/s/ aspiration in Andalusian Spanish in word internal position and across word boundaries: an experimental study of four cities.

La aspiración de /s/ implosiva en el interior de palabra y en la fonética sintáctica: un estudio experimental de cuatro ciudades andaluzas.

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Abstract

This study presents acoustic data relating to the realisation of coda /s/ in four cities in Andalusia. It differs from the majority of recent studies in that it analyses the effects of coda /s/ on all types of consonants, both word-internally and across word-boundaries. In the latter context, different morphological values of /s/ are also analysed. The results suggest that the phonological system of Andalusian Spanish is being radically altered. In word internal position, the historical effects of /s/ aspiration are producing a series of new incipient phonemic distinctions of which the most robust are elongated and/or aspirated consonants. As for across word-boundaries, the findings are only significantly different from word-internal coda /s/ for the city of Seville. For the speech of this city, it seems that /s/ has been lost / is being lost when it is a marker of 2sg on verbs and plural on nouns. However, when /s/ is part of lexeme, i.e. in the word dos 'two', the phonetic cues are robust and similar to those in word-internal position. I end the article with a tentative hypothesis as to how this situation could be effecting the morphological system and point to possible future developments.

Keywords: Andalusian Spanish; aspiration; gemination; sound change; morphologisation.

Este estudio presenta datos acústicos relativos a la realización fonética de /s/ implosiva en cuatro ciudades de Andalucía. Se diferencia de la mayoría de los estudios recientes en que analiza los efectos de /s/ implosiva ante todo tipo de consonantes, tanto en el interior de palabra y en la fonética sintáctica. En este último contexto, también se analizan los distintos valores morfológicos de /s/. Los resultados sugieren que el sistema fonológico del español de Andalucía se está cambiando notablemente. En el interior de palabra, los efectos históricos de la aspiración de /s/ están produciendo una serie de nuevas distinciones fonémicas de las que las más robustas son las consonantes alargadas y/o aspiradas. En cuanto a la fonética sintáctica, los resultados sólo son significativamente diferentes del contexto de interior de palabra para la ciudad de Sevilla. Para el habla de esta ciudad, parece que /s/ se ha perdido o se está perdiendo cuando es un marcador de 2sg en los verbos y de plural en los sustantivos. Sin embargo, cuando /s/ forma parte del lexema, es decir, en la palabra *dos*, las pistas fonéticas son sólidas y similares a las del contexto de interior de palabra. Concluimos el artículo con una hipótesis provisional sobre cómo esta situación podría estar afectando al sistema morfológico y señalamos posibles desarrollos futuros.

Palabras clave: Español de Andalucía; aspiración; geminación; cambio fonético y fonológico; morfologización.

1. Introduction

Recently, aspiration of coda /s/ before voiceless occlusives in Andalusian Spanish has attracted substantial academic attention due to its various phonetic realisations. The most notable of these is the lack of phonetic cues of aspiration after the vowel and, in its stead, the most frequent pronunciation is a voiceless aspirated stop in Western Andalusian Spanish (WAS) and a voiceless aspirated and elongated stop in Eastern Andalusian Spanish (EAS). There has been much debate on the phonetic motivation and phonological status of such sound changes. Regarding the latter, Torrerira (2007b, 2007a, 2012) has argued that these post-aspirated pronunciations are not intended by speakers but are the result of purely phonetic processes relating to the synchronisation and overlap of articulatory gestures. However, others have argued that at least some, if not the majority, of post-aspirated pronunciations are intended by speakers (O'Neill 2010, 2009; Parrell 2012). All scholars agree, however, that there is a sound change in progress in Andalusian Spanish, resulting in a process whereby the historic effect of /s/ aspiration is undergoing a metathesis and producing post-aspirated stops, which also have a tendency to also be elongated in EAS ((Gerfen 2002; Moya Corral 2007; O'Neill 2010, 2009; Parrell 2012; Ruch 2012; Ruch and Harrington 2014; Torrerira 2007b, 2007a, 2012; Torrerira and Ernestus 2011). Regarding the phonetic motivation of the sound changes. Issues have centered around whether an elongated consonant [pa^{h}t$^{\cdot}$a] [pat:a] (due to the overlap between the glottal gesture for the aspiration and the occlusive gesture) is a necessary initial step, or not, for the triggering of post aspiration via increased air-pressure during the closure and concomitant early release of the stop (O'Neill 2010, 2009; Torrerira 2007b, 2007a, 2012; Torrerira and Ernestus 2011; Ruch 2012; Ruch and Harrington 2014). Alternatively, it has been defended that post-aspirated stops could have emerged via the reorganization of the glottal spreading gesture for /s/ and the oral closure gesture for the stop, whereby instead of the gestures ocurring sequentially, they come to be synchronised with each other (Parrell, 2012). The different explanations make different predictions regarding the trade-offs between durations of pre-aspiration, post-aspiration and the occlusive closure gesture. However, different experiments produce different and, at times, contrasting results (see Ruch & Harrington 2014 and Ruch & Peters 2016 for comprehensive overviews).

Common to all the aforementioned studies, however, is (a) their exclusive focus on /s/ before voiceless occlusives in word internal contexts (e.g. *pasta, caspa*) and (b) the variety in the geographical origin of the participants selected to represented both EAS and WAS. Thus, whilst the participants in the study of Ruch and Harrington (2014) all came from either the city of Seville (WAS) or the city of Granada (EAS), Torreira's three speakers of WAS were from the city of Cádiz, and the 20 participants in Parrell's (2012) study came from the large provinces of both Cádiz and Seville. Torreira's (2007b) study stands out as having participants from geographically distant locations spread across seven different cities and four different provinces of Andalusia (Seville, Écija (85km from Seville) , Lepe (121km from Seville), Camas (8km from Seville); Chiclana de Segura (209km from Granada), Javalquinto (135km from Granada), La Rábita (56km from Granada), Almuñécar (46.5 km from Granada)).

In normal speech, /s/ tends not to have an alveolar fricative pronunciation before any consonants in Andalusia but there is a marked lack of research as to (a) what these pronunciations are, (b) the effects of external sandhi and (c) whether the morphological status of <s> influences its pronunciation. Moreover, Andalusia is the largest autonomous community in Spain and one which is particularly rich in diatopic variation, thus it is expected that the speech of people in a village in Cádiz will be markedly different from that of Seville capital, despite both being WAS; the former is usually characterised by *ceceo* whilst the latter by *seseo/distincción*.

The present study, therefore, does not primarily intend to explore the contested academic questions, summarised above, regarding the phonetic origin and phonological status of any new types of pronunciations; rather, the aim is to (a) expand on previous research in analysing more linguistic contexts of coda /s/, specifically: word internal position before all types of consonants and across word boundaries pre-vocalically and in all preconsonantal positions, and (b) explore the different types of morphological <s>, specifically: as a marker of 2SG on verbs, PLURAL on nouns and in the word *dos;* (c) dispense with the terms WAS and EAS and focus on the speech of particular geographical locations, specifically: the cities of Almería, Cádiz, Granada and Seville.

2. Method

The data for this experiment came from a corpus of recordings collected by the author in 2005. The recordings were of 4 subjects (2 male and 2 female), in the four cities mentioned above; all participants were 18 years old and native inhabitants of their respective cities. The corpus contained words containing the sequences V[owel]S[ibilant]C[onsonant]V[owel] (VSCV) in both word internal position and across words (VS#CV) and their minimal or near minimal pairs (VCV and V#CV sequences respectively). All the different types of consonants were included ([O]cclusives, [N]asals, [A]pproximants, [F]ricatives) but the numbers of each type of consonant were uneven. The corpus also contained sets of minimal pairs in which coda orthographic <s> occurred/did not occur in word final prevocalic contexts (VS#V vs. V#V). Given that the pronunciation of coda orthographic <s> is a sociolinguistic variable and speakers in formal situations and when reading can pronounce it as a voiceless sibilant, subjects were presented with photographs depicting the words in the corpus, along with a number of control words that did not contain orthographic <s>; participants were requested to name what they saw[1]. In word internal position the following carrier phrase was used *dame un* ____ *pa[ra] mí* 'give me a ____ for me', whilst in the external sandhi contexts there were three different types of carrier phrase depending on what type of <s> was being tested and in what phonological contexts. The first type of <s> tested was the marker of 2SG (S_{2SG}) in external sandhi before all types of consonants and in prevocalic position; its pronunciations were contrasted with phrases with 3SG verb forms in which there was no <s> (VS_{2SG}#CV vs. V#CV contexts or VS_{2SG}#V vs. V#V contexts). Speakers were required to name the images they saw in the photographs in the phrase *tu siempre comes* ____ 'you always eat ____' and then again in the phrase *él siempre come* ____ 'you always eat ____'. The second type of <s> tested was that in the word *dos* (S_{DOS}) before all types of consonants in external sandhi and prevocalically; speakers were required to name what they saw in the photographs in the phrase *digo dos* ____ *pa[ra] ti'* 'I say two ____ for you' and then again in the

[1] For those words in the corpus which it was impossible to solicit via the naming of images, subjects read the words embedded in a carrier phrase, from a card.

phrase *digo un/una ____ pa[ra] ti'* 'I say a ____ for you' (VS_{dos}#CV vs. V#CV contexts)[2]. These same carrier phrases were also used to examine the effects of the presence/absence of the third type of <s>, the nominal plural marker (S_{PLURAL}) and its effects in external sandhi exclusively on the following /p/ consonant in the phrase *digo dos ____ pa[ra] ti* (VS_{PLURAL}#$C_{/p/}$V vs. V#$C_{/p/}$V contexts). In order to test the effects of external sandhi in this context prevocalically (VS_{PLURAL}#V vs. V#$C_{/p/}$V) the following phrases were used: *digo dos ____ ahora* 'I say two ____ now' and *digo un(a) ____ ahora* 'I say a(n) ____ now' (VS_{dos}#V vs. V#V and VS_{PLURAL}#V vs. V#V contexts). The words for the prevocalic sandhi contexts are those in (2) and the words used in the word internal and preconsonantal sandhi contexts are given in (1). For clarity I give examples of the phrases used in accordance with the different phonological and morphological contexts in (3), along with the total number of words analysed. Note that due to space restrictions in the sandhi contexts only data from Seville and Granada will be presented.

(1) The words used in the carrier phrases for word internal contexts and the first two types of sandhi contexts

	word internal position – all cities				In external sandhi – Seville & Granada only	
consonant	VSOV	gloss	VOV	gloss	VS#OV	gloss
/p/	avispa obispo caspa	wasp bishop dandruff	pipa tipo capa	pipe type cape	pelotas peras pilas	balls pears batteries
/t/	pisto motorista pasta susto	a typical dish motorist pasta a scare	pito margarita pata luto	whistle daisy paw mourning	tartas tomate tortilla	cakes tomatoe tortilla
/k/	busca bizco casco mosca	he / she seeks cross-eyed helmet fly	nuca pico caco boca	back of neck beak thief mouth	cocos cubatas quesos	coconuts drinks cheese
consonant	VSNV	gloss	VNV	gloss	VS#NV	gloss
/n/	cine ano	cinema anus	cisne asno	swan ass	naranjas nubes	oranges clouds
/m/	como ama mimo fuma	how he loves mime he smokes	cosmos asma mismo chusma	cosmos asthma same mob	manzanas mapas motos	apples maps motorbikes
consonant	VALV	gloss	VALV	gloss	VS#AV	gloss
/l/	muslo isla	muscle island	mulo hila	mule he sows	limas lobos	limes wolves
/b/	Bisbal resbalar	Bisbal (person) slip	viva cabalgar	live horseride	bicis bolis vacas	pens bicycles cows
/d/	desde	since	dedo	finger	dado	die

[2] Note that speakers were presented with two images which corresponded to the word in first phrase and just one image in the second phrase to ensure that they produced the singular and plural forms

/g/	resguardo musgo	receipt moss	igualan Lugo	they even Lugo (place)	gamba	prawns
consonant	VFLV	gloss	VFLV	gloss	VS#FV	gloss
/θ/ /s/	piscina	pool	cecina	dried meat	cenicerros	ashtrays
	escena	scene	docena	dozen	cerezas	cherries
	discípulos	disciples	pacífico	pacific	salsichas	sausages
/f/	esfera	sphere	efusa	effuse	filetes	steaks
	desfile	procession	define	define	fresas	strawberries

(2) The words used in the carrier phrases for testing the effects of external sandhi in prevocalic contexts.

abeja(s) 'bee(s)', *ajo(s)* 'garlic(s)' *árboles* 'tree(s)', *autobuses* 'bus(es)', *escudo(s)* 'shield(s)', *espada(s)* 'sword(s)', *higo(s)* 'fig(s)', *hormiga(s)* 'ant(s)', *ojo(s)* 'eye(s)', *oreja(s)* 'ear(s)', *ordenador(es)* 'computer(s)', *uva(s)* 'grape(s)'.

(3) Examples of the carrier phrases in accordance with the different phonological and morphological contexts.

(a) VSCV vs. VCV (11 pairs of words per subject = 704 words overall for the four cities)

digo caspa pa[ra] ti vs. digo capa pa[ra] ti
I say 'dandruff' for you vs. I say 'cape' for you

(b) VS_{2SG}#CV vs. V#CV (36 pairs of words per subject = 288 for the city of Seville)

Tú siempre comes peras vs. él siempre come peras
You always eat 'pears' vs. he always eats 'pears'

(c) VS_{dos}#CV vs. V#CV and VS_{PLURAL}#$C_{/p/}$V vs. V#$C_{/p/}$V (36 pairs of words per subject per context = 576 for the city of Seville)

digo dos peras pa[ra] ti vs. digo una pera pa[ra] ti
I say two 'pears' for your vs. I say one 'pear' for you

(d) VS_{dos}#V vs. V#V and VS_{PLURAL}#V vs. V#V (12 pairs of words per subject = 96 for the city of Seville)

digo dos uvas ahora vs. digo una uva ahora.
I say two 'grapes' now vs. I say one 'grape' now

The overall number of words analysed was 1,664, although some had to be discarded due to either the speakers not saying the appropriate word or the quality of the recording. The data were analysed acoustically using Praat (Boersma & Weenink, 2005) and note was taken of the amount and type of cues for aspiration of <s>, which was termed GLOT and the manner of articulation and voicing quality of the following consonant. Additionally, the following measurements were taken for each word: (i) duration of the glottal gesture before the consonant (GLOT); ii) duration

of the consonant (C) and, exclusively with voiceless occlusive consonants, the duration of the VOT.

A statistical analysis was conducted using R (R Core Team, 2018) and lme4 (Bates, Maechler & Bolker, 2015) to perform a linear mixed effects analysis of the relationship between the phonological context (presence or lack of /s/) and the length and type of the following consonant. Different linear mixed effects analyses were carried out in accordance with the different contexts in (3a-c) above for each city and each type of consonants. The latter was necessary since consonants differ greatly in length and so all occlusive consonants had their own statistical analysis and all nasal consonants etc. These analyses mostly all shared the same method: phonological context and gender were coded as fixed effects. Intercepts for subjects and consonants, as well as by-subject random slopes for the effect of phonological context, were added to the model as random effects. Visual inspection of residual plots did not reveal any obvious deviations from homoscedasticity or normality. P-values were obtained by likelihood ratio tests of the full model with the effect in question against the model without the effect in question. Also, categorical variables (presence of GLOT, quality of consonant) were converted into dummy codes so they could be incorporated into a regression framework. In the cases of VSCV vs. VSCV minimal pairs which were not occlusives (e.g. pairs such as *cisne vs. cine; isla vs. ila; desde vs. dedo*), two-tailed t-tests were used to establish if the length of the consonants in VSCV sequences was significantly longer than in VCV contexts.

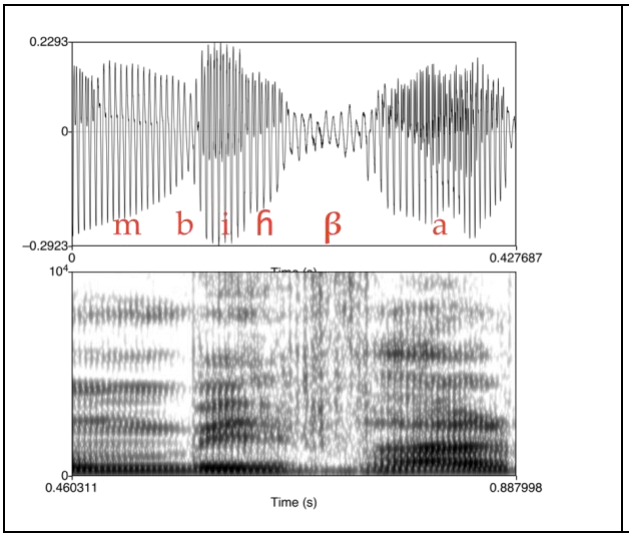
4. Results

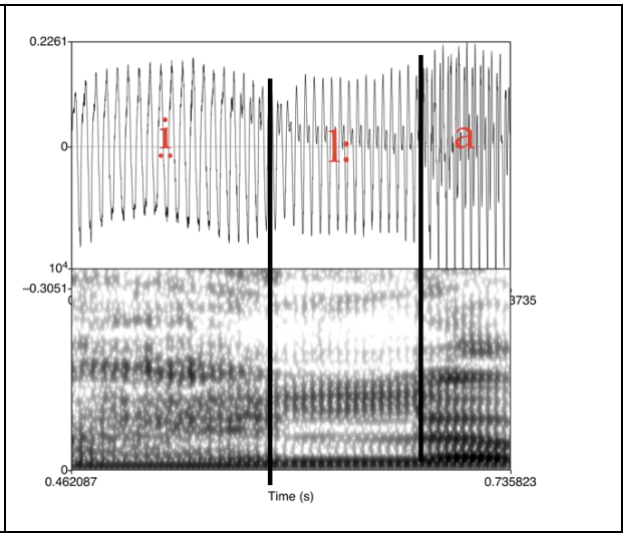
4.1 VSCV vs. VCV contexts: e.g. pasta vs. pata; cisne vs. cine; isla vs. ila; desde vs. dedo

A distinction is made between the sequences in which there is evidence of aspiration after the vowel, termed VSCV$_{GLOT}$, and those in which there is not, termed VSCV$_{NOGLOT}$. The former are only really present in VSOV sequences, outside these sequences aspiration is only attested in Seville and Cádiz and it is a very infrequent pronunciation; it only appeared in 7% of occurrences in Seville (4/52 tokens) and 9% in Cádiz (4/43 tokens). In both cities, the aspiration is always voiced and often appears as either breathy voice at the end of the vowel (see (4)a) or throughout the whole vowel (see (4)b).

(4) Spectrographs showing cues of aspiration before the consonant in VSCV sequences

(a) the surname *Bisbal*	(b) the word *isla* ‘island’





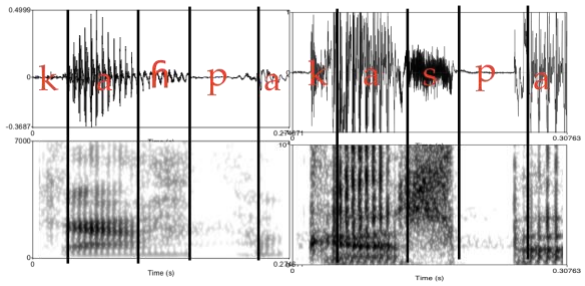
Within VSOV sequences, however, in all cities the pronunciations with aspiration before the consonant ($VSOV_{GLOT}$) outnumber those without it, as demonstrated by the figures in (5). As to the phonetic realisations of this aspiration, in the data, as illustrated by the spectrographs in (6), there was only one token in which there was an identifiable segment of voiced aspiration similar in length to that of [s] in non-aspirating varieties (6a); all other tokens were characterised by the presence of post-aspiration on the consonant combined with either breathy voice on the vowel (6c), pre-aspiration on the consonant (6b) or a combination of the both (6d). In $VSOV_{NOGLOT}$ contexts all varieties are characterised by aspirated voiceless occlusives (6f); in Granada the occlusive was also elongated (6e).

(5) The rates of pronunciations of VSOV with cues of aspiration (or nor) before the consonant.

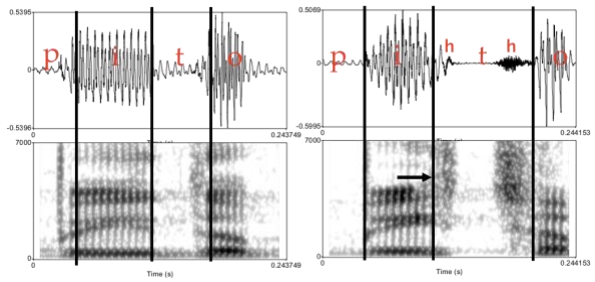
City	$VSOV_{NOGLOT}$	$VSOV_{GLOT}$	Total	Average length GLOT	SD
Seville	20 (46%)	24 (54%)	44	14.97	8.96
Cádiz	10 (23%)	34 (72%)	44	22.45	11.22
Granada	12 (30%)	28 (70%)	40	19.04	10.65
Almería	16 (37%)	28 (63%)	44	26.10	12.36

(6)

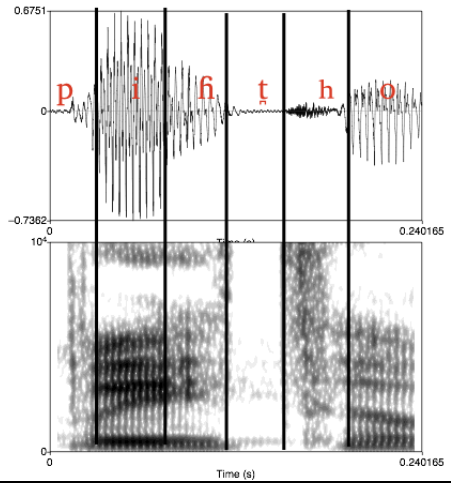
(a) The word *caspa* 'dandruff' by a speaker of Cádiz and Madrid respectively	(b) The words *pito* 'whistle' and *pisto* 'pepper food dish' by the same Granada speaker.



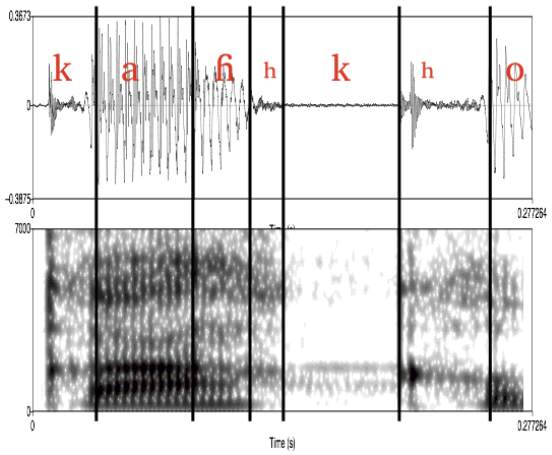
(c) The word *pisto* ‘type of Ratatouille’ by a Seville speaker



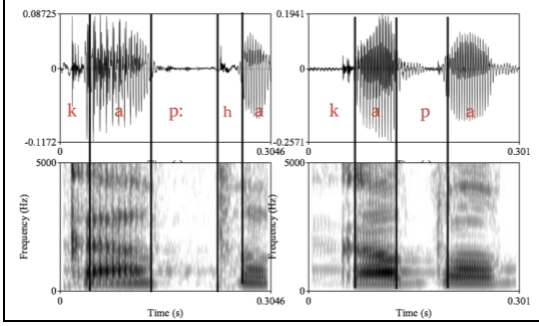
(d) The word *casco* ‘helmet’ by a Seville speaker

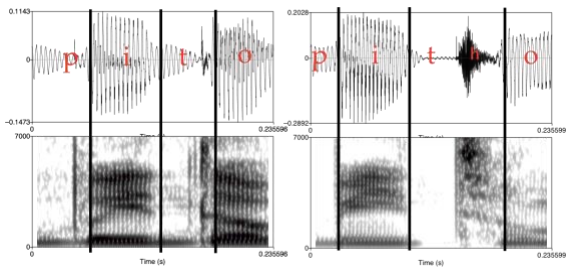


(e) The words *caspa* ‘dandruff’ and *capa* ‘cape’ by the same Granada speaker



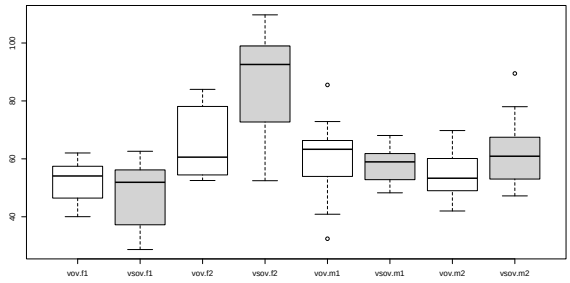
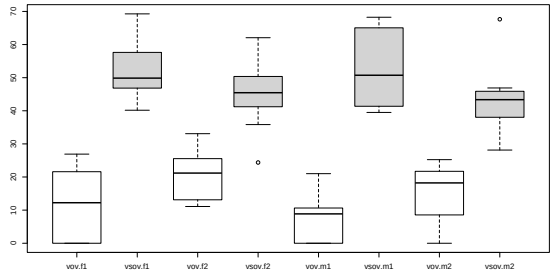
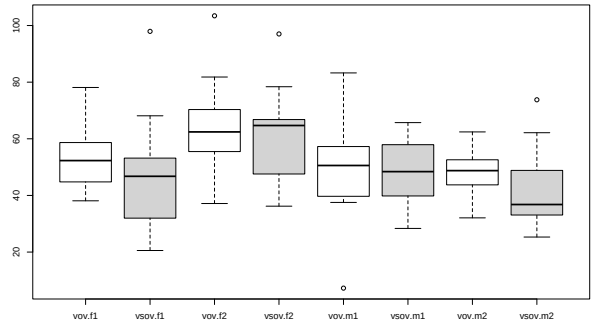
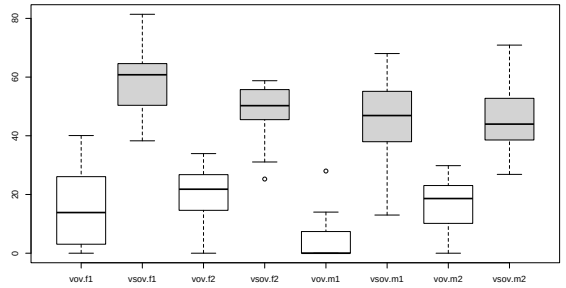
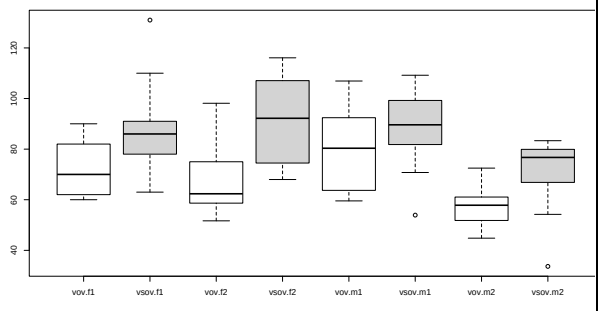
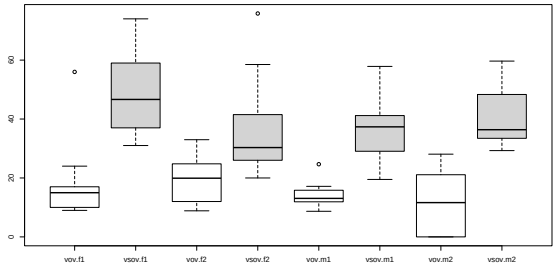
(f) The words *pito* ‘whistle’ and *pisto* ‘pepper food dish’ by the same Cádiz speaker

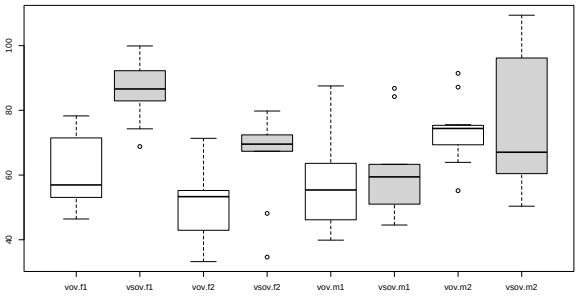


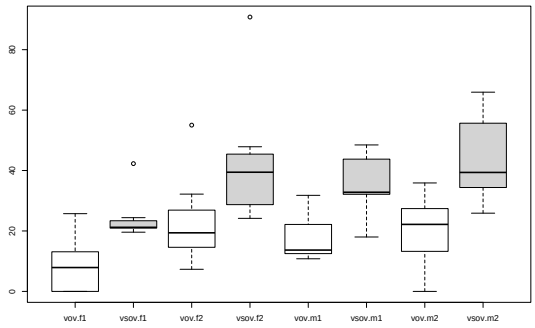


In the statistical analysis which was used to estimate the extent to which O and VOT could be predicted from the phonological context (presence or lack of /s/), as illustrated by the p-values below the boxplots in (7), the phonological context was only significant in Granada for length of O but in all cities for length of VOT. Speaker was significant in all cities for the length of O, but only significant in Almería and Cádiz for VOT; gender was not significant in any city.

(7) Boxplots of the length of O and VOT in the different cities depending on the differing contexts (VSOV vs. VOV) and different speakers.

Seville	
Length of O by context and speaker	Length of VOT by context and speaker
	
context is not significant $\chi(1)=1.027$, p=0.311 speaker is significant $\chi(3)$ 8.118, p= 0.044	context is significant $\chi(1)=11.836$, p=0.001 speaker is not significant $\chi(3)=3.045$, p=0.385
Cádiz	
Length of O by context and speaker	Length of VOT by context and speaker
	
context is not significant $\chi(1)=1.644$, p=0.120 speaker is significant $\chi(3)$ 10.35, p= 0.016	context is significant $\chi(1)=$ 13.427, p<0.000 speaker is significant $\chi(3)=8.173$, p=0.043
Granada	
Length of O by context and speaker	Length of VOT by context and speaker
	
context is significant $\chi(1)=7.584$, p=0.006 speaker is significant $\chi(3)$ 11.345, p= 0.01	context is significant $\chi(1)=11.498$, p<0.001 speaker is not significant $\chi(3)$ 6.881, p= 0.076
Almería	
Length of O by context and speaker	Length of VOT by context and speaker





context is not significant $\chi(1)=3.610$, $p=0.057$ speaker is significant $\chi(3)$ 11.86, $p= 0.008$	context is significant $\chi(1)=11.702$, $p<0.001$ speaker is significant $\chi(3)$ 11.013, $p= 0.012$

In the theoretical literature much emphasis is placed on the interactions between the lengths of GLOT, O and POST with respect to the origins of the post-aspirated pronunciations and whether they are phonological or phonetic; restrictions of space prevent a detailed discussion here but one theory is that these pronunciations could be the result of an early occlusive gesture which masks the aspiration after the vowel (O'Neill 2010, 2009; Torrerira 2007b, 2007a, 2012; Torrerira and Ernestus 2011; Ruch 2012; Ruch and Harrington 2014). This gestural overlap coupled with the increased length of VOT can lead to a phonological reanalysis of these sequences as consisting of either (a) voiceless aspirated occlusives or (b) elongated voiceless aspirated occlusives. The fact that speaker was significant for length of O in all cities could suggest that there is still much inter-speaker variation as to whether these sequences have been phonologized. In this respect, observe the behaviour of speakers in Almería. The two female speakers seem to favour pronunciation (b) whilst speaker M1 favours (a) and M2 displays much variation. Observe also the behaviour of speaker F2 in Seville, she stands out from the other speakers as having longer occlusives in VSOV contexts which could suggest that she is not intentionally producing short voiceless occlusives all of the time and that the elongated occlusives are the historical forerunners of these pronunciations (contrary to Parell (2012)). Note that this speaker also consistently had more $VSOV_{GLOT}$ pronunciations and, in general, VSCV pronunciations with more indications of the presence of an open glottis corresponding to orthographic <s>.

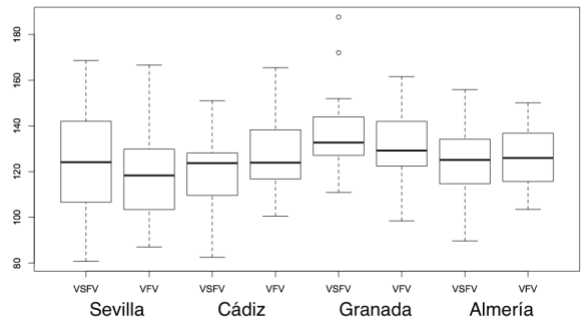
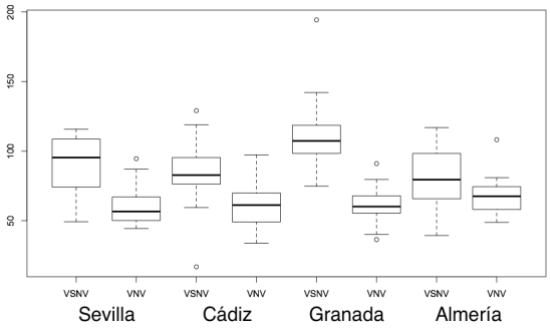
As to the voicing quality of the occlusives these were always voiceless in VSOV contexts and mainly voiced in VOV contexts. In these latter contexts, as illustrated in (8), the occlusive consonants could also be realised as approximants; sex was a contributing factor to such voiced pronunciations with men voicing and producing more approximants than women (O'Neill 2010).

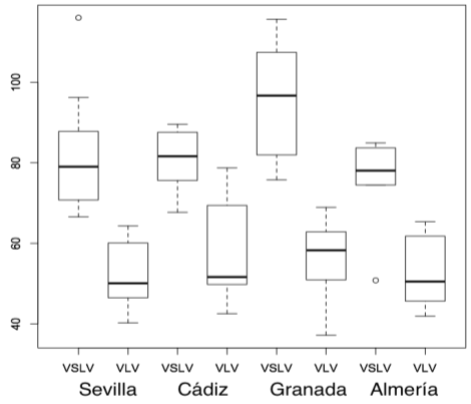
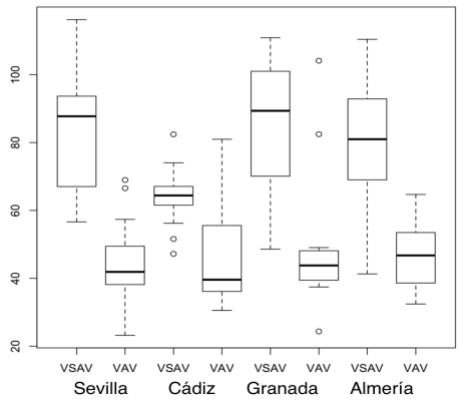
(8) Quality of consonant in VOV sequences

City	voiceless occlusives	voiced occlusives	approximants
Seville	3 (7%)	30 (70%)	10 (23%)
Cádiz	5 (13%)	24 (60%)	11 (28%)
Granada	12 (30%)	25 (61%)	4 (10%)
Almería	1 (2%)	36 (84%)	6 (14%)
Average	5 (13%)	29 (69%)	8 (19%)

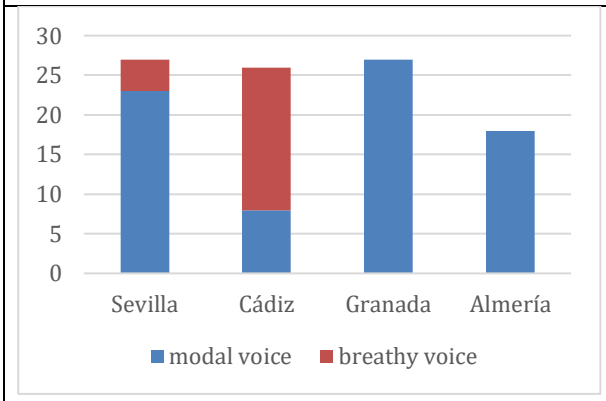
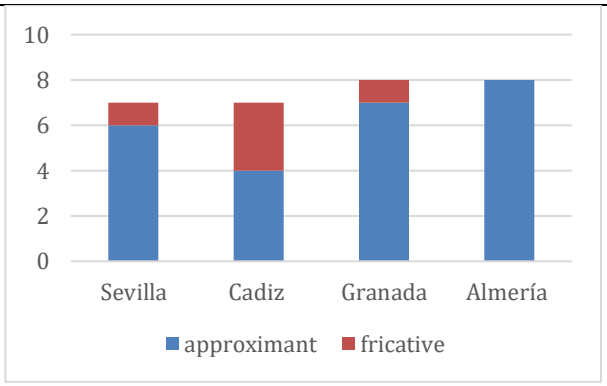
Moving away from occlusive consonants, all other consonants in VSCV sequences were significantly longer than in VCV sequences with the exception of fricative consonants (see (9) in which the p-vales correspond to two-tailed t-tests); Granada was the city in which the difference between the length of the consonants in the different sequences was greater and also the city where the consonants were generally the longest in VSCV sequences. Note that due to space restrictions the data is presented by city and not by speaker. As to the manner of articulation of the consonants, there was greater evidence in Seville and Cádiz for the coarticulation of aspiration with the following consonant and the concomitant changes to its manner of articulation (see (10) for an overview). Thus, as illustrated by the spectrographs in (11), in Seville and Cádiz nasals could be realised with breathy voice (a), lateral approximants with frication (c), and there was a greater tendency to produce spirant approximants as fricatives (e) which could also be voiceless (i). Contrastively in Granada and Almería nasals and laterals were simply elongated ((b) and (d) respectively) and the spirant approximants could also be elongated (f) but they could also be realised as voiced stops (g) and voiced fricatives ((h) & (j)). Note that in all cities modal voice was only attested for nasals in VNV sequences; in VLV contexts all consonants were produced as approximants, and in VAV contexts all consonants were either approximants or were elided (see also O'Neill 2010).

(9) Length of consonants in VSCV vs. VCV sequences (p=vales below graphs from two-tailed t-tests)

<table>
<tr><td>Fricative consonants</td><td>Nasal consonants</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Seville (p=0.12); Cádiz (p=0.13); Granada (p=0.19); Almería (p=0.81)</td><td>Almeria (p=0.02) all other cities (p= <0.00)</td></tr>
<tr><td>Lateral consonants</td><td>Spirant approximant consonants</td></tr>
</table>

	
Almeria (p=0.02); all other cities (p= <0.00)	Almeria (p=0.01); all other cities (p= <0.00)

(10) Manner of articulation of consonant in VSCV and VCV contexts

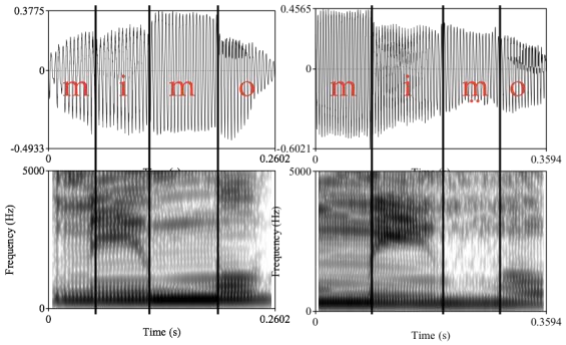
Nasal consonants	Lateral consonants
	

Spirant approximants in VSAV contexts

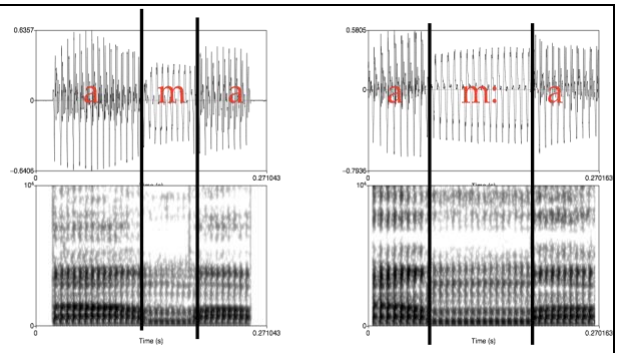
	approximant (voiced)	fricative (voiced)	fricative (voiceless)	occlusive (voiced)	total
Seville	3 (17%)	13 (72%)	2 (11%)	0	18
Cadiz	4 (24%)	13 (76%)	0	0	17
Granada	10 (71%)	1 (7%)	0	3 (21%)	14
Almería	5 (26%)	5 (26%)	0	9 (47%)	19

(11) Spectrographs of VSCV and VCV sequences

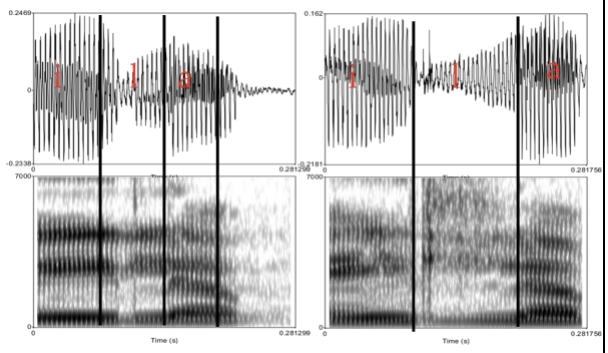
(a) The words *mimo* ‘mime and *mismo* ‘same’ spoken by the same Cádiz speaker	(b) The words *ama* ‘(s)he loves’ and *asma* ‘asthma’ spoken by the same Granada speaker



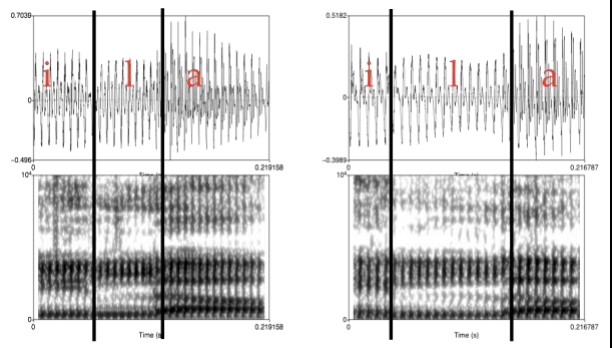
(c) The words *hila* ‘(s)he sows’ and *isla* ‘island’ spoken by the same Seville speaker



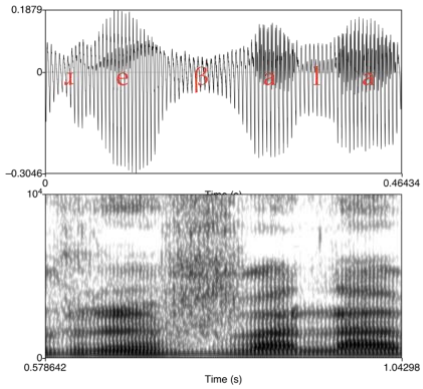
(d) The words *hila* ‘(s)he sows’ and *isla* ‘island’ spoken by the same Granada speaker



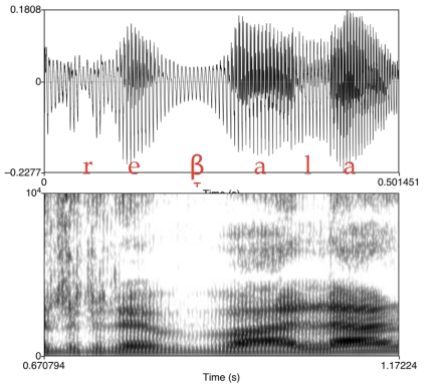
(e) The word *resbalar* ‘slip’ by a Seville speaker.



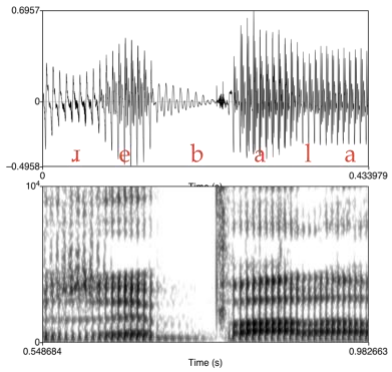
(f) The word *resbalar* ‘slip’ by a Granada speaker.



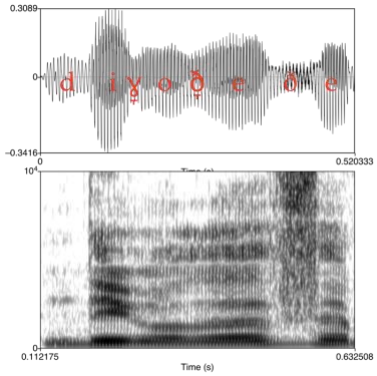
(g) The word *resbalar* ‘slip’ by a Granada speaker



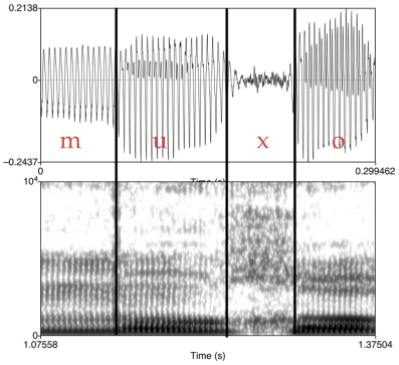
(h) The phrase *digo desde* ‘I say since’ by a Seville speaker.

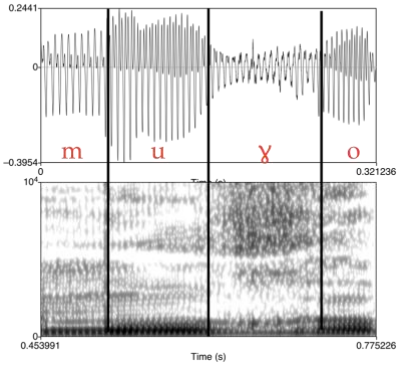


(i) The word *musgo* ‘moss’ by a Seville speaker.



(j) The word *musgo* ‘moss’ by a Almería speaker.





In conclusion to this section, all VSCV contexts, with the exception of fricative consonants, are longer than their VSV minimal pairs (especially in Granada) and, with the exception of occlusives consonants, there are no real cues for aspiration before the consonants; there is a tendency in the western cities for the following consonants to be produced with some evidence of an open glottis (breathy voice/voiceless frication). In VSOV contexts, the post-aspiration and voiceless quality of these consonants is a pan-Andalusian phenomenon and it is only in Granada where, for all speakers, the occlusive consonant is significantly and consistently longer in VSOV vs. VOV contexts.

4.2 VS#CV vs. V#CV contexts

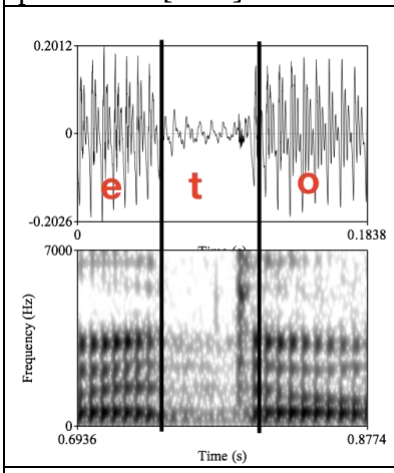
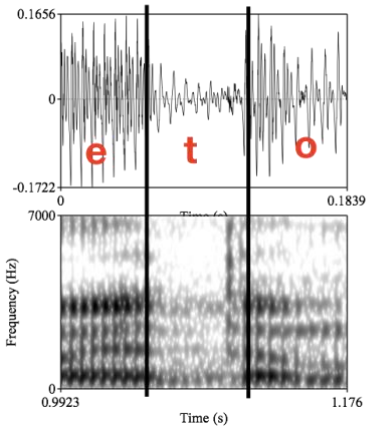
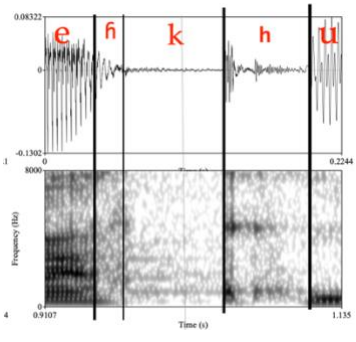
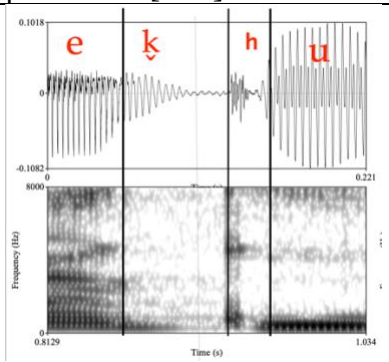
Recall that due to space limitations only pronunciations from Seville and Granada will be analysed for external sandhi contexts, in which a distinction will be made between (a) occlusive consonants (VS#OV contexts) and other consonants and (b) different morphological types of <s>: marker of 2SG in verbs (S_{2SG}), marker of PLURAL in nouns (S_{PLURAL}), part of the lexeme in the word *dos* (S_{DOS}).

4.2.1. VS_{2SG}#CV vs. V#CV – tú siempre comes ____ vs. él siempre come ____

When <s> was a marker of 2SG there were only tokens for cues of aspiration before occlusive consonants (that is VS_{2SG}#OV sequences). However, the differences between both cities was

qualitatively different. In Seville, there were only two tokens (one for M2 and one for F2) in which there were cues of aspiration before the occlusive whereas in Granada cues were present in 23 tokens, which constituted 64% of all VS_{2SG}#OV contexts. There were also stark differences between the two cities regarding the quality, voicing and length (both O and VOT) of the occlusives in comparison to V#OV contexts. In Seville the occlusives in VS_{2SG}#OV contexts pattern with the occlusives in V#OV contexts: they have the same propensity to be voiced/realised as approximate consonants, and both O and VOT have similar durations. In Granada, however, the occlusives in VS_{2SG}#OV contexts are markedly different from the V#OV contexts and pattern with the VSOV contexts: they tended to be more voiceless, elongated and more heavily aspirated. These differences are illustrated by the spectrograms in (12) the percentages in (13), and the box-plots in (14). Regarding the latter, note that there are clear gender differences with respect to the length of O, but not VOT, in Granada.

(12) Spectrograms of VS_{2SG}#CV vs. V#CV contexts

<table>
<tr><td colspan="2">Seville</td></tr>
<tr><td>Spectrogram of the sequence VS#CV in the phrase com[es to]mates in Seville (M1)</td><td>Spectrogram of the sequence V#CV in the phrase com[e to]mates in Seville (M1)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">Granada</td></tr>
<tr><td>Spectrogram of the sequence V#OV in the phrase com[es cu]batas in Granada (F1)</td><td>Spectrogram of the sequence V#OV in the phrase com[e cu]batas in Granada (F1)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

(13) Percentages relating to the phonetic realisation of the occlusives in VS#OV and V#OV

Seville

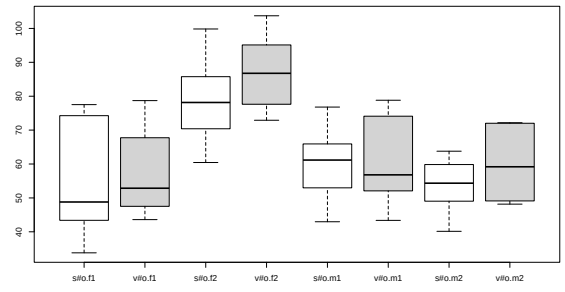
Context	VS#OV			V#OV		
Speaker	voiceless occlusives	voiced occlusives	voiced approximants	voiceless occlusives	voiced occlusives	voiced approximants
F1	1 (13%)	6 (75%)	1 (13%)	1 (13%)	4 (50%)	3 (38%)
F2	6 (75%)	2 (25%)	0	6 (75%)	2 (25%)	0
M1	0	5 (38%)	8 (62%)	0	4 (33%)	8 (67%)
M2	1 (14%)	6 (86%)	0	0	6 (100%)	0
average	2 (25%)	5 (56%)	2 (19%)	2 (22%)	4 (52%)	3 (26%)

Granada						
Context	VS#OV			V#OV		
Speaker	voiceless occlusives	voiced occlusives	voiced approximants	voiceless occlusives	voiced occlusives	voiced approximants
F1	10 (100%)	0 (0%)	0 (0%)	4 (40%)	6 (60%)	0 (0%)
F2	7 (88%)	1 (12%)	0 (0%)	2 (25%)	5 (62.5%)	1 (12.5%)
M1	10 (100%)	0 (0%)	0 (0%)	0 (0%)	9 (90%)	1 (10%)
M2	8 (100%)	0 (0%)	0 (0%)	6 (75%)	2 (25%)	1 (10%)
average	35 (97%)	1 (3%)	0 (0%)	17 (40%)	22 (52%)	3 (7%)

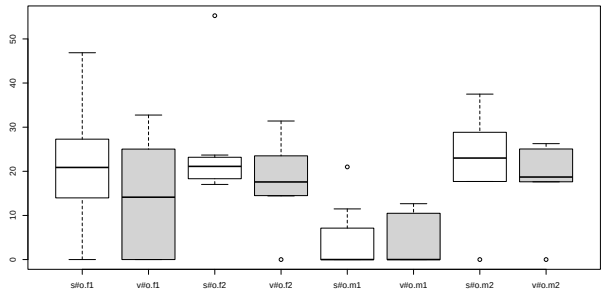
(14) Boxplot of the length of O and VOT in VS_{2SG}#OV and V#OV contexts

Seville

Boxplots of length of O according to speaker

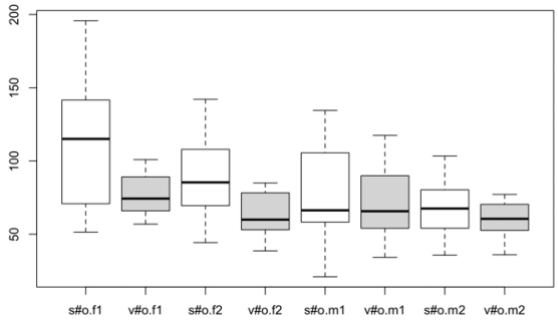


Boxplots of length of VOT according to speaker

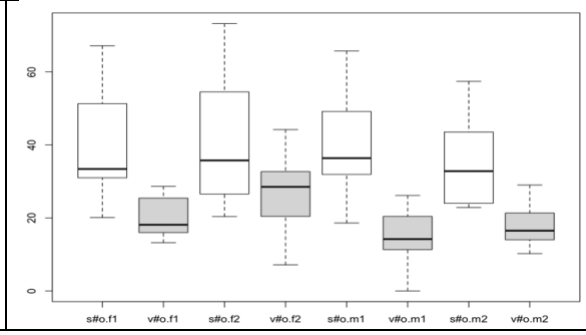


Granada

Boxplots of length of O according to speaker



Boxplots of length of VOT according to speaker



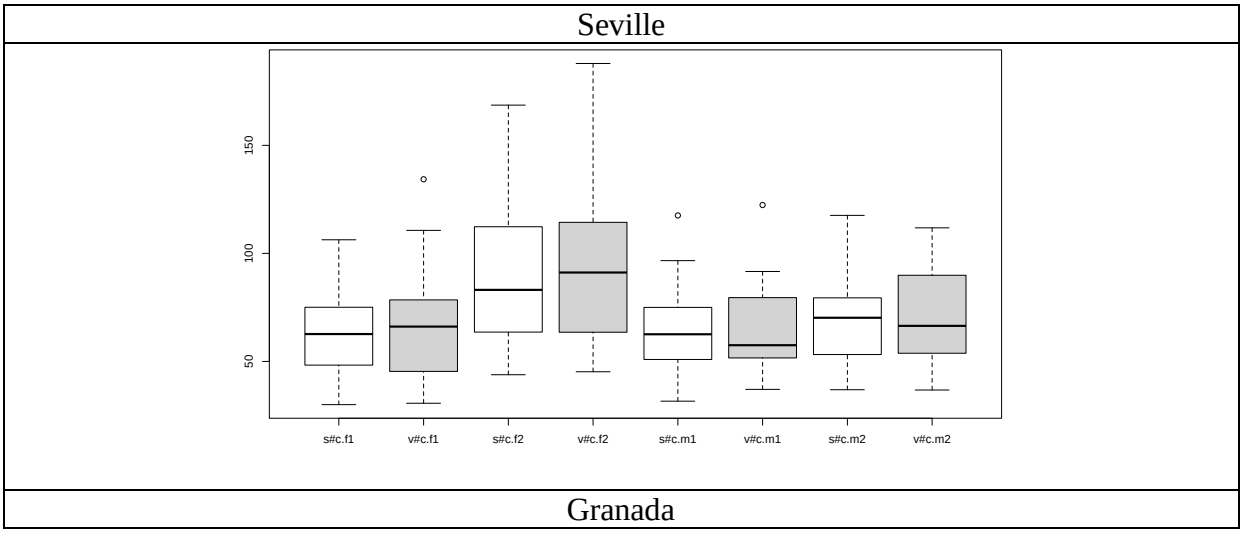
The impressionistic conclusion that in Seville the occlusives in VS_{2SG}#OV contexts pattern with those in V#OV whereas in Granada they are markedly different (VS_{2SG}#OV patterning more

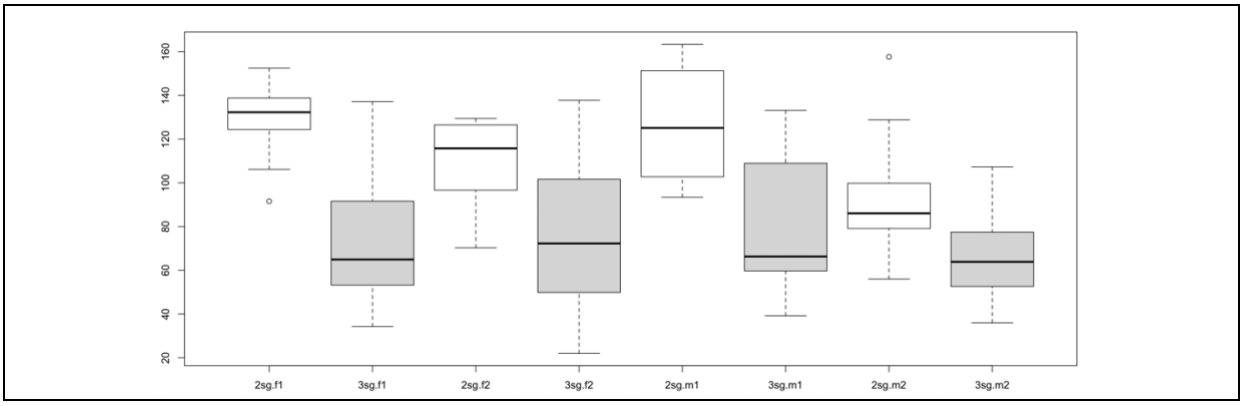
with VSOV contexts) is confirmed by the inferential statistical analysis which compared VS_{2SG}#OV and V#OV contexts. The results were the following:

- VS_{2SG}#OV contexts did not reliably predict the presence of aspiration in Seville ($\chi 2$ = 0.237, p= 0.626) but did in Granada ($\chi 2$ = 42.05, p= < 0.000)
- VS_{2SG}#OV contexts did not have any significant effect on the type of consonant in Seville ($\chi 2$ = 1.478, p= 0.224) but did in Granada ($\chi 2$ = 16.865, p= <0.000) where the presence of <s> increased the number of voiceless pronunciations
- VS_{2SG}#OV contexts did not have any significant effect on the length of the following consonant in Seville ($\chi 2$ = 1.546, p= 0.218) but did in Granada ($\chi 2$ = 10.003, p= 0.002) where the presence of <s> increased the length of the consonant by 49.11ms ± 7.3 (standard errors).

As for the other consonants (contexts VS_{2SG}#NV, VS_{2SG}#AV and VS_{2SG}#FV), in Seville when proceeded by S_{2SG} there were no indications of any aspiration coarticulated with the consonants, in contrast to when these sequences occurred in internal position; all nasals were pronounced with modal voice, all laterals as approximants and all spirant approximants as approximants or elided. The consonants were also not significantly longer with respect the S_{2SG}-less contexts (V#NV, V#AV and VS#FV). The same was not true, however, in Granada since the consonants were significantly longer. Compare the box-plots below in (15).

(15) Boxplots of length of C according to speaker for Seville in the context VS_{2SG}#CV vs. V#CV





Again, the impressionistic conclusion that in Seville the consonants in VS_{2SG}#CV contexts pattern with those in V#CV contexts whereas in Granada they are markedly different (VS_{2SG}#CV patterning more with VSCV contexts) is confirmed by the inferential statistical analysis. R (R Core Team, 2018) and lme4 (Bates, Maechler & Bolker, 2015) were used to create a mixed linear model to estimate the extent to which the length of the consonant could be predicted from the fixed factors phonological context ((VS_{2SG}#CV vs. V#CV), and sex. Intercepts for subjects and consonants, as well as by-subject random slopes for the effect of phonological context were added to the model as random effects. The results were that, in Seville, the length of the consonant it is significantly affected by speaker ($\chi^2(1)= 67.74$, p= <0.000), by the type of following consonant ($\chi^2(13)= 255.51$, p= <0.000) but not by the phonological context = preceding orthographic <s> ($\chi^2(1)= 1.242$, p= 0.265) or sex ($\chi^2(1)=0$, p=1). In Granada, however, the length of the consonant is significantly affected by the phonological context ($\chi^2(1)= 4.3854$, p= 0.036), in addition to being affected by the speaker ($\chi^2(1)= 14.651$, p= <0.000) and the following consonant ($\chi^2(13)= 57.786$, p= <0.000). As with Seville, however, the sex of the speaker was not significant ($\chi^2(0.4084)=0$, p=0.522).

In summary, in Seville there are no phonetic cues to distinguish between 2SG and 3SG present indicative forms of the verb in sentences such as *tú siempre comes limas vs. él siempre come limas* and therefore the orthographic <s> corresponds to no mental unit. The same, however, cannot be said for Granada since in this city, in VS_{2SG}#C contexts (e.g *comes limas*), the consonants are significantly longer when compared with VS_{3SG}#V contexts (e.g. *come limas*). In Granada, therefore, there is still some mental unit at the end of 2SG and 3SG present indicative forms which leaves phonetic cues in sandhi contexts.

4.2.1.2 VS_{2SG}#V vs. V#V – tú siempre comes ajos vs. él siempre come ajos

On the basis of the data and conclusion from the previous section one would expect that in VS_{2SG}#V contexts there should be phonetic cues for aspiration in Granada but not in Seville, since, in this city, S_{2SG} corresponds to no mental element. This hypothesis is borne out by the results of VS_{2SG}#V vs. V#V contexts in Seville, in which there were no cues of aspiration in the former contexts which entirely resembled the latter contexts. Note, however, this was also the result for these contexts in Granada; in no VS_{2SG}#V context were there any cues for aspiration between the

vowels. Therefore, in Granada, VS_{2SG}#V contexts contrast with VS_{2SG}#CV contexts, since in the latter S_{2SG} has robust phonetic cues in the following consonants.

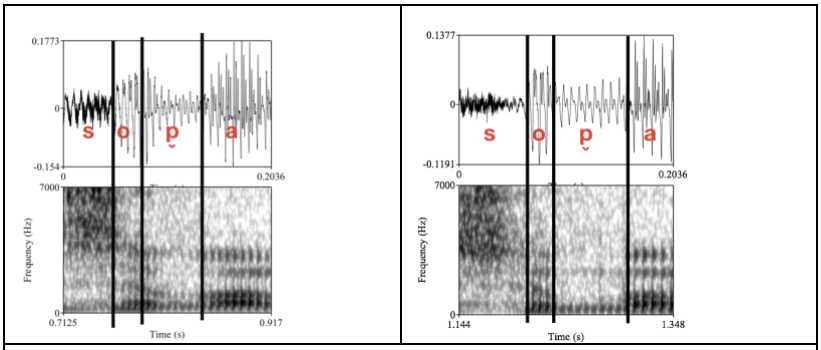
*4.2.2., VS_{PLURAL}#$C_{/p/}$V vs. V#$C_{/p/}$V contexts: - dame dos ___**s** **p**a mí vs. dame un/una ____ **p**a mí*

When <s> was a marker of PL the carrier phrase used meant that only the effects on the consonant /p/ could be analysed. In these contexts, as in the previous section, the differences between both cities were qualitatively different. Cues for aspiration before the consonant appeared only in 3% of tokens from Seville but in 32% of tokens from Granada. Moreover, in <s> contexts, the quality, voicing and length (both O and VOT) of the occlusives did not differ from the non-<s> contexts for all but one speaker in Seville but did notably differ in Granada for all speakers. As with the VS_{2SG}#OV contexts of the previous section, VS_{PL}#OV contexts in Granada patterned with VSOV contexts: they tended to be more voiceless, elongated and more heavily aspirated. These differences and the contrasts with Seville are illustrated by the spectrograms in (16), the percentages in the Table in (17) and the box-plots in (18). Once again, the impressionistic conclusion that in Seville the occlusives in VS_{PLURAL}#OV contexts pattern with those in V#OV contexts whereas in Granada they are markedly different (VS_{PLURAL}#OV patterning more with VSOV contexts) is confirmed by the inferential statistical analysis which compared VS_{PLURAL}#OV and V#OV contexts. The results were the following:

- In <s> contexts cues for aspiration before the consonant appeared in 32% of cases in Granada but only 3% of cases in Seville. Statistical analysis confirmed that the different contexts did not reliably predict the presence of aspiration in Seville ($\chi2 = 0.967$, $p= 0.325$) but did in Granada ($\chi2 = 7.025$, $p= 0.008$)
- <s> contexts did not have any significant effect on the length of the following consonant in Seville ($\chi2 = 1.515$, $p= 0.218$) but did so in Granada ($\chi2 = 10.003$, $p= 0.002$) where the presence of <s> increased the length of the consonant by 49.11ms ± 7.3 (standard errors)
- <s> contexts did not have any significant effect on the type of consonant in Seville ($\chi2 = 1.478$, $p= 0.224$) but did so in Granada ($\chi2 = 16.865$, $p= <0.000$) where the presence of <s> increased the number of voiceless pronunciations.

(16) Spectrograms of VS_{PL}#CV vs. V#CV contexts. Note only the parts in square brackets are represented in the spectrograms

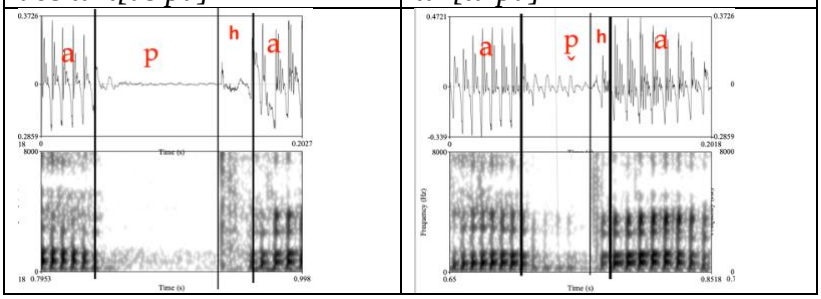
Seville	
Spectrograms of the phrases *dos que[sos pa] mí.*	Spectrograms of the phrase *un que[so pa] mí*



Granada

Spectrogram of the phrase *dos tart[as pa] mí*

Spectrogram of the phrase *una tar[ta pa] mí*

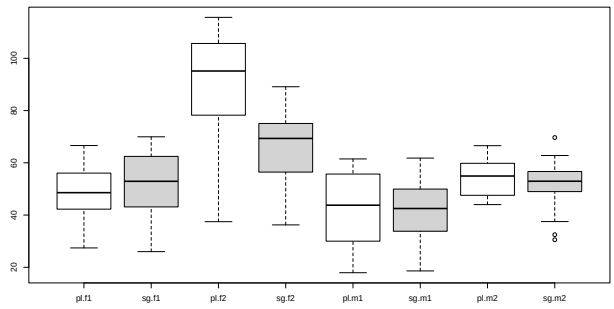
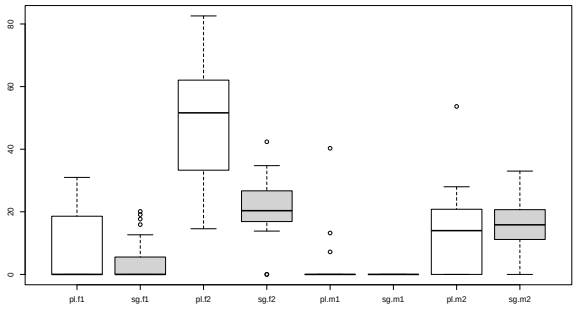
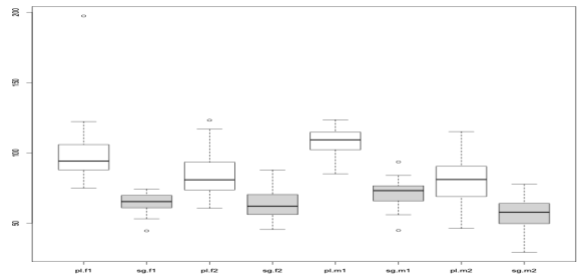
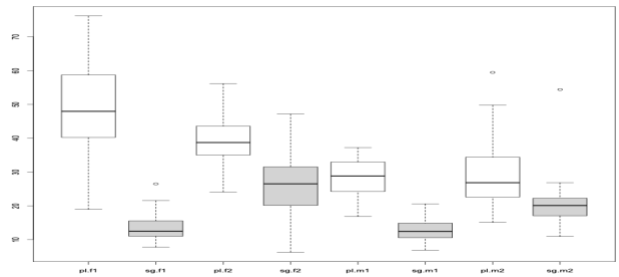


(17) Type of consonant in VS_{PLURAL}#OV and V#OV sequences

Seville						
Context	VS_{PLURAL}#OV			V#OV		
Speaker	voiceless occlusives	voiced occlusives	approximants	voiceless occlusives	voiced occlusives	approximants
F1	0	10 (44%)	13 (57%)	0	6 (26%)	17 (74%)
F2	21 (91%)	2 (9%)	0	17 (74%)	4 (17%)	2 (9%)
M1	0	9 (39%)	14 (61%)	0	0	23 (100%)
M2	1(4%)	16 (67%)	7 (29%)	0	19 (79%)	21 (0%)
average	6 (22%)	9 (44%)	6 (34%)	4 (22%)	7 (34%)	12 (44%)

Granada						
Context	VS_{PLURAL}#OV			V#OV		
Speaker	voiceless occlusives	voiced occlusives	approximants	voiceless occlusives	voiced occlusives	approximants
F1	32	0	0	8 (25%)	23 (72%)	1(3%)
F2	33	0	0	8 (24%)	18(55%)	7(21%)
M1	32	0	0	2(6%)	26(84%)	3(10%)
M2	35	0	0	14(41%)	14(41%)	6(18%)
average	33 (100%)	0	0	8 (25%)	20 (62.5%)	4 (12.5%)

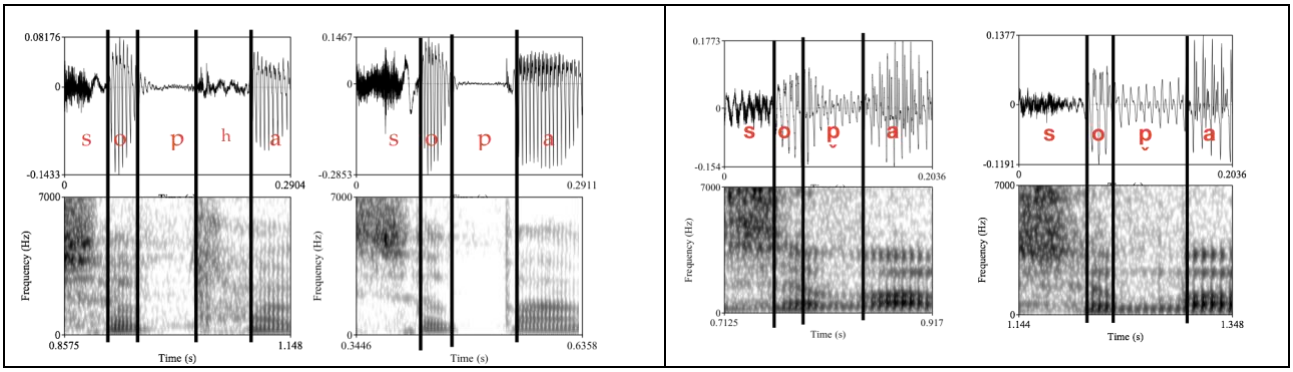
(18) Boxplots of length of O and VOT according to speaker in the VS$_{PLURAL}$#C/$_{P/}$V (pl) vs. V#C/$_{P/}$V (sg.) contexts

(a) length of O in Seville	(b) length of VOT in Seville
	
(a) length of O in Granada	(b) length of VOT in Granada
	

The results of this section align themselves closely, though not exactly, with those of the previous section, in that they suggest S$_{PLURAL,}$ as was the case with S$_{2SG,}$ corresponds to no mental element in the city of Seville. However, upon close inspection of the boxplots in (18) above it becomes clear that speaker F2 patterns differently from other speakers: she consistently has longer O and VOT in in VS$_{2SG}$#OV contexts. This impression was also confirmed by the statistical analysis since the variable speaker in Seville was significant, when speaker was controlled for context. Also, the difference between the lengths of O and VOT in the different contexts for speaker F2 of Seville was confirmed as being significant in a paired t-test (length of O (p= 0.014) length of VOT (p= 0.001)). Witness also the difference between the occlusives in the spectrograms below in (19) for identical phrases produced by M1 and F2 of Seville; F2 displays an aspirated voiceless occlusive when preceded by S$_{PLURAL}$ but M1 produces a closed approximant/unreleased voiced stop, very similar to that produced in the V#CV context.

(19) Spectrograms of VS$_{PL}$#CV vs. V#CV contexts for two speakers of Seville

Seville Spectograms of the phrases *dos que[sos pa] mí* and *un que[so pa] mí.* Only the parts in square brackets are represented in the spectrograms; VS$_{PL}$#C is on the left	
(a) speaker F2 in Seville	(b) speaker M1 in Seville



One, however, must not be hasty to conclude that all speakers in Seville, save F2, have lost the morphological marker which corresponds to orthographic <s>, since close inspection of the data in (17) relating to the different voicing qualities and manner of articulation of the consonant /p/ in the VS_{2SG}#OV contexts vs their near minimal pairs (V#OV) reveal interesting tendencies. Specifically, it seems that there is a tendency to produce /p/ as a voiced stop as opposed to an approximant when proceeded by S_{PLURAL}. These data are extremely interesting since it could signal the final days of a sound change S_{PLURAL} > Ø whereby speakers can still make a slight distinction in their production but it is doubtful that this will be perceived by listeners since intervocalic <p t k> are readily realised as both approximants and voiced stops in Andalusia and the best cues for the sequence VS or V#S is usually a voiceless stop as in VSOV contexts.

*4.2.2.1 VS_{PLURAL}#V vs. V#V contexts: - dame dos ___**s** **a**hora mí vs. dame un/una ____ **a**hora*

Further evidence to support the living but moribund status of S_{PLURAL} in Seville comes from prevocalic external sandhi contexts (VS_{PLURAL}#V, *fresas ahora, cerezas ahora*) as illustrated by the data in (20). Here, despite there only being cues for aspiration in just under a third of all phrases, these percentages contrast with those from the last section (*tú siempre comes ajos vs. él siempre come ajos*) in which for VS_{2SG}#V contexts there were no cues of aspiration at all and these contexts resembled V_{3SG}#V contexts entirely. Note also that in the data below in (20) there are clear individual differences with M1 displaying no tokens of aspiration at all and F2 displaying the most tokens (75%).

(20) Table showing the percentages of aspiration in VS_{PLURAL}#V contexts

Context	VS_{PLURAL}#V		
Speaker	voiced aspiration	no cues of aspiration	[s]
F1	1 (9%)	10 (91%)	0
F2	9 (75%)	3 (25%)	0
M1	0	10 (100%)	0
M2	6 (50%)	6 (50%)	0
average	16 (35.5%)	29 (64.5%)	0

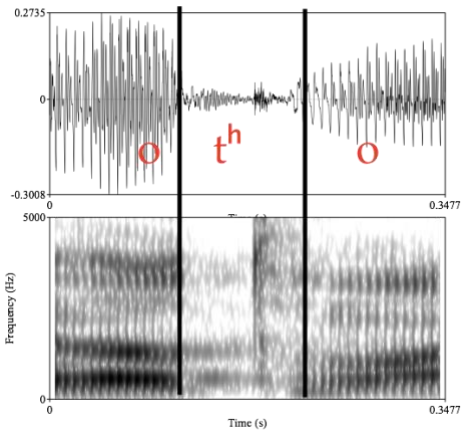
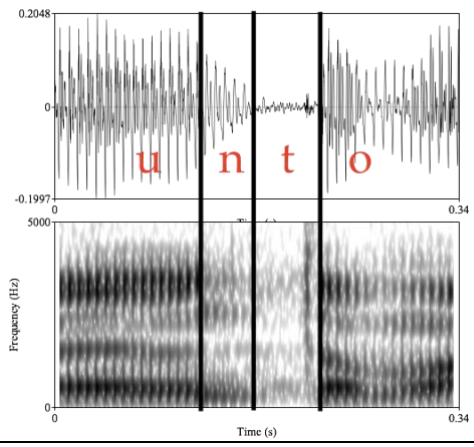
In Granada, as with S_{2SG} in which there were phonetic cues for /s/ on the following consonants (e.g *comes limas*) but none in prevocalic position (e.g. *comes ajos*), so too with $S_{PL.}$ For

VS_{PL}#V contexts (*peras ahora vs. pera ahora*) there were no phonetic cues for S_{PL} in any of the tokens analysed, which contrast not only with the data from Seville but also with the robust phonetic cues for Granada when S_{PL} was followed by a consonant (*peras pa[ra] mí).*

4.2.3 VS_{DOS}#CV vs. V#CV contexts- dame dos ___ pa mí vs. dame un/una ____ pa mí

The results of this section contrast with those of the previous two sections. Within VS_{DOS}#OV sequences there were not only some cues of aspiration before the consonant in both cities but the occlusives in these sequences were different in the quality, voicing, and length (both O and POST) when compared with those in the V#OV contexts in both Seville and Granada. These facts can be appreciated in the spectrograms in (21), the percentages in (22), and the box-plots in (23). Unlike the occlusives following S_{2SG} which patterned with those in V#OV contexts, those following S_{DOS} show a greater tendency to be voiceless.

(21) Spectrogram of the sequence VS_{DOS}#CV and V#CV

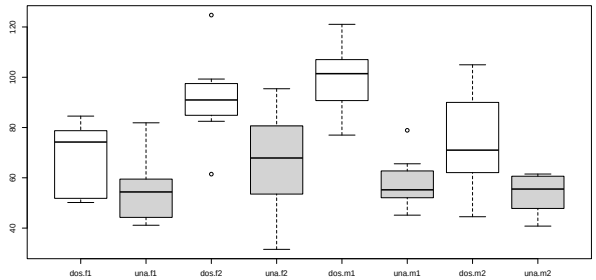
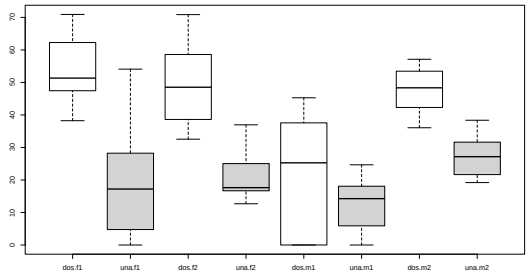
(a)Spectrogram of the sequence VS#CV in the phrase *dos tomates* in Seville	(b)Spectrogram of the sequence VN#CV in the phrase *un tomate* in Seville
	

(22) Type of consonant in VS_{DOS}#OV and V#OV sequences

Seville						
Context	VS_{DOS}#OV			V#OV		
Speaker	voiceless occlusives	voiced occlusives	approximants	voiceless occlusives	voiced occlusives	approximants
F1	5 (71%)	2 (29%)	0	4 (50%)	3 (38%)	1 (13%)
F2	8 (100%)	0	0	7 (88%)	1 (13%)	0
M1	2 (22%)	2 (22%)	5 (56%)	0	4 (67%)	2 (33%)
M2	8 (100%)	0	0	2 (25%)	6 (75%)	0
average	6 (73%)	1 (13%)	1 (14%)	3 (41%)	4 (48%)	1 (11%)

Granada						
	VS_{DOS}#OV			V#OV		
Context	voiceless occlusives	voiced occlusives	approximants	voiceless occlusives	voiced occlusives	approximants
average	27 (100%)	0	0	13 (48%)	14 (52%)	0

(23) Boxplots of length of O and VOT according to speaker

Boxplots of length of O according to speaker for Seville in the VS_{DOS}#OV vs. V#OV (una) contexts	Boxplots of length of VOT according to speaker for Seville in the VS_{DOS}#OV vs. V#OV (una) contexts
	

The impressionistic conclusion from the figures above that in Seville the occlusives in VS_{DOS}#OV contexts do not pattern with those in V#OV contexts but rather with VSOV contexts is confirmed by the inferential statistical analysis which compared VS_{DOS}#OV and V#OV contexts (*dame dos peras pa[ra] mí vs. dame una pera pa[ra] mí*). The results were the following:

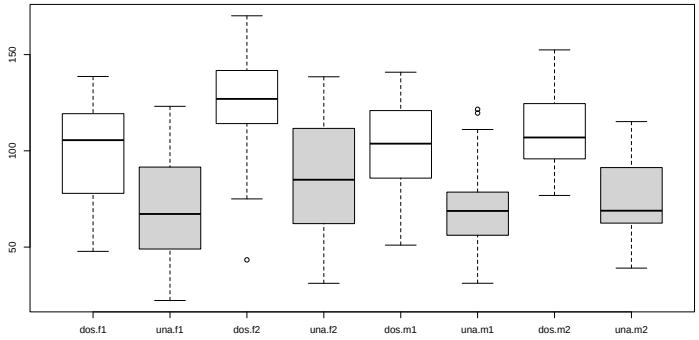
- In <s> contexts cues of aspiration before the consonant appeared in **50%** of <s> contexts in Seville and **75%** of cases in Granada. Statistical analysis confirmed that the different contexts did reliably predict the presence of aspiration in Seville ($\chi 2 = 10.03$, $p = 0.002$) and in Granada.
- <s> contexts had a significant effect on the length of the following consonant in **both** Seville and Granada
- <s> contexts also did have a significant effect on the type of consonant in **both** Seville and Granada, increasing the number of voiceless pronunciations

It is clear therefore that there is some mental element at the end of the word *dos* which causes the following occlusive consonant to be longer and more heavily aspirated.

Regarding the other consonants in VS_{DOS}#CVcontexts , the results are consistent with those of the occlusives for both cities: they adhere more to patterns in VSCV contexts than those in VCV contexts. The consonants are consistently longer in VS_{DOS}#CV than in the minimal VS#CV pairs as illustrated by the boxplots in (24) for Seville. Regarding the quality of the consonants, although there were no cases of nasal vowels being visibly pronounced with breathy voice on the spectrogram, there were modifications in the approximant pronunciation of laterals and spirants, which were grouped together as approximants; there were even two instances of breathy voice

before the vowel which then was coarticulated partially with the approximant. The data are presented in the table in (25) for Seville only. For this city, I also carried out a mixed linear model for the contexts VS$_{DOS}$#CV and VS#CV. The results were that the phonological context was significant (χ2(1)= 17.643,p= 0.001) and speaker was significant (χ2(1)= 7.8933, p= 0.019), gender was not significant. The manner in which the consonant was realised was not controlled for since there were too many different realisations.

(24) Boxplots of length of C according to speaker for Seville in the VS$_{DOS}$#CV vs. V#CV (una) contexts



(25) Comparison of the pronunciations of lateral and spirant aproximants in VS$_{DOS}$#CV vs. V#CV contexts in the city of Seville.

	VS$_{DOS}$#CV contexts				
	approximant (voiced)	occlusive (voiced)	fricative (voiced)	occlusive (voiceless)	breathy voice
F1	4 (57%)	0	1 (14%)	0	2 (29%)
F2	0	0	5 (71%)	2 (29%)	0%
M1	4 (57%)	0	3 (43%)	0	0
M2	3 (43%)	1 (14%)	3 (43%)	0	0
Average	11 (39%)	1 (4%)	12 (43%)	2 (7%)	2 (7%)

	V#CV contexts				
	approximant (voiced)	occlusive (voiced)	fricative (voiced)	occlusive (voiceless)	breathy voice
F1	7 (100%)	0	0	0	0
F2	4 (57%)	2 (29%)	1 (14%)	0	0
M1	5 (71%)	2 (29%)	0	0	0
M2	5 (71%)	2 (29%)	0	0	0
Average	21 (75%)	6 (21%)	1 (4%)	0	0

These data suggest that orthographic <s> still corresponds phonetically to some type of opening of the glottis. The resulting increased airflow can then have an effect on the following consonant whose gesture is timed at the same moment as the glottis gesture, leading to none, or very few cases of pre-consonantal aspiration.

4.2.3.2 VS_{DOS}#V vs. V#V contexts- dame dos orejas/ojos vs. dame una oreja/ojo

In pre-vocalic position (VS_{DOS}#V) aspiration is robustly attested for Seville as illustrated in (26); note, however, that percentages did not reach 100% in any speakers but there were more cases of resyllabification (pronunciation of [s] in *dos* ojos) than of no-aspiration.

(26) Table showing the percentages of aspiration in VS_{DOS}#V contexts

Context	VS_{DOS}#V		
Speaker	voiced aspiration	no cues of aspiration	[s]
F1	19 (79)	3 (13%)	2 (8%)
F2	21 (88%)	1 (4%)	2 (8%)
M1	20 (83%)	1 (4%)	3 (13%)
M2	16 (70%)	7 (30%)	0
average	76 (80%)	12 (13%)	7 (7%)

These data contrast with those from Granada in which there were no cues for aspiration in none of the phrases analysed. This result is consistent with the other cases of pre-vocalic /s/ in external sandhi contexts for Granada and contrasts with the cases of pre-consonantal /s/ for which there are robust phonetic cues for /s/ on the following consonants.

4.3 Summary of results

In VSCV contexts, word-internal orthographic <s> does not correspond to any phonetic cues in VSFV contexts. In VSOV contexts it usually realised as some type of voiced aspiration before the consonant (breathy voice or pre-aspiration on the occlusive), which is always accompanied by a voiceless aspirated occlusive. This consonant tends to be elongated with respect to VOV sequences in Granada and more heavily aspirated in Seville. Outside these sequences the consonantal gesture of the following consonant is, with few exceptions, timed to occur at the end of the vowel and the consonants are all elongated with respect to VCV sequences. In western varieties there are indications of a more open glottis gesture which is coarticulated with the consonant; this coarticulation manifests itself as breathy voice on nasals and frication on approximants. In VS#CV contexts, it is necessary to make a distinction between the different morphological types of <s>: $S_{2SG,}$ S_{PLURAL} and $S_{DOS.}$ The first of these (S_{2SG}), on the basis of the evidence in this article, cannot be considered to represent a mental element for speakers of Seville since it is bereft of any phonetic cues. In Granada, however, the phonetic cues are similar to those in word-internal position (VSCV contexts) indicating that in VS_{2SG}#CV contexts there remains

some mental element at the end of these words. Contrastively, in pre-vocalic contexts, (*comes ajos/orejas*) there are no phonetic cues for this S_{2SG} in Granada. The same is true for S_{PLURAL} in Granada: VS_{PL}#V contexts (*tartas ahora*) show no cues for /s/ but VS_{PL}#CV contexts do. These contexts pattern with VSCV contexts and contrast with their minimal pairs in V#CV (*tartas pa[ra] mí vs tarta pa[ra] mî*). In Seville, however, S_{PLURAL} seems to be heading in the same direction as S_{2SG}. That is, it is undergoing a sound change towards its complete elimination. Indeed, only one speaker (F2) showed consistent and robust phonetic cues for $S_{PLURAL.}$ Finally, for $S_{DOS,}$ with the exception of pre-vocalic contexts in Granada (*dos ajos/*orejas), in both cities there were considerable phonetic cues for this element, especially in prevocalic contexts in Seville. In preconsonantal contexts, the phonetic cues in VS_{DOS}#CV contexts were similar to those in word internal position and different from their near minimal pairs in V#CV (*dos peras vs. una pera*).

5. Discussion:

It is clear that the phonological system of Andalusian Spanish is being radically altered due to the historical effects of /s/ aspiration and that there is much diatopic and inter-speaker variation (Stevens and Harrington 2014). In word internal position, this is producing a series of new incipient phonemic distinctions of which the most robust are elongated consonants (*cine* [sine] / [θine] vs. *cisne* [sin:e] / [θin:e]; *hila* [ila] vs. *isla* [il:a]) and aspirated consonants (*pata* [pata] vs. *pasta* [pat^{h}a], *caco* [kako] vs. *casco* [kak^{h}o]). It is worth remembering that the fieldwork for the current study dates from 2005 and that, in this study, only 46% and 23% of tokens in VSOV contexts in the cities of Seville and Cádiz respectively showed **no** evidence of aspiration before the ($VSOV_{NOGLOT}$ pronunciations, see (5)). Contrast this with Parrell's (2012) study focussing on speakers from these same cities and their wider autonomous communities in which 75% (936/1239) of the VSOV tokens had no phonetic cues of aspiration before the consonant but rather 'after' the consonant as post-aspiration. This increase in $VSOV_{NOGLOT}$ pronunciations is, perhaps, indicative of how the sound change is progressing historically and how such new pronunciations are creating a new phonemic distinction.

As for the realisations of word final /s/ in external sandhi, it seems that in Seville only /s/ behaves differently depending on its morphological status. When /s/ is a marker of 2SG on verbs there are no phonetic cues for its presence in Seville. When /s/ is a marker of PLURAL on nouns, the cues are extremely scant (with the exception of one speaker) in Seville and will in the future possibly disappear (if it has not already done so). However, when /s/ is not a morphological marker but it forms part of lexeme, as is the case for the word *dos*, the phonetic cues are robust. The conclusion from these data could be that sound change is sensitive to the morphological environment, which would have interesting theoretical implications. I do not think that this is the case, however, since there are parallels with the Andalusian data presented here and phonological changes in the history of Italian which suggest that the phonological effects of word final /s/ on the following consonants are becoming opaque and lexicalized.

The diachronic developments in Italian that mentioned above are those which took place in central and southern varieties of Italo-Romance and produced the phenomenon known as *rafforzamento*, or *raddoppiamento* (*fono*)*sintattico*. This is a process, illustrated by the examples in (27), whereby a lexicalised set of words produce gemination or strengthening of the initial consonants of the following words e.g. Italian. *da casa* 'from home' [dak:asa] vs. *la casa* 'the house'[lakasa] (for an overview see Wheeler and O'Neill (2019)).

(27) words which trigger *rafforzamento* (*fono*)*sintattico* in standard Italian.

a 'to': *a lui* 'to him' [al:ui]; *a Napule* 'to Naples' [an:apulə]
né 'neither/nor': *né caldo né freddo* 'neither hot nor cold' [ne k:aldo ne f:ɾeddo]

che: *che dite?* 'what are you saying?' [ke d:ite]

è: è vero 'it is true' [ɛ v:ero]

fa': *fammi un favore* 'do me a favour'

tre: *tre cani* 'three dogs' [tre k:ani]

The origin and historical evolution of this phenomenon is complex (see Loporcaro (1997)) but the incipient stages are essentially similar to the developments underway in Andalusian Spanish. In late Latin, word final consonants were totally assimilated to the following consonantal onset <*sud die*> for SUB DIE (Loporcaro 1997: 42, 121). The consequences of this assimilation process can be seen word internally in the history of Italian dialects where the outcome was elongated consonants (DICTU(M) > *detto* 'said'; RUPTU(M) > *rotto* 'broken'; FRIG(I)DU(M) > *freddo* 'cold'). In word final position, it is hypothesised that this same process was active in all pre-consonantal external sandhi contexts, as is the case with the phonological effects of /s/ in the word *dos* in Seville and all cases of wor final /s/ in Granada. In Italian, the final consonants which triggered changes in the following words eventually came to be deleted. Again, there are pararells with the Andalusian data since in Seville /s/ can be considered to have deleted when it is a marker of 2SG in verbs it is currently being deleted when it is a maker of PLURAL in nouns. In the relevant varieties of Italo-Romance, as illustrated by the data in (28), in certain monosyllabic words (note that the words in (27) are all monosyllables, such words have a special status historically, especially if stressed, see Wheeler and O'Neill (2019) for an overview) there are traces of these lost consonants in the phonological effects that these words have on following word-initial onset, making them geminate. Likewise, in the Spanish spoken in Seville, the <s> in the monosyllabic word *dos* is triggering changes in following consonants but, unlike the Italian data, it cannot be claimed that this consonant has been deleted yet.

(28) Historical summary of the development of *rafforzamento* (*fono*)*sintattico* in Italian.

Hypothesized prior stage of development in which there was a phonological rule which applied pre-consonantally in sandhi contexts			
_#C	_#C	_#V	_#‖
MANDŪCAT PANEM	DAT PANEM	DAT AQUAM	NON DAT
manduc/at#pane/	/dat#pane/	/dat#akwa/ 'gives water'	/non#dat/
manduc[ap:ane]	[dap:ane]	[datakwa]	[nondat]
'(s)he gives bread	'(s)he gives bread	'(s)he gives water'	'(s)he does not give'
Modern Italian pronunciations of the above phrases			

mangia pane *mangi*[ap:ane]*	*dà pane* [dap:ane]	dà acqua [dakwa]	non dà [non da]

Word final /s/ is clealy undergoing a process of deletion in the Spanish spoken in Seville but it is being maintained in the monosyllable *dos* and, I would hypothesise, in other monosyllables (*más, los, las, sus, mis, mes, les, es, das, vas*)[3]. In the future, /s/ could be deleted in these words but, like with what happened in Italian, one may be able to appreciate the effects of this historical consonant in the initial consonants of following words. However, unlike in Italian in which the lexical items only trigger gemmination. In Andalusian Spanish, the lexical items could also make following occlusives post-aspirated, and turn approximants into fricatives.

A future development of Andalusian Spanish, therefore, could be that the historical effects of /s/ aspiration are only apparent (a) word internally via new phonemes (*obis*[pʰ]*o* 'bishop') and (b) due to the effects that a specific set of monosyllabic words have on consonant-initial words (*dos* [pʰ] *ersonas* 'two people'). All other word-final contexts in which /s/ occurred, as could be the case in the current Spanish spoken in Seville, would not trigger such changes in following consonants (e.g. *comes* [p]*an* 'you eat bread' and *importantes* [p]*ersonas* 'important people'). Moreover, given that the plural articles in Spanish are monosyllables, it could be hypothesised that the morphological distinction between singular and plural is currently being transferred from moribund noun final /s/ to word initial consonants via the phonological effects on the following nouns of final /s/ in the articles '*los/las'*. That is, the marker of plurality might be in a process of being metathesised to the start of the word due to the effects of external sandhi of word final /s/ in the articles. Thus, the historical development of *los toros* 'the bulls' would be the following [lohtoɾoh] > [loʰtoɾo] > [loʰtʰoɾo] > [lotʰoɾo], whereby the distinction between the singular *el* [t]*oro* and plural lo[tʰ]*oros* is expressed phonetically via a different initial consonant, producing a hypothetical situation in which one one would have *un toro* 'one bull' [untoɾo] but *cinco toros* 'five bulls' [siŋkotʰoɾo].

Anecdotally, around the city of Seville the word *todos* 'everyone' seems to be pronounced with a more aspirated initial consonant than the corresponding singular form *todo* 'everything'. Also, Pons Rodriguéz (2019) in a discussion of the phenomenon of the pluralization of the particle *que* in exclamative and interrogative sentences (*qués cosas* 'what things' instead of *qué cosas*), notes how in the tweets in which this form appears, orthographic <s> is used to signal some type of aspiration. Another interpretation of the forms *qués cosas, qués ganas etc,* which could be applied in parallel to the existence of pluralised *ques,* could be that the orthographic use of <s> in these specific contexts is a sign that my future hypothesis for Andalusian Spanish is already underway. That is, that the marker of PLURAL on nouns has been transferred from the end to the start of the word and is phonetically realised as a more aspirated/breathy consonant. Evidence in favour of such an interpretation comes from the tweet below in (29) in which the additional orthographic <s> appended to the clitic *te* seems to indicate a following aspirated consonant. Likewise, the orthographic rendering *qués,* in the same tweet, is clearly singular and therefore not a case of a pluralised *que*. The situation could be that, just as with nouns in which the distinction between singular and plural is being morphologized via an initial aspirated consonant, so with verbs the same distinction is analogically being adopted to express the distinction between 2SG

[3] note that maintenance of word final /s/ is not ensured and speaker M2 in Seville did not have any cues for S_{DOS} in 30% of tokens in VS_{DOS}#V contexts (see (26))

and 3SG. A distinction which, as with PLURAL on nouns, was originally expressed via a final /s/. Thus, the orthographic forms *tu ques queieres* and *tu tes calla* would represent the forms [kekʰjeɾes] and [t̪ekʰaja], respectively, and would contrast with *que quiere* [kekjeɾe] and *se calla* [sekaja].

(29) Tweet taken from the study by Pons Rodriguéz (2019: 23)

@FaliGutierrez jajaja , tu ques quieres pelea ehhhhhhhh que si err negro te vacila tu tes calla y lo asimila :P [Tuit de @LauritaBravo99, 29/12/2012, Sevilla-Cádiz].

"@FaliGutierrez hahahah, what do you want? A fight? Ehhhhhhh if the black man teases you, you should shut up and take it"

In the foregoing, much experimental evidence from Andalusian Spanish has been presented showing how the historic effects of /s/ aspiration are radically changing the phonological system of this variety of Spanish. It has also been suggested that there could be changes in progress which are effecting the morphological system. Most recent research on Andalusian /s/ aspiration has focussed mainly on its effects on occlusives in word internal position and on how these occlusives are becoming post-aspirated and, in some places, elongated. All types of consonants in word internal position and in external sandhi contexts have been analysed in the present paper. The results from this article show just how rich a field Andalusian dialectology is and its potential for exploring the mechanisms involved in sound change, phonologisation and morphologisation.

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