ON SOME PHONETIC AND PHONOLOGICAL PROPERTIES OF THE GREEK GLIDE

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1. INTRODUCTION

Glides cross-linguistically exhibit a 'schizophrenic' behavior, acting as allophones of high Vs (Latin, Sanskrit) or as independent phonemes themselves (Karuk, Pashto) [see Levi 2011 for an overview].

In Greek it's worse, because the glide can act as both (Rytting 2005, Topintzi & Baltazani 2013 and refs therein):

- independent phoneme /J/ contrasting with /i/ (1) (/J/= shorthand for different phonetic realizations of the glide, see below)
- or as an allophone of /i/, e.g. in alternations in the paradigm of neuter nouns ending in *–i* (2)

(1) [á.ði.a] "permission" vs [á.ðja] "empty"
(2) [pó.ði] "foot" vs [pó.ðja] "feet"

We aim to answer three questions (of which, only the first has been addressed in previous research) . The answers are briefly outlined here. For details, read on!

- Is the GLIDE underlying?
  YES, but it can also be allophonic
- Are palatals underlying?
  Except for the GLIDE itself, they are always derived
- Does morphology influence patterns in GLIDE distribution?
  YES; certainly much more than previously assumed

2. THE DATA

Phonetics of GLIDE (brief outline)
If tautosyllabic **V+J → j** [majda'nos] "parsley"

If tautosyllabic **J+V** then:
If /l/ or /n/ + J + V → **ʎ, ɲ** [ku.'kʎa] "dolls" [pa.'ɲa] "cloths"
If [voiced obstruent] + J + V → **j** ['po.ðja] "legs"
If [voiceless obstruent] + J + V → **ç** ['matça] "eyes"
If /m/ + J + V → **ɲ** [mɲa] "one"

Phonological distribution of GLIDE

- **Evidence for Glide as a phoneme**

Minimal pairs with or without semantic affinity

'aðia	permission	*'aðja*	empty
vi'astike	was raped	*'vjastike*	was in a hurry
'ðolio	devious	*'ðoʎo*	poor soul
'opio	opium	*'opço*	whichever

- **Evidence for GLIDE as allophone of /i/**

(3) [i] ~ [J] alternations

No Alternation			Alternation		
Nom.Sg.	Nom.Pl.		Nom.Sg.	Nom.Pl.	
pe.'ði.o	*pe.'ði.a*	field	*pe.'ði*	*pe.'ðja*	child
ðo.'ma.ti.o	*ðo.'ma.ti.a*	room	*ðe.'ma.ti*	*ðe.'ma.tça*	stock

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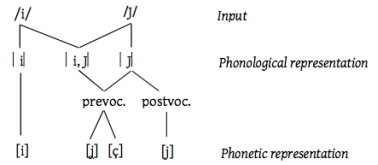
3. OUR PROPOSAL FOR THE GLIDE

→ The dual nature of the GLIDE as both a phoneme and an allophone of /i/ can be captured if we assume the following representation:

(4) Schema for /i/-/J/ contrast and neutralization in Greek



→ We also argue that the presence vs. absence of alternations can be – at least partly – predicted by morphological considerations:

- Neuter nouns (3) predictably present alternations vs. lack thereof depending on the noun's morphological class:
  /i/-stem final + ∅ suffix → no alternation
  /i/-stem final + V-initial suffix → alternation
- **But why?** Paradigm uniformity asks that same number of syllables is preserved across the paradigm
- Technically, we utilize the Optimal Paradigms framework (McCarthy 2005) and claim that while hiatus is normally admitted (Faith-IO >> *VV) accounting for contrast, the number of syllables in a paradigm, should remain the same (cf. Bat-El 2008; OP-Faith-σ#), explaining the predictable neutralization. Thus:

pe.'ði.o (Nom.Sg) – pe.'ði.u (Gen.Sg) – pe.'ði.a (Nom.Pl) 'field' is OK
pe.'ði (Nom.Sg) – *pe.ði.'u (Gen.Sg) – *pe.ði.'a (Nom.Pl) 'child' is NOT
Solution: i → [J] and consequently tautosyllabic syllabification of i+V.
Hence: pe.'ði (Nom.Sg) – pe.'ðju (Gen.Sg) – pe.'ðja (Nom.Pl)

4. THE GLIDE AND PALATALS

As seen in (3), the *i-Glide* alternations between Nom. Sg. and Pl. are realized by means of *i* vs. *palatal fricative*. But what about cases where there is a palatal C in the Nom.Sg. too?

(5) [i] ~ [∅] alternation with palatals?

Nom. Sg.	Nom. Pl		
'luci	*'luca*	**lucça*	gutter
pu'ji	*pu'ja*	**pu'jja*	reticule

Although superficially no GLIDE emerges here in the Nom.Pl, it should have as these data are completely analogous to those of (3) in terms of the identical morphophonological environment.

- **Claim:** Greek employs both simple and extreme palatalization (SP, EP). SP applies before /i, e/, EP before /J/. In EP, the PAL-trigger (a glide) fuses with the target, as it is easily recoverable. In SP, the PAL-trigger (a vowel) remains, because its absorption would entail loss of a nucleus (cf. Bateman 2007)
- **Consequence:** palatals (except for /J/) in Greek are always derived
  /luki-∅/ → [luci] simple palatalization, SP
  /luki-a/ → lukJ-a → lucJ-a → [luca] extreme palatalization, EP
- **Welcome extension:** similar analysis for palatals found in purely phonological contexts (morpheme-internally)
- Compare: /kJali/ → cJali → ˈcali "binocular" (with EP) vs. /kili/ → [ˈcili] "hernia" (with SP) vs. /kali/ → [ˈkali] "beauty" (no change)
- We can now also explain why words like [ciaˈnos] "blue" exist alongside [ˈcali]. Claim: [ciaˈnos] < /kianos/ through SP. [ˈcali] presents EP, hence absorption of the PAL-trigger

5. EXPERIMENT : THE PHONETICS OF PALATALIZATION

There are few phonetic studies of Greek palatalization. Articulatorily palatalization has been shown to involve a shift of the primary articulation towards the palatal region for sonorant alveolars [l] and [n] and also for velar obstruents [k, g, x, ɣ], eg. [paɲa, luca].(Nicolaidis 2003). However, nothing more is known about palatalization.

Question: How much is the phonological account above reflected in the phonetic realization?

Method and materials:

- 7 female speakers
- words with/Ci/ or /Cja/ sequencesin word-initial and word-final position, as shown in Table below:

INITIAL			FINAL		
SEQUENCE	EXAMPLE	PROCESS	SEQUENCE	EXAMPLE	PROCESS
# Ci	*ci'mas*	Simple Pal.	Ci#	*'luci*	Simple Pal.
#CjV	*ca'laro*	Extreme Pal. (underived)	CjV#	*'luca*	Extreme Pal. (derived) at a morphological boundary

- 18 Cs: [c, ɟ, ç, j, n, l, p, b, t, d, s, z, f, v, θ, ð, m, r]
- In total, 504 tokens (18 Cs x 4 sequences x 7 speakers) were recorded.

Measurements:

- duration (ms) of the consonant closure, C-to-V transition, [a] and [i]
- consonant release burst
- frequency (Hz) of the second formant (F2) measured at 5ms intervals
  - Here we report on the [i] duration, the C-to-V transition duration and F2 values

6. EXPERIMENT B: RESULTS

1. Two types of Greek consonants: (i) /k, g, x, ɣ, n, l/, under the right conditions, change place of articulation; (ii) /p, b, t, d, s, z, f, v, θ, ð, m, r/ never do (Figure 1).

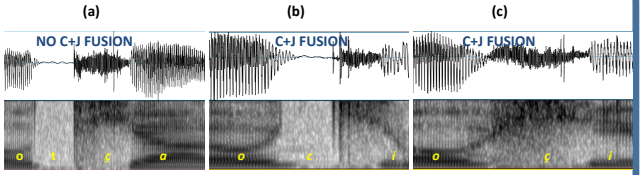


Figure 1. Panel (a): Consonant-glide sequence for alveolars in [leo tçara]. The lack of i-like transitions in preceding vowel [o]shows no palatalization within the [t] itself. Panels (b, c): Fusion of palatal trigger and velar consonant in [leo cimas] (b) and [leo çili] (c). There is a clear i-like transition from the preceding vowel into the palatal C. The complete fusion of the velar with the palatal is best seen in the i-like F2 formant trajectory throughout the frication period in [çili].

2. SP and EP difference: the trigger of PAL remains under SP; it fuses with the PAL-target in EP (Fig 2).

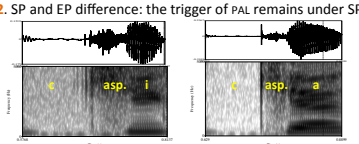
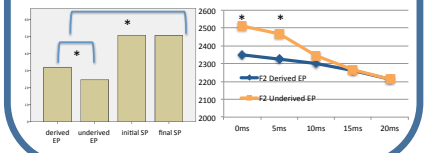


Figure 2 Left: the syllable [ci] of the word [luci], an example of SP. Right: the syllable [ca] of the word [luca]. The trigger of PAL is intact in [luci], there is nothing but a C-to-V transition in [luca].

3. The amount of fusion in EP is different in underived (intra-morphemically) and derived environments (across morphemes), as evinced by duration (F(2.188)= 18.446, p<. 000) and F2 comparisons of the vocalic stretches following the C. *(vocalic stretches = [i] or C-to-V transition)*

(a) The vocalic stretches show a duration distinction (Fig. 3a):
- The [i] in SP is statistically longer than the C-to-V transition in EP
- C-to-V in underived EP is statistically longer than in derived EP

(b) The F2 of the C-to-V transition in underived EP is significantly higher than in derived EP at 0ms (t(27)=-3.535, p=.001) and at 5 ms (t(27)=-3.007, p=.006)



7. SUMMARY AND DISCUSSION

→ There are two major PAL-target C-classes in Greek:
- Cs involving a change in place of articulation for /k, g, x, ɣ, n, l/ → [c, ɟ, ç, j, ɲ, ʎ], where the PAL-trigger fuses with the C
- Cs without change in place of articulation for /p, b, t, d, s, z, f, v, θ, ð, m, r/. The glide is articulated intact in a way similar to the Br. English palatal approximant in /tju:n/ or / tʃu:n/, 'tune' and /fju:m/ 'fume'

→ Our hypothesis about phonetic differences among the palatalization processes of SP and EP is confirmed: the trigger of PAL remains under SP; it fuses with the PAL-target in EP

→ Phonetic differences were also detected between derived and underived EP: the C-to-V transition in derived EP is shorter in duration and has a lower F2. These results suggest that the presence of the morphological boundary attenuates co-articulatory influences of the PAL-target on the following vowel [a].

8. CONCLUSIONS

Our proposal manages to
- provide a **link** between the GLIDE and the palatals that had previously gone unnoticed
- **resolve** the paradox in the nature of the GLIDE by means of (4) [past accounts failed to do so adequately]
- offer **evidence** that the distribution of the GLIDE vs. /i/ is to some extent regulated by grammatical considerations, i.e. morphology, instead of sociolinguistic factors that have been proposed in the literature as the main regulating factor in the distribution of GLIDE, cf. Nyman (1981)
- **distinguish** among different palatalization processes and highlight their differences in phonetic implementation

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