La prosodie des mots grammaticaux : le cas des deux déterminants "du" et "deux"

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ABSTRACT

Does explicit knowledge of prosody help L2 learners to identify the two determiners "du" and "deux" in French? An analysis of 162 sentences read by 3 French native speakers show the expected tendency of F0 and duration ("deux" being longer and higher than the function word "du"). Then, 3 sets of 8 synthesised stimuli were generated using Mbrola, with expected and unexpected f0 and duration patterns. A perception experiment with 16 French native speakers suggests that they tend to be biased by the unexpected prosody (duration, in particular) when they listen to the sentences with white noise. In another experiment, three groups of Japanese-speaking learners were asked to identify the two words in 48 sentences read by a native speaker. The preliminary results suggest that teaching explicit knowledge of prosody might facilitate the acquisition.

1. INTRODUCTION

Sound changes have shown a strong interaction between segments, lexical stress, the grammatical state of words, and prosody (rhythm, intonation) in languages. Prosody has long been relatively marginal in the teaching of pronunciation of foreign languages, in spite of some important contributions such as the emblematic O'Connor and Arnold's textbook (1961/1973) on the intonation of British English. Dalton & Seidlhofer (1994: 73) mention the relatively high teachability of segments and the relatively high communicative importance of intonation in the teaching of English pronunciation and argues that lexical stress is situated in an area with "maximum overlap of" the two factors. As for the teaching of French, Wioland (1991) proposes the final syllable of rhythm groups as a favourable position in the teaching and learning of segmental contrasts. Prosody has shown to play a major role, when speech is heard in adverse conditions (in noise, for instance), and in synthesised speech.

In the present study, the case of the determiners "du" (partitive article) and "deux" (numeral "two") is taken as a paradigm to illustrate the interaction of segmental and suprasegmental features in the teaching and learning of pronunciation of French as a foreign language. Both of the two words in question are determiners and thus can occupy the same syntactic position, namely, (immediately or not) before a noun. We obtain minimal pair sentences such as "Nous avons du chocolat (we have some chocolate)" and "Nous avons deux chocolats (we have two chocolates)". As far as segments are concerned, the only difference is the vowel quality. In terms of articulation, /y/ in the word "du" is higher and more rounded than /ø/ in "deux". The two vowels occupy adjacent vowel spaces. Acoustically speaking, F2 and F3 of /y/ are close (CALLIOPE 1989: 84), while the first three formants of /ø/ are distributed more or less equally (figure 1). The identification and discrimination of front rounded vowels in French are known to be difficult to the speakers of languages that do not have them in their phonemic system (Gottfried 1984 and Levy & Strange 2002). It is the case for Japanese, which has a 5-vowel system.

However, the vowel quality is not the only element that may possibly differentiate the realisations of these two words. In French, as in many other languages, function words tend to be pronounced with a lower pitch and a shorter duration, as reported in Vaissière (1980). In our examples, the partitive "du" is a function word, while the numeral "deux" is considered to be a content word, possibly contrasted with other numerals.

If these prosodic differences are acoustically and perceptually salient in these sentences, and if learners are conscious of it, will they be able to discriminate the two determiners more easily? In order to examine this question, the following three experiments were conducted: 1) acoustic analysis of sentences containing the two determiners "du" and "deux", read by native speakers of French, 2) perceptual experiment with native French subjects, 3) perceptual experiment with Japanese-speaking learners.

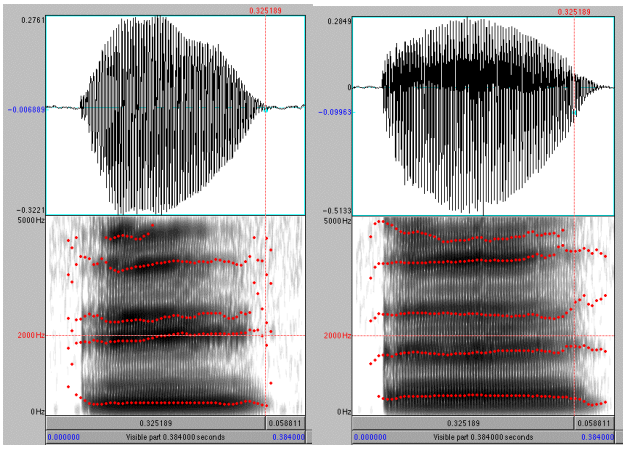

Figure 1: Wave form and wide-band spectrogramme of the vowels /y/ (left) and /ø/ (right) pronouced is isolation by speaker 3.

2. EXPERIMENT 1: PRODUCTION OF THE CONTRAST "DEUX"-"DU" BY NATIVE SPEAKERS

2.1. Procedures

3 native speakers of French (postgraduate students) living in and around Paris read 162 sentences containing a noun phrase with "du" or "deux" as either a complement ("C'est du/deux thé(s).") or a direct object. The length of the subject noun phrase ranges between 1 ("nous", "Jean") and 6 ("le garçon du village"), verb phrase from 2 ("(nous) avons") to 4 ("NP a commandé"), the object noun phrase from 2 ("du/deux thé(s)") to 4 ("du/deux chocolat(s)"). The sentences were presented to the speakers one by one on a computer screen. They were arranged in a semi-random order so that one of the determiners would not occur too frequently in a given sequence. The duration and the mean fundamental frequency (f0) of the segments concerned, as well as the first three formants of the vowels /y/ and /ø/ in the words in question, were calculated by Praat.

2.2. Results

The vowel in the word "*deux*" turns out to be significantly longer (91 ms, 76 ms, 88 ms for each speaker) than that of "*du*" (72 ms, 72 ms, 66 ms: figure 2), and similarly higher in f0 (222 Hz, 200 Hz, 229 Hz) than that of "du" (192 Hz, 178 Hz, 178 Hz: figure 3). See figure 1 for the general tendency of the sentences.

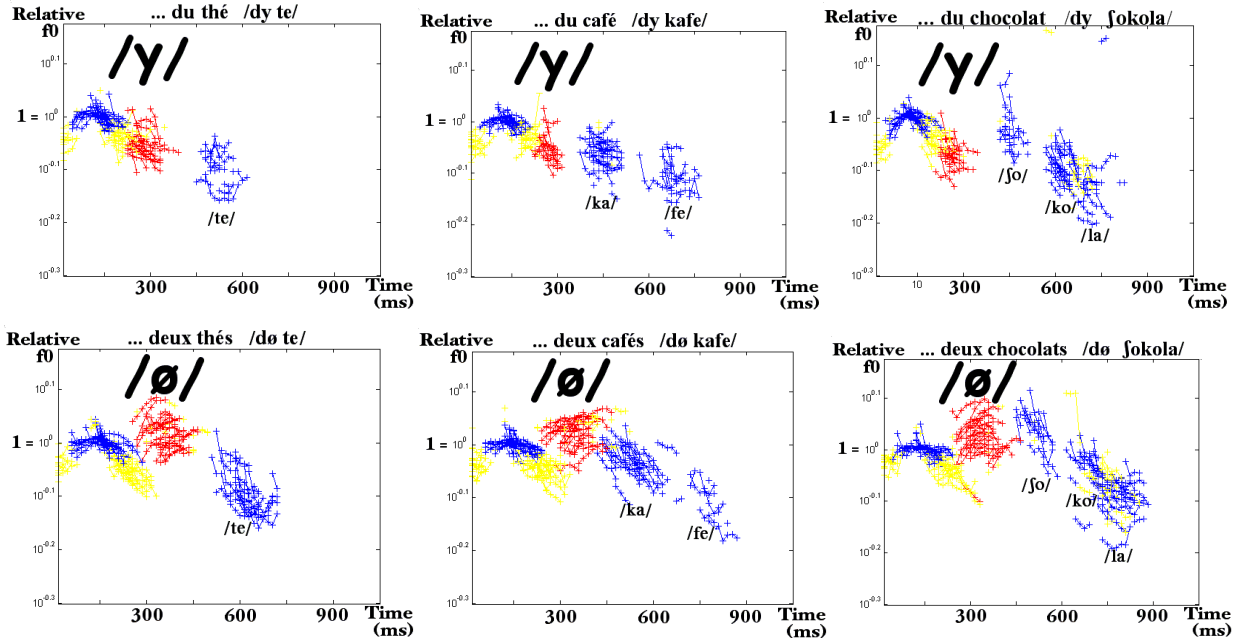

Figure 1 : Superimposed f0 curves (values relative to the mean of the vowel preceding /dy/ and /dø/, on a logarithmic scale) of 27 sentences each ending with "*duthé / café / chocolat*" (top) and "*deux thés / cafés / chocolats*" (bottom) read by Speaker 1. The red crosses represent the vowels in the two words in question.

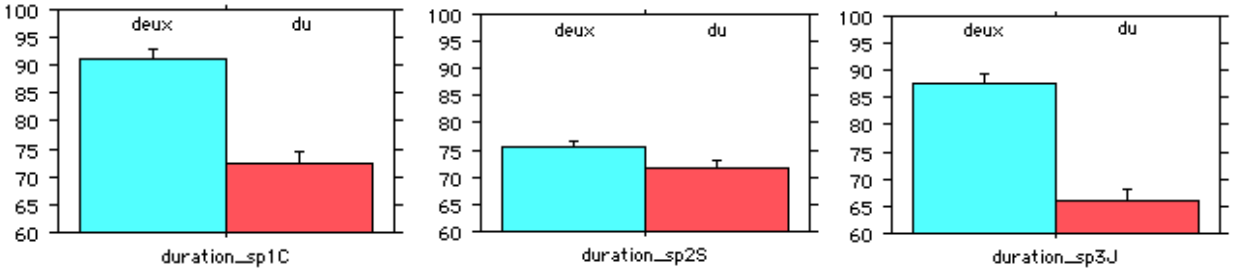

Figure 2 : Mean vowel duration (ms) of the two determiners "*deux*" and "*du*" pronounced by 3 female native speakers (in 27 sentences for each word). The error bar represents 1 standard deviation.

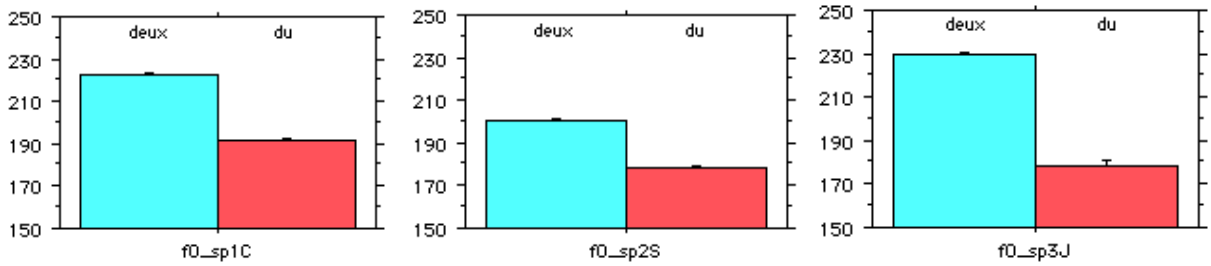

Figure 3: Mean f0 during the vowel of the two determiners "*deux*" and "*du*" pronounced by 3 female native speakers (in 27 sentences for each word). The error bar represents 1 standard deviation.

3. EXPERIMENT 2: NATIVE SPEAKERS' PERCEPTION

3.1. Stimulus Materials

The stimuli sentences were generated with the diphone synthesiser Mbrola, using a segment database of a French speaker (database fr4). For each pair of sentences (e.g. "*Le garçon a commandé du/deux chocolat(s)*"), stimuli differ solely in the vowel quality, and in f0 and duration of the two determiners. The f0 and duration patterns of the sentences imitate the production of Speaker 1 (Figure 1). 4 different conditions were created: 1) no modification, 2) unexpected duration (e.g. "*du*" with the duration of "*deux*"), 3) unexpected f0, 4) unexpected duration and f0. 3 pairs of sentences (ending with "*chocolat*", "*café*", "*thé*") were chosen, which makes 24 stimuli (3 pairs * 4 conditions). White noise that has approximately the same peak amplitude as that of the stimuli was added in order to realise the noise condition (48 stimulus tokens).

3.2. Procedures

16 native speakers of French living in and around Paris participated. The experiment consists of two parts. The first one consists of stimuli with white noise and the second without noise. The presentation order of the two parts was changed for half of the listeners. The stimuli, preceded by a beep sound (440 Hz, 50 ms), were presented in a semi-random order, and the list of stimuli was repeated twice (three times for the noise condition) in a different order. The task of the subject was to listen to the stimulus and answer the following question by clicking with a mouse the corresponding box on a computer screen: "*Avez-vous entendu '... deux N' ou '... du N*' ? (Did you hear … or …?)"

3.3. Results

The French listeners identified the two words "correctly" almost perfectly (except one answer out of 48 occasions * 16 subjects) in spite of the unexpected prosodic patterns. As for the noise condition, none of the following factors contributed to a statistically significant difference in the results: position of the two buttons, presentation order (with/without noise), and list order. The duration seems to be the most important factor that might dictate the listeners' judgement (the sentence "Le garçon a commandé du chocolat" with the expected duration of "*deux*" was judged to have "*deux*" in it in 22 out of 48 occasions, and "Le garçon a commandé deux cafés." with the duration of "*du*" was considered to contain "*du*" in 20 out of 48 occasions), but in combination with the f0 factor, the tendency is not always observed clearly. This result happens to demonstrate the importance of duration, a factor that is largely neglected in recent studies (in contrast to f0).

4. JAPANESE-SPEAKING LEARNERS' IDENTIFICATION

4.1. Subjects

14 native speakers of Japanese learning French as a foreign/second language at ILPGA (Institut de phonétique et linguistique générales et appliquées) in Paris participated in the experiment. Their learning experience varies from 9 months to 4 years.

4.2. Procedures

The learners listened to 48 sentences read by Speaker 1 in Experiment 1. The experiment, preceded by a brief training session, consists of three parts: 1) pretest, 2) treatment, and 3) posttest. The subject groups consisting of 2 to 4 learners received three types of treatment: 1) no explicit feedback: they were given the answer of 6 short sentences used in the training session, 2) explicit description of the articulatory and perceptual differences + feedback of the training session, 3) explicit description of frequently observed prosodic patterns ("*deux*" being longer and higher) + the same feedback. The pretest and the posttest were exactly identical. In each of them, the list of stimuli was repeated twice in a different order with a pause in between. The learners' task was to listen to the stimuli and answer the following question by circling the corresponding alternative on an answer sheet: "*Avez-vous entendu « du » ou « deux » ?*" We considered that the learners answered correctly if and only if they were consistent in their answer, that is, if they gave the same and correct answer twice in each of the two tests.

4.3. Preliminary results

Regardless of the treatment type, most learners got more than 40 sentences correct (out of 48) in the pretest. Even though there is some improvement in the posttest (2-4 more sentences correct), we have to consider the ceiling effect. However, there are 2 learners who got 30 and 32 respectively in the pretest, and improved their scores up to 43 and 40 in the posttest, after receiving explicit information on the prosodic differences.

5. CONCLUSIONS

The results of Experiment 1 show that native speakers of French tend to pronounce the determiner "*deux*" longer in duration and higher in pitch than the partitive article "*du*". Those of Experiment 2 suggest that, in identifying the two words in question, native speakers of French might be influenced by the expected prosodic pattern (the duration, at least) in an unfavourable environment, even though they identified them almost perfectly in spite of unexpected prosody, if the segmental information is readily available. Further experiments will have to be conducted with better stimuli and experimental conditions, with a view to validating the tendency. The Experiment 3 could eventually lead us to the conclusion that explicit knowledge in prosody might facilitate the comprehension of words with difficult segments, but our preliminary results do not sufficiently validate the hypothesis. The experiment should probably be carried out with learners at more elementary level with less exposure to the sound of the target language. Our experiment also shows that it may be advantageous to teach learners to identify segmental contrasts in noise and adverse conditions, so that they would get more sensitive to secondary cues that are often essential in everyday life. The use of synthesised speech, which makes it possible to control each parameter (formant synthesis necessitates the control of the distances between formants, while with Mbrola we can only control duration and f0), may reveal to be essential in teaching learners to be more sensitive to acoustic cues that are not used in their native language.

Even if the number of such examples as the "*du*"-"*deux*" pair is fairly limited, this might be an example showing the interface between segmental and suprasegmental features in the teaching and learning of pronunciation of a foreign language.

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