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Introducing Voice Analysis Software into the Classroom: how Praat Can Help French Students Improve their Acquisition of English Prosody.

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Abstract

In previous experiments, we have shown how the use of a computer-assisted phonetic transcription marker, associated with a filing system, in the classroom, can help French students of English as a Second Language improve not only their phonetic transcription skills, but also their phonological competence by linking theory to practice. Further development of this tool indicated how adding an auditory to a visual modality significantly increased the stability of acquisition. Our aim was to study how French students deal with individual phonemes at word-level or with word stress in English, as well as improving their skills in English rhythm and intonation, the latter being a major hindrance in communication with English speakers for L2 learners. We have therefore integrated the use of a voice analysis program into the teaching/learning practice of prosody. The present study aims to target the type of errors made by students in understanding of English prosody, and help them overcome these obstacles through explicit learning. The software enables the student to synchronize listening to a sound file and visualizing the oscillogram of that selected sound. It also enables the sound to be annotated by creating parallel text-grids below the spectrogram and pitch windows. The sentences chosen for the experiment were excerpts from News programs offering no particular lexical difficulties. Students were asked to represent four levels of segmentation by creating four different tiers; the task included segmentation of the continuous flow of speech into Intonational Phrases (IPs), and the identification of the structure of these IPs, including the indication of the place and type of tone used by the speaker as nucleus or tonic syllable. They were also asked to give a representation of the rhythmic units of the speech, which addressed the issue of how to bridge the gap between a syllable-timed language (French) and a stressed-timed language (English). The basic idea behind the form of the experiment was to enable learners to use errors to develop their cognitive approach to the learning of English prosody.

1. Introduction

This paper provides details of a further stage in research carried out over several years, aimed at developing the oral skills of French students of English as a Second Language. In the first stages we had successfully tested a program designed to teach phonetic transcription to University students. This e-learning tool was integrated into instructional sessions where its use, combined with an adapted theoretical input on English phonology, played a positive role in the teaching/learning process of spoken English [1]. However, class practice had shown the limits of the experiment and led us to think that the transcription task could be improved by providing students with sound as well as text. A new transcription program was therefore implemented with its adapted sound file. The invaluable filing system, providing both teacher and students with individual feedback on error after each session was retained but this new version proved to be disappointing in the first stages of the experiment. Adding an auditory to a visual modality to the learning process showed that progress in abstract symbolisation was actually hindered by listening to English, rather than improved as expected initially. However, once the effects of the higher cognitive cost and multi-tasking involved were overcome, test results proved highly positive, as they showed regular improvement in students' task performance as well as stability in acquisition [2]. Aiming to develop phonological competence in oral English in French students, we were now confronted with the limits of the new version of our transcription marker and, furthermore, with the limits of the nature and scope of the transcription task itself. Consequently, we have now planned to integrate voice analysis software, i.e. Praat [3], into our teaching procedure, aiming to go beyond the symbolisation of sounds and word stress to give our students a more adequate picture of the different, yet interconnected, levels of acquisition necessary to improve their oral skills.

2. Material and Procedure

2.1 Sample of students tested

As in former experiments with university students of English [1], [2], the groups of students who volunteered for the tests, were of the same age and gender, and shared similar educational backgrounds. However, at this stage, we chose to introduce Praat to third-year students (i.e. more advanced) during their second semester, rather than involving second-year students (i.e. intermediate), as the first two years of the theoretical syllabus in phonology only tackle general questions related to rhythm and intonation. During the first semester of their third year, the students follow a traditional course on the fundamentals of English rhythm and intonation using English Intonation [4]. They had had some training in recognition and reproduction of basic intonation patterns of English in context, using short dialogues from contemporary film extracts as teaching material. A total of 58 students, in three groups were tested at the end of the course.

2.2 Teaching procedure

The course itself dealt with the basics of acoustic phonetics, combining theory and practice on a computer with Praat. The instructional sessions were based on A Course in Phonetics [5]. We first dealt with the acoustic properties of individual segments in words, introducing the formant structures of English vowels, studying the spectrum of consonants, presenting their different places and manners of articulation as well as their voicing characteristics. Students were led to identify the different visual acoustic representations of individual segments provided by the software as well as to develop their finer listening skills. Praat creates a textgrid for each sound file studied; we gradually showed the students how to produce the segmentation of individual phonemes on a first tier and to annotate their script, by creating boundaries for each segment and using the Sampa alphabet to identify the sounds [6]. Students were also asked to work at sentence level, to chunk a sentence up into its constituent Intonation Phrases (IPs), to give its internal structure (indicating the place and type of tonic syllable) and to annotate its rhythmic structure (in terms of feet). Two more tiers were added to the first, leading to the production of a complete three-level textgrid (Fig.1).

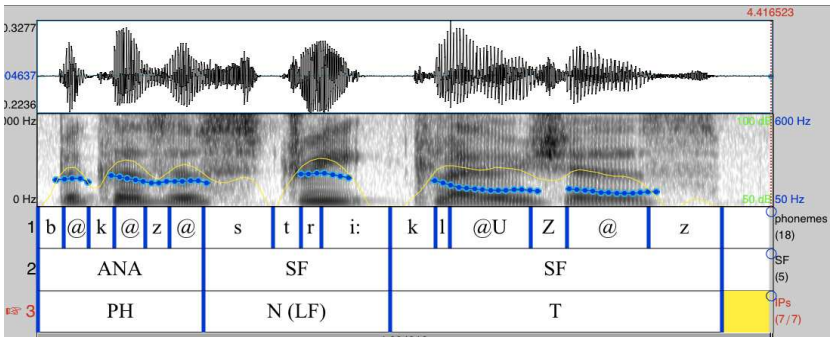

Fig.1. Teacher annotated sound file: three-level tiers (...*because of street closures*) - test 1.

2.3 Testing procedure

The sounds chosen consisted of 4-second BBC news items in British English, with no major lexical difficulties for third-year students. In Table 1, the slash indicates boundaries between IPS as pronounced by the speaker.

test n°	**BBC news extracts:**
test 1	And for hours / road traffic had to contend with diversions /because of street closures/
test 2	Some roads / in West and South Wales / remain blocked / by trees and flood waters /
test 3	Reports are coming in from Brussels / of an explosion / apparently caused by a bomb /

Table 1. Test sentences

They were also selected from a pedagogical point of view as they made chunking up the sound-file into IPs possible, whereas, in the perceptive approach adopted in the first semester, the students worked on short sentences from dialogues previously edited by the teacher. Our aim was to check on their acquired ability to separate intonation units in English. Each group was given 45 minutes aimed at producing a three-level textgrid. Further progress could easily be made outside the classroom

situation, by downloading voice analysis software and practising in an autonomous manner. Data-collection for our research was carried out after the tests, by comparing our master textgrids and their expected/correct annotations (cf. figure 1 above) to each student's production.

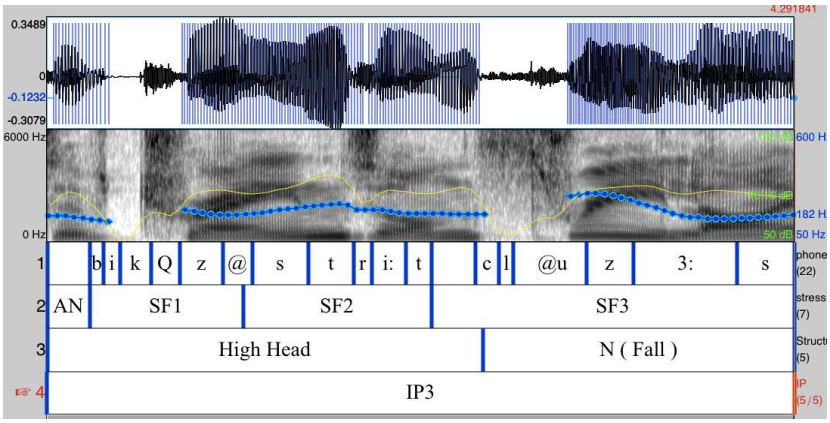

Fig. 2. Student sample annotation - test 1

3. Test results and discussion

3.1. Quantitative approach

Table 2 shows the percentage of correct answers in each test, identifying five different targets: IP segmentation, in terms of the number of IPs into which the sentence had been separated, IP structure, meaning the internal organization of the IP in the expected elements [4], i.e. in Prehead (or unstressed syllables before the head), Head (from the first stressed syllable - onset - to the nucleus or tonic syllable), Nucleus (bearing main stress at IP level), and Tail (made up of the post-nuclear unstressed syllables). Another criterion related to intonation that we wanted to check was the correct choice of tone assigned to the nucleus. Finally, student response to rhythm in English was tested by checking their answers on sentence organization into stress feet and anacrusis.

	IP segmentation	IP structure	Place of nucleus	Tone of nucleus	Rhythm
test 1	94%	0%	23%	23%	12%
test 2	10%	16%	23%	3%	30%
test 3	90%	90%	90%	25%	36%

Table 2. Correct answers in the three tests

3.2. Towards an integrated study of intonation and syntax

Results in IP separation, which is one of the major roles played by intonation in English, appear to be highly dependent on sentence type. In the first test, the sentence is made up of three different IPs, separation clearly following the syntactic organization of the sentence into prepositional time clause introduced by a conjunction (*and*), main clause, and subordinate causal clause (introduced by *because*). In the third test, the success rate in chunking is also high as the number and nature of IPs run parallel to the syntactic organisation of the sentence into main clause, noun complementation (*of* + Noun) and past participle complementation (adverb + *caused by*). In the second test, failure to identify the four different IPs may be due to the higher number of IPs targeted. Interestingly, half of the students identified two IPs instead of the four expected; the general oral rendering of the sentence was divided into two parts, corresponding to the Nominal phrase and to the Verb phrase. No account was taken of the sub-clauses forming each of the main clauses.

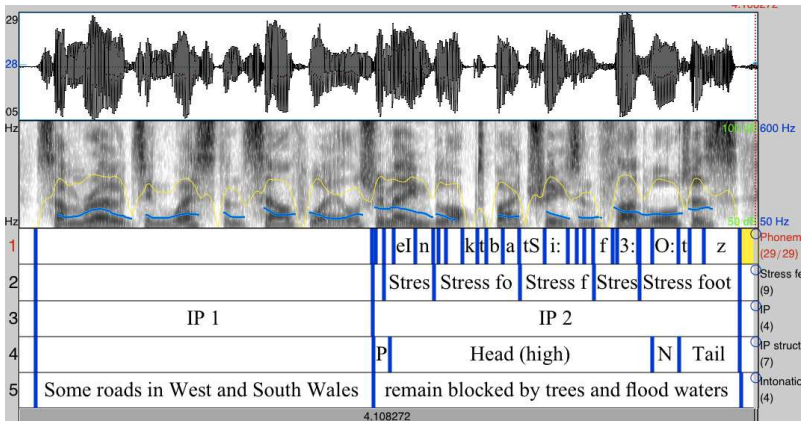

Fig. 3. Error in IP segmentation: student sample annotation - test 2

Such discrepancies in identification lead us to propose that the teaching of intonation be closely linked to syntax, providing clear, explicit explanations as to the close link between the two levels of study.

3.3. Towards an integrated study of intonation and semantics

The results show another striking discrepancy, in this case, in nucleus discrimination between test 1 and 2 as opposed to test 3. The high level of success in the latter test is explained by the presence of a canonical nucleus, assigned by the speaker to the last lexical word. However, in tests 2 and 3, the nucleus follows the early lexical stress common in compounds rather than late stress (here, *street closures* (Fig.2) and *flood waters* (Fig.5) with main stress on *street and flood*).

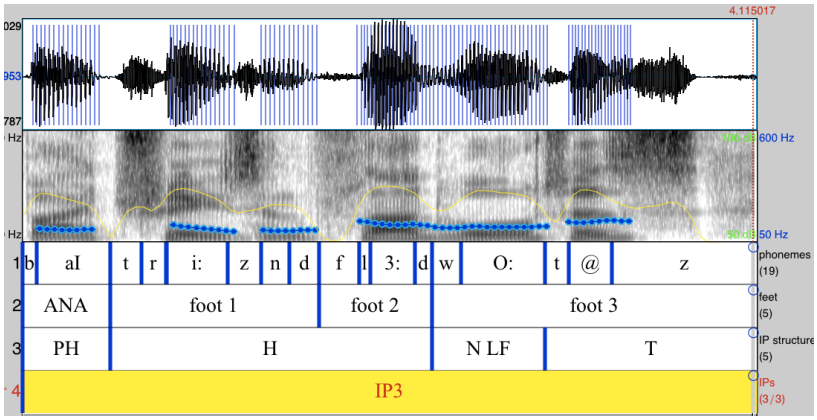

Fig 4. Nucleus placement error: student sample annotation - test 2

The French students have not identified the compounding of the two nouns, which is a very common process in news writing and reading in Germanic languages, aimed at gaining space and time. Here again, the availability of sound, visible representation and acoustic data should have helped them uncover the correct stress. It shows the need to highlight the semantic role of compounding in English and to bridge the gap between their role and meaning in language and their auditory and acoustic realizations.

3.4. Towards an integrated study of intonation and rhythm

Data collection shows the worst possible result in correct answers (0%) in IP rhythmic structure in test 1. French students are seen to have erroneously transcribed *because,* pronounced by the speaker with two unstressed syllables and weak vowels (schwa), with a stressed final syllable and a strong vowel, which is specific to French pronunciation. This reflects their common mispronunciation of words where unstressed syllables are to be found in final position (e.g. *closure*, [Fig.2]). Consequently, their interpretation of the rhythmic organization of the unit is also incorrect. Such cases enhance the interplay of L1 (French being a syllable-timed, not a stress-timed language) in the learning process [7]. The rhythmic nature of the mother tongue remains a major obstacle.

4. Conclusion

Praat's availability as a teaching/learning tool encourages us to continue to target French students' errors of interpretations of oral English, setting new learning goals and showing how to renew the learning process, based on improving listening skills combined with visible cues on sounds given by software. Practical skills should be combined with a basic theoretical background in acoustic phonetics – seen as insufficient in itself – and an appropriate mix of interconnected knowledge of syntax and semantics. Such an approach will help them understand how intonation and rhythm work in English in more complex sentences. Our research aims to enhance our knowledge of the nature of difficulties encountered by French students, by proposing a computer-assisted learning tool. Our next step is to use the latter to test the oral production of students having used Praat to reproduce the intonation patterns of English. Such software offers a recording function to help learners of English as a second language practice and improve their production, first on a comparative basis, and then more freely, as to express meaning in an intelligible manner.

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