

Assimilation and Dissimilation of Syllable Final /k/ in North-Central Spanish

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1. Introduction¹

Stops in Spanish are highly variable, especially in syllable final position; they range in pronunciation from full stops to complete deletion. Consider for example (1).

- (1) Syllable final /k/ in *doctor* ‘doctor’ (Quilis 1993:204–6, 218–220)²
- | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| [dok. ¹ tor] | [dog. ¹ tor] | [doy. ¹ tor] | [doθ. ¹ tor] | [dos. ¹ tor] |
| [doh. ¹ tor] | [dox. ¹ tor] | [dow. ¹ tor] | [do. ¹ tor] | |

For syllable final /k/, three of the realizations in (1) are frequently heard in areas of North-Central Spain, including parts of Castile, La Rioja, Asturias, Cantabria and the Basque Country. /k/ is pronounced as a voiceless stop in words such as *comic* (2a). In words like *taxi*, /k/ is optionally deleted or pronounced as a voiceless stop (2b). Finally, in words like *actor*, /k/ is commonly pronounced as a voiceless interdental fricative [θ] (2c) (Hualde 2005: 20, 148).

- (2) Syllable final /k/ in North–Central Peninsular Spanish
- | | | | | | |
|-----|-----------|------------------------|---|------------------------|---------|
| (a) | [k] | [¹ ko.mik] | | | ‘comic’ |
| (b) | [k] ~ Ø | [¹ tak.si] | ~ | [¹ ta.si] | ‘taxi’ |
| (c) | [k] ~ [θ] | [ak. ¹ tor] | ~ | [aθ. ¹ tor] | ‘actor’ |

The pronunciation of /k/ as [θ] in (2c) is a surprising outcome, since /k/ changes both its place and manner of articulation. Also surprising is the lack of attention this phenomenon has attracted in the literature. A few authors mention that it is restricted to *ct*- clusters, as in *aspecto* ‘aspect’ (Navarro Tomás 1996:138–140; Lapesa 1981:478; Quilis 1964:23; Hualde 2005:20). Its association with ‘regional’ or ‘uneducated’ speech has also been observed. For example, Hualde (2005:146) notes that this pronunciation is “...somewhat stigmatized and thus less common (...)”, and also “not part of the standard and (...) avoided by some other speakers of the same dialect” (Hualde 2005:20; see also Quilis 1993:219, Navarro Tomás 1996:138).

This paper focuses on two main issues related to the pronunciation of /k/ as [θ] in North Central Peninsular Spanish (henceforth NCP Spanish). The first issue is whether the realization of syllable final /k/ as [θ] is restricted to *ct*- clusters. As will be shown, this pronunciation also occurs for *cd*- and *cn*-. Second, this paper explores the motivation(s) underlying this phenomenon. Two explanations have been previously put forward. Lapesa (1981: 467, 478) considers it an instance of hypercorrection. Hualde (2005: 146) suggests that it may be orthographically based, since the letter *c* has the value [θ] in other contexts (for example, in *cine* ‘cinema’). This paper proposes a double phonological

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² The linguistic data in this paper belong to North-Central Peninsular Spanish (NCP Spanish) unless otherwise noted. Transcriptions are given following IPA conventions. Spanish orthography is indicated in italics, English glosses with quotation marks, and misspellings with an asterisk (*) in front of them.

motivation for the pronunciation of syllable final /k/ as [θ] in NCP Spanish: namely, /k/ dissimilates in manner and assimilates in place of articulation to a following coronal stop.

The organization of this paper is as follows. Section 2 examines the phonotactics of syllable final /k/, and section 3 presents data regarding the context of pronunciation of /k/ as [θ] in this dialect. Section 4 discusses previous explanations for this phenomenon, and section 5 proposes dissimilation and assimilation as its phonological motivation. Section 6 offers a preliminary analysis in Optimality Theoretic terms, and finally, section 7 is the conclusion.

Before proceeding, the reader not familiar with sound and spelling correspondences in NCP Spanish should be aware that /k/ is spelled *c* and /θ/ is spelled *z* before consonants, before non front vowels, and word finally (3). Before front vowels, /θ/ is spelled *c*, as in *cena* [¹θe.na] ‘dinner’, *cine* [¹θi.ne] ‘cinema’. *z* is found occasionally for /θ/, as in *zeta* [¹θe.ta] ‘letter z’ (Quilis 1993:200, 248, Hualde 2005:4, 6).

(3)	Spelling:	<u>/k/ as c</u>		<u>/θ/ as z</u>			
	(a)	<i>claro</i>	[¹kla.ro]	‘clear’	<i>jazmín</i>	[xaθ.¹min]	‘jasmine’
	(b)	<i>cara</i>	[¹ka.ra]	‘face’	<i>zapato</i>	[θa.¹pa.to]	‘shoe’
	(c)	<i>tic</i>	[tik]	‘nervous tic’	<i>luz</i>	[luθ]	‘light’

2. Phonotactics of syllable final /k/

In order to identify the contexts where /k/ may be pronounced [θ], the phonotactics of /k/ are examined word finally and word medially (2.1, 2.2). Section 2.3 provides some generalizations.

2.1 Word final /k/

Usually, word final /k/ is pronounced as a voiceless velar stop in monosyllables. One example is *rock* ‘rock’, pronounced [rok] in most cases. Other similar words include *block* ‘pad’ and *click* ‘click’. By contrast, in polysyllables, word final /k/ may be deleted or pronounced as [k] (cf. Hualde 2005:147–148). For example, *coñac* ‘brandy’ is pronounced [ko.¹nak] or [ko.¹na]. Other similar words are *comic* ‘comic’ and *anorak* ‘parka’.

Nouns ending in word final /k/ may be pluralized, as in *blocks* ‘pads’, *coñacs* ‘brandies’. Word final /k/ may be maintained as a voiceless velar stop or deleted in these cases.

2.2 Word medial /k/

Word medially, the distribution of syllable final /k/ is more complex. /k/ is not found before labials; clusters **cf*–, **cv*–, **cp*– are unattested, and there are only three words with clusters *cb*–, *cm*–: *pecblenda* ‘pecblenda’, *dracma* ‘drachma’ and *francmasonería* ‘freemasonry’. These three words are infrequent. /k/ is not found before dorsals either; clusters **cj*–, **cñ*–, where /k/ precedes a palatal consonant, and **cg*–, **cq*–, where /k/ precedes a velar consonant, are unattested.

On the other hand, syllable final /k/ is quite common before coronals. Table 1 provides examples of syllable final /k/ preceding coronal fricatives /θ/ (in *cz*– and *cc*– clusters) and /s/ (in *cs*– clusters and in intervocalic *x*).³ Although very few examples are found for *cz*– and *cs*–, words with *cc*– clusters and intervocalic *x* abound; Table 1 gives the ten most frequent examples found for each in the C-ORAL-ROM database (Cresti and Moneglia 2005). This database consists of corpora of spontaneous oral and written speech from French, Italian, Portuguese and Peninsular Spanish that includes 300,000 words for each of these languages.

³ *x* usually corresponds to [k.s] between vowels, as in *examen* [ek.¹sa.men] ‘exam’. Table 1 does not include words with *x* before consonants, because corresponding [ks] is syllabified in coda: *excepción* [eks.θep.¹θjón] ‘exception’.

Table 1 Word-medial /k/ before coronal fricatives

cz- /kθ/		cc- /kθ/		cs- /ks/		x /ks/	
<i>eczema</i>	'eczema'	<i>dirección</i>	'direction'	<i>facsimil</i>	'facsimile'	<i>existir</i>	'to exist'
		<i>traducción</i>	'translation'	<i>fucsia</i>	'fuchsia'	<i>exigir</i>	'to demand'
		<i>selección</i>	'selection'	<i>macsura</i>	'maqsura'	<i>próximo</i>	'near'
		<i>protección</i>	'protection'			<i>máximo</i>	'maximal'
		<i>acceso</i>	'access'			<i>examen</i>	'exam'
		<i>accidente</i>	'accident'			<i>éxito</i>	'success'
		<i>acción</i>	'action'			<i>taxi</i>	'taxi'
		<i>infección</i>	'infection'			<i>reflexión</i>	'thought'
		<i>diccionario</i>	'dictionary'			<i>auxiliar</i>	'auxiliary'
		<i>producción</i>	'production'			<i>exagerado</i>	'exaggerated'

Table 2 provides examples of syllable final /k/ preceding coronal stops /t, d, n/. There are only a handful of words with word medial *cd-* clusters in Spanish and about 20–30 words with *cn-*. The number of words with *ct-* clusters is considerably higher. All examples of words with clusters *cd-* are given in Table 2; for *cd-* and *ct-*, the ten most frequent words found in C-ORAL-ROM are given.

Table 2 Word-medial /k/ before coronal stops

<i>cd-</i>		<i>cn-</i>		<i>ct-</i>	
<i>anécdota</i>	'anecdote'	<i>tecnología</i>	'technology'	<i>producto</i>	'product'
<i>anécdótico</i>	'anecdotal'	<i>técnico</i>	'technician'	<i>efectivamente</i>	'effectively'
<i>ecdótico</i>	'ecdotics'	<i>técnica</i>	'technique'	<i>proyecto</i>	'project'
<i>sinécdoque</i>	'synecdoche'	<i>tecnológico</i>	'technological'	<i>exactamente</i>	'exactly'
		<i>técnicamente</i>	'technically'	<i>prácticamente</i>	'practically'
		<i>biotecnología</i>	'biotechnology'	<i>actividad</i>	'activity'
		<i>nemotécnica</i>	'mnemonic'	<i>característica</i>	'characteristic'
		<i>politécnico</i>	'polytechnic'	<i>actitud</i>	'attitude'
		<i>tecnicismo</i>	'technical term'	<i>respeto</i>	'respect'
		<i>tecnológicamente</i>	'technologically'	<i>contacto</i>	'contact'

2.3 Generalizations

One main generalization emerging from the data presented above is that word final /k/ is pronounced [k] in monosyllables, but it tends to delete in polysyllabic words. A second generalization is that /k/ tends to occur before coronal consonants only.

Deletion is common when /k/ precedes /s/ or /θ/; this was already noted by Quilis (1964:22–3) for Madrid Spanish in the sixties. Word medial /k/ may also occur before coronal stops /t, d, n/, as in *doctor*, *anécdota* and *acné* (4). As mentioned previously, the sequence *ct-* is commonly pronounced [θt] in NCP Spanish (4a) (see also Quilis 1964:22–3).⁴ The following section provides evidence that *cd-* and *cn-* are also pronounced by some speakers of this dialect as [θd] and [θn] (4b, c).

(4) Syllable final /k/ as [θ]

- | | | | | | |
|-----|------------|-----------------------------|---|-----------------------------|------------|
| (a) | Before /t/ | [dok. ¹ tor] | ~ | [doθ. ¹ tor] | 'doctor' |
| (b) | Before /d/ | [a. ¹ nek.do.ta] | ~ | [a. ¹ neθ.ðo.ta] | 'anecdote' |
| (c) | Before /n/ | [ak. ¹ ne] | ~ | [aθ. ¹ ne] | 'acne' |

⁴ In the word *tic-tac* 'tic-tac', /k/ tends to be maintained as [k], possibly because of morphological considerations.

3. Evidence for /k/ as [θ] in *cd-*, *cn-* and *ct-* clusters

Published data on the pronunciation of syllable final /k/ in NCP Spanish is scant, even if linguistic atlases are considered. For example, the questionnaires of the *Atlas Lingüístico de la Península Ibérica* (ALPI) do not include any words with *cs-*, *cz-*, *ct-*, *cd-*, *cn-*, *cm-* or intervocalic *x*, and only one example is found for *cc-* (for the word ‘lección’ *lesson*).

The examination of misspellings has the potential to illuminate the contexts where /k/ is pronounced [θ] in NCP Spanish. The reason is that the letter *z* always corresponds to the interdental fricative /θ/ in this dialect, unlike *c* (see section 1). If speakers do pronounce /k/ as [θ] in some contexts, it is likely that they will show some confusion regarding spelling. They might, for example, write *recto* ‘straight’ as **rezto*. On the other hand, if speakers seldom or never pronounce /k/ as [θ], hardly any misspellings or none at all will be found involving *z*. For example, *taxi* might be written **tasi* (indicating deletion of final /k/), but seldom or never **tazsi*.

To obtain evidence of the pronunciation of /k/ as [θ] word medially in NCP Spanish, a list of frequent words with *ct-*, *cd-*, *cn-*, *cs-*, *cc-*, *cz-* and intervocalic *x* was compiled using the text search engine Contextes (1.1.0) (© Jean Véronis) on the Spanish text files available in C-ORAL-ROM. This list of words was used to conduct a web search of potential misspellings in Google (www.google.com), limiting the search to pages in Spanish from Spain. This methodology is not novel, since text corpora based on software search engines such as *Google Query* have been previously used to investigate phonological properties of languages that are illuminated by the orthography, including Tagalog (Zuraw 2000) and Hungarian (Hayes and Cziráky Londe 2006).

Table 3 shows the results of a search of online misspellings of *ct-*, *cd-*, *cn-*, including information regarding normative spelling, the actual form of the misspelling, and the number of web pages where misspellings were found. Misspelling results are arranged from highest to lowest number of occurrences; non occurrences are omitted.⁵ For *ct-*, the ten most frequently misspelled words are given. For *cd-*, the five most frequently misspelled forms are given; for *cn-*, only two words were found with misspelled forms.

Table 3 Misspellings of *ct-*, *cd-*, *cn-* (www.google.com, January 16, 2007)

<i>ct-</i> as <i>*zt-</i>			
NORMATIVE	MISSPELLING	GLOSS	OCCURRENCES
<i>actor</i>	<i>*aztor</i>	‘actor’	(31,200)
<i>contacto</i>	<i>*contazto</i>	‘contact’	(1,210)
<i>pacto</i>	<i>*pazto</i>	‘pact’	(1,110)
<i>respecto</i>	<i>*respezto</i>	‘respect’	(512)
<i>producto</i>	<i>*produzto</i>	‘product’	(494)
<i>actitud</i>	<i>*aztitud</i>	‘attitude’	(459)
<i>doctor</i>	<i>*doztor</i>	‘doctor’	(349)
<i>directo</i>	<i>*direzto</i>	‘direct’	(299)
<i>característica</i>	<i>*carazterística</i>	‘characteristic’	(256)
<i>directamente</i>	<i>*direztamente</i>	‘directly’	(225)
<i>cn-</i> as <i>*zn-</i>			
<i>tecnología</i>	<i>*teznología</i>	‘technology’	(199)
<i>técnica</i>	<i>*téznica</i>	‘technique’	(84)
<i>arácnidos</i>	<i>*aráznidos</i>	‘arachnoids’	(57)
<i>técnico</i>	<i>*téznico</i>	‘technical’	(29)
<i>tecnológico</i>	<i>*teznológico</i>	‘technological’	(5)
<i>cd-</i> as <i>*zd-</i>			
<i>anécdota</i>	<i>*anézdota</i>	‘anecdote’	(231)
<i>anécdótico</i>	<i>*anezdótico</i>	‘anecdotal’	(7)

⁵ A few hits such as **zooteznia* and **bioteznología* (*zootecnia* and *biotecnología*) did not clearly correspond to Spanish words, since they appeared listed with Italian and Catalan words. These are not included in Table 3.

Examples of misspellings for *exactamente* ‘exactly’, *anécdota* ‘anecdote’, and *acné* ‘acne’ and the sentences and web pages where they occur are given in (5) (misspelled words are in bold).

(5) Misspelling examples

- *zt “Desde ya el norte, no recuerdo en qué pueblo **exaztamente**, podéis coger un mini-crucero de dos o cuatro días para ver los fiordos...”⁶
- *zd “Pues bueno durante toda la tarde al que más le tocaron fue a mí, aunque Ginés dio el campanazo y la **anezdota** de la tarde al sacar un Melba de 1’2KG (...)”⁷
- *zn “Da buenos resultados en el tratamiento del **azne**. Favorece la buena digestión y puede utilizarse en pacientes con hiperacidez o gastritis”⁸

Table 4 lists misspellings found for frequent words with *cc-*, *cz-*, *cs-*, and *x*. *cc-* and intervocalic *x* are usually misspelled as **c* and **s* respectively, which indicates that deletion of /k/ has taken place. Similar misspelling patterns are found for *cs-* and *cz-*.

The words listed in Table 4 were checked for possible misspellings involving *zs* and *zc*. No results were found for words like **ezsigir* (*exigir*, ‘to demand’) or **ezsagerado* (*exagerado* ‘exaggerated’). One result was found for **fuzsia* (*fucsia* ‘hot pink’).

Table 4 Misspellings: *cc-*, *cz-*, *x*, *cs-* (www.google.com, January 16, 2007)

<i>cc-</i> /kθ/			
NORMATIVE	MISSPELLING	GLOSS	OCCURRENCES
<i>dirección</i>	* <i>direción</i>	‘direction’	(385,000)
<i>protección</i>	* <i>protección</i>	‘protection’	(147,000)
<i>selección</i>	* <i>selección</i>	‘selection’	(131,000)
<i>acceso</i>	* <i>aceso</i>	‘access’	(139,000)
<i>accidente</i>	* <i>acidente</i>	‘accident’	(48,000)
<i>cz-</i> /kθ/			
<i>eczema</i>	* <i>ezzema</i>		(2)
<i>x</i> /ks/			
<i>próximo</i>	* <i>prósimo</i>	‘next’	(17,200)
<i>auxiliar</i>	* <i>ausiliar</i>	‘auxiliary’	(1,400)
<i>examen</i>	* <i>esamen</i>	‘exam’	(1,360)
<i>exagerado</i>	* <i>esagerado</i>	‘exaggerated’	(1,220)
<i>exigir</i>	* <i>esigir</i>	‘to demand’	(547)
<i>cs-</i> /ks/			
<i>fucsia</i>	* <i>fusia</i>	‘fuchsia’	(766)
<i>facsimilar</i>	* <i>fasímil</i>	‘fax’	(93)

In conclusion, two different misspelling patterns are found for word-medial /k/. *ct-*, *cd-* and *cn-* are frequently misspelled **zt-*, **zd-*, and **zn-*. However, *cc-*, *cz-*, *cs-*, and *x* are frequently misspelled **c-* or **s-*. This is evidence that in NCP Spanish, word medial /k/ may be pronounced [θ] before coronal stops only; otherwise /k/ tends to be deleted. This observation has previously been unreported.

⁶ From www.toprural.com/foroviajeros/index.cfm/accion/msg/idm/62334.htm. ‘From the North, I do not remember which town **exactly**, you can take a mini-cruise of two or four days to see the fiords’.

⁷ From www.anjupesca.com/currican.htm. ‘So, during the whole afternoon most of them came to me, although Ginés caused a stir and the **anecdote** of the afternoon when he took out a Melba of 1.2 kilos (...)’.

⁸ From www.usuarios.lycos.es/nubeazul11/newpage60.html. ‘It has good results in the treatment of **acne**. It favors good digestion and can be used on patients with hyperacidity or gastritis’.

4. Previous explanations

4.1 Orthography

Orthography and hypercorrection have been suggested as motivations for the pronunciation of *ct-* clusters as [θt] in NCP Spanish. Hualde (2005:146) states that “both the pronunciation of coda *g* as [x] and of coda *c* as [θ] seem to be orthographically motivated, since (...) *g* and *c* may also have these respective values in other positions.”

Orthography, however, does not capture some relevant facts regarding the pronunciation of *c* and *g* syllable finally. First and foremost, it fails to account for syllable final fricativization of stops other than /k/. For example, *p* is sometimes pronounced [θ], as in *apto* [‘aθ.to] ‘apt’ (Quilis 1993: 218; see also section 5.3). Unlike *c*, *p* never has the value [θ] in Spanish.

Secondly, the fricative realizations of *c* and *g* syllable finally in NCP Spanish involve different feature changes and contexts of application, which suggests that they result from different phonological phenomena. Syllable final /k/ undergoes a change in place and manner of articulation to [θ] before coronal stops /t, d, n/ only. By contrast, fricativization of /g/ to [x] involves a change in manner of articulation and voicing and is not restricted to any subset of consonants (6). In fact, voiced stops /b, d, g/ are commonly fricated and devoiced to [ϕ, θ, x] syllable finally in this dialect (Hualde 1989, Martínez-Gil 1991, Morris 2002, González 2002, 2006) (6–8). An orthographic account fails to capture this generalization.⁹

(6)	Syllable final /g/ in NCP Spanish			
(a)	Before /m/	/sintagma/	[sin.‘tax.ma]	‘phrase’
(b)	Before /d/	/magdalena/	[max.‘ða.‘le.na]	‘muffin’
(c)	Before /θ/–word finally	/θigθag/	[θix.‘θax]	‘zig-zag’
(7)	Syllable final /b/ in NCP Spanish			
(a)	Before /n/	/subnormal/	[suϕ.nor.‘mal]	‘retarded’
(b)	Before /x/	/obxeto/	[oϕ.‘xe.to]	‘object’
(c)	Word-finally	/pub/	[‘puϕ]	‘pub’
(8)	Syllable final /d/ in NCP Spanish			
(a)	Before /l/	/pensadlo/	[pen.‘saθ.lo]	‘think about it’
(b)	Before /k/	/adkirir/	[aθ.ki.‘rir]	‘acquire’
(c)	Word-finally	/madrid/	[ma.‘ðriθ]	‘Madrid’

4.2 Hypercorrection

An alternative explanation is mentioned in passing by Lapesa (1981: 467, 478), who considers the pronunciation of *ct-* as [θt] an instance of “hypercorrection”. Hypercorrection can be understood as the inappropriate correction of the auditory signal by the listener (Ohala 1992: 341). In essence, speakers in this dialect are aware of the fact that a consonant ‘should be’ pronounced in coda position, and prefer pronouncing it as [θ] rather than deleting it. This, however, does not necessarily explain why [θ] is favored over other pronunciations for syllable-final /k/ for many speakers of this dialect.

Even if orthography or/and hypercorrection were contributing factors to the pronunciation of /k/ as [θ] in *ct-*, *cd-* and *cn-* in NCP Spanish, neither account captures the fact that syllable final /k/ is pronounced as [θ] before coronal stops only. The following section proposes a phonological explanation that takes into consideration this generalization.

⁹ In NCP Spanish, [x] is attested as an allophone of /k/ in *ct-* clusters, but it is much more common as an allophone of /g/ in coda (Hualde 1989, Martínez-Gil 1991 and González 2002, among others). See also section 1.

5. Proposal

This section proposes manner dissimilation and place assimilation as underlying the pronunciation of syllable final /k/ as [θ] in NCP Spanish (sections 5.1, 5.2). Section 5.3 considers related phenomena.

5.1 Coda manner dissimilation

In dissimilation, a segment becomes less similar to another segment. Crosslinguistically, dissimilation is less common than assimilation (Ohala 1992 and references therein). In Spanish, synchronic dissimilation is rare compared to diachronic dissimilation, although some examples are found dialectally or in ‘vulgar’ speech (Martínez Celdrán 1994:376). The fact that syllable final /k/ is pronounced as [θ] before stops but not before fricatives suggests that dissimilation in manner of articulation takes place before /t, d, n/.

Recall from section 1 that stops are subject to much variation syllable finally, especially in NCP Spanish. Example (1) is repeated below as (9) for convenience. Note that allophones of syllable final /k/ range from voiceless stops (9a) to deletion (9i), with approximants and fricatives in between (9b–h).

- (9) Syllable final /k/ in *doctor* ‘doctor’ (Quilis 1993:204–6, 218–220)
- | | | | | | |
|-----|-------------------------|-----|-------------------------|-----|-------------------------|
| (a) | [dok. ¹ tor] | (d) | [doθ. ¹ tor] | (g) | [dox. ¹ tor] |
| (b) | [dog. ¹ tor] | (e) | [dos. ¹ tor] | (h) | [dow. ¹ tor] |
| (c) | [doɣ. ¹ tor] | (f) | [doh. ¹ tor] | (i) | [do. ¹ tor] |

How can so many different realizations be accounted for? From an acoustic point of view, segments in syllable final position are less sonorous, less perceptible and have less amplitude than segments in other positions in the syllable (Quilis 1993: 363). Coda consonants are usually shorter and perceptually less salient than onsets. Voiceless stops are hard to pronounce and perceive syllable finally, which may involve a shorter articulation and/or weaker perception. This can result in different outcomes, including (i) incomplete closure at the oral tract, as in approximants (9c, h); (ii) lack of a supralaryngeal closure, causing debuccalization (9f); or (iii) perception as voiced, since voiced obstruents are shorter than voiceless ones (9b) (Kirchner 1998, Lavoie 2001). Thus, ‘undershooting’ of a consonantal gesture and/or impoverished perceptual cues might be the underpinnings of the varied realizations of /k/ in coda in this dialect.

However, syllable final /k/ also has fricative realizations (9d, e, g). Voiceless fricatives are usually as long as or longer than voiceless stops, and are also quite salient, especially [s] (Albalá and Marrero 1993). If articulatorily and perceptually weak segments are expected syllable finally, what explains the occurrence of salient, long voiceless fricatives as allophones of /k/ in this position?

It is proposed here that dissimilation triggers the realization of syllable final /k/ as a fricative in this dialect (9d, e, g). Dissimilation avoids two contiguous stops. This might have articulatory and perceptual bases. Adjacent stops are articulatorily complex, since they involve the production of two complete occlusions almost simultaneously. Perceptually, the cues for the first stop are not as salient before another stop as before other segments. Consider for example the case of Faroese, where in /skt/ clusters, /k/ deletes or metathesizes with /s/ because of similar perceptual considerations (Hume and Seo 2001).

The fact that dissimilation targets the coda stop instead of the stop onset follows from the infrequent occurrence of stops in coda position (Hualde 2005: 75–76), as well as from the weak status of codas in the syllable (Quilis 1993:363). Supporting evidence for dissimilation includes the fact that /k/ is maintained as [k], or deleted, before /s, θ/ and also word finally. Because no stop follows /k/ in these cases, there is no reason for dissimilation to apply.

It is interesting that some native speakers of NCP Spanish find that syllable final /k/ as [θ] is more rarely heard and difficult to pronounce before /n/ than before /t, d/ (Susana Huidobro, p. c). This seems to be a gradient effect that might be captured in the grammar with stochastic constraints, as

proposed by Frisch, Pierrehumbert and Broe (2004) for Arabic verbal roots. One possible explanation is that dissimilation is more likely the closer two segments are featurally (Côté 2004, Colantoni and Steele 2005). /k/ might be more prone to dissimilate from /t/ because they only differ in their place of articulation. Dissimilation will be quite likely for /k/ before /d/ since both are oral stops. But before /n/, dissimilation of /k/ might not be common; /k, n/ differ in place of articulation, voicing and orality/nasality. Further investigation might reveal a gradient pattern of dissimilation dependent on the features shared by the two consonants. A matter for further research is whether speakers in NCP Spanish show different types of dissimilation patterns for syllable final /k/ along these lines; namely, in *ct-* clusters only; in both *ct-* and *cd-*; or in *ct-*, *cd-*, *cn-* alike.

Although realizations of syllable final /k/ include fricatives [θ, s, x], the most common outcome is [θ]. The next section proposes that place assimilation is responsible for this preference.

5.2 Coda place assimilation

In coda place assimilation, a syllable final consonant takes the place of articulation of an immediately following onset. Co-articulation is usually considered to underlie cases of assimilation, which tend to be progressive, although perception might also be relevant in some cases (Ohala 1992). In Spanish, nasals and /l/ undergo coda place assimilation. Nasals take the place of articulation of the following onset, but place assimilation for /l/ is restricted to coronal consonants (Quilis 1993:228–231, 309–10, Hualde 2005:174–5, 179). Both /n/ and /l/ are reportedly pronounced as interdental before /θ/ (10a, c) and dental before /d, t/ (10b, d) in NCP Spanish.

- (10) Coda assimilation: /n/, /l/ (Navarro Tomás 1996:95)
- | | | | | |
|-----|----------|----------|------------|-----------------|
| (a) | ‘trenza’ | /trenθa/ | [ˈtren.θa] | <i>braid</i> |
| (b) | ‘andas’ | /andas/ | [ˈan̩.das] | <i>you walk</i> |
| (c) | ‘alza’ | /alθa/ | [ˈal.θa] | <i>raise</i> |
| (d) | ‘alto’ | /alto/ | [ˈal̩.to] | <i>tall</i> |

In NCP Spanish, coronals include fricatives /θ, s/ and stops /t, d, n/. The fact that syllable final /k/ is realized as [θ] before /t, d, n/ more often than /s, x/ suggests that /k/ assimilates to an adjacent coronal. Of the contexts where syllable final /k/ may be pronounced [θ], /t, d/ are dental while /n/ is alveolar. If place assimilation takes place, two different outcomes are expected (ignoring for a moment certain details); [θ] before /t, d/, and [s] before /n/. However, [θ] occurs in all three cases. The following paragraphs discuss the realization of syllable final /k/ in these contexts in more detail.

▪ Before /d/

The phoneme /d/ in Spanish has an interdental allophone [ð] after vowels, approximants, and fricatives. The realization of syllable final /k/ as [θ] in this context is expected, since both [θ] and [ð] are interdental.

▪ Before /t/

[θ] is also expected as the place assimilated allophone of /k/ before /t/. Dentals and interdentals are arguably closer in articulation than dentals and alveolars (cf. Hualde 2005: 52–53). For dentals and interdentals, the active articulator is the apex of the tongue, while the passive articulator is the upper front teeth. For alveolars, the apex or the predorsum is the active articulator and the alveolar ridge is the passive articulator (Hualde 2005:50). No dental allophones of /s/ occur in Spanish (Quilis 1993:251).

Co-articulation between [θ] and [t] may be accomplished by two means: the dentalization of [θ], or the interdentalization of [t]. A dental articulation of [θ] is not implausible because dentals and interdentals are articulatorily close.¹⁰ Additionally, interdental realizations for /t/ have been

¹⁰ There is further evidence that suggests that /θ/ might be dentalized before a dental, perhaps as the result of a shared tip of the tongue articulation. This is common in other languages (Gafos 1996) and apparently takes place

reported after /θ/, as in ‘hazte allá’ [ˈaθ.t̪e aˈja] *move over there* (Navarro Tomás 1996:95–6). The bottom line is that [θ] and [t] are co-articulated; whether this is achieved through dentalization of [θ] or interdentalization of [t] is a matter for future investigation.

▪ *Before /n/*

Before alveolar /n/, [s] is expected rather than [θ]. The most common articulation of /s/ in NCP Spanish is apico-alveolar, with the apex of the tongue towards the upper alveolar region and a concave shape of the tongue (Quilis 1993:248). Quilis (1993:226) describes the articulation of /n/ as linguo-alveolar, with the sides of the tongue adhering to the upper molars and the apex of the tongue against the alveolar ridge. This means that when the articulatory gesture for [θ] is being formed, the sides of the tongue are already in place for the articulation of /n/. It is also plausible that /n/ fronts its place of articulation to dental or interdental after [θ]; dental and interdental allophones of /n/ are attested in Spanish (10a, b). For these reasons, it will be assumed in this paper that [θ] and [n] are co-articulated in this context.

If coda place assimilation took place exclusively in *ct-*, *cd-* and *cn-* clusters, gemination would result; assimilation would also be expected for syllable final /k/ before coronals /s, θ/, giving pronunciations such as *[ˈtat.si] or *[ˈtaθ.si] for *taxi*.¹¹ Since neither of these two situations is attested in this dialect, this means that both assimilation and dissimilation target syllable final /k/.

5.3 Related data

The pronunciation of /k/ as a voiceless interdental fricative syllable finally is not an isolated phenomenon in NCP Spanish. Although not as widespread, /p, t/ are pronounced as [θ] in some cases.

(11)	/p, t/ as [θ]	(from Quilis 1993: 218–23)		
(a)	<i>apto</i>	/apto/	[ˈaθ.to]	‘apt’
(b)	<i>étnico</i>	/etniko/	[ˈeθ.ni.ko]	‘ethnic’

Syllable final /m/ is pronounced as [θ] in /mn/ clusters in some occasions in this dialect: *columna* [ko.ˈluθ.na] ‘column’, *alumno* [a.ˈluθ.no] ‘student’. These pronunciations are, to my knowledge, very rare, but they might evidence an emerging trend in Spanish to dissimilate two nasal stops in manner of articulation and assimilate them in place of articulation. However, the realization of /mn/ as [mn] or even [n] is much more frequent (Quilis 1993: 244–245).¹²

The data presented in this section suggest that in NCP Spanish, synchronic dissimilation may be more common than previously thought, and that place assimilation may extend to consonants other than nasals and laterals. Investigation of contexts of distribution and incidence of misspellings, currently underway, will shed light on whether assimilation and dissimilation are plausible motivations for the realizations of /p, t, m/ as [θ] in this dialect.

6. Preliminary OT analysis

As noted in sections 1 and 5.1, many patterns of variation are attested for syllable final /k/ in NCP Spanish. Some of them are more prevalent than others, as evidenced by personal observation and examination of online misspelling data. Two of the most widespread patterns are (i) the pronunciation

in *ld-* clusters in Spanish, which are pronounced [l̪.d̪]; compare [ˈka.l̪.do] for *caldo* ‘broth’ with [ˈka.l̪.β̪.o] for *calvo* ‘bald’. For details, see Mascaró (1984) and González (2006).

¹¹ This might be the case in other dialects, however. Pronunciations such as [ˈset.si] for *sexy* are attested, for example, in Mexican Spanish (Jaime Rivera, p. c.).

¹² A final observation, to my knowledge also unreported in the literature, is that fricative clusters tend to be avoided through dissimilation of a syllable initial onset in NCP Spanish. One example is *piscina*, pronounced as [pis.ˈti.na] ‘swimming pool’. Cf. optional fricative dissimilation in English, where [θ] is pronounced as [t] after another fricative, as in *fifth* /fɪfθ/ [fɪft̪] and *sixth* /sɪksθ/ [sɪkst̪] (from Tserdanelis and Wong 2004:113).

of /k/ as [θ] before coronal stops but its deletion before other consonants, and (ii) the pronunciation of syllable final /k/ as [k] in all contexts. Speakers seem to follow one of these patterns regardless of register, style, or other sociolinguistic factors.

This is consistent with Guitart (2005), who observes a similar speaker-dependent pattern in the (non) lateralization of /r/ in Caribbean Spanish. Further investigation will clarify whether the realization of syllable final /k/ as approximants, debuccalized fricatives or voiced stops noted by Quilis (1993) is common and consistent enough to warrant a phonological analysis. In the meantime, this section offers a preliminary analysis of the realizations of syllable final /k/ for the two most common patterns of realization for syllable final /k/ in NCP Spanish, namely:

- i. Speakers who consistently pronounce syllable final /k/ as [k].
- ii. Speakers who pronounce /k/ [θ] before coronal stops but delete it in other contexts.

This preliminary analysis is couched in Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1994). More specifically, it follows the Correspondence Theory of Faithfulness (McCarthy and Prince 1995). This framework is well suited to capture phonological variation via constraint re-ranking. Constraints are universal phonological tendencies that are in tension with each other; through different rankings, varied phonological strategies might arise cross-linguistically. The analysis will capture at least two different phonological grammars in NCP Spanish:

Grammar A: Syllable final stops surface faithfully as stops.

Grammar B: Syllable-final /k/ dissimilates in manner and assimilates in place to a following coronal stop, but deletes in other contexts.

6.1 Grammar A: Faithful codas

In this grammar, syllable final consonants are generally realized faithfully; this is captured by a ranking where the faithfulness constraint MAX-IO (which penalizes deletion of segmental material) is ranked higher than the markedness constraint NO CODA (which penalizes syllable final consonants). Two other relevant constraints are OCP [consonant], which rules out geminates, and IDENT-IO [continuant], which penalizes differing continuant specifications in input and output. IDENT-IO [continuant] is independently needed to capture ‘spirantization’ in Spanish (see for example González 2006). OCP [consonant] is also needed independently to rule out geminates in Spanish.

(12) Grammar A: Constraints

MAX-IO	Every element of the input has a correspondent in the output.
NO CODA	Syllable final consonants are dispreferred.
OCP [consonant]	Identical contiguous consonants are dispreferred.
IDENT-IO [cont]	Correspondent segments in the input and output have identical values for the feature [continuant].

Tableau 1 shows the ranking among the constraints in (12). High ranked OCP [consonant] and MAX-IO rule out, respectively, candidate (e) –which has a geminate– and candidate (f) –where deletion has taken place. Candidates (b–d), which realize input /k/ as a fricative, fail on violations of IDENT-IO [continuant] and NO CODA. Candidate (a) is optimal because it only violates NO CODA, which is low ranked.

Since the consonant following /k/ does not bear on the realization of /k/ in this grammar, tableaux for contexts other than *ct-* are not included; the reader can check that the same ranking applies in these cases. This ranking would also predict the faithful realization of other codas in this grammar. Additional constraints would be needed to capture coda place assimilation for laterals and nasals, which applies in all Spanish dialects; see below and González 2006.

Tableau 1 /k/ as [k] before [t]

/aktor/	OCP [CONS]	MAX	NO CODA	IDENT [CONT]
☞ a. ak.tor			*	
b. aθ.tor			*	*!
c. ax.tor			*	*!
d. as.tor			*	*!
e. at.tor	*!		*	
f. a.tor		*!		

6.2 Grammar B: Dissimilated and assimilated codas

In Grammar B, syllable final /k/ is pronounced [θ] before coronal stops, but deletes before other consonants. Two constraints are needed in addition to those in (12): OCP [manner], which penalizes similar manner specifications in adjacent consonants, and CORONAL PLACE AGREEMENT, which captures coda assimilation before a coronal. This constraint is also needed to capture nasal and lateral place assimilation in Spanish (see González 2006 for an analysis).

(13) Grammar B: Additional constraints

- OCP [manner] Identical manner of articulation in contiguous segments is dispreferred.
- CORONAL PLACE AGREEMENT A consonant agrees in tongue tip orientation with an immediately following coronal (based on Gafos 1996).

As shown in Tableau 2, for the input /aktor/, candidate (b) is selected as optimal, since it does not violate any of the higher ranked constraints, unlike the rest of the candidates. Candidates (a, e) violate OCP [manner] since they have two adjacent stops. Candidates (a, c, d) violate CORONAL PLACE AGREEMENT since the word medial coda does not agree in place of articulation with the following dental consonant. Finally, candidate (f) involves deletion and violates MAX-IO.

Tableau 2 /k/ as [θ] before [t]

/aktor/	OCP [MANNER]	CORONAL PLACE AGREE	MAX-IO	NO CODA	IDENT [CONT]
a. ak.tor	*(!)	*(!)		*	
☞ b. aθ.tor				*	*
c. ax.tor		*!		*	*
d. as.tor		*!		*	*
e. at.tor	*!			*	
f. a.tor			*!		

This ranking also captures dissimilation and assimilation in *cd-* and *cn-* clusters (Tableaux 3, 4). In Tableau 3, candidates (a, f) have adjacent segments with identical manner specifications, thus violating high ranked OCP [manner]. In candidates (a, c, d, e), the coda consonant does not agree with the tongue tip orientation of the following onset; in (a), the coda is velar and the following onset is dental; in (c), the syllable final consonant is interdental but the adjacent onset is dental; in (d), the coda is velar but the following onset is interdental, and in (e), the coda is alveolar, but the adjacent onset is interdental. Thus, candidates (a, c, d, e) violate high ranked CORONAL PLACE AGREEMENT and fall from the evaluation at this point. On the other hand, candidate (g) involves deletion and violates high ranked MAX-IO. This means that candidate (b), which violates low ranked NO CODA and IDENT-IO [continuant], is selected as winner. A similar result obtains with the input /anekθota/ (not shown); this is expected under Richness of the Base (Prince and Smolensky 1993).

Tableau 3 /k/ as [θ] before [ð]

/anekdota/	OCP [MANNER]	CORONAL PLACE AGREE	MAX-IO	NO CODA	IDENT [CONT]
a. a.nek.do.ta	*(!)	*(!)		*	
☞ b. a.neθ.ðo.ta				*	*
c. a.neθ.do.ta		*!		*	*
d. a.nek.ðo.ta		*!		*	*
e. a.nes.ðo.ta		*!		*	*
f. a.neð.ðo.ta	*!			*	*
g. a.ne.ðo.ta			*!		

Tableau 4 shows the input /akne/ *acne*. Once more, the evaluation selects as winner the candidate with violations of lower ranked constraints NO CODA and IDENT-IO [continuant] (candidate c). Candidates (a, d, e) fail on high ranked OCP [manner]. Candidates (a, b, e) violate high ranked CORONAL PLACE AGREEMENT, and candidate (g) loses on MAX-IO.

Tableau 4 /k/ as [θ] before [n]

/akne/	OCP [MANNER]	CORONAL PLACE AGREE	MAX-IO	NO CODA	IDENT [CONT]
a. ak.ne	*(!)	*(!)		*	
b. aθ.ne		*!		*	*
☞ c. aθ.ɲe				*	*
d. at.ne	*!			*	
e. as.ne		*!		*	*
f. an.ne	*!			*	
g. a.ne			*!		

Before fricatives, no dissimilation or assimilation applies. This is captured by the same ranking, as observed in Tableau 5. Candidates (b, c) violate two of the higher ranked constraints, OCP [manner] and CORONAL PLACE AGREEMENT. The rest of the candidates are tied at this point, since they all violate one of the higher ranked constraints. Candidate (f), which does not have extra violations of the lower ranked constraints, is selected as winner.

Tableau 5 /k/ deletes before [s]

/taksi/	OCP [MANNER]	CORONAL PLACE AGREE	MAX-IO	NO CODA	IDENT [CONT]
a. tak.si		*		*!	
b. taθ.si	*	*!		*	*
c. tax.si	*	*!		*	*
d. tas.si	*			*!	*
e. tat.si		*		*!	
☞ f. ta.si			*		

This section has presented a preliminary analysis of the realization of syllable final /k/ in NCP Spanish. Two grammars have been examined: one where voiceless stops surface faithfully, and one where dissimilation and place assimilation apply before coronal stops. Further phonetic and phonological investigation will clarify various aspects of this phenomenon, including the precise means by which coarticulation takes place between [θ] and [t, d, n], possible differences in patterns of articulation/dissimilation before each coronal stop, and the relative frequency of occurrence of /k/ as [θ] in this dialect. It is expected that consideration of additional data will contribute to the refinement of the analysis and the exploration of its implications for the phonological system of NCP Spanish.

7. Conclusion

This paper has focused on the pronunciation of syllable final /k/ as [θ] in NCP Spanish. A major finding is that syllable final /k/ may be pronounced as [θ] not only in *ct-* clusters, as previously reported, but also in *cd-* and *cn-* clusters. In clusters *cs-*, *cz-*, *cc-* and *x*, syllable final /k/ tends to be deleted. Evidence from online misspellings in NCP Spanish supports this distribution, since misspellings involving *z* [θ] are found for *ct-*, *cd-*, *cn-* only.

This paper proposes that the pronunciation of /k/ as [θ] before /t, d, n/ has a double phonological motivation. It is suggested that articulatory and perceptual factors contribute to the avoidance of contiguous stops in NCP Spanish, triggering manner dissimilation for syllable final /k/ in some contexts. Additionally, assimilation causes syllable final /k/ to adopt the coronal place of articulation of the following stop, mainly for articulatory reasons. Together, dissimilation and assimilation achieve coronal fricative coda realizations, and prevents gemination, sequences of identical stops, and deletion before coronal stops. Additionally, a preliminary analysis in Optimality Theory is put forward to capture two grammars in this dialect: one where syllable final /k/ is realized faithfully in all contexts and one where /k/ is realized as [θ] before coronal stops but deleted otherwise. These two grammars are speaker dependent.

This work opens up many questions for future investigation. This includes (i) coarticulation patterns involving [θ] and [t, d, n], (ii) the pronunciation of /p, t, k/ as [θ] before coronal stops and its relationship to frication and devoicing of /b, d, g/ syllable finally, and (iii) the connection of this phenomenon with *velar softening*. Velar softening refers to a type of morpho-phonological alternation whereby /k/ is pronounced as [θ] and /g/ as [x] before front vowels and word-finally (Cressey 1978:89). Examples include ‘médi[k]o’ *medical* vs. ‘medi[θ]ina’ *medicine*, and ‘eléctri[k]o’ *electrical* vs. ‘electri[θ]idad’ *electricity*. This line of research, currently underway, focuses on the fact that assimilation to an anterior segment takes place in both cases.

The main contribution of this study is the examination of a poorly understood phenomenon of Spanish phonology. It shows the importance of phonotactics, large corpora and misspellings in phonological research. It is expected to be a stepping stone to reach a deeper understanding of the phonetics and phonology of syllable final consonants in NCP Spanish, and, more generally, of Spanish dialects.

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