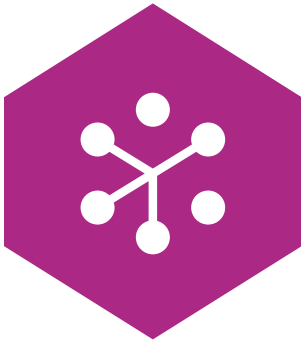




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Non-native English Prosody

A Comparative Study

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The Classification of Languages and Dialects into Rhythm Classes and the Production of Non-native English Prosody: A Comparative Study

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Abstract: The world's languages are generally classified into two categories on the basis of their rhythmic organization. The most well-known classification, proposed by Pike (1945), is the "stress-timed" language classification, in which stresses tend to recur at regular time intervals. English is one example of such a language category. "Syllable-timed" languages, where all syllables—stressed or unstressed—are produced at equal duration, are exemplified by French. Later, a third group was equally proposed: "mora-timed" languages, exemplified by Japanese and Tamil. "A mora is a unit of timing. Each mora takes the same length of time to say" (Ladefoged, 1975). However, the main problem in categorizing these types of languages was trying to find experimental evidence or acoustic correlates of language rhythm in the speech signal. Since the late 1960s, linguists have been trying to provide empirical support for the "isochrony/regularity theory" with varying degrees of success. The most that can be said for its legitimization is that a tendency toward isochrony is best felt at a perceptual level. In this research, it was hypothesized that a perceptual study could generate more convincing results relevant to rhythm typology. This approach has been adopted by using discrimination experiments based on spectral inversion in order to decide the rhythmic status of many languages as well as many Arabic and English dialects. Based upon the results of this study, it made sense for listeners to use rhythm as an essential cue to classify languages and dialects according to their rhythmic properties. Listeners were also able to perceive rhythmic differences between languages and dialects belonging to the same rhythm class. This implies the possibility of subclasses of broad rhythmic categories (Ghazali et al., 2002; Hamdi et al., 2005; Ben Abda, 2004). When non-native speakers of English produced read and spontaneous speech, they tended to use some of their first language prosodic features in the production of English suprasegmentals, which resulted in differences between native and non-native English in terms of rhythm and stress.

Keywords: Rhythmic Typology, Suprasegmentals, Prosodic Transfer

Introduction

Pike 1 and Abercrombie 6 emphasized that the existence of the different rhythmic classes was beyond doubt. Languages may fall into two rhythm classes: stress-timed rhythm and syllable timed rhythm. In the first group, languages such as English, Dutch and German show patterns of equal duration between accented prominent syllables (morse code rhythm). In the second group, all syllables, stressed or unstressed are of equal duration (machine gun rhythm), French, Spanish and Italian exhibit the characteristics of this rhythmic pattern. Later, Ladefoged 2 introduced another type of rhythm based on the morae (the mora can be composed of a /V/, a/CV/, or a /CjV/ where /j/ is a glide; the nasal /N/, the stop /Q/ and the vocalic lengthening /V:/ 7 are associated with Chinese loan words) which are also produced at equal time intervals, this kind of rhythm is exemplified by Japanese. However the main problem was trying to find experimental evidence or acoustic correlates of language rhythm in the speech signal and since the late 1960's linguists have been trying to provide empirical support for the 'isochrony/regularity theory' with more or less success.

In the present study, it is hypothesized that a perceptual study is the proper empirical basis to classify languages and dialects into rhythm classes. The main purpose of this study is to see:

- whether (and if so to what extent) the concepts of "stress-timing", "syllable-timing" and "mora-timing" have a perceptual reality in the minds of different listeners of the different languages and dialects investigated in the study.

- the realization of English suprasegmentals by different English non-native speakers and the possibility of mother tongue prosodic influence on the production of English prosody.

Materials, Methods, and Experimental Tasks

Task One

Sets of speech data were collected from native speakers of different languages and dialects (more than one native speaker per language/dialect):

- American English (Am), Received Pronunciation (RP), Welsh English (WE), Texan English (TE), French (Fr), Chinese (Ch) and Japanese (Jap): 12 sentences each (3 native speakers in each language/variety; 4 sentences per speaker).
- Scottish English (SE) and German (G): 8 sentences each (2 native speakers in each language/variety; 4 sentences per speaker).
- Irish English (IE), Tunisian Arabic (TA) and Moroccan Arabic (MA): 16 sentences each (4 native speakers in each variety; 4 sentences per speaker).
- Algerian Arabic (AA) and Lebanese Arabic (LA): 10 sentences each (2 native speakers in each variety; 5 sentences per speaker).

The speech data were in forms of long and short sentences or small passages selected from:

- *The Beauty and The Beast* (Native speakers of these languages and dialects were asked to listen to the selected sentences and translate them spontaneously into their native language or dialect).
- Les accents Des Français (<http://accentsdefrance.free.fr>).
- IDEA: International Dialects of the English Archive (Established by Paul Meier in 1997) (<http://web.ku.edu/idea/dialectmap.htm>).
- The British Library (<http://www.bl.uk/>).
- The IViE Corpus: (http://www.phon.ox.ac.uk/files/apps/old_IViE/).
- Recordings from the website archive of audio documents ‘SemArch’ at the department of Semitic linguistics, university of Heidelberg (<http://semitistik.uni-hd.de/>) (<http://www.semarch.uni-hd.de/index.php43?lang=en>).
- Every Tongue. com (<http://www.everytongue.com/index.htm>).

Once recorded, the selected sentences were spectrally inverted. The Praat digital speech processing software was used to perform the spectral inversion. It was created by Boersma & Weenink 8. It is software on which we can directly record sounds. It allows speech analysis like spectral (spectrograms), pitch and intensity analysis. It also allows segmentation of speech samples and manipulation of sounds. Some of the interesting features of this program are graphics for articles and theses, integrated phonetic symbols and statistics like discrimination analysis. The Praat software presents two pages: the Praat Objects where we can record, analyse and edit sounds and the Praat Picture where we can draw figures and curves and store them in various format.

The technique of spectral inversion was described by Blesser 9. When heard, the inverted speech has speech-like qualities. Timing cues, particularly the boundaries of segments were not modified. The listeners (Native speakers representing the different languages (Am: 11 listeners, RP: 8, Jap: 10, Ch: 11, G: 13 and Fr: 16 listeners) and dialects (TA: 14 listeners, AA: 10, MA: 10, LA: 13, WE: 7, SE: 4, IE: 5 and TE: 9 listeners)), thus, did not recognize the original sentences in terms of the place of articulation of sounds. The language samples were not

recognizable even by native speakers of the languages and dialects studied. Suprasegmental information was left untouched, features like rhythm, intonation, duration and stress. Thus, listeners had to rely on acoustic prosodic cues only. The spectral inversion technique can be helpful in generating more reliable results, because when the speech samples are known to listeners, this may to some extent affect their judgments and they may use cues other than pure suprasegmental ones.

Native speakers (mentioned above) of all languages and dialects were asked to categorize the samples collected from speakers representing these dialects and languages (Am, RP, WE, TE, Fr, Ch, Jap: 12 sentences (each) - 4 sentences per speaker-, SE, G: 8 sentences (each) - 4 per speaker- IE, TA, MA: 16 (each) -4 sentences per speaker-, AA and LA: 10 (each) -5 sentences per speaker) into one of seven columns going from “strongly stress-timed” (column one) to “mora-timed” (column seven). Columns two and five correspond to “simply stress-timed” and “simply syllable-timed” respectively, columns three and four correspond to “weakly stress-timed” and “weakly syllable-timed” and column six corresponds to the “strongly syllable-timed” category. The speakers were trained enough to correctly classify the items before taking the listening tests (Appendix 1). They were also asked to describe the rhythmic differences they felt between the samples.

Task Two

There were twenty-five subjects, males and females: RP (6), German (4), Chinese (6), French (4) and Japanese (5) native speakers (Appendix 2: details about native speakers). The recordings were collected from IDEA. Each of these recordings consisted of a reading passage “*Comma Gets a Cure*” (Appendix 3) and spontaneous speech in English. The reading passage was written by Jill McCullough and Barbara Somerville and edited by Douglas N. Honorof. This passage allows research on languages and dialects by testing the speakers’ pronunciation and their production of segments and suprasegmentals. The two speech styles and especially read speech of all subjects were analysed in terms of prosodic production, mainly, the alternation of stressing and unstressing, weak forms, word stress and the reduction of unstressed vowels. English non native speech production was evaluated by two other teachers of pronunciation to avoid any subjective judgement.

The aim of this experiment was to see:

- whether English non-native speech rhythm can still be fitted into the rhythmic scale.
- the awareness of German, French, Chinese and Japanese native speakers of English prosody.

The interest was also in:

- the origin of the mistakes in non-native production of English prosody and more specifically, the possibility of L1 prosodic transfer into English prosodic phonology.
- the way English foreign/second language learners produce English timing patterns that differ and do not differ from the timing characteristics of their L1:

In this experiment, the null hypothesis would be the absence of prosodic or more specifically rhythmic transfer into foreign/second language. I used a different hypothesis that interference of L1 prosodic system is possible.

Results and Interpretation

Interpretation of Task One

Table 1. Inverted Speech: Listeners' Perception of Languages and Dialects.

	RP	Am	G	Ch	Fr	Jap	MA	AA	TA	LA	WE	IE	SE	TE
Strongly stress-timed	1310	271	667	0	0	0	1821	1028	517	0	2	18	25	272
Stress-timed	378	953	455	0	0	0	435/ 2256	382/ 1410	1001	94	118	1237	691	1214
Weakly stress-timed	4/ 1692	468/ 1692	6/ 1128	0	2	0	0	0	643	709	798	955	399	206/ 1692
Weakly syllable-timed	0	0	0	9	18	0	0	0	95/ 2256	503	589	9/ 2256	13/ 1128	0
Syllable-timed	0	0	0	464	511	1	0	0	0	104/ 1410	185/ 1692	0	0	0
Strongly syllable-timed	0	0	0	1219/ 1692	1161/ 1692	9	0	0	0	0	0	0	0	0
Mora-timed	0	0	0	0	0	1682/ 1692	0	0	0	0	0	0	0	0

Listeners' Perception of Languages /Varieties.

The results showed a great deal of agreement between listener groups about the classification of German and RP as ‘strongly stress-timed’ and Am and TA as simply ‘stress-timed’. Some subjects felt that Am and RP were ‘weakly stress-timed’. No one felt that Am, RP and German belong to the ‘syllable-timed category’. However, some speakers categorized TA as ‘weakly syllable-timed’. The following figures show the speakers’ classification of languages and dialects according to their perceived rhythmic typology:

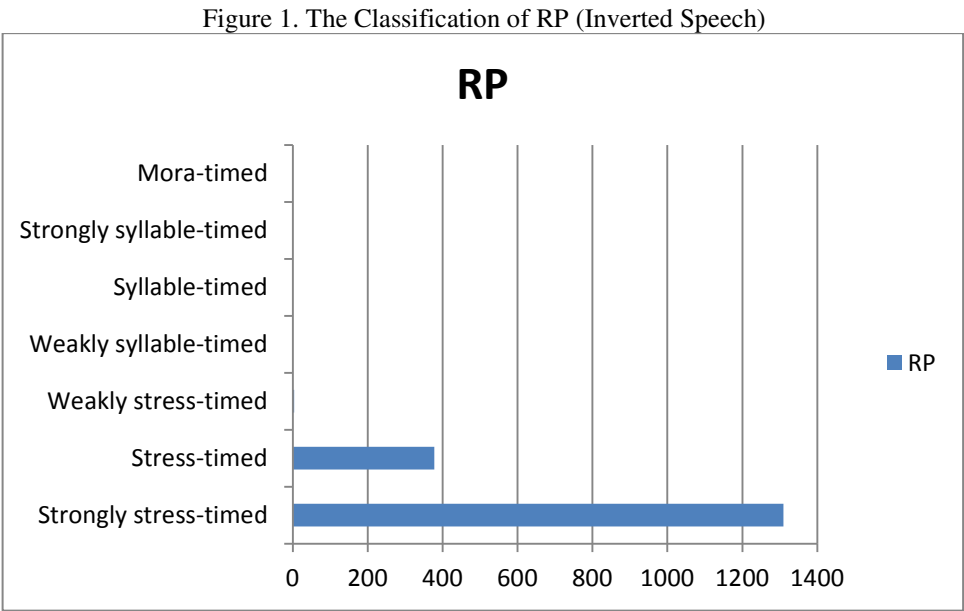


Figure 2. The Classification of German (Inverted Speech)

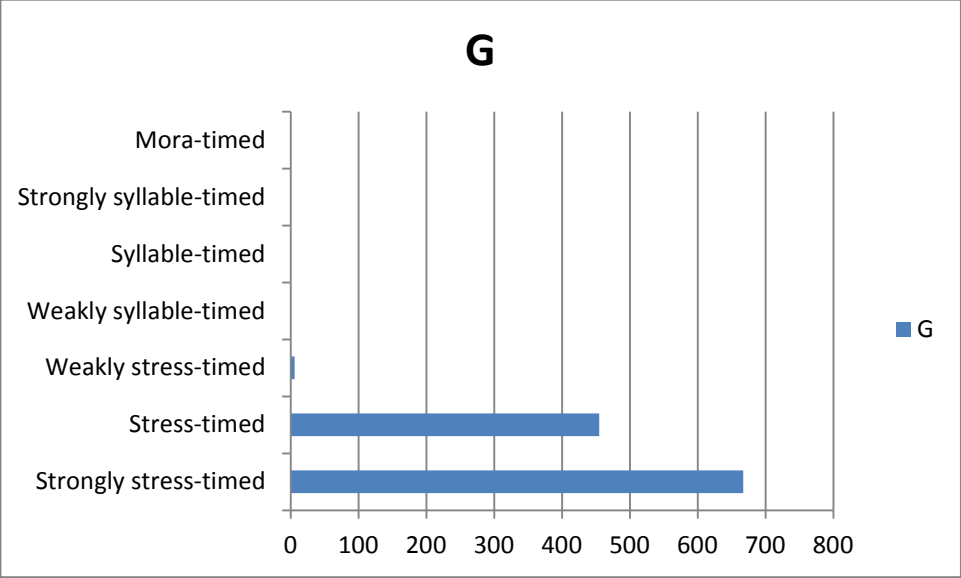
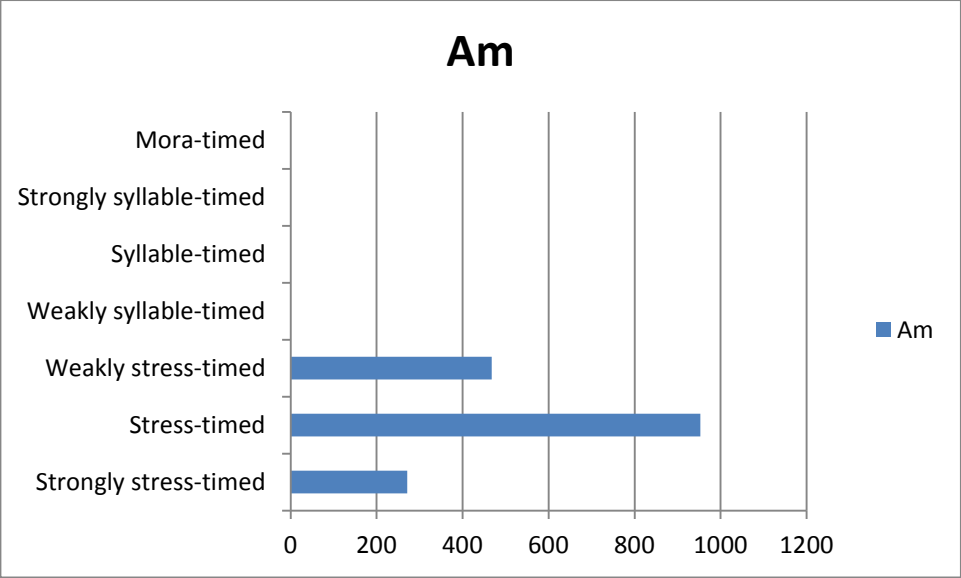


Figure 3. The Classification of American English (Inverted Speech)



The results clearly confirm the previous findings that French and Chinese were easily categorized and described as different at least from TA, RP, Am and German. Most of the listeners' answers were clustered around the 'strongly syllable-timed' category when classifying French and Chinese. Hence, it appears that it was possible for listeners to perceive the different rhythmic classes of languages using perceptual information; therefore, rhythm may be a sufficient cue to discriminate between languages:

Figure 4. The Classification of French (Inverted Speech)

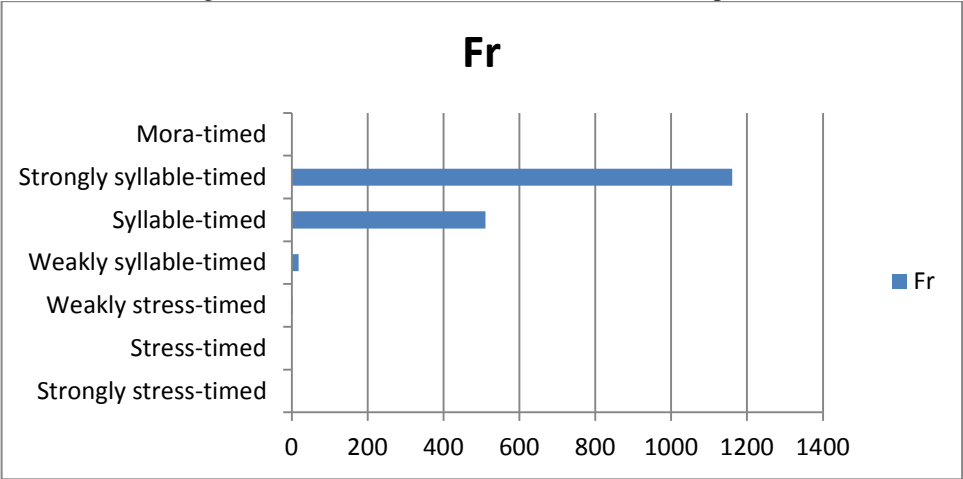
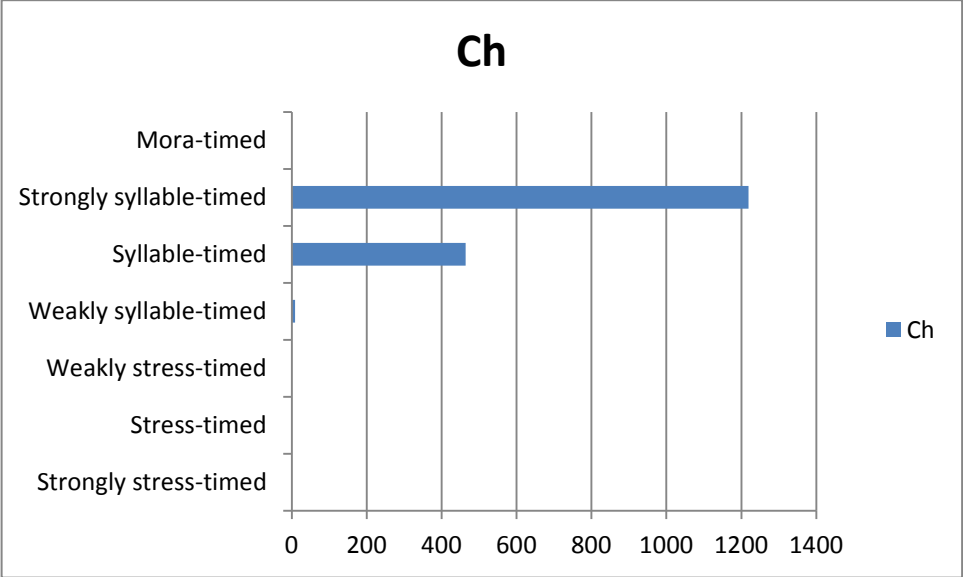


Figure 5. The Classification of Chinese (Inverted Speech)



Concerning Japanese, almost all listeners described it as a mora-timed language. They clearly felt that its rhythmic nature was different from that of the other languages, this is illustrated in the following figures:

Figure 6. The Classification of Japanese (Inverted Speech)

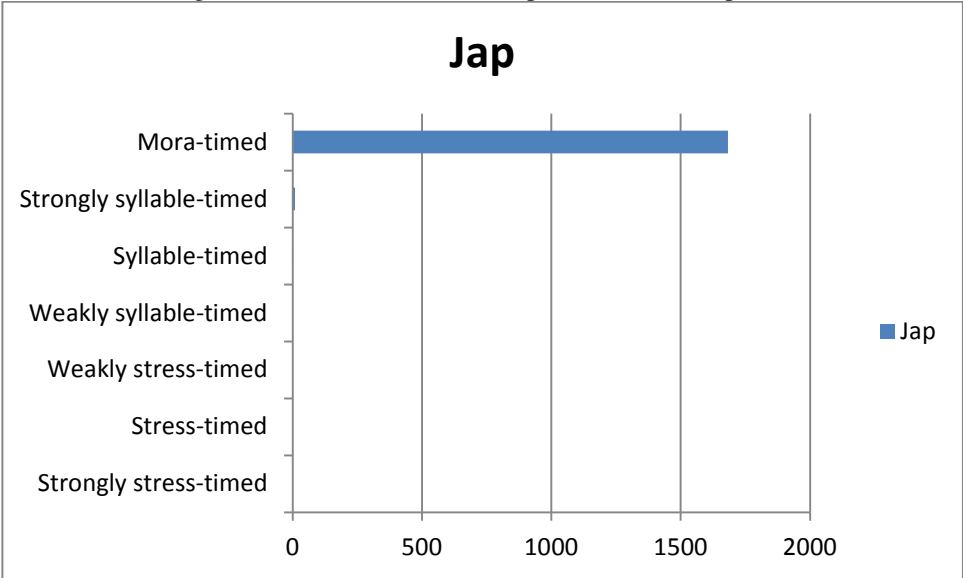
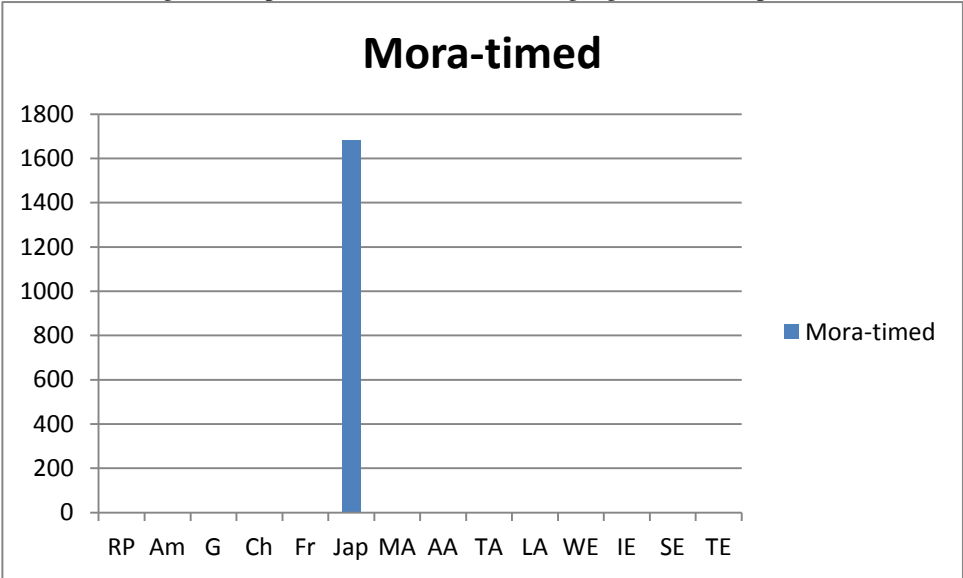


Figure 7. Japanese as a Mora-timed Language (Inverted Speech)



(Japanese was the only language that was described as mora-timed)

This agreement within and between listener groups in classifying languages in different rhythm classes implies again that the notion of rhythmic typologies does exist and confirms the findings of the previous studies about rhythm concerning the classification of Arabic, English and German as stress-timed, Chinese and French as syllable-timed and Japanese as mora-timed. It is important to notice that the Listeners’ responses fluctuated between ‘strongly stress-timed’ and ‘stress-timed’ for German and RP and between ‘strongly stress-timed’ and ‘weakly stress-timed’ for Am and TA. This shows that there may be differences in the rhythmic structure of

these languages/varieties even though they belong to the same rhythm class, we may again get the impression of sub-categories of a broad rhythmic class.

Listeners’ Perception of Dialects.

AA and MA were classified as ‘strongly stress-timed’ and some listeners described them as “stress-timed.”

Figure 8. The Classification of Moroccan Arabic (Inverted Speech)

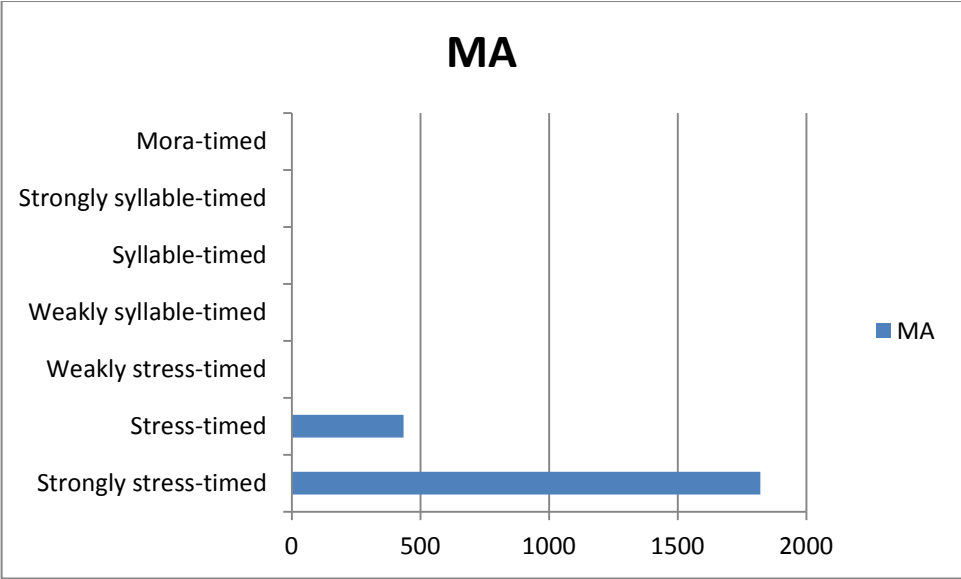
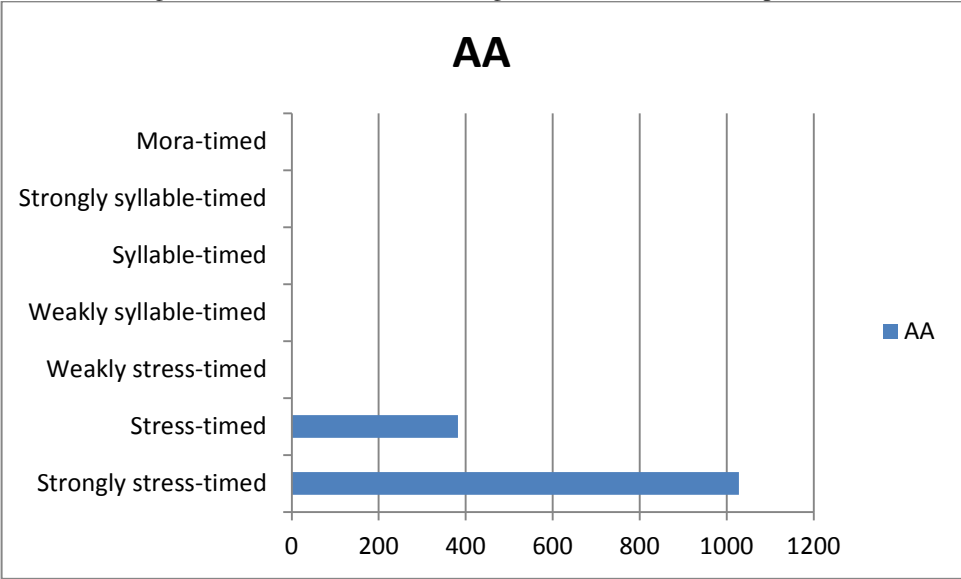


Figure 9. The Classification of Algerian Arabic (Inverted Speech)



Concerning SE, IE and TE, the responses fluctuated generally between ‘strongly stress-timed’ (A very few speakers felt that) and ‘weakly stress-timed’. LA and WE were mostly categorized as ‘weakly stress-timed’ and ‘weakly syllable-timed’, some listeners even categorized them as ‘syllable-timed’ (104/1410 for LA and 185/1692 for WE). TA was classified more as ‘stress-timed’ or ‘weakly stress-timed’ the same as SE and IE (sentences produced by TA speakers from Douz (South west of Tunisia) and Djerba (South east of Tunisia) were felt as ‘strongly stress-timed’ or ‘stress-timed’ while those produced by Tunisois and Sfaxi (Sfax: East of Tunisia) speakers were categorized more as ‘weakly stress-timed’ and sometimes as ‘weakly syllable-timed’. This raises the idea of rhythmic differences across regions of the same dialect:

Figure 10. The Classification of Irish English (Inverted Speech)

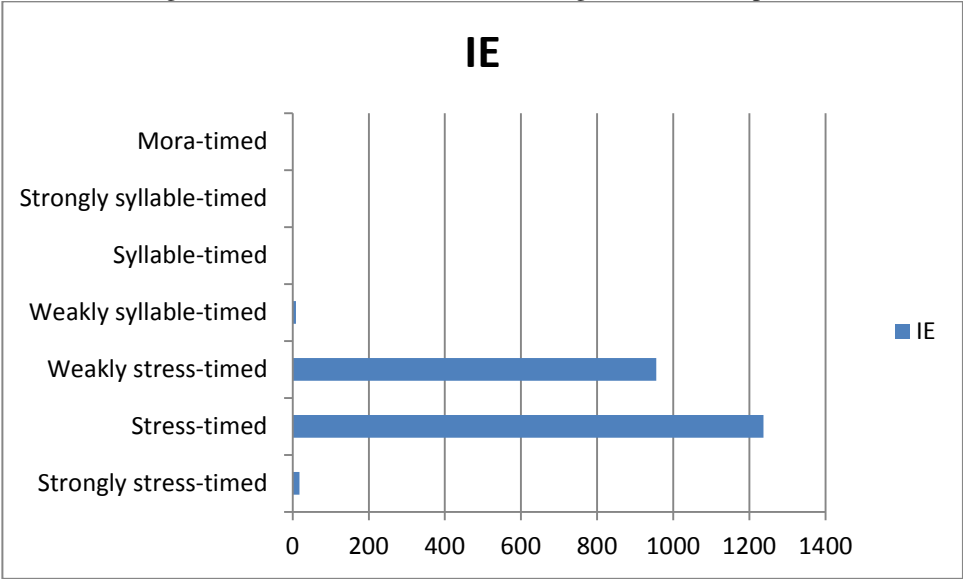


Figure 11. The Classification of Scottish English (Inverted Speech)

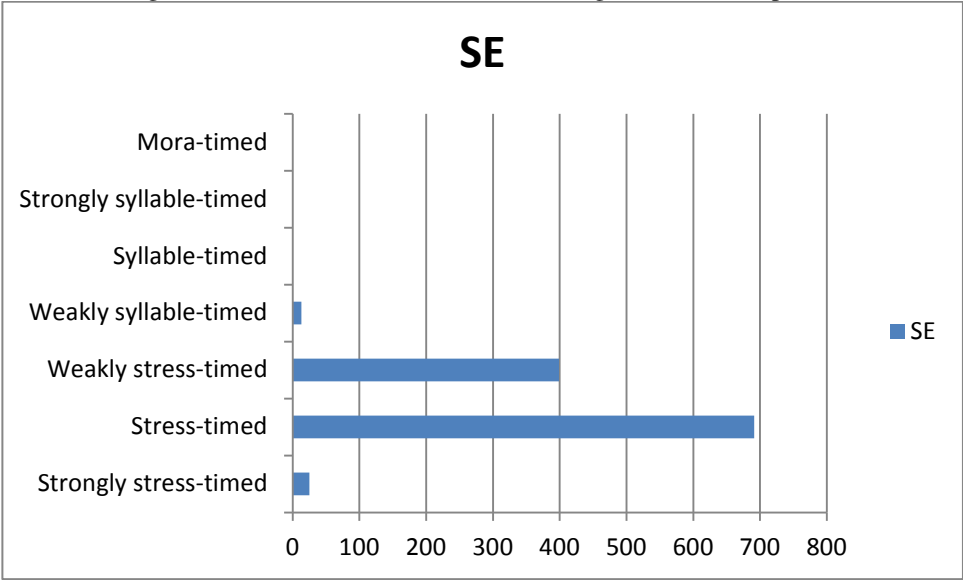
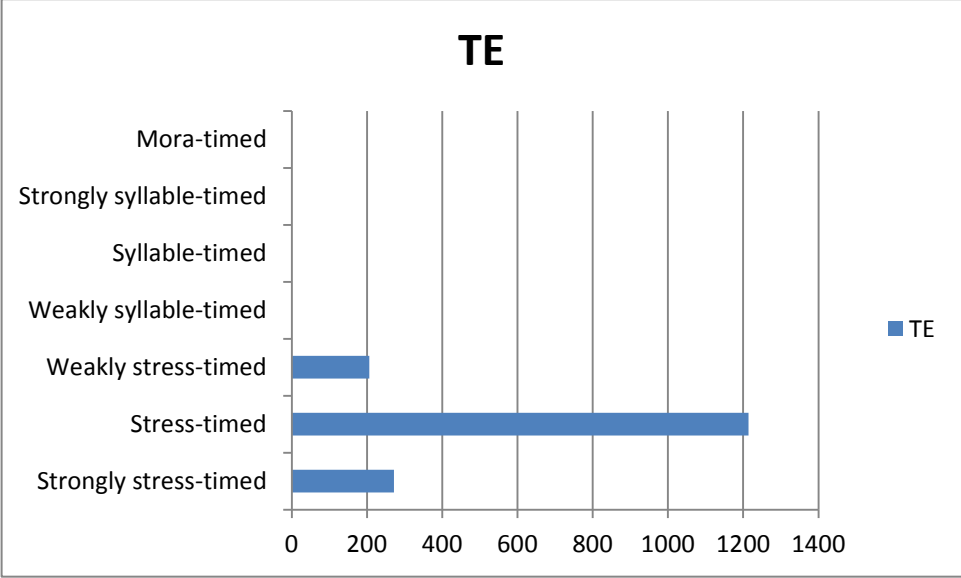


Figure 12. The Classification of Texan English (Inverted Speech)



The responses confirm the results obtained for TA which was perceived as exhibiting longer vowels and a slower speech rate than MA and AA -which tend to exhibit many consonant clusters, very short vowels and a very fast speech-but shorter vowels and more complex syllable structures than LA. TA, thus, was seen as an intermediate category between MA and AA as more ‘stress-timed’ and LA and WE classified as ‘weakly stress-timed’ and ‘weakly syllable-timed’. The difference in rhythm was perceived within dialects of the same language and also across dialects belonging to the same rhythm class. The following figures show the classification of LA and WE as ‘weakly syllable-timed’ and ‘syllable-timed’, and TA which also exhibits a few characteristics of syllable-timing:

Figure 13. The Classification of LA and WE as Weakly Syllable-timed (Inverted Speech)

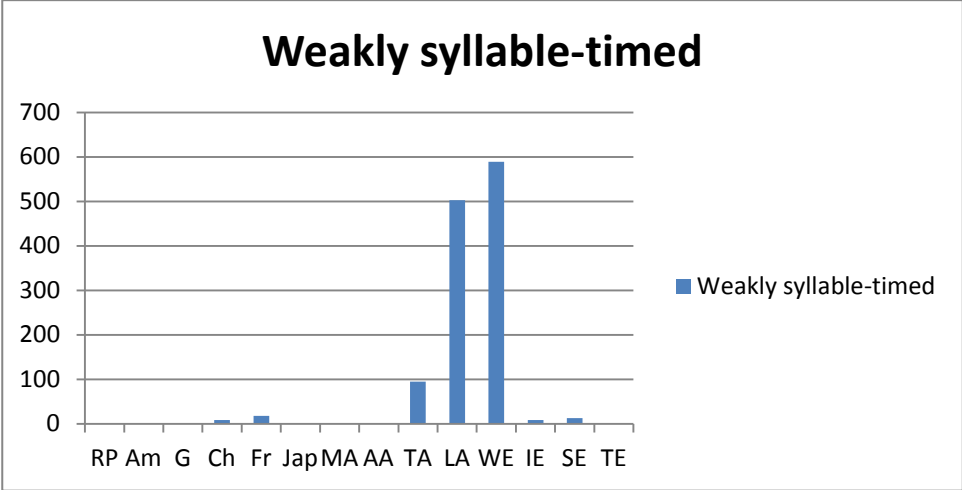


Figure 14. The Classification of LA and WE as Syllable-Timed (Inverted Speech)

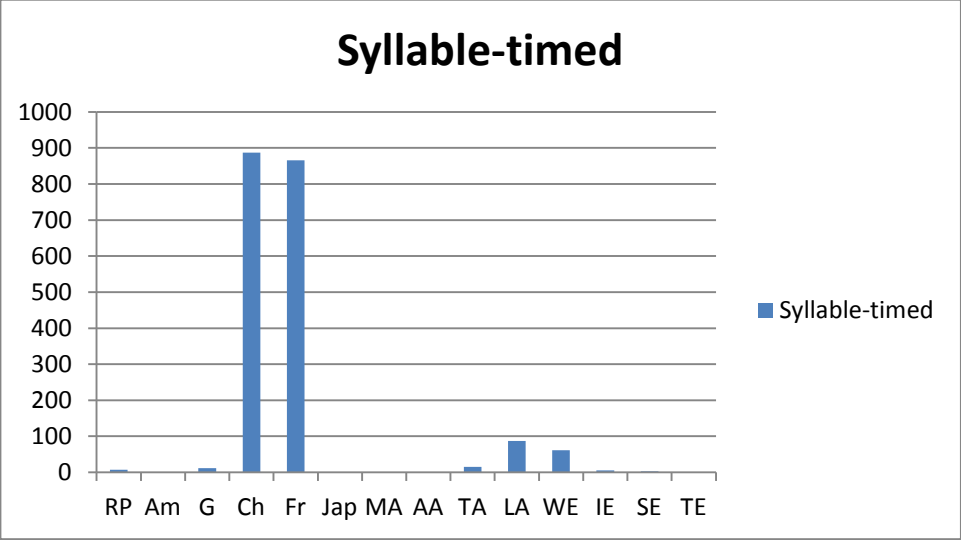
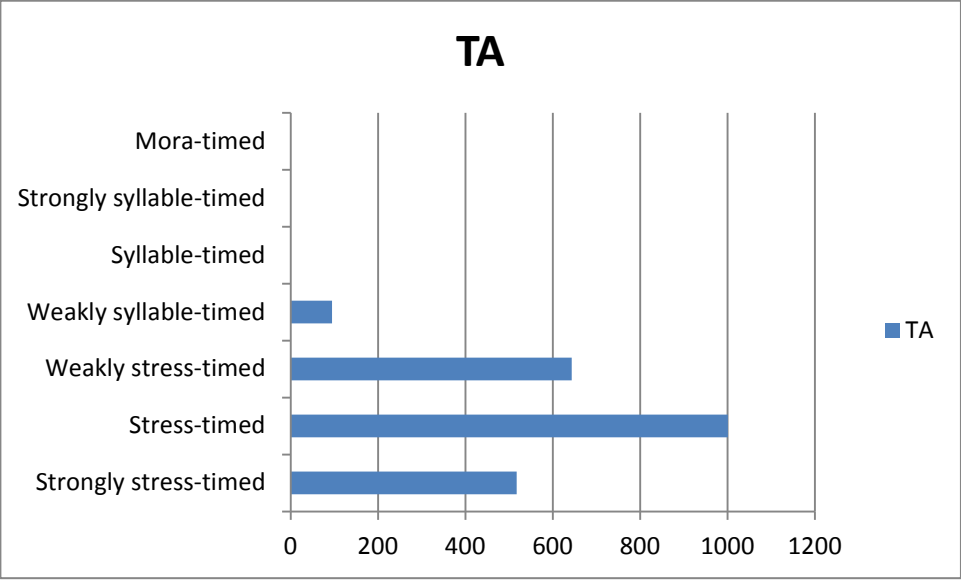


Figure 15. The Classification of Tunisian Arabic (Inverted Speech)



*Interpretation of Task Two***Analysis of Non-native Production of English Prosody**

Foreign/second language prosody and suprasegmental errors may be caused by one of the following factors:

- The two languages do not have the same prosodic typology, or
- Foreign/second language learners use their L1 prosodic system (i.e., prosodic transfer of L1).

These aspects were investigated in this experiment.

Speech Produced by French Native Speakers

French subjects had problems when they produced English rhythm and suprasegmentals in general 10. They tended to produce full vowels and did not easily realize the production of reduced vowels. This was confirmed in results reported in Burgess & Spencer 11. Questionnaires were given to EFL teachers who mentioned that learners had difficulties in realizing and producing correct or natural stress, rhythm, intonation and vowel reduction. This may be due to the fact that English and French do not have the same prosodic patterns and learners may find it easier to use their L1 prosodic structures, which may result in problems of intelligibility.

The English and the French stress systems are different. Vaissiere stated that: “The notion of (lexical stress) is indeed very elusive for French natives. They only discover the existence of that unnatural and unnecessary complication when they have to learn a foreign language” 10. One could notice that French native speakers tended to focus on single words and pronounce them separately. They seemed to realize or view each word as an entire thought group. Stress was realized mainly on the last syllable of the word which was marked by a noticeable pitch accent or an F0 (Fundamental Frequency) rise (on the last syllable of each prosodic unit, also called “syntagme prosodique” 12 by Vaissiere. Most subjects misplaced stress on the last syllables of many words such as:

- “*prac ‘tice”
- “*por ‘ridge”
- “*wo ‘man”
- “*sentiment ‘tal”
- “*suffe ‘ring”
- “*e ‘ther”
- “*ma ‘nage”
- “*so ‘rry”
- “*to ‘wer”
- “*le ‘tter”
- “*Sa ‘rah”
- “*e ‘fforts”
- “*beauti ‘ful”

The last syllables in these words should be produced with a short vowel or a reduced schwa and stress is not placed on last syllables. However, French speakers did not seem to show native-like stress patterns because they clearly used their L1 segmental and suprasegmental patterns of syllable timing. They used full vowels in almost all syllables and there were no vowel reduction

processes or syllable shortening. Henry et al. describe how English and French differ in terms of stress production:

The French lexical accent is essentially correlated to a lengthening of the last syllable of the word. Thus, French learners will tend to keep this lengthening to English realizations even on unstressed syllables [...] The lexical accent is strongly marked on a acoustical point of view whereas the French one is relatively weak [...] English lexical accent is characterized by a pitch modification, an increase of intensity and a lengthening of the vocalic nucleus of the stressed syllable (56) 13.

As explained here, the influence of L1 prosodic patterns of French on second language learning and production was evident. This was clear in their use of stress on words in isolation and equal stress on almost each syllable, which made them equally prominent because no word or syllable was made longer, louder or clearer. So, the function of stress in their speech did not highlight information as in native English. It was quite hard, then, to preserve the English rhythm. The syllabic dark [ɫ] in the last syllable of “sentimental” and the reduction of vowels in the second syllables of “efforts /ɔ/ and “Sarah”/a/ were replaced by a French full vowel. These words exist in French and are pronounced the same way French native speakers produced them in their non-native speech, which shows the influence of the French prosodic patterns on L2 production of prosody. Some of the French subjects placed stress on the last syllable of the word “*ma’nage” and used the diphthong: /eɪ/ instead of the short vowel /ɪ/. These errors of stress placement which are considered as a transfer of French phonology show that French subjects may not be aware of the English suprasegmental system. These errors may also be due to the influence of the common pronunciation of the word “age” which begins with the diphthong /eɪ/. This may also explain why most of the French subjects pronounced the word “manage”/ma’neɪdʒ/ with a diphthong in the second syllable they stressed. It should also be noted that French native speakers did not use secondary stress in polysyllabic words and most of them tended to insert inappropriate phonological pauses ([]) in word intervals, in their read as well as spontaneous speech: “practice [] in North Square near the [] Duke [] street [] Tower”. Moreover, they tended to link determiners and prepositions with words in sentences, for instance:

- “[she was] happy [to start] [a new] job.”
- “In no time [the goose] began [to tire].”
- “[the letter] implied that [the animal].”

This may imply that French native speakers are already used to associating these markers with words in their language.

The appropriate use of pauses, primary and secondary stress and the use of reduction processes constitute the rhythm of the English language. So, if these features are not used appropriately, the overall rhythm is distorted and non-native English production of speech rhythm would deviate from the strictly stress-timed nature of the English language and would probably sound more syllable-timed.

In their speech, the French subjects showed that they were not familiar with the alternation of stressing and unstressing of words/syllables, therefore, most of their production of strong and weak forms was not correct. Weak forms were pronounced with full vowels. In mid or final position, the words “her” and “would” took long vowels, /ɜ:/ and /u:/ respectively. Some of the speakers did not pronounce the sound /h/ in “her”, “had” (and some other content words like “happy” and “hurry”). This “h” dropping did not seem to be awareness of the necessity to reduce function words but most probably because this glottal fricative does not exist in the French language, so, they could not pronounce it. Such segmental errors have an impact on suprasegmental production since speech rhythm realization is subject to intricate factors and some of them are segmental aspects. To conclude, errors in stress placement, absence of vowel

reduction and insufficient shortening or weakening of unstressed syllables proved to be difficult problems encountered by French speakers of English when producing L2 prosody.

Speech Produced by Chinese Native Speakers

The recorded read and spontaneous speech of Chinese native speakers revealed that they had difficulties in producing natural or native-like English word stress. They tended to stress every syllable in a word and every word in a sentence. This was probably because in Chinese, the basis of speech rhythm is the number of syllables and the production of every syllable takes nearly the same amount of time to say. They might do so by unconsciously transferring suprasegmental patterns from their native stress and rhythm inventory. They pronounced every syllable with almost the same length, clarity and pitch. They did not seem to know how to weaken and reduce unstressed syllables. A very important feature in English that most of the Chinese speakers missed was that the vowels in unstressed syllables, which should be reduced to a centralized schwa or a short /ɪ/, were produced as full vowels. Gilbert stated that: “Clarity of the vowel is a particularly difficult concept for many students since in their languages all vowels are spoken in a full, clear way” (36) 14.

In Chinese, words are generally composed of a consonant and a vowel with no complex structures or consonant clusters. In their speech, Chinese subjects transferred these features negatively into English and added an /e/ vowel at the end of words or even in mid position of the word to avoid long sequences of segments, for instance:

- “superb” /superbe /
- “strict” /strikte/
- “Jacket” /dʒækite /
- “and” /ænde/
- “more” /mɔre/
- “had” /hæde /
- “treatment” /tritement/
- “huge” /hjudʒe/
- “first” /fɔste /
- “her” /hɔre/
- “kept” /kepte/
- “times” /tæmze/
- “was” /wɔze /
- “but” /bʌte /

Subjects pronounced structure words separately with prominence, they even overstressed them using full vowels like in: “was”, “had”, “her” and, “and”. In Chinese the use of short or long vowels does not affect meaning and since they did not seem to make the difference between short and long vowels in their speech, this shows the subjects’ tendency to carry over Chinese segmental and suprasegmental features into their English speech which made it unnatural compared to native English. Browne & Huckin stated that: “It is precisely such overuse and misuse of stress that produces the foreign-sounding speech rhythms that make speech comprehension difficult” (p. 54) 14. This interference of L2 prosodic system affects the appropriate production of word stress and sentence stress and hence the stress-timed nature of English speech rhythm.

Chen et al. 15 conducted an acoustic study about Mandarin speakers’ production of American English sentence stress. F0, vowel duration and vowel intensity produced by Mandarin subjects were compared to those of American English. It was reported that Mandarin speakers succeeded in discriminating between stressed and unstressed words in terms of F0, duration and

intensity, but used different characteristics to signal stress or absence of stress, such as a higher F0 and shorter duration when producing stresses and a higher F0 and greater intensity when producing unstressed words. The higher F0 used by Mandarin speakers may be explained by the interference of Mandarin tones when producing English. Words in Chinese have intonation which significantly tends to fall on the endings of each word as equally noticed in their speech in the present article. Eady 15 pointed out that Mandarin speech already consists of greater F0 on syllables when compared to English. He explained that this feature is due to the fact that each syllable in Chinese has its fixed tone.

To conclude, it was evident that Chinese speakers used segmental and suprasegmental features of their language in their production of the English language. It would be reasonable, thus, to speak of L1 interference into L2 prosodic system. This suggests that the rhythm of non-native English would sound more syllable-timed since these subjects showed unawareness of grouping of syllables, alternation of stressing and unstressing and the tendency to assign the same weight and length to almost every syllable and word.

Speech Produced by Japanese Native Speakers

The Japanese language differs from German, Chinese, French, English and Arabic in many regards. Japanese does not exhibit vowel weakening or reduction, it does not have stress too. It is a pitch-accent language where accent is mainly signaled by a clear fall in F0. This fall starts from a high-pitched mora to the next syllable/mora and intensity is a rarely acoustic feature used to signal accent 16. Concerning consonant and vowel duration, it is generally accepted that Japanese speakers differentiate between short and long vowels as well as strengthened (geminate) consonants.

Japanese speakers exhibited some of the features just mentioned, in their read and spontaneous speech as well as some other important segmental and suprasegmental features that seemed to affect their L2 prosodic production:

- Consonant clusters in mid and final position of words were often simplified according to the subjects' L1 rules, for instance: "entering" /entərɪŋ/, "difference" /dɪfərəns/, "gently" /dʒentəli/ and (they pronounced them as three-syllable words) "manage" /mænɪz/. They simplified consonant clusters either by vowel epenthesis after every consonant or by the frequent deletion of word final consonants like in: "entered" /entə/, "scientists": /saɪəntɪs/. This is may be due to the simple structure of syllables in Japanese.
- The velarized dark [ɫ] was replaced by clear [l] in all environments (mid and final position): "sentimental" /sentɪmentəl/.
- Weak syllables were not reduced properly compared to English native speech. There was a tendency to use vowels such as [æ] when followed by a nasal sound in word final position, /ɒ/, /ɜ:/, /ʌ/ and /eɪ/ instead of /ə/ in unstressed syllables: "Japan" /dʒæpæ/, "and" /ænd/ "efforts" /efɔrts/, "her" /hɜ:/, "surprising" /sʌpraɪzɪŋ/ and "private" /praɪveɪt/.

The Japanese subjects did not show awareness of contrasts between stressed and unstressed syllables or words, but used a pattern of equal importance of emphasis on all words. This was the case even for weak forms in both speech styles. Their speech showed also many inappropriate stops between words resulting in unnatural flow of the English speech.

Speech Produced by German Native Speakers

German has often been described as a stress-timed language exhibiting complex syllable structures, vowel reduction and stressing/unstressing contrasts. These features are also characteristics of the English language said to belong to the same rhythmic category. The question that we should ask is whether these prosodic features are also exhibited in non-native English production by German native speakers.

In native German, vowels in weak syllables are weakened and the vowel schwa is produced. Most of the structure words have reduced vowels on weak forms. A good example is the vowel [e:] which is reduced to [e], then completely left out: “dem” [de:m] [dəm] [d ɐ] [b ɐ] [ɐ] 17, 18. It is reported 17 that inflections in German undergo strong vowel reductions like “essen” (meaning “to eat”) [es. en] [es. ən] [es. ɪ] and most of the schwas that occur after stressed or accented syllables are deleted.

In this experimental task, German subjects weakened the weak forms of some structure words like: “had”/həd/, and “was”/wəz/. Some other structure words were not properly reduced by most of the speakers, words such as: “from”/frɒm/, “to”/tə/, “of”/ɒv/ and “but”/bət/. In these words, speakers did not use long vowels, but also did not reduce them to /ə/. Some vowels were deleted in post stress positions: “normally”/nɔ:məli/, “family”/fæmili/, “sentimental”/senti'mentəl/ and some other vowels were shortened: the long vowel /u:/ and the diphthong /aɪ/ were replaced by short /ʊ/ and /ɪ/ in “futile”/fju:tl/. Concerning the vowels produced in pre stress positions, they were not reduced to /ə/ or even weakened by most of the subjects, for example: “surprising”/sʊpraɪzɪŋ/. There were many sound changes and stress placement errors:

- /æ/ was often replaced by /e/: “accent”/’æksənts/.
- /e/ was often replaced by /æ/: “effective”/ɪ’fæktɪf/.
- The /l/ was pronounced as a clear [l] in final position.
- The misplacement of stress on the words:
 - “superb”/*’su:perb/
 - “penicillin”/*’penɪsɪlɪn/
 - “lunatic”/*lɒ’netɪk/
 - “efforts”/*e’fɔ:ts/

One can conclude that subjects applied stronger reduction processes in post stress environments but failed to do so in pre stress positions. This can probably be explained by the fact that, in German, strong reductions of vowels only occur in post stress syllables such as inflections but in English, they occur in many environments and vowel weakening and deletion occur before and after stressed or accented syllables. German subjects did not properly produce vowel reduction in unstressed syllables and in a native-like manner and even when they reduced vowels in post stress environments and weak forms, the quality of those vowels seemed to be different from reduced vowels used in native English. They tended to be longer and in a less central position of the tongue. This was also reported in Delattre 19, who showed that reduced vowels in German are closer to full vowels. The degree of vowel reduction in terms of tongue position and the neutral position of the lips is much less in German compared to English.

Conclusion

The subjects’ perception of the different speech samples strongly accounts for rhythm classes. Listeners classified the different languages and dialects into different rhythm classes using segmental and especially suprasegmental cues mainly rhythm and pitch. They also managed to perceive rhythmic differences even among languages and dialects belonging to the same rhythm classes. RP, G, MA and AA were categorized as “strongly stress-timed”, Am, SE, IE, TE and TA

fluctuated between the “strongly stress-timed” and the “weakly stress-timed” columns. TA was described as exhibiting an intermediate rhythmic category between MA, AA and LA. It was perceived as having a simpler syllable structure, a slower speech rate and longer vowels than MA and AA but exhibited more complexity regarding syllable weight, more reduction of vowels and a faster speaking rate than LA. Fr and Ch were classified as “strongly syllable-timed” and Japanese behaved differently from all the other languages and dialects and was described by almost all speakers as a “mora-timed” language. LA and WE did not fall on the pure stress-timed rhythm class but exhibited, according to listeners, many of the characteristics of syllable timing. The fact that subjects perceived suprasegmental differences within stress-timed or syllable-timed languages/dialects, generally suggests that languages and dialects do not fall into very pure and separate rhythmic categories but rather show a degree of variation in rhythmic tendencies. The last experimental task dealt with non-native production of English prosody and raised again the question of L1 transfer of rhythmic patterns when producing English suprasegmentals.

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APPENDIX 1

Listening Test Taken by Subjects (Example)
Task One (Inverted speech)

Samples	Strongly stress-timed	Stress-timed	Weakly stress-timed	Weakly syllable-timed	Syllable-timed	Strongly syllable-timed	Mora-timed
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
...							

APPENDIX 2

Details about Subjects (Task Two)

Received Pronunciation

- **Speaker One:** Raised in Hertfordshire, a university graduate and works in publishing
- **Speaker Two:** A 52 year-old male, a teacher and a trained actor
- **Speaker Three:** A 21 year-old female student; she was born in Southeast London
- **Speaker Four:** A 50 year-old male, a local government officer, educated to A-level
- **Speaker Five:** A 23 year-old female; lives in Central London; a student at WAC College of Media and Performing Arts in Belsize Park, north London
- **Speaker Six:** A 32 year-old female; MA level; raised in South London

Chinese Native Speakers

- **Speaker One:** A 19 year-old male; a university student
- **Speaker Two:** A 22 year-old male; a university student
- **Speaker Three:** A 22 year-old female; a university student
- **Speaker Four:** A 22 year-old female; a university student
- **Speaker Five:** A 23 year-old male; a university student
- **Speaker Six:** A 21 year-old male; a university student

Japanese Native Speakers

- **Speaker One:** A female, born and raised in Iwakuni, Japan
- **Speaker Two:** 29 years old; was born in Nagano, Japan; a student preparing her MA in Art
- **Speaker Three:** A 25 year-old female; a student finishing her senior year in college)
- **Speaker Four:** A 24 year-old female; a student (theatre))
- **Speaker Five:** A 24 year-old male; a model and a two-year college graduate)

German Native Speakers

- **Speaker One:** A white male in his forties, raised and educated in Essen
- **Speaker Two:** A white male in his fifties; was born in Hann Munden; a sales manager
- **Speaker Three:** The speaker was born in Germany in 1968; grew up in South Germany and has lived in London, Cape town and NewYork for the last 5 years
- **Speaker Four:** A 23 year-old male undergraduate college student; born and raised in Heidelberg, Germany; he has been learning English for 12 years

French Native Speakers

- **Speaker One:** A 22 year-old female, a student and a foreign language assistant
- **Speaker Two:** A male; born in 1980 in Normandy; a PhD student, learned British English at school
- **Speaker Three:** A 44 year-old male; a secretarial assistant
- **Speaker Four:** A 68 year-old male; MBA in finance; a financial advisor

APPENDIX 3

Read Speech

“Comma Gets a Cure and derivative works may be used freely for any purpose without special permission provided the present sentence and the following copyright notification accompany the passage in print, if reproduced in print, and in audio format in the case of a sound recording: Copyright 2000 Douglas N. Honorof, Jill McCullough & Barbara Somerville. All rights reserved.”

“Comma Gets a Cure”

Well, here's a story for you: Sarah Perry was a veterinary nurse who had been working daily at an old zoo in a deserted district of the territory, so she was very happy to start a new job at a superb private practice in North Square near the Duke Street Tower. That area was much nearer for her and more to her liking. Even so, on her first morning, she felt stressed. She ate a bowl of porridge, checked herself in the mirror and washed her face in a hurry. Then she put on a plain yellow dress and a fleece jacket, picked up her kit and headed for work.

When she got there, there was a woman with a goose waiting for her. The woman gave Sarah an official letter from the vet. The letter implied that the animal could be suffering from a rare form of foot and mouth disease, which was surprising, because normally you would only expect to see it in a dog or a goat. Sarah was sentimental, so this made her feel sorry for the beautiful bird.

Before long, that itchy goose began to strut around the office like a lunatic, which made an unsanitary mess. The goose's owner, Mary Harrison, kept calling, "Comma, Comma," which Sarah thought was an odd choice for a name. Comma was strong and huge, so it would take some force to trap her, but Sarah had a different idea. First she tried gently stroking the goose's lower back with her palm, then singing a tune to her. Finally, she administered ether. Her efforts were not futile. In no time, the goose began to tire, so Sarah was able to hold onto Comma and give her a relaxing bath.

Once Sarah had managed to bathe the goose, she wiped her off with a cloth and laid her on her right side. Then Sarah confirmed the vet's diagnosis. Almost immediately, she remembered an effective treatment that required her to measure out a lot of medicine. Sarah warned that this course of treatment might be expensive—either five or six times the cost of penicillin. I can't imagine paying so much, but Mrs. Harrison—a millionaire lawyer—thought it was a fair price for a cure.

ABOUT THE AUTHOR

Imen Ben Abda: Abda, an assistant lecturer at Institut Supérieur des Langues de Tunis (Higher Institute of Languages) in Tunisia, is a PhD student whose area of investigation—within experimental phonetics—consists of a series of perceptual experiments using cues from natural and inverted speech, as well as pitch extracted from speech data. The study is an attempt to categorize speech rhythm over a large set of Arabic and English dialects as well as Chinese, Japanese, French and German. The aim of Abda's work is also to investigate non-native production of English prosody and the question of first language rhythmic transfer into the production of English suprasegmentals.

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