintos” (1934:274), “however, in everyday Spanish pronunciation they are two different sounds produced in accordance with their two different phonemic origins”.

He then noted that “Se diferencian entre sí por el elemento fonético que llamamos rehilamiento, vibración relativamente intensa y resonante con que se producen ciertas articulaciones. La z es
rehilante y la d no lo es”, “they differ from each other in the phonetic characteristic called rehilmiento, a relatively intense and resonant vibration with which several articulations are produced. z is rehilada, but d is not”. (Compare the two spectrograms in Figure 1). Later (p. 276), he indicated that “en la acepción fonética de rehilar comprendemos asimismo juntamente la vibración que estremece los órganos, no sólo en la laringe, sino en el punto de articulación, y el efecto acústico que de esto resulta”, “in the phonetic sense, by rehilar we also understand the vibration that takes place in the organs, not only the larynx, but also at the place of articulation and the resulting acoustic effect”. That is, Navarro Tomás described what was later known as the “turbulent airstream” (Ladefoged & Maddieson 1996:137) that characterizes true fricatives.

I first used the term approximant to refer to these sounds (Martínez Celdrán 1984), and since then I have studied them in depth and defended this classification on several occasions (1985, 1991b, 2004). In fact, I have been doing nothing more than following other authors, such as Catford (1977) and Canepari (1979). After my initial classification for Spanish, many authors supported my ideas unreservedly, (e.g. Canellada and Madsen 1987, Santagada and Gurlekian 1989, D’Introno et al. 1995, Aguilar 1997, and Hualde 2005). However, others still remain reluctant (e.g. Quilis 1993, Núñez Cedeño and Morales Font 1999, and Torrejón 2000). Guitart (2004:30-31) even affirms that

Es importante señalar que con frecuencia en español una fricativa inestridente o débil como [β] en lobo, o [ð] en todo, o [ɣ] en hago, se pronuncia aproximante en el habla sumamente relajada. Por ejemplo, para [β] el gesto hecho con el labio inferior no logra crear en combinación con el labio superior la estrechez que se necesita para que el sonido resulte fricativo.

“It is important to note that very often in Spanish a non-strident or weak fricative like [β] in lobo ‘wolf’, or [ð] in todo ‘everything’, or [ɣ] in hago ‘I do’, is pronounced as an approximant in very relaxed speech. For instance, for [β], the gesture made with the lower lip in conjunction with the upper lip fails to form the constriction needed for the resulting sound to be fricative.”

The spectrogram in Figure 2 is taken from the speech of a Spanish television host during a programme broadcasting a political debate. Accordingly, his register is formal and careful. Consequently, it is impossible for speech to be very relaxed in these circumstances as described by Guitart. Despite this, approximants appear throughout the utterance, not only with /g,b/ but also with the rhotic sound. The following spectrogram shows but one example of the many instances that could be presented for all dialects.

![Figure 2. Examples of approximants in formal, careful speech.](image-url)
Whereas the spectrogram in Figure 2 is a sample from Castilian Spanish, Figure 3 provides the spectrogram of the sentence *La bodega (estaba cerrada)* ‘The wine cellar (was closed)’ read by a native Venezuelan speaker, who produces all the sounds in question as approximants.

![Figure 3. Approximants in Venezuelan speech.](image)

With reference to Ladefoged’s (1975) definition of approximant, a modification needs to be made – namely, the constriction in the articulatory organs can exist and yet we still have an approximant. Romero (1995) accepts that the constriction of the articulatory organs in approximants might be the same as that in fricatives; hence, the greater openness of the organs does not constitute a requirement sine qua non (Martínez Celdrán 2004). In the spectrogram in Figure 3 three degrees of closure can be observed: nearly complete closure in the bilabial segment, half-closure in the dental and slight closure in the velar. This casts doubt on the nature of the first sound: is it a stop or an approximant?

I believe it is an approximant, since any stop in intervocalic position must have a burst. Most references state that “when the oral closure is released in the offset phase of an oral stop…, the compressed air escapes into the atmosphere with a small but audible explosion, sometimes referred to in the acoustic phonetic literature as the stop burst” (Laver 1994:205); this happens particularly when the stop is followed by a vowel. Therefore, I consider this burst essential. In close approximants the air is not compressed, thus there is no burst (for differences between those sounds see Figure 4).

There is a crucial articulatory difference between a stop and a close approximant. Catford (1977:118) indicates that “there is a continuum of possible degrees of openness running from the complete, tight closure of a stop like [p] or [b]…”. In my view, the use of the adjective “tight” is paramount to the definition of a stop. Thus, while in the articulation of a close approximant the organs can be very close to the point of almost touching each other, there is never complete closure. It then follows that this nearly complete closure cannot be tight (as in stops); hence there is no burst.

![Figure 4. Comparison of a stop and close approximant.](image)
All things considered, it is evident that spirant approximants constitute a prototypical sub-category with some elements located in the neighbouring boundary of stops while others approach vowels. On the left side of Figure 4 the reader can see clearly the stop burst for the [d] after the nasal; in contrast, on the right-hand side there is no burst for the second [G]. This is the typical manifestation of a close approximant on a spectrogram. From a perceptual point of view, there is no audible stop, rather an approximant of the type observed leftward in the same spectrogram. True voiced intervocalic stops usually sound rather like unvoiced stops in Spanish because of their greater tenseness as compared to the respective approximants.

Ladefoged and Maddieson (1996:137) point out that

The gesture forming the constriction in many fricatives has a greater degree of articulatory precision than that required in stops and nasals […]. A stop closure will produce more or less the same sound as long as it is complete, irrespective of whether there is firm or light contact. But in a fricative a variation of one millimeter in the position of the target for the crucial part of the vocal tract makes a great deal of difference. There has to be a very precisely shaped channel to produce a turbulent airstream.

This quotation is of interest to those wishing to characterize the true nature of these sounds. Among other things, the category of fricatives has traditionally been a hodgepodge class to which any consonant sound other than stops was assigned; a good example of this is spirant approximants. These sounds do not share any of the typical features of fricatives. That is, they do not have a turbulent airstream nor do they need a crucial degree of articulatory precision – which, in fact, is less than in stops. Additionally, spirant approximants are significantly shorter than fricatives. Moreover, in the case of close approximants, there is not the complete closure found in stops. It can be seen then that there is no reference to tension, but to articulatory precision, although on occasion the strength of the stop closure is mentioned. Ladefoged and Maddieson avoid discussing articulatory tension, but there might be a subtle way to address it, namely, by referring to the degree of articulatory precision, as they do. Based on this notion, three degrees of articulatory precision can be established: maximum in fricatives, medium in stops, and minimum in approximants.

Why are these types of approximant called spirants? It is simply a matter of differentiating them from semi-vowels, liquids and rhotics, which also are approximants. Furthermore, the term is reminiscent of the distinction Martinet (1956) drew between fricatives and spirants.2 In spite of the fact that the term has been used as a synonym of fricative, it has become obsolete. On the other hand, the true meaning of “spirantization” is a process of weakening, whereby the segment turns into a spirant approximant rather than a fricative. If the process resulted in a fricative, there would be no weakening. According to the quotation from Ladefoged and Maddieson above, this is the case for large areas of Spain, where word-final /d/ is realized as [0] (e.g., Madrid [maDaardi]). From my point of view, the traditional confusion between fricatives and approximants underlies the claim that spirantization is a process of change from stop to fricative, whereas it is in fact a change from stop to approximant (“spirant”).

Apart from bilabial, dental, and velar segments, the palatal segment should also be classified as a spirant approximant, although the phonetic literature on Spanish still puts into question such a categorization. A number of authors who recognize the existence of the aforementioned approximants continue to describe the palatal segment as a fricative. For instance, Face (2003) states that “In other positions, /b,d,g/ are realized as voiced approximants” (p.26), but then he comments regarding /D/ that “the most common pattern is a palatal fricative pronunciation” (p.27). Following the publication of his

2 “Il est indiqué de distinguer entre les articulations relâchées (type du d d’esp. ocupado), qui tendent vers une ouverture de type vocalique, pour lesquelles on réservera le terme de spirantes, et des consonnes d’articulation ferme, nettement caractérisées par le frottement de l’air, qui sont proprement des fricatives (type du th d’angl. father)” (Martinet 1956:24-25). “It is appropriate to distinguish between relaxed articulations (as with Spanish d in ocupado), which tend towards a vowel-like openness, for which we will keep the term spirants, and consonants with a strong articulation, clearly characterized by the frication of the air, which are true fricatives (as with English th in father)” [boldface added]
article on “rehilamiento”, Navarro Tomás admitted the existence of three possible realizations of the segment he transcribed as /y/: “la y de mayo, con pronunciación suave, africada o rehilante, constituye igualmente una sola unidad fonológica” (1946:9) “the y in mayo ‘May’, with a soft, affricate or rehilante pronunciation, constitutes a single phonological unit”; hence he no longer talked about fricative, but instead used the terms ‘soft’ or rehilante. It can be shown that what he called ‘soft’ is a spirant approximant, which is the most common realization except in emphatic speech and in dialects of the River Plate region. A prototypical realization is displayed in the spectrogram of the word apoyado ‘leaning’ (Figure 5, left), where the absence of noise, a very weak F2, and the clear formant structure of the remaining elements can be observed. Thus, it is clearly not a fricative. The corresponding semi-vowel is a mere lengthened transition of the vowel accompanying the syllable nucleus, as demonstrated in the spectrogram of the word hacia ‘towards’ below (Figure 5, right). Needless to say, we agree with the claim that the palatal spirant and the palatal semi-vowel are distinct sounds and phonemes. As long ago as 1895, Saroïhandy stated that the confusion between these two sounds was not plausible: u in bueno ‘good’ and i in bien ‘well’ are, above all, asyllabic vowels, while (h)i- in hierba ‘grass’ and (h)u- in hueso ‘bone’ are true consonants. For that reason, he suggested the transcriptions bien and bueno; yerba and weso, respectively.

Figure 5. Palatal approximants: spirant and semi-vowel realizations in Castilian Spanish.

Figure 6. Palatal approximants in Venezuelan Spanish: spirant and semi-vowel realizations, respectively.

The spectrogram in Figure 6 illustrates the pronunciation of the palatal approximant by a yeísta speaker (a speaker that pronounces Spanish /ʃ/ as [ʃ]) from Venezuela. In comparison to the corresponding semi-vowel, it can be seen that there is weakening in F2 and F1. Moreover, its short

3 In this quote, the term rehilante is a synonym for “fricative” since it characterizes a sound which is produced with a turbulent airflow.
duration and a total absence of noise can be observed. In the same word *lluvia* ‘rain’ the differences between a spirant and a semi-vowel can be easily discerned, particularly as concerns F2. Moreover, there is a further difference worth noting – namely, the palatal spirant labializes before back vowels or a back semi-vowel, whereas the palatal semi-vowel cannot become labialized.

Navarro Tomás never mentioned a stop realization among the allophones of such a sound, but rather an affricate. However, if an affricate realization involves a fricative release, this allophon is neither an affricate nor a stop, since its release often involves an approximant element (Martínez Celdrán & Fernández Planas 2001).

![Figure 7. Affricate realizations: alveolo-palatal and palatal, respectively.](image)

In the image on the left of Figure 7, the typical voiced alveolo-palatal affricate of Catalan is shown. On the right, there is a “double articulation” realization of the palatal segment, where the occlusion is very short and is followed by an approximant element.

When the second element of this allophone contains noise, as in the spectrogram of Figure 8, then it is not an alveolo-palatal type ([ʒ]), but rather a palatal ([ʝ]). Thus, a more accurate transcription would be [ʝ]. In addition, when the element is approximant, the corresponding diacritic should be added to this transcription.

The electropalatograms in Figure 9 demonstrate that the affricate and the “double articulation” have different places of articulation: the former alveolo-palatal, the latter palatal. From top to bottom, the first row represents the gum ridge boundary, where the front teeth are embedded. The following three rows correspond to the alveolar ridge, the next three rows to the palate, and the last row to the velum. The electropalatograph provides an image every ten milliseconds; therefore the three

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4 Consequently, the transcription [ðʒ] suggested by Quilis (1993) and Aguilar (1997) is not accurate.
electropalatograms of each affricate in Figure 9 depict 30 milliseconds of sound production. The contact points are marked with small zeros.

Figure 9. Electropalatograms of alveolo-palatal and palatal affricates, respectively.

3. Second chimera: devoicing - voicing

Torreblanca (1976) has shown the large number of instances of voicing in Spanish voiceless consonants, especially in Toledo:

En el habla toledana, la norma consiste en la sonorización parcial o total de los fonemas /p, t, k/, precedidos de sonidos sonoros. Únicamente en el discurso enfático aparecen casos de oclusión totalmente sorda. Incluso con gran tensión articulatoria, es posible que ocurran algunas vibraciones laringeas al principio de la consonante. La sonorización es un proceso gradual (1976:127).

‘In the speech of Toledo the norm consists of the partial or full voicing of the phonemes /p,t,k/ when preceded by voiced sounds. Only in emphatic speech do cases of fully voiceless closure occur. Even with great articulatory tension, it is possible for some laryngeal vibration at the beginning of the consonant to occur. Voicing is a gradual process.’

He also demonstrated that

El ensordecimiento de /b,d,g/ es el resultado de un aumento de tensión articulatoria. En cuanto a la sonorización de /p,t,k/, tiene su origen en una disminución de tensión articulatoria (1976:138).

‘The devoicing of /b,d,g/ is the result of an increase in articulatory tension. As for the voicing of /p,t,k/, it has its origin in a diminution of articulatory tension.’

En pronunciación más relajada, la sonorización de /p,t,k/ puede ser total, hecho comprobado en el español peninsular y en el americano. Inversamente, los supuestos fonemas sonoros /b,d,g/, pueden ensordecirse totalmente al principio de sílaba, en la pronunciación enfática. Lo que distingue /p,t,k/ de /b,d,g/ en cualquier modo de pronunciación, es la mayor tensión articulatoria de los primeros fonemas, la cual se manifiesta en diferencias de duración y de grado de cerrazón (Torreblanca, 1979:456).

‘In more relaxed pronunciation the voicing of /p,t,k/ can be full, as observed in Castilian and Latin American Spanish. Conversely, the alleged voiced phonemes /b,d,g/ can fully devoice at the beginning of syllables in emphatic pronunciation. In any mode of pronunciation, what distinguishes /p,t,k/ from /b,d,g/ is the greater articulatory tension of the first class of phonemes, which manifests itself in differences in duration and degree of closure.’

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5 He found the same tendency in many other places, as stated in a footnote.
As mentioned earlier Bonet used the terms “softness” and “strength” to make a distinction between /b/ and /p/, respectively, as well as between the two variants of the phoneme /d/ (i.e. approximant and stop). As such, Bonet had already described the differences between these two sounds in terms of their relative strength, which is currently referred to as tension (Torreblanca, 1979).

Nevertheless, the extent to which a speaker’s pronunciation should be so relaxed as to produce instances of voicing is not clear, as Torreblanca himself points out. Once again, the spectrogram in Figure 10 shows the former Spanish TV host participating in a political debate, saying “lo que se pretende…” ‘what is intended…’.

![Figure 10. Instances of voicing in formal, careful speech.](image)

It should be noted that initial *que* and *se* are voiced, the rhotic sound is also an approximant, and the dental consonant following the nasal in *pretende* is not a stop as many handbooks claim, but rather an approximant. Such voicing occurs in speech that is by no means relaxed. Moreover, some dialects might voice everything. The spectrogram in Figure 11 presents a Murcian speaker reading several sentences aloud. Here the speech is not relaxed, either. The glottal pulses corroborate the full voicing of the sentence “la guitarra se toca con (paciencia)” ‘the guitar is played patiently’.

In Figure 11, <t> in *toca* ‘is played’ is a voiced stop, while <c> is an approximant with all of its features (i.e. absence of noise and rather shorter duration). To a certain degree this is in contrast to Hualde (2005:143), who indicates that duration is longer with /p,t,k/. This does not apply when they are approximants, since they are shorter. Another relevant study is Machuca (1997). She examined speakers of Barcelona and concluded that 40% of the occurrences of /p,t,k/ became voiced, and only 9% of the instances were approximants. Yet I would question this finding as the author may have counted close approximants as stops. In addition, there is no firm evidence that voicing only takes place in conversational and informal registers, as the spectrograms above show that voicing is present in formal registers too. In all these instances there is clear neutralization of cues for stops and voicing, as well as duration, since the voicing of /k/ creates an approximant (Figure 11, *toca*), the duration of which is no longer than that of /g/ in *guitarra*, as illustrated above.

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6 A similar reanalysis and tallying of the data in Lewis (2001) can be argued for. This author displays spectrograms for which segments transcribed as stops involve no trace of a burst (e.g. Figure 1.12, p. 29, /k/ in *la vaca* ‘the cow’). These sounds are in fact close approximants and, accordingly, the number of approximantized realizations is higher than the instances of voicing of voiceless stops.
On commenting on Zipf's law, Malmberg (1967:202) observed that voiceless sounds have twice the frequency rate of appearance of voiced sounds in languages where voicing is a distinctive feature. By contrast, many instances of intervocalic voicing are common in Spanish, in addition to being the most recurrent realizations in coda position (see the spectrogram of the word *affecta* ‘affects’ in Figure 12, where /k/ becomes a voiced approximant in coda position).

Table 1 provides the frequency of voiceless and voiced stops in syllable onsets in Spanish spoken texts based on Quilis (1981). Contrary to Malmberg’s generalization, the frequency of voiceless sounds is not twice that of voiced bilabials and denti-alveolars.

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Denti-alveolar</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiceless</td>
<td>2.77</td>
<td>4.53</td>
<td>3.98</td>
</tr>
<tr>
<td>Voiced</td>
<td>2.37</td>
<td>4.24</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Table 1. Frequency rates in spoken texts.

Without a doubt, the status of the voicing feature in Spanish is very controversial. Therefore, if phonology needs to be grounded in a firm phonetic basis, voicing cannot be considered a distinctive
feature in Spanish. While there are marked differences in duration, these are often neutralized, particularly if a segment becomes approximantized through voicing. Approximantization has been observed to be a more frequent phenomenon than traditionally thought to be.

Most present-day phoneticians and phonologists, however, would object to readopting the feature [tense] of Jakobson & Halle (1956) and Chomsky & Halle (1968), since it does not have controllable parameters. That is, they reject the presence of tension since the exact nature of such a feature is not known. All this is in opposition to normal practice in other fields of science. For instance, in astronomy the existence of Neptune was inferred long before undeniable evidence came to light. Likewise, in physics or biology it is common to assume certain phenomena that are still not fully known. Thus, even in the absence of indisputable facts, the existence of such entities is not denied.

There have always been references in the literature to the feature [tense]. However, as yet there is no definite way to characterize it in acoustic and articulatory terms. In my own research, several attempts have been made to demonstrate its existence, although there has been no decisive evidence to date. For example, a neurologist informed me that one method was to measure sweat on the palm of the hand through a machine. This is because “electrodermal activity (EDA) reflects sympathetic cholinergic sudomotor function which induces changes in skin resistance to electrical conduction. EDA, assessed by the Sympathetic Skin Response (SSR), has been proposed as an easily obtainable index of sudomotor function and as a sensitive index of bodily arousal related to emotion and attention” (Vetrugno et al. 2003:256). SSR is commonly used for measurements in psychophysiological studies. Figure 13 shows one of the various tests performed by myself. First, some electrodes were placed on the lips in order to measure activity, while the electrodes on the palm of the hands measured sweating. “SSR shape consists usually of negative and positive phases. The source of the negative component of SSR is the sweat gland itself and depends directly on its neuronal innervation” (Vetrugno et al. 2003:261). As can be observed in Figure 13, lip activity is greater in [p] than in [β]. More importantly, there is a larger difference in the sweating response, that is, in the negative area of the wave, which is bigger in [apa]. A greater negative wave phase entails a greater effort in the articulation of [apa]. This proposal constitutes a possible way to confirm the existence of articulatory tension.

In spite of the reluctance to use the feature [tense], some authors talk about “strong consonants” and “weak consonants”, or even “strength” (Face, 2003). Although all that is regarded as a process, this notion is still taken into account: for instance, an approximant is a weak consonant, in contrast to a stop which is a strong consonant.

E.g. an extract from a biology book reads “desconocemos la naturaleza de los antígenos propios implicados en la supervivencia de los linfocitos”, “we do not know the nature of the antigens involved in the survival of lymphocytes” (Abbas & Lichtman 2004:21).

Approximately, the area of the negative waveform of [p] is 47.5 mm² and that of [β] is 12 mm² – i.e. a 35.5 mm² difference as measured on paper (image size: 75 mm high x 60 mm wide).
The difference in duration between stops and approximants is present. In short, it is the result of tension, as demonstrated by Martínez Celdrán (1991a,1993). However, it should be recalled that the instances of /p,t,k/ voicing often result in approximants, rather than voiced stops. This involves a reduction in duration, yet auditorily /p,t,k/ are still perceived as such. In that case, an additional distinct feature other than voicing and duration comes into play, unless these phenomena (tension, voicing, duration...) can be accounted for by means of a phonological model based on usage, such as that of Bybee (2001). In this model the phonological structure of words stored in the lexicon is the determining factor in the interpretation given to what it is perceiving. In fact, if attention is paid to the sound in question, it is perceived as voiced. By contrast, if we hear the whole word, the sound is perceived as voiceless, based on the use that we make of our knowledge of the word and the context. Nevertheless, speakers of a dialect that typically voices everything cannot be guided by context, thus they have to resort to other cues to distinguish between sounds.

4. Third chimera: apico-dental versus laminal denta-alveolar

Based on Ladefoged and Maddieson’s (1996) book, several issues in Spanish phonetics should be reconsidered, among others, the issue of Spanish dentals. The authors state that “in many languages [...] the dental stops typically have a long contact in the sagittal plane, and might better be regarded as laminal denta-alveolars rather than pure dentals” (p.21). Earlier in the book they note that “in the languages we have investigated, dental stops are usually laminal rather than apical, with contact on both the teeth and the front part of the alveolar ridge”. According to these authors, only the Temne language has pure dentals involving no contact with the alveolar ridge and apicals.

These affirmations contradict the statements of many other authors concerning Spanish. The classic essays on Spanish phonetics described [t,d] stops as apical dentals. Take, for instance, Menéndez Pidal (1918:83-84), who indicated that

Para pronunciar la t, la punta de la lengua se aplica a la cara interna de los dientes, bajando hasta el borde inferior de los mismos, pero no avanza a ser interdental. Es, pues, una t más baja que la francesa (que se articula hacia las enclases), y mucho más que la inglesa (articulada hacia los alvéolos).

“In order to pronounce t, the tongue tip touches the inside of the [upper front] teeth, stretching down to their lower edge but not to the point of becoming interdental. It is, therefore, a lower t than that of French (which is articulated towards the gum ridge) and even lower than that of English (articulated towards the alveolar ridge).”

More recently, Hualde (2005:47) has argued that “In dental consonants the passive articulator is the base of the upper front teeth […] these consonants are apicodental”. Along the same lines, Torrejón (2000) presents two articulatory diagrams which illustrate stops and approximants (Figure 14, left and right side, respectively).

Both diagrams are inaccurate, though. The diagram on the left corresponds to a pure apico-dental stop which does not represent any current Spanish sound. As mentioned above, Ladefoged and Maddieson (1996) observe that only Temne has this type of articulation. According to Torrejón, the diagram on
the right depicts an approximant – or, in his words, fricative – but [θ] is indeed interdental, therefore the tongue tip protrudes between the teeth, which in turn are in contact with the laminal area. As a matter of fact, the articulatory diagram on the right shows the dentalization of apical /s/ before /t,d/ (e.g. este, desde, etc.; Navarro Tomás 1918 §105).

On the other hand, Navarro Tomás had already noted in 1918 that “la punta de la lengua se apoya contra la cara interior de los incisivos superiores [...] después, el contacto de la lengua se extiende más o menos, hacia arriba, por las encías y los alveolos...”, “the tongue tip touches the inside of the upper teeth [...] then, the contact of the tongue to a greater or lesser degree stretches upwards, along the gum and alveolar ridges” (Navarro Tomás 1918:97). That is to say, the articulatory diagrams that best characterize these articulations are those in Figure 15, where the approximants involve the tongue tip between the teeth, and the stops are denti-alveolar, as Ladefoged and Maddieson demonstrate.

Figure 15. Articulatory diagrams of interdental and denti-alveolar sounds (Martínez Celdrán 2003:32).

In addition, the four consecutive electropalatograms below illustrate the ample contact of the tongue with the alveolar ridge (Figure 16), and further confirm that in the production of the stop there exists ample contact with the alveolar ridge (Fernández Planas & Martínez Celdrán 1997). By contrast, the first row does not tend to display any contact with the alveolar ridge; instead it clearly shows pure dental realizations: “for dentals the place of articulation is at the first row of EPG electrodes” (Krull, Lindblom, Shia & Frutcher 1995:436, and in the similar terms Jannedy, Poletto & Weldon 1994:80).

Figure 16. Electropalatograms of a denti-alveolar sound.

5. Conclusions

The aim of the present paper was to address three chimeras of traditional Spanish phonetics by means of examining previous research findings and theoretical argumentation, in addition to providing new insights into the issues under scrutiny.

The first chimera was concerned with the traditional hypothesis that the non-stop allophones of /b,d,g/ are fricative, that become approximants only in very relaxed speech. In contrast, it was shown that these segments are usually approximants in most Spanish dialects. Additionally, the use of the term spirant to refer to a subclass of approximants different from semi-vowel, rhotic, and lateral approximants has helped to better define what is meant by spirantization, specifically a lenition or weakening process. Furthermore, it was ascertained that voiced palatal consonants are realized as either double articulations or spirant approximants, depending on the context, which parallels the realization of /b,d,g/; while the fricative realization of the voiced palatal consonants in question is emphatic.
The second chimera discussed was the maintenance of voicing – usually associate with vocal fold vibration – as a feature relevant to Spanish phonology, despite its unstable realization in Spanish involving a large number of instances of voicing not only of /p,t,k/ but also of the fricatives /f,s,x/, and in spite of the weakness of this feature in the syllable coda. For all these reasons, it was established that the feature [tense] characterizes these phonemes better. Moreover, further evidence was provided in support of the function of tension, even if its exact nature is still not known at present.

Finally, the third chimera involved the laminal denti-alveolar realization of the allophones [t,d], as opposed to the pure apico-dental realization claimed by some. In an effort to support my claim, I have presented a series of electropalatograms showing the ample contact of the tongue with the alveolar ridge in the production of Spanish dental stops. There is additional support from Ladefoged and Maddieson (1996), who have argued that in most languages dentals are in fact denti-alveolar rather than pure dentals, which are really interdentals.

Taking all of the above into account, it might be concluded that some widely accepted phonetic and phonological facts of Spanish call for refinement. It is important not to groundlessly repeat the arguments that have been put forward since the beginning of the 20th century. Modern analysis techniques can assist in better defining and improving the available knowledge of the phonetics of languages: it is a matter of being open to change.

References


