Exploring complex segments in Greek

The internal composition of consonant clusters has primarily been dealt with by means of sonority (cf. Clements, 1988, 1990, 1992). Sonority distance seems to be responsible for cluster well-formedness (Steriade 1982). More specifically, the bigger the distance among cluster members, the better-formed the cluster. To give an example, [cl] is better formed than [fθ], because the sonority distance holding among cluster members on the sonority scale is bigger for [cl] than for [fθ].

Recent studies on the synthesis of Greek consonant clusters have shown that consonantal strings range on a scale-like manner with respect to their internal coherence (Tzakosta & Vis 2009a, b, c). More specifically, **O**(bstruent)**L**(iquid) clusters, though the best formed, exhibit the least coherent phonological structure. This is supported by the fact that **OL** sequences are frequently prone to epenthesis or deletion, phonological processes frequently attested in language development data (1a-c). Put differently, while **OL** clusters are the best formed clusters due to the fact that they characterized by the bigger possible sonority distance among their cluster members, this distance assigns them a loose phonological representation.

On the other hand, **O**(obstruent)**O**(bstruent) sequences display higher coherence compared to **OL** sequences. This is shown by the fact that, first, **OO** sequences are marked by a smaller sonority distance compared to **OL** clusters and, second, when **OO** sequences, like [pt] and [kt], are repaired, they are not subject to epenthesis on deletion, but, rather, to fusion, as shown in the examples in (2a-f). Given that in fusion the product of the repair is a segment preserving featural characteristics from both mother segments, this is evidence that the original cluster is accurately perceived, though not accurately produced. In other words, coherent phonological representations facilitate accurate cluster perception.

Finally, Greek affricates exhibit extensive internal coherence; affricates [ts] and [dz] seem to be rarely prone to repair strategies, rather, they are accurately produced from very early in language development, as illustrated in (3a). It is interesting that affricates replace other consonant clusters, mostly **O+/s/** ones, something that adds to the argumentation for the coherence of the former. Such data maintain that Greek affricates are complex segments rather than consonant clusters.

In Greek, in between coherent clusters, like [pt] and [kt], and affricates lie consonantal sequences consisting of **O+/s/**, most popular of which are the stop + /s/ sequences [ps] and [ks]. [ps] and [ks] are considered to behave like complex segments on the same line with affricates (Tzakosta & Vis 2009a, b, Tzakosta 2009). To partially sum up, cluster coherence is a notion opposite to cluster well-formedness, however, cluster coherence is determined by a sonority scale which is similar to the one which governs cluster well-formedness (4).

This scale is supported by a great variety of data from synchronic and diachronic phonotactics, experimental and language acquisition data (Tzakosta & Vis 2009a, b, c, Tzakosta 2009). However, the exact formal representation and the typological differences concerning the composition of these sequences are issues that remain open. In this paper, we focus on stop + /s/ sequences and explore their internal composition. More specifically, we present the results of two experiments on sequences [ps] and [ks] and investigate, first, whether [ps] and [ks] are subordinate to one single root node or not and, second, if [s] should be assigned either the feature [sibilant] or [fricative]. These experiments contribute to a more accurate description of the underlying representation of stop + /s/ sequences.

In the first experimental task (Task 1), we ask 20 native speakers of Greek to read a sentence which contains a sequence of word final stop + [s] sequence ([ts], [ps], [ks]) followed by the same sequence in word initial position of the subsequent word (see data in 5). Our goal is to explore whether degemination applies as well as whether similar processes emerge in series of single segments (data in 6). If the answer to this question is positive given the statistical analysis of the data, we consider this evidence to be an argument in favour of a single-root representation of [ts], [ps] and [ks] sequences.

In the second experimental task (Task 2), we ask 20 native speakers of Greek to read a sentence containing a sequence of stop + [s] followed by a voiced segment (examples in 7). This additional parameter facilitates our aim to investigate the nature of the sibilant [s] in the stop + [s] sequences and, more specifically, whether this segment should be characterized by the features [sibilant] or [fricative]. In Greek, [s] followed by any voiced segment (i.e. stop, fricative or sonorant) results in voiced [z]. Fricatives [f], [θ], and [x], however, do not participate in this process and, therefore, do not become voiced. If segment [s] is realized as voiced [z], then we have a clear indication of the involvement of the feature [sibilant]. If [s] remains voiceless, this can be attributed to the voicelessness of the stop preceding the feature [fricative].

The results of the present study prove that, first, [ts] exhibits different degrees of coherence compared to [ps] and [ks]. [ts] displays higher rates of degemination in Task 1 as opposed to [ps] and [ks]. This makes [ts] similar to single segments like [s]. Moreover, [ts] is not prone to voicing in Task 2, something that supports the claim that [s] in [ts] is not a [sibilant]. To sum up, although previous experimental studies testing native speakers' perception of consonantal sequences illustrate that [ts] and [ps]/ [ks] demonstrate similar degrees of coherence (cf. Tzakosta & Vis 2009a, b, c, Tzakosta 2009), the present study delves into a more thorough investigation of the subtle differences of the nature of consonantal sequences that look alike on the surface.

Examples

(1a) /**vl**é.po/ → [**l**é.po] 'see-1PRES. SG.' (B.M. 2;02.12)
(1b) /**pr**á.si.no/ → [**p**á.to] 'green-ADJ. NEUT.' (B.T. 1;10)
(1c) /**γr**í.γo.ra/ → [**γə.l**í.γo.la] 'fast-ADV.' (B.M.: 2;03.04)

(2a) /δá.**xt**i.lo/ → [ká.**c**i.lo] 'finger- NEUT. SG.NOM.' (B.M. 2;02.18)
(2b) /fí.la.**ks**e/→ [fí.la.**t**e] 'save-2nd IMP.' (B.T.: 1;11.10)
(2c) /pé.**ks**u.me/→ [pé.**θ**u.ne] 'play-1PRES.PL.' (D: 2;01.16)
(2d) /kó.**ps**is/→ [kó.**f**i] 'cut-2SUBJ.' (D: 2;03)
(2e) /pé.**ks**o/ → [pí.**θ**o] 'play-1SUBJ.' (B.M. 1;11.18),
[pé.**t**o] 'play-1SUBJ.' (I: 2;04.03)
(2f) /**ps**i.lá/ → [**f**i.lá] 'high-ADV.' (D: 2;02)

(3a) /**ts**u.lí.**θr**a/ → [**ts**u.lí.**θ**a] 'slide- FEM.SG.NOM.' (D: 2;08.09, F: 2;11.01)
(3b) /má.ze.**ps**è.ta/ → [má.ze.**ts**è.ta] 'pick them up-2IMP. PERF.' (D: 2;04.17)
(3c) /ta.**ks**í.δi/ → [a.**ts**í.δi] 'trip- NEUT.SG.NOM.' (I: 2;07.01)
(3d) /**ks**é.ro/ → [**ts**é.ro] 'know-1SG.PR.' (I: 3;03.15)
(3e) /fú.**st**a/ → [fú.**ts**a] 'skirt- FEM.SG.NOM.' (F: 2;00.27)
(3f) /**γr**á.ma.ta/ → [**ts**á.ma.ta] 'letter-PL.NEUT.' (I: 3;01.24)

(4) [pt], [kt] >> [ps], [ks] >> [ts], [dz]

(5) /kimpu**ts** + **ts**apizo/ 'kibbuts + dig-1PRES.' > [ts # ts] or [ts]?

(6) /lao**s** + **s**openi/ 'people + be quiet-3 PRES.' > [s]

(7) /kimpu**ts** + **m**u/ 'kibbuts + my-1POSSES.' > [dz # m] or [ts # m]?

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