THE PERCEPTION OF CYPRIOT GREEK 'SUPER-GEMINATES'

Spyros Armosti

Phonetics Laboratory, University of Cambridge
sa449@cam.ac.uk

ABSTRACT

In Cypriot Greek, word-final /n/ assimilates to word-initial fricative and sonorant geminates producing 'super-geminates'. This study examines whether these super-geminates are perceptually distinct from other types of word-initial and post-lexical geminates.

The results of the study indicate that super-geminates were not readily identified by the subjects, while the contrast between word-initial geminates and singletons was more marked.

Keywords: Cypriot Greek, super-geminates.

1. INTRODUCTION

Cypriot Greek (henceforth CG) has plosive, fricative, affricate and sonorant geminates, all of which can appear in word-medial and word-initial position. Post-lexically, word-final /n/ assimilates to word-initial fricatives and sonorants producing geminates, e.g. /ˈipɐn ˈliɐ/ → [ˈipɐˈlːiɐ], i.e. "they said Lia" (proper name). It was commonly believed (e.g. [3], [4], [5]) that word-final /n/ deletes before word-initial geminates and most consonant clusters, e.g. /ˈipɐn ˈlliɐ/ → [ˈipɐˈlːiɐ], i.e. "they said few". Recently, though, it was demonstrated that word-final /n/ does not fully disappear, but rather makes the following geminate even longer, thus creating a kind of 'super-geminate'; e.g. [ˈipɐˈlːˑiɐ] [6]. In particular, it was concluded that CG exhibits four statistically different types of word-initial laterals: (i) word-initial singletons: /#l/; (ii) word-initial geminates: /#ll/; (iii) word-boundary geminates: /n#l/; and (iv) word-boundary super-geminates: /n#ll/ (henceforth S, WI-G, WB-G, SG respectively).

While previous studies ([2] and [6]) examined the durational and non-durational characteristics of post-lexical geminates articulatorily and acoustically, this study aims to investigate whether the aforementioned categories are *perceived* as different from one another by native speakers of CG, thus supporting the findings of previous studies.

2. METHOD

2.1. Material

The stimuli were created using tokens of a previous study [1], of which the present study is a follow-up.

2.1.1. Talker

The talker in [1] was MM, female, 25 years old and originally from Limassol. MM had been living in the UK for three years at the time of the recording. She has a linguistic background, but no information was provided to her prior to the recording. MM did not report any speech or hearing disorders.

2.1.2. Stimuli

The stimuli for the perceptual study were created from the recordings of MM, as shown in Table 1. The test sentence containing the S lateral was selected, and with the use of the PRAAT speech processing package the duration tier of the lateral was manipulated to produce ten stimuli of increasing [l] duration (105 ms – 240 ms). A second set of stimuli was created from SG, in order to account for any effects resulting from non-durational cues, like nasality residuals.

Table 1: The four categories under investigation; the two indicated were the base of the two sets of stimuli.

Cat.	UR	SR	Gloss
☞ S	/ˈɛn ipɐ ˈliɐ/	[ˈɛnipɐˈliɐ]	I didn't say 'Lia'
WI-G	/ˈɛn ipɐ ˈlliɐ/	[ˈɛnipɐˈlːiɐ]	I didn't say 'few'
WB-G	/ˈɛn ipɐn ˈliɐ/	[ˈɛnipɐˈlːiɐ]	They didn't say 'Lia'
☞ SG	/ˈɛn ipɐn ˈlliɐ/	[ˈɛnipɐˈlːˑiɐ]	They didn't say 'few'

2.1.3. Listeners

Seven male and twenty female native speakers of CG aged 20 to 52 (mean = 28.35; s.d. = 9.99) were the subjects of the study. All were living in Cyprus at the time of the experiment with the exception of one, who had been living abroad for eight years. None of the subjects reported any hearing disorders.

2.2. Procedure

The experiment was designed using PRAAT. The task was preceded by an introduction, which aimed to familiarise the subjects with the procedure. Time was provided between the introduction and the actual experiment for the subjects to ask for any clarifications.

During the introduction phase of the experiment, the subjects heard four sentences recorded in the previous study [1], which consisted of the stimuli and the complementary phrases as shown in Table 2. In the actual experiment they only heard the first part of the sentences and they were asked to choose the ending. The four complementary phrases are shown in Table 2.

The purpose of this design is to make the subjects concentrate on the meaning and not the form. By not having the four choices presented to them being just the stimuli in written form, the subjects would never see the crucial geminates or nasals written anywhere. Instead, they would hopefully think in terms of the complementary phrase primed by the stimulus.

Table 2: Stimuli and responses.

stimulus	complementary phrase
I didn't say 'Lia',	I said 'Helen'.
I didn't say 'few',	I said 'many'.
They didn't say 'Lia',	they said 'Helen'.
They didn't say 'few',	they said 'many'.

Each stimulus was randomly repeated three times in the experiment without any two identical stimuli occurring successively. A different randomisation of the stimuli was automatically performed every time the experiment was run. Hence there were 3 repetitions × 10 steps of stimuli × 2 S/SG sets = 60 repetitions. The subjects were allowed to have a short break after the 30th stimulus.

2.3. Analysis

2.3.1. Measurements

The measurements taken were the kind of answer (S, WB-G, WI-G or SG) given for each stimulus by each subject.

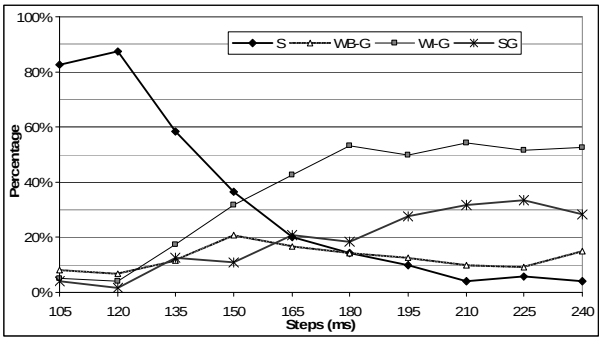
2.3.2. Statistics

The data were subjected to a repeated measures analysis of variance (ANOVA) using the SPSS statistical software package. The dependent variable was the percentage of selection of each of the four categories for each of the ten steps under the two levels of the S/SG set of stimuli factor.

3. RESULTS

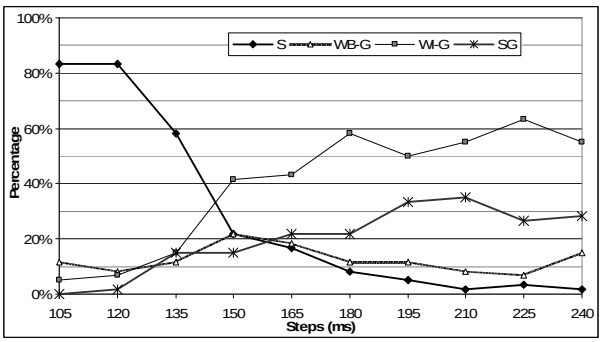
Figure 1 illustrates the percentage of selection of the four categories (these data were computed by averaging the two S/SG sets of the stimuli for every step). The WB-G curve exhibited a rise during its last step. Its peak was at step 4 (150 ms). The 50th percentile of the S curve lay between the 3rd and 4th step (140.8 ms). All categories (except for WI-G) had roughly the same chance of being chosen at step 5 (17% - 21%).

Figure 1: Percentages of selection of each of the four categories at each of the 10 steps.



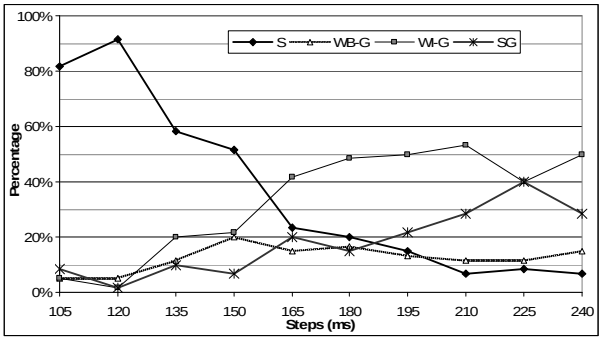
The results of the SG-set of stimuli are shown in Figure 2. The peak for the WB-G curve was at the 4th step (150 ms). The 50th percentile for S lay between the 3rd and 4th step (138.4 ms). The S, WB-G and S-G curves had a common intersection point between the 4th and 5th step (150 – 165 ms).

Figure 2: Percentages of selection of each of the four categories for the SG-set of stimuli.



The results of the S-set of stimuli are shown in Figure 3. The peak for the WB-G curve was again at the 4th step (150 ms). The 50th percentile for S has moved to the 5th step (150.8 ms).

Figure 3: Percentages of selection of each of the four categories for the SG-set of stimuli.



3.1. Statistical Analysis

The main effects of the '4-categories' factor were statistically significant ($F(1.763, 33.490) = 22.174$; $p < 0.05$). The only pair that exhibited no significant difference was S×WI-G ($t(19) = -0.301$; $p > 0.05$). The interaction between '4-categories' and 'S/SG-sets' was significant ($F(2.671, 50.717) = 9.164$; $p < 0.05$). The '4-categories'×'S/SG-sets' simple main effects are shown in Table 2.

Table 2: The t-values (d.f. = 19) for the simple main effects of '4-categories' × 'S/SG-sets'; the bold figures indicate no statistical significance at $\alpha = 0.05$.

		S	WB-G		WI-G		SG	
		[s]	[sg]	[s]	[sg]	[s]	[sg]	[s]
S	[sg]	5.999	6.132	6.470	2.515	**0.809**	2.553	4.527
	[s]		7.249	7.203	**0.231**	**2.035**	4.378	6.031
WB-G	[sg]			**0.252**	5.226	5.334	3.523	3.398
	[s]				5.075	4.716	3.837	3.560
WI-G	[sg]					2.505	2.996	4.379
	[s]						2.573	3.888
SG	[sg]							**1.452**

4. DISCUSSION

The only curve that most safely could be characterised as sigmoid (the characteristic curve in categorical changes) was that of S, which was clearly identified during the first four steps (see Figure 1). After the fourth step and until the end of the continuum, WI-G became the most identifiable category, but not as clearly as S (the maximum percentage of identification reached was 54%). WB-G was not sigmoid and never actually exceeded 21%. SG was generally the less identifiable category, showing almost the same picture as WB-G. Thus, the only robust contrast was arguably between S and WI-G, i.e. between lexical categories. This observation is supported by the statistics in Table 2: the WI-G curve can be said to be roughly the mirror image of the S curve over a horizontal axis, hence their difference adding up to nearly zero, leading to no statistical difference between them.

When it comes to the 'S/SG-sets' factor, the statistical analysis indicated significant difference between the two sets, but the picture did not seem to be the same for all four categories. By comparison of Figures 2 and 3, in the case of the S curve, there was a shift downwards for the SG-set of stimuli compared to the S-set, which means that the S was less identifiable for the SG-set. The opposite pattern was observed for the WI-G and the SG, although for the latter the difference was not statistically significant (see Table 2). WB-G seemed not to be particularly affected by the 'S/SG-set' factor, and this was also supported by the statistical analysis.

The S curve was, as expected, negatively influenced by the SG-set, but the results for the other three curves were not as one would assume: if the SG-set contained nasality traces (either on the preceding vowel or the consonant itself), then WI-G (i.e. the *lexical* category) would be expected to be negatively affected by the presence of the alleged nasality of the SG-set, while WB-G and SG (i.e. the *post-lexical* categories) should be positively affected by the SG-set (which would serve as an indication for the deleted nasal in their case). Surprisingly, the picture was different: the lexical geminate was positively affected by the SG-set factor, whereas the post-lexical categories remained statistically unaffected.

Thus, the category of SG was very closely linked to that of WI-G, i.e. the category from which it originates. There were common patterns between the two curves, which suggested that they might share common features. This observation is supported by the results of the electropalatographic study in [2], which showed common articulatory configurations between post-lexical segments and the segments from which they derive.

5. CONCLUSION

Even though previous research asserted that durationally there are finer distinctions than the mere singleton vs. geminate contrast [6], the picture resulting from the perceptual study was not as neat as expected. The only robust contrast was arguably between S and WI-G, i.e. between lexical categories. The post-lexical categories, and especially WB-G, were not readily identified by the subjects. No concrete evidence was found for the

four categories being, in fact, four linguistically functional categories.

The study indicated that non-durational cues must indeed play a role in identifying the four categories, though possibly those cues are not related to residuals from the deleted nasal, but to other spectral characteristics that make S different from WI-G.

These findings do not necessarily contradict the existence of the four categories under investigation. Acoustically, they are all of statistically different durations due to 'phonological assimilation or phonetic accommodation (e.g. gestural overlap)' of the nasal to the following consonant, [6]. However, *perceptually*, only the contrast between the two lexical categories S vs. WI-G is robust (similarly to what happens word-medially); the extra duration added from the deletion of the nasal is not needed perceptually to enhance any difference between lexical and post-lexical categories, as ambiguous cases rarely occur. Consequently, the results of this study suggest that four categories do exist, but not all seem to be linguistically functional.

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6. REFERENCES

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