

PERCEPTION OF WORD STRESS AMONGST FRENCH LEARNERS OF ENGLISH: NUCLEAR TONE & SUFFIX

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ABSTRACT

French-speaking learners of second languages are said to be partially *stress deaf* (Dupoux et al. 2008). However, little is known about error tendencies in auditory identification of lexical stress in English. 55 advanced learners identified the primary stress of 46 utterance-final words pronounced by an American English speaker with an aggregated 36% of errors rates. Words ranged from 2 to 6 syllables (mode = 4). The study measures the impact of 6 stress-imposing endings (plus the addition of *-ing* for 3 of them) with 3 nuclear tones (fall, rise, fall-rise) on word-stress identification. Results show a significant difference in the error rate between the rising tone and the other tones ($p < 0.006$). Amongst all participants, stress-imposing endings also had a significant impact on error rates ($p < 0.001$) and even more so when combined with the neutral suffix *-ing*, with stresses being more frequently identified on the syllable preceding *-ing* with an unreduced vowel, e.g. 'celebrate vs. cele'brating.

Keywords: L2 word-stress perception, nuclear tone, French learners of English, stress-imposing endings

1. INTRODUCTION

French-speaking learners of second languages are said to be somewhat *stress-deaf* ([1] [2] for Spanish; [3] for French Canadian learners of English). They are perceptually less sensitive to lexical stress in second languages and thus have difficulty in learning to perceive it. This study aims to investigate how advanced learners of English perceive lexical stress in words of two syllables or more, the majority of which contain a stress-imposing ending (*-ate, -ify*). It also tests whether varying F0 patterns have an impact on the identification of stress by these learners.

Native listeners of English are known to identify lexical stress through various acoustic parameters: fundamental frequency (f0), duration, intensity and vowel quality [4]; [5]; [6]. The use of such a combination of parameters is challenging for

French-speaking learners of English since French has no lexically distinctive stress and the parameters used to cue initial and final phrase accents in French are mainly duration (lengthening of the onset of the initial syllable and of the rhyme of the final syllable) and f0 (more or less high f0 depending on the prosodic hierarchy of the boundary, except in utterance-final position) ([7]; [8] *inter alii*). Are French-speaking learners simply *stress-deaf* and insensitive to any prosodic parameters, or are they sensitive to specific cues when identifying lexical stress in English? Do they also resort to segmental parameters such as the lack of reduction in vowels, be they lexically stressed or unstressed? The correlation between f0 movement and perceived primary stress has often been examined in both native [9] and non-native speakers [10]. Tremblay [3] highlighted the difficulty of French-speaking Canadian learners of English in hearing stress in nonce words in isolation (AXB test). [11] also examined the perception of stress in disyllabic word-pairs using synthetic speech.

However, the stimuli used in the above-mentioned studies were restricted to disyllabics, and to our knowledge, the use of f0 by French learners as a cue to perceiving lexical stress in English on suffixed words has not yet been examined.

Although many frequent words in English are stressed on the first syllable [12], many words used in Academic English do not follow this pattern. Words derived from Latin/French [13] often contain stress-imposing endings which modify the stress-pattern of the words they derive from, e.g. 'stable => sta'bility. Some of these word-endings, such as *-ate, -ify* and *-ize* can be combined with a neutral suffix, which do not affect the stress-pattern (e.g. *-ing*): 'celebrating, i'dentifying, 'harmonising. Secondary stress is also found on an earlier syllable if primary stress falls on the third syllable or later (,visualiz'ation). Such combinations and constraints lead to an increase in the learner's difficulties and strategies to identify primary stress. [14] listed at least 6 factors influencing stress placement

amongst Brazilian learners of English (reading of target words within sentences). Some of them include the tenseness of the vowel in the final syllable of verbs, the presence of a tertiary stress (i.e. syllables with unreduced vowel not receiving primary or secondary stress), the stress pattern of derivatives along with the predominant stress-patterns of English.

The present analysis examines multiple effects influencing the perception of lexical stress across two groups of advanced learners, one specialising in the English language, literature and culture (henceforth *Eng*), and the other, in applied uses of English and another modern language, namely, German or Spanish (henceforth *AppLang*). We expect *Eng* to perceive correct primary stresses more often than *AppLang* since only the former received formal training on pronunciation and explicit knowledge on stress placement in relation to common stress-imposing endings. We also hypothesise that French learners are likely to identify primary stress on the initial syllable or on the last syllable based on acoustic patterns observed in French. Finally we predict that a rising nuclear tone may lead to the perception of a stress on the syllable receiving a rise.

2. METHODOLOGY

The 55 listeners were French-speaking learners of English at university level (year 2). (1) 26 *Eng* (440 hours of courses related to English in year 1 + semester 1 of year 2): in year 1, they had received 24 hours of formal teaching in the pronunciation of English (introduction to phonemes, word-endings and word stress, etc.). In year 2, the pronunciation module did not include word stress. 2 students were removed from the study because they were native speakers of English living in France. (2) 29 *AppLang*, who all receive courses in English and in either Spanish or German (264 hours of courses related to English). They spend 30% less time in class studying English and had not yet received any training or explicit knowledge on word stress. However, the other language they major in also has lexical stress, which may raise their awareness on lexical stress indirectly.

The 46 test words shown at the end of the paper mostly contain a stress-imposing ending (*-ate*, *-i/yse*, *-ify*, *-igible*, *-ion*, *-ity*), with or without a neutral suffix (*-ing*, *-ment*) and their length ranges from 2 to 6 syllables (mode=4). They were placed in sentences eliciting 3 different nuclear tones, namely, fall, rise, fall-rise in the British School of intonation analysis ([15] *inter alii*): e.g. *No, I didn't use the*

word ... for fall; Have you ever said ... for rise; I didn't like the word ... for fall-rise. These utterances were presented in a randomized order for each nuclear tone and read once by a male speaker of General American from New England in his twenties. Fig. 1 shows f0 values of some of the utterances thus obtained.

The utterances were then arranged in a semi-random order so that the same stress-imposing ending would not be presented in two succeeding trials, and that the same nuclear tone succeeds maximally twice. The list of 138 (= 46 test words x 3 nuclear tones) utterances were then presented twice in two different orders to the participants on a screen, who were asked to select the primary stress of the test words presented in orthography and broken down into syllables. A clearly indicated training phase that preceded the test phase helped the participants familiarise with the task. The experiment was compiled with Praat [16] and lasted around 30 minutes. A mixed effect model was run with correct/incorrect placement as dependant variable and student group, tone, suffix and syllable number as independent ones. Participants were treated as random effects.

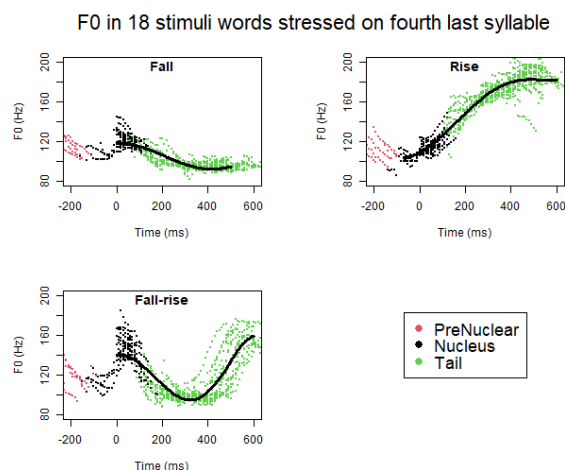


Figure 1: F0 measured (automatically then corrected manually on Praat [16] Pitch object) every 10ms for the 18 target words with stressed syllable followed by 3 unstressed ones (e.g. 'notifying, in'terrogating) pronounced with fall, rise and fall-rise. 5th-degree polynomial fitting curve. Time 0: beginning of rhyme of stressed syllable.

3. RESULTS

Eng and *AppLang* exhibited significantly different scores of correct/incorrect stress identification (henceforth *cor/inc*) ($\chi^2 = 261.81$, $df = 1$, $p < 2.2e-16$), with *Eng* outperforming *AppLang* (Table 1).

Learner group	% Correct	% Incorrect
<i>Eng</i> n = 26	69.0% (5025)	31.0% (2200)
<i>AppLang</i> n = 29	56.0% (4609)	43.1% (3461)

Table 1: % of cor. vs. incor. primary stress placement by learner group. Counts are between parentheses (n=15295).

Overall, *Eng* tend to favour the correct syllable over any other incorrect syllable, unlike *AppLang* students fro specific words (e.g. **anaLYsing*, **celeBRAting*, **notiFYing*; **eliGIble*, **specialLisation*). A GLME model confirmed a group difference with *Eng* being 20.5% more likely of correct hits ($p = .03$, Std.E. = .28).

3.1. Nuclear tone and *cor/inc* stress identification

The model also confirmed that a rising tone yields more incorrect answers ($p = .006$, Std.E. = .046). Stimuli with a rise are 41.7% more likely to lead to incorrect hits compared to a fall. Differences in scores of incorrect stress identification between fall and fall-rise were not significant.

3.2. Direction of misidentification: beginning or end?

Across incorrect answers, *AppLang* favoured a right-shifting of stress 30% of the time (vs. 20% for *Eng*). However, only 17.4% of the incorrectly chosen syllables were word-initial and 10.4% were word-final. Incorrect scores on initial syllables are higher than for final partly due to the presence of a secondary or tertiary stress in some of the words (**Visualisation*, **ORganisation*). Figures drop to 2.5% when the final syllable contain a monophthong. Namely, the proportion of word-final syllables chosen as primary stress in both groups was considerably higher when they ended in a stress-imposing suffix containing a final diphthong (18%-46% of incorrect syllables).

Table 2 displays the aggregated percentages of stress identification on last syllable by suffix(es) and group. Although average scores by group are reasonably low, when the suffix contains a word-final diphthong, scores are at least twice as high, which indicates that vowel quality in final unstressed syllables may enhance L1 transfer of identifying prominence on the final syllable. In the two words without suffix (*interpret* and *develop*), *AppLang* chose the final syllable 4 times as much as *Eng*, who opted for initial stress (89.2% of misidentification on these two words). However, it is rather on the penulti-

Eng	7.5%	AppLang	11.7%
'ATE	24.5%	'ATE	25.5%
AT'ING	0.4%	AT'ING	0.4%
I'FY	21%	I'FY	46.50%
IFY'ING	0%	IFY'ING	0%
'IZE	42.2%	'IZE	42.3%
IZ'ING	2%	IZ'ING	2%
I'BLE	4.8%	I'BLE	2.7%
I'TY	0.6%	I'TY	2.2%
'TION	5.2%	'TION	3%
'MENT	4%	'MENT	3.4%
none	10.7%	none	42%

Table 2: % incorrect primary stress identification on last syllable by learner group and suffix(es). Top line: aggregate % incorrect primary stress on **last syllable only**. *Eng*: n=26; *AppLang*: n=29; 6 *-ate* and *-ating* words respectively, 4 *-ify*, *-ifying*, *-iyse* and *-iysing* words respectively x 3 tones x 2 repetitions. None = *interpret* and *develop*.

mate syllable that most common stress misidentification occurs in words of 3 syllables, with a final unstressed diphthong, and with a correct stress on the first syllable (e.g. *symbolise*, *celebrate*, *notify*); *Eng*: 78.9% of incorrect responses vs *AppLang*: 65%). And for the same word-type with *-ing*, stress on the penultimate remains high (55.7%, both cohorts), albeit with a more even share of stresses identified on the ante-penultimate syllables (43.9%, both cohorts).

3.3. Misidentification by suffix & combination of suffixes

In both groups of learners, primary stress in words with *-tion* (e.g. *simplification*) and *-ize+ing* (e.g. *symbolising*) exhibited higher scores of misidentification (*Eng*: 46.9% *-tion*, 52.1% *-iysing*; *AppLang*: 57.9% *-tion*, 78.8%). In addition, a systematic increase of incorrect responses is observed when a strong suffix containing a diphthong is combined with *-ing* (Fig. 2), with a majority of stress misidentification on the diphthong contained in the stress-imposing suffix: 54% amongst all other possible answers for both cohorts. Only the word *interrogating* never followed this pattern, while *realising* followed it 93% of the time (**realLISing*).

4. DISCUSSION

The results presented above show that *Eng* with some formal training and explicit knowledge on English lexical stress (only during the previous semester) perceived the correct primary stress better

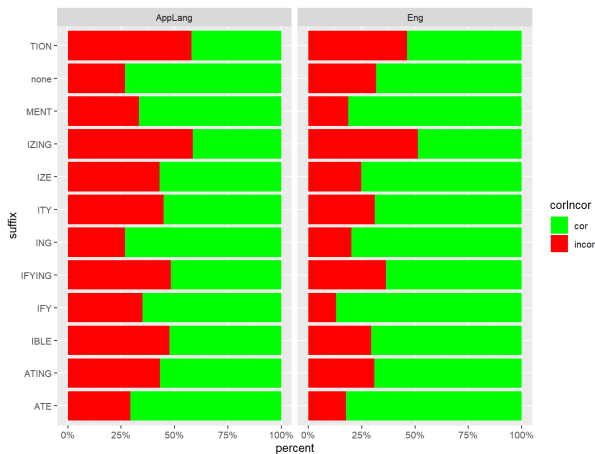


Figure 2: % cor/inc response by suffix and group. *Eng*: n=26; *AppLang*: n=29; 5 *-tion* words, 2 words without suffix, the word *development*, 4 *-ify*, *-ifying*, *-i/lyse* and *-i/ysing* words respectively, 16 *-ing* words, 4 *-igible* words and 6 *-ate* and *-ating* words respectively x 3 tones x 2 repetitions.

than *AppLang* (69% vs. 56%). While this difference suggests the impact of formal training and explicit knowledge, it is also possible that the two cohorts initially had a different proficiency level of English upon entering university.

Tone seems to play a certain role in the perception of primary stress, which led to more misidentification on words carrying a rising tone, suggesting a possible impact of the prosodic pattern of the phrase accent in their L1. This should be examined further in a production experiment.

Contrarily to the expectations based on simple contrastive analysis on prosody, primary stress was rarely identified on initial or final syllables overall. However, stress-imposing endings containing a diphthong (/aɪ/ in *-ise* & *-ify*, /eɪ/ in *-ate*) were more often incorrectly identified as stressed on the last syllable. [14] also remarks that Brazilian learners of English at university level have similar strategies in production but that this may not be confined to Portuguese-speaking learners. [17] made a specific remark on the suffix *-ise* which is often stressed by learners of English as a foreign language due to disyllabics like *demise*, *arise* being stressed on the final syllable. Although this should be investigated further in a production experiment, the difficulties raised by [17] and [14] may account for the higher proportions of stress identification on these suffixes carrying a diphthong, and more specifically, on the considerably higher incorrect scores observed on the suffix *-ise* regardless of the learners' L1. A more systematic study should be extended to learners of L1s other than Romance languages.

Unexpected results concerned the above-mentioned suffixes when followed by *-ing*, which led to considerably higher error rates than when they are not. The same pattern was also found in a preliminary survey on paper carried out on the same words prior to the perception test with a larger number of students from the same university programmes and year. It is possible that students over-generalise the Latin stress rule in English by re-organising primary stress on the heavy penultimate syllable (with a diphthong, at least) and potentially over-generalising the *-ion* rule for which the stressed vowel is free, *i.e.* either diphthong or long (except when the vowel letter is the monograph <i>, [13]). This over-generalisation can be accounted for by the fact that *-ion* endings are the most frequent suffixes in Academic English [18].

5. CONCLUSION

The present study indicates that French-speaking learners of English are far from identifying lexical stress at random out of *stress-deafness* and that they show interlanguage perceptual patterns beyond expected transfers from their L1 (initial / final prominence) and mobilise multiple cues such as F0, the presence of a suffix or the lack of reduction of unstressed vowels to detect primary stress in English. Over-generalisations of stress rules (e.g. *-ion* stress rule) are an indicator of learners' strategies to inhibit transfers from their L1. Awareness raising on such strategies may help the learner to go further towards a more accurate perception and acquisition of primary stress in English.

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Test words

-ATE: 'celebrate; 'celebrating; 'decorate; 'decorating; do'mesticate; do'mesticating; fa'cilitate; fa'cilitating; in'corporate; in'corporating; in'terrogate; in'terrogating

-I/YSE: 'analyse; 'analysing; 'authorise; 'authorising; 'realise; 'realising; 'symbolise; 'symbolising

-IFY: 'notify; 'notifying; 'pacify; 'pacifying; 'purify; 'purifying; 'specify; 'specifying

-IGIBLE: 'eligible; in'telligible; in'corrigible; 'negligible

-TION: ,amplifi'cation; ,organi'sation; ,simplifi'cation; ,speciali'sation; ,visua'lisation

-ITY: ,expres'sivity; ,regu'larity; ,pro-duc'tivity; ,simi'larity

(no stress-imposing ending): de'velop; de'veloping; de'veloPMENT; in'terpret; in'terpreting