

The Moving Boundaries of the First-Acquired Variety's Phonological Features: Evidence From Production/Perception of Moroccan Arabic's Vowels

Mohamed EMBARKI* and Christian GUILLEMINOT**

*UMR CNRS 5475, Montpellier III, France

mohamed.embarki@univ-montp3.fr

**Université de Franche-Comté & membre associé UMR 5475

christian.guillemintot@univ-fcomte.fr

ABSTRACT

This paper aims to explore socially-conditioned phonetic variation in speech production and perception in Moroccan Arabic (henceforth MA). The linguistic variant studied here is the low central vowel /a/. It is correlated with social factors; schooling and age are incorporated as independent variables which must reveal forms of variation on this vowel. Two studies, dealing with a list of 10 words which are Ca-Ca syllable type in MA, were conducted in apparent-time. The first study deals with durational measurements of these words produced by 32 pupils aged from 6 to 16 years. The second study investigates the perception of the same words by 32 MA pupils aged from 7 to 15.

1. LANGUAGE CONTACT AND PHONOLOGICAL FEATURES

Phonetic variation is often seen in sociolinguistics as a result of external factors, such as sex, age, social class, etc. Abundant literature that aims to identify linguistic variants is carried out in a monolingual situation. However, phonetic variation correlated with language contact takes up a minor place in the current sociolinguistic studies.

In the situation of language contact, forms of deviation from the norm were first seen as a result of interference (Weinreich, 1968). This term was replaced later by the concept of transfer, which is supposed to be more positive to translate these forms of deviation. In the classic studies, both in sociolinguistic and second language acquisition, phonetic variation is often considered as emblematic of the influence of the source language's phonological features on the recipient language. This process is called *imposition* by Van Coetsem (1988).

To quote only research dealing with Arabic languages spoken in the Arabic area, forms of variation occur when the speaker *imposes* his/her regional phonological features (source language) on his/her use of contemporary standard Arabic (henceforth CSA). Benkirane (1998) noticed that Arabic speakers use prosodic structures of their regional variety when they speak CSA. Sabhi (1997) showed shift in CSA's interdental fricatives, remarkably ordered according to a regional scale. Barkat (1999) showed that when speakers use CSA, their native regional variety could be identified by listeners of any Arabic area according to phonetic and prosodic cues; the author's regional scale is quite parallel to Sabhi's.

2. PHONOLOGICAL vs. SOCIOPHONETIC LENGTHENING

Literature on MA is inclined to favour phonological quantity opposition between three long and three short cardinal vowels, following the example of CSA's vowel (cf. Jomaa, 1994, for an overview). In a previous study, Embarki (2002) showed that preschool children's production in MA did not present any opposition of lengthening of the lower central vowel /a/ appearing in bisyllabic words.

While the duration ratio of the long vowel/short vowel varies from 1.3 to 3.1 according to languages where vowel lengthening is phonological, the duration ratio between the two [a] in the preschool children's speech is equal to 1. Embarki (2003) showed that Moroccan highly educated adults did not produce any significant lengthening between MA's vowels; the duration ratio of the three supposed long cardinal vowels on the three supposed short ones is 1.1. However, when the same corpus was submitted for evaluation to other highly educated Moroccan adults, they perceived an opposition of lengthening among MA's vowels.

Evidence drawn from speech production by Moroccan preschool children and highly educated adults showed that MA's vocalic system does not reveal any evident opposition of lengthening. This finding focuses on variation between production and perception of MA speech by highly educated subjects. However factors that control this variation remain uninvestigated. Our hypothesis is: while over time the speaker's production of MA's vowels does not undergo any change, the speaker's perception of the same vowels is widely modified by schooling. So, MA's vowel would be perceived as containing no opposition of lengthening by children attending first levels of primary school while the same vowels would be perceived as containing an opposition of lengthening by pupils attending advanced levels of primary school and first levels of secondary school. Thus, perception of only one category of vowels in MA would be emblematic of uneducated or those rarely exposed to CSA; by contrast, perception of two categories of vowels, short and long, in MA would mark the inception of CSA's features in the operations of phonological treatment by educated or fluent subjects in CSA.

3. METHODOLOGY

The linguistic variant studied here is the low central vowel /a/ in MA. This vowel was chosen because it is less sensitive than /i/ and /u/ to coarticulation. The corpus is formed by 10 words which are Ca-Ca syllable type in MA (C=consonant); the word list in MA has an equivalent in CSA which is Ca:-Ca syllable type, i.e. the first /a/ is long, and the second is short, the word consonants are the same in both languages.

The social factors chosen here are schooling and age. The incorporation of these independent variables would enlighten the apparition and the progress of the phonetic variation. The population taking part in the experiments was composed of 64 Moroccan children, 29 girls and 35 boys, aged from 6 to 16 years and attending the six levels of primary school and the two first levels of secondary school. Pupils were selected according to three criteria: First, because they were native-born of Ksar el Kebir (north of Morocco), they had always been living there or their parents were from the area. Second, they were attending Moroccan public school. Third, the two parents were native Arab speakers and not native Berber speakers. All the pupils were living in the same area and had the same social background.

Two studies dealing with the word list were conducted in apparent-time (Labov, 1963, 1966). The first study deals with durational measurements of the words produced by 32 pupils. The second study investigates the perception of the same words by 32 MA pupils. The incorporation of apparent-time may show how regular modifications emerge over time in the production and the perception of the vowel [a].

4. PRODUCTION

32 pupils took part in the production, 16 girls and 16 boys, aged from 6 to 16 years old. They were all attending public primary or secondary school. Children were recorded individually, every pupil was asked to produce the word list as normally as possible according to his/her pronunciation in MA. Every pupil was asked to produce the word list twice: an ordinary articulation for the first production and a rapid articulation for the second production.

16 productions appearing in the corpora were analysed here, the remaining 16 productions are currently being analysed and the results will be presented during the Conference. Results of speech productions produced here belong to 16 girls aged 6 to 15 years. Every age group was represented, except the 11 years-old. Every schooling level is represented among the 16 productions, except the 5th level of primary school and the 1st level of secondary school.

The aim of durational measurements is to check whether the first vowel [a] (henceforth V1) of the word list is longer than the second vowel [a] (henceforth V2), in view of the equivalent of each word in CSA where V1 is longer than V2. Considering literature on MA's vocalic system

which is inclined to favour the vocalic quantity, the ratio V1/V2 of our corpora should vary from 1.3 to 2.0.

Durational measurements were carried out by Praat 4.0. Results of the ordinary articulation show that the mean duration of V1 is 149 ms. with a standard deviation of 37 [values are varying from 84 ms. to 235 ms.], the mean duration of V2 is 141 ms. with a standard deviation of 34 [values are varying from 92ms. to 225 ms.].

	Mean	StDv
V1	149	37
V2	141	34
V1/V2	1.05	0.14

Table n° 1: mean duration in ms. and V1/V2 ratio in the production of the word list by 16 Moroccan children (ordinary articulation).

The mean ratio of V1/V2 is slightly higher than 1 (1.05 more precisely) with a standard deviation of 0.14. Values of the ratio presented in figure n° 1 vary from 0.8 to 1.3.

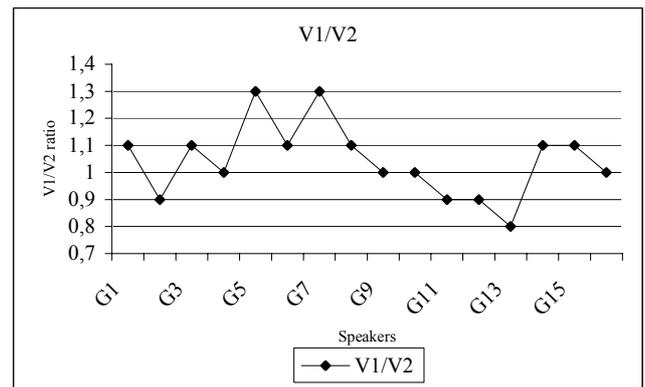


Figure n° 1: durational ratio of V1/V2 of the word list produced by 16 speakers.

4.1 VARIATION WITH SCHOOLING

In Figure n° 2, results by schooling level are presented. The distribution of V1/V2 ratio varies around 1. Unlike literature on MA's vowels, there is no significant durational difference between V1 and V2 in the production of the 16 children.

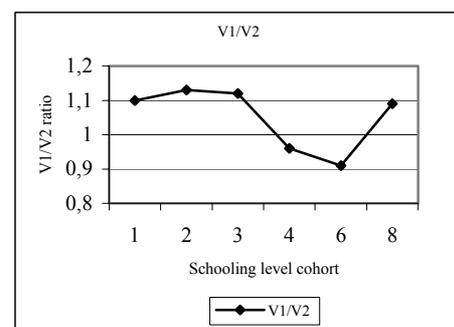


Figure n° 2: durational ratio of V1/V2 of the word list according to schooling level.

4.2 VARIATION WITH AGE

In figure n° 3, durational ratio V1/V2 is examined according to the age variable: 3 groups were formed. The ratio V1/V2 is slightly higher than 1 for the youngest group and for the middle generation, the ratio is slightly lower than 1 for the oldest group.

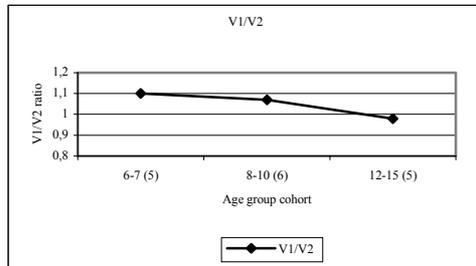


Figure n° 3: durational ratio of V1/V2 of the word list according to 3 age groups.

Results of the rapid articulation do not show any durational difference in favour of V1. The mean duration of V1 is 98 ms. with a standard deviation of 18 [values are varying from 71 ms. to 130 ms.], the mean duration of V2 is 108 ms. with a standard deviation of 21 [values are varying from 74ms. to 150 ms.]. Unlike the ordinary articulation, the mean ratio of V1/V2 in this situation is lower than 1 (0.9) with a standard deviation of 0.10.

	Mean	StDv
V1	98	18
V2	108	21
V2/V2	0.9	0.10

Table n° 2: mean duration in ms. and V1/V2 ratio in the production of the word list by 16 Moroccan children (rapid articulation).

Production of the word list by 16 children clearly provides strong support for the equal duration of the two vowels: no vocalic lengthening can be observed in these MA corpora. Apparent-time distributions do not show any variation between the youngest and the oldest group and provide clear confirmation of our hypothesis: the schooling variable does not have any influence on speech production in MA.

5. PERCEPTION

32 pupils took part in the perception test, 13 girls and 19 boys. All the schooling levels of primary school and the two first levels of secondary school were represented. The test was individual, every pupil was asked to transcribe graphically the word according to the stimulus that he/she heard once or twice. 4 forms of transcription were possible for each word of the list: 1) Ca-Ca; 2) Ca:-Ca; 3) Ca-Ca: and 4) Ca:-Ca:.

5.1 SCHOOLING EFFECT

Results presented here show only scores of word list perception like Ca-Ca and Ca:-Ca, the two other

possibilities did not score very highly among the pupils. Figure n° 4 shows the percentage of survey respondents by schooling level cohort who perceived acoustic stimuli as Ca-Ca and Ca:-Ca. This figure shows a progressively increasing perception of stimuli as Ca:-Ca across the 8 groups of schooling level, by contrast the form Ca-Ca decreases progressively according to the same independent variable. The figure shows that perception of stimuli as Ca-Ca represents the largest percentage and the perception of stimuli as Ca:-Ca represents the smallest percentage among the first levels. By contrast, with the advanced levels, the percentages are reversed. Middle levels use percentages that are somewhere in between. The apparent-time distributions presented in this figure show that stimuli of the word list, which was Ca-Ca, were perceived differently according to the schooling variable: a decreasing perception of the form Ca-Ca and an increasing perception of the form Ca:-Ca are noticed according to the schooling progression.

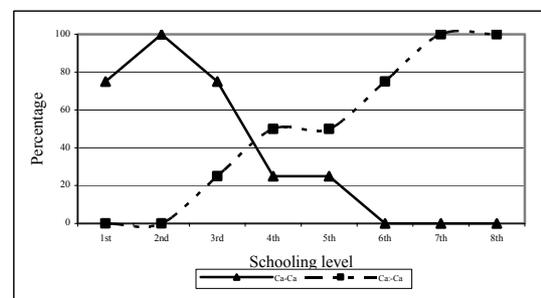


Figure n° 4: perception of the word list as Ca-Ca or Ca:-Ca by schooling level cohort.

5.2 AGE VARIABLE

For the age variable, 3 groups of children were formed: the first group contains 7, 8 and 9 years-old, the second group contains 10, 11 and 12 years-old, the last group is composed of teenagers of 13, 14 and 15 years.

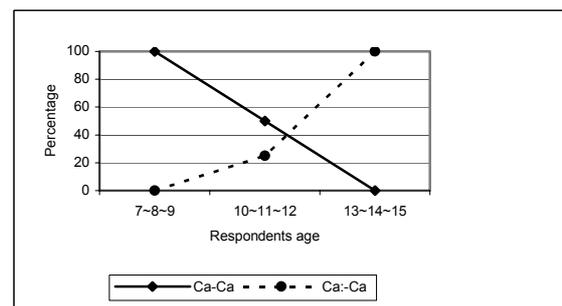


Figure n° 5: perception of the word list as Ca-Ca or Ca:-Ca by 3 age groups.

In the figure n° 5, the perception of the forms Ca-Ca and Ca:-Ca forms a mirror image: Ca:-Ca is increasing whereas Ca-Ca is decreasing with the age variable. The youngest cohort perceived stimuli exclusively like Ca-Ca. The perception of the same list as Ca:-Ca is increasing over time and becomes the unique form perceived by the oldest cohort. Perception of the word list according to schooling level and to age group clearly provides a strong

progression of the form Ca:-Ca over time. Despite the equal duration of the two [a], words were progressively perceived as containing an opposition of vocalic lengthening, the first [a] was perceived as long, and the second [a] was perceived as short.

6. DISCUSSION

The apparent-time distributions suggest clear modification in the perception of MA's low central vowel [a] in the word list. With the same stimuli containing no difference of lengthening between the two [a], the perception of the word list by young children attending first levels of primary school and by oldest and advanced children is radically different, the latter tend to perceive the word list identical to the original form in CSA with the first [a] as long and the second [a] as short.

The perception of the word list as Ca-Ca by the youngest cohort and beginners, as Ca:-Ca by the oldest and advanced cohort shows that schooling in CSA modifies the perception of MA's phonological features over time.

Unlike literature that affirms an opposition of quantity between MA's vowels, the word list provides here clear evidence that this opposition of lengthening is a mental representativeness, strongly conditioned by schooling which was conducted in CSA.

In ordinary situations of second language acquisition, production/perception can be characterised by phonological imposition or phonological borrowing (Van Coetsem, 1988). Phonological imposition is quite parallel to Troubetzkoy (1939), i.e. the phonological filter which occurs when speakers use their own phonological features when learning a foreign language. Phonological borrowing occurs when speakers import features to produce loan words from foreign languages.

The situation occurring in the perception of Moroccan pupils presents a different case whether from imposition or borrowing. MA pupils seem to implement new phonological categories during the schooling progression. This implementation is the result of language contact and the place attributed to each language: some phonological features of CSA (the recipient language), that are high estimated by pupils, seem to be implemented in MA (the source language). For the moment, the new categories implemented seem to function during operations of perceptive treatment.

These findings confirm our hypothesis and show that MA's vowels cannot be classified in two categories: short and long vowels. Literature asserting the existence of vocalic quantity in MA often presents data which is socially-conditioned, authors are themselves influenced, without realising, by their own perception of MA's vowel, perception obviously and strongly modified by schooling in CSA.

7. CONCLUSION

Any concrete examples of sociophonetic variation in MA's vowels production and perception have been shown

before. In this paper, the low central vowel /a/ was shown socially-conditioned. Schooling and age, incorporated as independent variables, showed that the apparent-time distributions do not reveal any difference of lengthening between the two [a] of the word list in speech production. By contrast, forms of variation in perception of MA's low central vowel [a] were observed. These forms of variation are strongly conditioned by schooling progression and age. Considering the equivalent in CSA, each word of the list was perceived progressively, according to age and schooling level, with a first vowel [a] as long and a second vowel [a] as short.

REFERENCES

- [1] M. Barkat, "Identification of Arabic dialects and experimental determination of distinctive cues", *Proceed. of XIVth ICPHS*, San Francisco, 1-7 august, pp. 901-904, 1999.
- [2] T. Benkirane Intonation in western Arabic (morocco), in *Intonation Systems: A Survey of Twenty Languages*, D. Hirst and A. Di Cristo eds., pp. 345-359, Cambridge: Cambridge University Press, 1998.
- [3] M. Embarki, "Cross-linguistic analysis: ongoing change or competing phonological structures", in *Linguistics on the Way into the Third Millennium*, R. Rapp ed., pp. 705-714, Berlin: Peter Lang, 2002a.
- [4] M. Embarki, « L'acquisition de l'allongement vocalique en arabe marocain : productions de jeunes enfants marocains en âge préscolaire », *Actes des XXIV^o JEP*, pp. 173-1176, Nancy 24-27 juillet, 2002b.
- [5] M. Embarki, « Contraste phonémique vs identité acoustique ? L'oxymoron des voyelles en arabe marocain », in *Revue Parole*, 2003 (submitted).
- [6] M. Jomaa, « L'opposition de durée vocalique en arabe : essai de typologie », *Actes des XX^{èmes} JEP*, pp. 395-400, Trégastel, 1994.
- [7] W. Labov, "The social motivation of a sound change", *Word* 19, pp. 273-309, 1963.
- [8] W. Labov, *The Social Stratification of English in New York City*, Washington: Center for Applied Linguistics, 1966.
- [9] N. Sabhi, « La variabilité dialectale arabe peut-elle être un moyen de reconnaissance de l'origine géographique ? Les fricatives interdentes, outils d'identification », in *Revue Parole* 2, pp. 161-181, 1997.
- [10] N. Troubetzkoy, *Principes de Phonologie*, Paris : Klincksieck, 1949.
- [11] F. Van Coetsem, *Loan Phonology and the Two Transfer Types in Language Contact*, Dordrecht: Foris, Publications in Language Sciences, 27, 1988.
- [12] U. Weinreich, *Languages in Contact: Findings and Problems*, The Hague: Mouton, 1968.