

Speech Rhythm Production in a Multilingual Setting

تحقيق النبرة الصوتية في محيط متعدد اللغات

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Abstract

Algerian learners majoring in English as a foreign language have already been exposed to a second standard language, French, early in their learning curriculum, in addition to their mother tongue, dialectal Arabic. This multilingual profile of Algeria has been proved to affect different aspects of English acquisition mainly in the area of phonetics and phonology. However, studies dealing with the influence of the previously linguistic systems on the production of L3 speech rhythm are very scant. Therefore, the present study is conducted to classify the interlanguage rhythm and to find out whether it is conceived as a stress-timed vs. syllable-timed dichotomy or as a continuum. Audio recordings of 63 third year Algerian EFL students at Mentouri Brothers University, Constantine were segmented into vowels and consonants' sequences, and their derived rhythm metrics (%V and ΔC) were calculated using PRAAT, speech analysis software. The results of the two measured rhythm metrics yield that the informants' speech rhythm is rather 'intermediate', merging a stress-timed ΔC and a syllable-timed %V. Accordingly, this study reveals that crosslinguistic interference in the area of phonology touches not only segments but also speech rhythm.

Key words: *Interlanguage Rhythm, Multilingualism, Crosslinguistic Interference, Rhythm Metrics: %V and ΔC .*

الملخص

لقد تعلّم الطلبة الجزائريون المتخصصون في دراسة اللغة الانجليزية كلغة أجنبية لغتهم الثانية أي اللغة الفرنسية في مرحلة مبكرة من مشوارهم الدراسي، زيادة على لغتهم الأم التي تتمثل في اللغة العربية الدارجة. وقد ثبت أن هذا التعدد اللغوي في الجزائر يؤثر على جوانب مختلفة في مرحلة اكتساب اللغة الإنجليزية، خصوصا في مجال الصوتيات وعلم الأصوات. و مع ذلك، تعتبر الدراسات التي تتناول تأثير اللغات السابق تحصيلها على النغمة الصوتية للغة الثالثة قليلة جدا. لذلك، تهدف هته الدراسة الى تصنيف اللغة البينية بالاضافة الى البحث عما إذا كان يجب تقسيمها الى ايقاع ثنائي بين لغات ايقاعية النبرة و اخرى مقطعية او بالأحرى تصنيفها عبر تسلسل ايقاعي مستمر. تم تقسيم التسجيلات الصوتية لـ 63 طالب جزائري متخصص في اللغة الإنجليزية كلغة أجنبية في جامعة الاخوة منتوري بقسنطينة إلى تسلسلات الاحرف المتحركة و الساكنة، وتم حساب عوامل النغمة الصوتية (%V و ΔC) باستخدام برنامج PRAAT لتحليل الكلام. أسفر حساب عوامل النغمة الصوتية %V و ΔC على أن اللغة البينية للطلبة المعنيين بهته الدراسة 'هجينة' وليست 'منفصلة' إذ تجمع بين اللغات الايقاعية النبرة و %V اللغات المقطعية النبرة. و بالتالي، تكشف هته الدراسة على أن ظاهرة التحويل الفونولوجي بين اللغات تمتد أيضا الى ميدان الايقاع اللغوي

الكلمات الدالة : النغمة الصوتية للغة البينية، التعدد اللغوي، التحويل بين اللغات، عوامل النغمة الصوتية ΔC و %V.

Introduction

In a multilingual setting, cross linguistic influence is an inevitable result that could touch positively or negatively any aspect of the language being taught: morphology, syntax, phonology, etc. However, among the various language subsystems, phonology is generally considered the area that took the lion's share as far as transfer is concerned, mainly, due to the fact that foreign language learners are not likely to attain a native-like accent albeit their high level of fluency. Therefore, the present study addresses one aspect of suprasegmentals namely speech rhythm. We attempt to investigate to what extent Algerian learners of English as L3, a typical stress-timed language, transfer rhythmic components from their in-mind linguistic repertoires i.e. Algerian Arabic, a stress-timed language (henceforth AA) and French, a typical syllable-timed language (henceforth Fr.).

1. Speech Rhythm Typology

It is widely accepted that the human ear has a natural tendency to distinguish between different sound patterns among different languages. French and English, by means of example, are never said to belong to the same speech pattern. Perhaps what gives this perceptive impression is the recurrence of the same element at regular intervals: stresses in English as opposed to syllables in French. Based on such temporal organization, languages were pigeonholed as either syllable-timed or stress-timed languages (Pike 1945 and Abercrombie 1967). However, in the absence of empirical validation, this longstanding isochronous-based rhythmical scheme was discarded. As a matter of fact, it was strongly confuted by the majority of instrumental studies (Auer and Uhmann 1982, Dauer 1983 and Roach 1982) undertaken in the early 80s to check the validity of the earlier claims. Indeed, Dauer concluded that the different realizations of phonological properties namely: syllable structure, vowel reduction, and salient stress across languages give a clear gestalt to the phonological word or syllable. As a matter of fact, stress-timed languages, as opposed to syllable-timed languages, exhibit a variety of syllable structures, a system of reduced vowels, and a strong influence of stress on vowel duration and

syllable prominence. Based on this ground, a scalar classification of languages in a rhythm continuum was suggested to replace the old typology as those language-dependent phonological properties do not always co-occur (Polish, as an example, exhibits complex syllable structure but no vowel reduction).

Following the success of the phonological account of speech rhythm, a new wave of studies emerged aiming at putting into practice the concepts of the phonological account. The pendulum hence swung back to durational measurements of some acoustic signals and the ad hoc researchers set specific durational correlates that best fit the most important aforementioned criteria. Ramus et al. (1999) computed the duration of vocalic and intervocalic intervals of an utterance and derived from both values acoustic metrics %V (the proportion of vocalic intervals) and ΔC (the standard deviation of vocalic intervals). This time, in the empirical field, those rhythm metrics bore fruit as the results obtained fit the old rhythmic classification of languages set forth by Pike (1945) and Abercrombie (1967). In light of Ramus et al.'s encouraging results, some researchers applied rhythm metrics in their studies, to name but a few: Ghazali et al., (2002), Barry et al., (2003), Mairano et al., (2011),... etc. while others introduced a set of other rhythmic indices in order to complement Ramus et al. metrics: PVI (Grabe and Low, 2002), Varcos (Dellwo and Wagner, 2003).

2. Speech Rhythm in a Multilingual Setting

In the last few years, researchers in the area of phonetics and phonology became interested more and more in the properties of non-native speech rhythm and as a result, a myriad number of studies was conducted in order to investigate the influence of prior linguistic systems on the acquisition of a given foreign language speech rhythm, to name but a few: Gut (2003), Dellwo et al. (2005), Ordin and Polyanskaya (2015). However, studies dealing with the acquisition of speech rhythm in L3 are very scant. As a matter of fact, we could only find the pioneer work of Gabriel et al. (2012, 2014) that focused on the acquisition of French by German seniors with a Mandarin background. Likewise, in an Algerian context, Benrabah (1991) Iddou-Derraz (2009),

Hanafi (2014), among others, have investigated the influence of prior linguistic systems notably French as an L2 on the acquisition of English phonology but no work has addressed the speech rhythm of English as a third language in Algeria and how far the latter is shaped by prior linguistic systems i.e. AA and Fr. Therefore, the present work is an attempt to classify the speech rhythm of 63 Algerian learners of English' interlanguage. An equally important aim of the present study is to find out to what extent De Angelis' combined transfer i.e. «the simultaneous influence of more than one language upon a target language, i.e. a many-to-one type» (2007, p. 21) shape the rhythmic production of our informants.

3. The Study

3.1. Subjects

63 third year students reading for a BA degree at the Department of English, Mentouri Brothers University, Constantine were involved in the present study. The choice of population is based on the fact that the BA degree is obtained after passing the third year. Therefore, students at that level are presumably supposed to have a good command of English both in using and understanding the language.

3.2. Recording Procedure

The informants were gathered in one classroom and asked to read silently the International Phonetic Association's story 'the north wind and the sun', as many times as they needed in order to get acquainted with the passage. The recording process took place in a laboratory at the Department of English, Mentouri Brothers University, Constantine, and the informants were recorded individually. The author's laptop was the main equipment for implementing this task, and Praat was the recording software used to record the subjects' performance using a condenser microphone.

3.3. Segmentation and Analysis Procedures

All the 63 recorded files (approximately 40 to 50 seconds per each file) were segmented by the author of this study following the experimental procedures put by Ramus et al. (1999). Praat, speech analysis software, was the tool used to tokenize the audio

files as well as to segment the phonemes into V and C sequences relying on acoustic (formants, shape of spectral waveforms, etc.) and audio cues. The criteria responsible for the identification of vowels and consonants adopted in this study comply with those generated by Ramus et al.

3.4. Measurements Procedure and Results

The first step was to merge any string of consecutive vowels or consonants, except those separated by a pause, in the same sequence at the V/C annotation tier since the concern of the present study is to measure the proportion of vocalic and inter-vocalic intervals and not the duration of individual phonemes per se. As a way of illustration, /ðænðə/ was segmented as follows [CVCV] where the second C refers to both /n/ and /ð/.

The second step was computing vowel quantity and consonant variance (V% and ΔC , respectively) using Correlatore, software specially designed to measure different rhythm metrics based on formulas generated by Ramus et al. (1999). The calculated mean of each metric is shown in the following table:

Table 1: Mean Values of %V and ΔC

Metric	Mean
%V	41.53
ΔC	64.88

The results show a weak correlation between %V and ΔC : 41.53 and 64.88 respectively $r=0,013$ which is not statistically significant $p=0.91$. According to Ramus et al. (1999), the rhythmic class that best fits this correlation is the stress-timed category. The latter exhibits a variation in the syllable structure which implies variability in the number of consonants included within a syllable as well as variability in the overall duration of individual consonants within the syllable. Lower values of %V are an inescapable result of higher ΔC as the more consonants used, the fewer vowels displayed.

3.5. Discussion

3.5.1. ΔC Analysis

The higher percentage of ΔC can be attributed to the following reasons:

3.5.1.1. The Unrestricted Retention of /r/

The informants retained the /r/ in all phonological environments. This is shown more or less in all the participants' performances (45 out of 63 in final positions and around 54 elsewhere). This is partly due to interlingual transfer that includes the influence of prior orthographic systems' attitudes on the pronunciation of English as a foreign language (see table 2). As a matter of fact, Arabic and French differ from English when it comes to spelling rules. Unlike the English /r/, which is pronounced before vowels, its Arabic and French counterpart is pronounced before or after vowels except for the French 1st group

infinitive verb. For that reason, learners tend to carry over their already acquired attitudes and pronounce the /r/ whenever it occurs. Moreover, words almost sharing the same graphological make up in both English and French favour transfer: 'north'- 'nord' and 'considered'- 'considérer' (54 and 61 erroneous instance, respectively). In the majority of cases, the /r/ is retained and under some circumstances is substituted with a trill that is mostly used in Dialectal Arabic. This shows the seemingly unavowed influence of the mother tongue on learners' pronunciation even if French is the language used as the source of the graphological-based transfer.

Table 2: Retention of /r/ sound

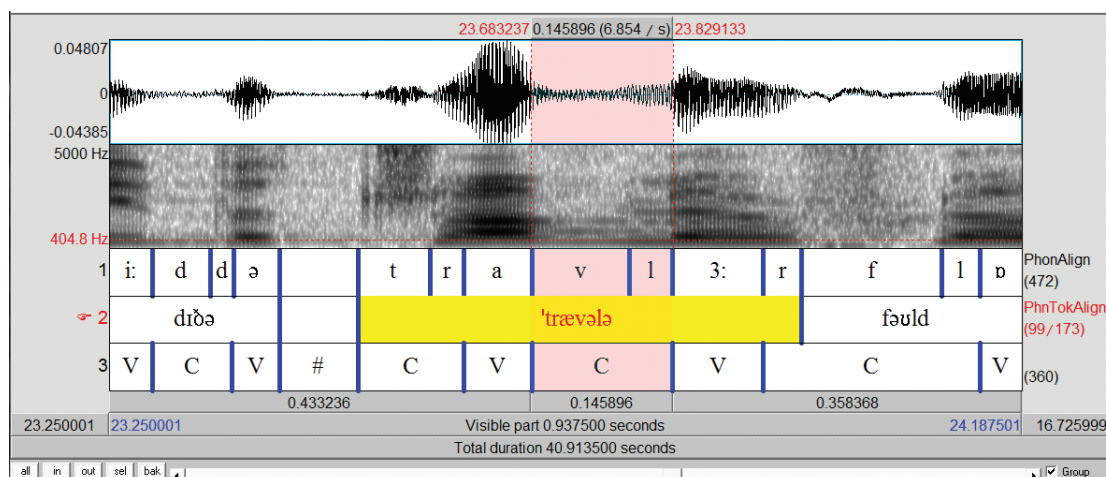
Word	Informants' Pronunciation	French Possible Source of Transfer	Arabic Possible Source of Transfer	Number of Students
/nɔ:θ/	/nɔ:rθ/	/nɔʁ/	-	54
/wɔ:m/	/wɔ:ɪm/	-	/waɪd/	55
/'fɜ:st/	/fɜ:ɪst/	-	-	53
/kən'sɪdəd/	/kɔ̃sɪdrəd/	/kɔ̃sideʁe/	-	61
/hɑ:d/	/hɑ:rd/	-	/llaɪd/	54
/wɔ:mli/	/wɔ:ɪmli/	-	-	58

3.5.1.2. Vowel Syncope

Second, vowel syncope or the deletion of weak vowels notably the schwa in some unstressed syllables caused the creation of consonant clusters and hence an addition

to the overall duration of consonantal intervals as two resulting juxtaposed consonants, normally separated by the schwa, are gathered in the same sequence (see table 3). The following spectrogram represents schwa deletion in /'trævələ/ in one of the informants' production:

Figure 1: Example of Schwa Deletion in /'trævələ/



This prevalent error can be explained by crosslinguistic interference. AA is characterized by the deletion of short vowels in open syllables that creates clusters basically impermissible in Standard Arabic: *شَبْعٌ* /ʃbʕ/ (he is full) instead of /ʃabaʕa/ شَبْعٌ. Therefore, learners unconsciously norm this characteristic and apply it whenever two juxtaposed open syllables are displayed, be it a schwa sound or other short vowel. As for Standard French, word internal schwas are generally speaking

deleted by the majority of its speakers (Walker, 2001). Indeed, even though they are not fluent in French, Algerians are accustomed to code switch smaller constituents to French like adjectives, conjunctions, prepositions and specifically adverbs of manner such as *facilement* (easily), *logiquement* (logically), *normalement* (normally), etc. which, according to Dell (1973), undergo a compulsory schwa deletion /fa.sil.mã/, /lo.ʒik.mã/, /noʁ.mal.mã/, respectively.

Table 3: Instances of Schwa Deletion

Word	Informants' Pronunciation	French Possible Source of Transfer	English Possible Source of Transfer	Number of Students
/ˈtrævələ/	/ˈtrævlə/ɔr/	/ʒvlop/	-	49
/kənˈsɪdəd/	/ˈkɔ̃sɪdrəd/	/dʁa/	/əˈdres/	63

3.5.2. %V Analysis

%V (41.66) is lower than ΔC (64.45) but to some extent high in respect to the native performance taken from the study conducted by Hamdi and colleagues (2004) as a comparative value: 38.07. Two basic factors can account for such production: the resort to epenthetic vowels and the use of strong forms of function words:

3.5.2.1. Addition of Short Vowels

The addition of an epenthetic vowel /ə/ or /ɪ/ to break clusters adds a non-existing syllable and thereby extra vocalic duration. This phenomenon was observed in the pronunciation of final 'ed' of regular past tense exactly the same way as it is written. The following table illustrates the informants' faulty pronunciation of final 'ed' in *wrapped* /ræpt/, *succeeded* /səkˈsiːdɪd/, *shined* /ʃaɪnd/, and *obliged* /əˈblaɪdʒd/:

Table 4: Informants' Rendition of Final 'ed'

Word	Correct Pronunciation	Informants' Pronunciation	Number of Students
Wrapped	/ræpt/	/ræpid/	2
		/ræpəd/	29
		/ræpət/	3
		/ræptəd/	1
Succeeded	/səkˈsiːdɪd/	/səkˈsiːdəd/	47
Shined	/ʃaɪnd/	/ʃaɪnəd/	15
Obliged	/əˈblaɪdʒd/	/əˈblaɪdʒəd/	26

We believe that what best accounts for such insertion of vowels is the influence of spelling on pronunciation. English possesses a recalcitrant spelling system that entails a highly inconsistent mapping between grapheme and phoneme. This inconsistency is considered the major cause of pronunciation errors for EFL learners (Cook, 1997). Likewise, the informants, instead of applying pronunciation rules of how to

pronounce the suffix 'ed', they rather pronounced the words exactly as they appear in spelling (except for /wr/ in *wrapped* since they are familiar with such a silent letter in the overused word 'write'). Such purely physical pronunciation is due to the lack of learners' awareness and practice to how and when the blind spelling pronunciation should not take place. As a result, the addition of such epenthetic vowels that

created extra syllables added to the overall vocalic duration and contributed to the arrhythmicity of our informants' utterances.

3.5.2.2 Replacing Short Vowels by Full Vowels

The schwa is the most sound replaced by full vowels, generally the one that corresponds to its graphical representation. This is mostly, but not mainly, a property of function words.

Undoubtedly, the students are not sufficiently familiar with the circumstances under which function words should be reduced; they almost always use the strong forms (see table 5). This is triggered off by the faulty assumption that the reduced forms are incongruous, slangy and sloppy in Received Pronunciation (RP)

not knowing that both forms co-exist in this variety, and more importantly the weak form is the norm and the strong one is the exception. Moreover, the fact that French shares the same alphabetical system with English misguides students and results in the replacement of the weak central mid-open vowel /ə/ by strong French vowels as they are more or less accustomed to the relatively consistent French spelling if compared to its English counterpart. This fact adds to the overall vocalic duration (see table 5) if we are to compare the standardized duration of English schwa, which is 30 ms according to Marusso et al. (1999), with the duration of the substituted vowel in the informants' production.

Table 5: Production and Duration of schwa in Weak Forms

Word	Correct Use	Wrong Pronunciation	Vowel duration in ms	Number of Instances	Total
And	/ənd/	/ænd/	45 < X < 79	67	252/252
		/ænd/	60 < X < 150	105	
		/aund/	100 < X < 250	80	
Were	/wə/	/wər/	27 < X < 58	05	63/63
		/wer/	32 < X < 110	16	
		/wɜ:r/	68 < X < 150	42	
Was	/wəz/	/wəz/	54 < X < 57	02	188/189
		/wɒz/	40 < X < 150	97	
		/wɔ:z/	100 < X < 270	89	
As	/əz/	/əz/	62 < X < 63	02	63/63
		/æz/	74 < X < 180	48	
		/ɑz/	120 < X < 220	13	
At	/ət/	/ət/	69 < X < 77	03	63/63
		/æt/	64 < X < 100	47	
		/at/	100 < X < 170	13	
To	/tə/	/tə/	23 < X < 48	11	62/63
		/tʊ/	28 < X < 95	39	
		/tu:/	110 < X < 220	12	
Of	/əv/	/ɒv/	23 < X < 110	37	63/63
		/ɔ:v/	92 < X < 200	26	
Should	/ʃəd/	/ʃʊd/	28 < X < 99	51	63/63
		/ʃu:d/	86 < X < 140	12	

In addition to the schwa, other vowels are replaced by their represented letters. Learners, confused by the inconsistencies in the spelling of English, yet helped by the fact that French and English share the same Latin alphabetical symbols, tend to generalize, as it

is illustrated in the following table, the pronunciation of either English (intralingual transfer) or French (interlingual transfer) vowels to all sounds represented by the same grapheme.

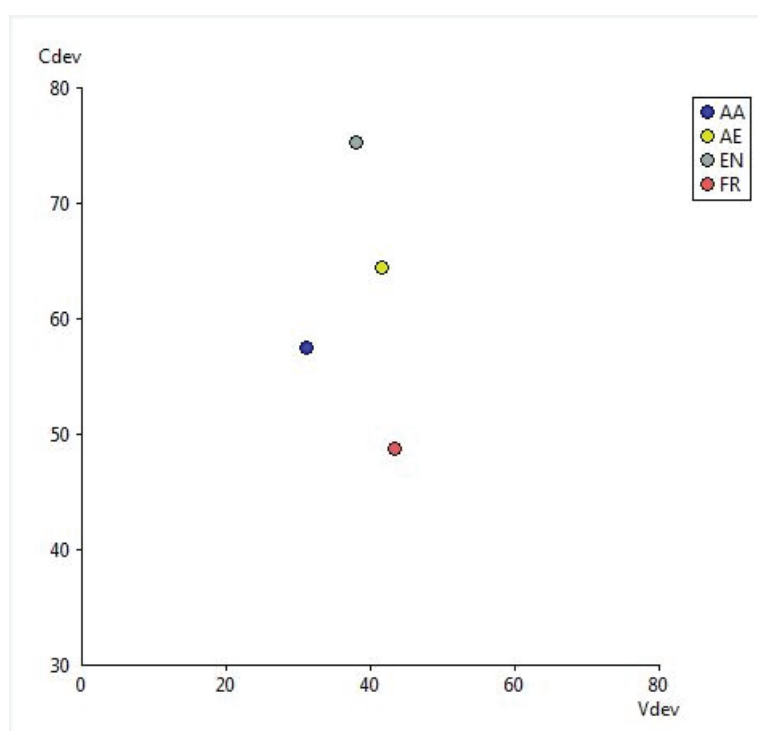
Table 6: Substituting Weak Vowels by their Represented Grapheme

Sound	Correct Use	Wrong Use/Pronunciation	The Standard Duration of Vowel	The Actual Duration by Informants	Number of Instances	
/i/	/wɪnd/	/wɑɪnd/	139	110 < X < 200	35/ 252	
/ɒ/	/'strɒŋgər/	/'strɔːngər/	178	91 < X < 170	26	189
		/'strɔ̃gər/		91 < X < 240	44	
/ə/	/kən'sɪdəd/	/'kɔ̃sɪdrəd/	30	100	2	63
		/'kɒnsɪdrəd/		23 < X < 100	23	
		/kæn'sɪdəd/		38 < X < 94	22	
		/kæ:n'sɪdəd/		80 < X < 100	3	
	/ə'blaɪdʒd/	/ɒblaɪdʒəd/		30 < X < 110	32	63
	/ə'tempt/	/'ɑːtempt/		96 < X < 140	07	61/63
		/'ættempt/		42 < X < 120	20	
	/kən'fes/	/'kɔ̃fes/		96 < X < 240	04	63
		/'kɒnfəs/		45 < X < 120	24	
		/'kænfəs/		66 < X < 110	03	

4. Classification of the Present Interlanguage Rhythm

To best classify the Algerian English (AE) speech rhythm, it is important to compare the latter against the prototypical stress-timed language, English (EN),

along with the prototypical stress-timed language, Fr. in addition to the mother tongue of the informants, AA. The data for comparison used in the following chart are taken from Hamdi et al. (2004).

Figure 2: Comparison of %V (x axis) and ΔC (y axis) in AA, AE, EN, and Fr.

The data presented in the above chart tally with the aforementioned justification for the deviated rhythm of the informants. The AE' %V (41.66)

nearly matches the one of Fr. (43.38) than the other languages presented on the chart; AA (31.14) and EN (38.07). Conversely, the AE' ΔC (64.45) is closer to

AA (57.54) rather than Fr. (48.72) or EN (75.27). The AE is situated somewhere between the prototypical extremes and, therefore, can be classified, according to the results of the present study, as neither a pure stress-timed language nor a discrete syllable-timed language, but an intermediate language combining properties of both classes.

Conclusion

The above analysis of the two measured rhythm metrics yield that the informants' interlanguage speech rhythm is rather 'intermediate', merging a stress-timed ΔC and a syllable-timed %V. Accordingly, this study reveals that crosslinguistic interference in the area of phonology touches not only segments but also speech rhythm. Therefore, it highlights the necessity of developing a good language-in-education policy in a multilingual setting in order to provide a healthy ground for the acquisition of English as a foreign language.

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