

The role of locus equation in characterizing CV coarticulatory patterns for the plain-emphatic distinction in Libyan Arabic

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This study examines how locus equation parameters play an important role in the plain-emphatic distinction in Libyan Arabic (LA). This study uses non-pharyngealized /t/, /s/, /d/ and pharyngealized /t^ʕ/, /s^ʕ/, /d^ʕ/ in the vocalic contexts /ɪ:, ɪ, e:, u:, ʊ, o:, ə: and ε/, using words of the CVC syllable structure where the initial C is either a plain or an emphatic consonant. 20 speakers are involved in this study. The target words are presented to native speakers in a carrier sentence in Arabic script. LE parameters are quantified using Lindblom (1963)'s method in which LE straight line regression fits to data points are formed by plotting F2 onset along the y axis and their corresponding F2 midpoint along the x axis. The line-of-best-fit in the regression equation yields slope and y-intercept values that represent plain and emphatic consonants. The onset of the vowel is determined as the start of energy representing formant frequencies at the very beginning of the vowel and the midpoint is the point in the middle of the vowel. Generally speaking, group results show that the slope and y-intercept are significantly lower for the emphatic than the plain context, reflecting better CV coarticulation for the plain context. This indicates that the emphatic consonant exerts coarticulatory effects on the neighbouring vowels as a result of having, according to Laradi (1983), an additional secondary articulation. This effect is acoustically manifested in the extensive decrease in F2 onset as compared to F2 midpoint of the following vowel. Although all the emphatic consonants follow the same pattern with having lower slope and y-intercept than the plain ones, the extent of slope and y-intercept difference depends on the consonantal type. The slope and y-intercept difference is significant between /t/ and /t^ʕ/. The y-intercept difference is significant between the /s/ and /s^ʕ/ and /d/ and /d^ʕ/ while the slope is not. Table 2 presents the mean slope and y-intercept value for all plain and emphatic consonantal types. Results from different speakers show that variations exist across speakers with respect to slope and y-intercept (notice the variation across three sample speakers and the mean for all 20 speakers in Table 1). The shaded boxes in Table one show how the emphatic contexts could have higher slope and y-intercept than the plain one. In spite of the group results concerning the coarticulatory resistance expressed by the emphatic consonant, CV coarticulation may vary depending on consonantal type and speaker in LA. These results from LA are compared with those of Arabic dialects. In general, LA shares some CV coarticulatory features with some Arabic dialects, but differs from them in how far LE parameters distinguish the plain-emphatic contrast.

Table 1 The slope and y-intercept for three speakers along with the mean value for all 20 speakers.

speaker	slope		y intercept		R ²	
	plain	emphatic	plain	emphatic	plain	emphatic
1	0.67	0.355	591	735	0.845	0.684
10	0.717	0.704	534	359	0.916	0.949
15	0.431	0.519	1079	558	0.648	0.845
mean	0.63	0.55	684	515	0.84	0.82
<i>SD</i>	<i>0.085</i>	<i>0.086</i>	<i>157</i>	<i>98</i>	<i>0.073</i>	<i>0.081</i>

Table 1 The slope and y-intercept for different plain and consonantal types.

	slope		intercept		R ²	
	/t/	/t ^ɕ /	/t/	/t ^ɕ /	/t/	/t ^ɕ /
mean	0.71	0.56	588	466	0.91	0.89
<i>SD</i>	<i>0.10</i>	<i>0.11</i>	<i>210</i>	<i>119</i>	<i>0.05</i>	<i>0.06</i>
mean	0.47	0.46	963	644	0.77	0.77
<i>SD</i>	<i>0.11</i>	<i>0.11</i>	<i>204</i>	<i>160</i>	<i>0.14</i>	<i>0.11</i>
mean	0.68	0.63	578	443	0.90	0.91
<i>SD</i>	<i>0.10</i>	<i>0.11</i>	<i>169</i>	<i>109</i>	<i>0.07</i>	<i>0.05</i>

References

- Laradi, W.J., 1983. Pharyngealization in Libyan (Tripoli) Arabic. Thesis (Ph D). Edinburgh University.
- Lindblom, B., 1963. 'On vowel reduction', Report, No. 29, The royal institute of technology, Speech transmission Laboratory, Stockholm, Sweden.