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Peaks and valleys of a stress group in three geographically distant varieties of French in contact and non-contact settings

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Abstract

Previous studies of intonation in regional French showed differences in tonal alignment in comparison with the Standard variety [1], [2]. While high tones appeared timed similarly in Québec and Vendée French, they showed different secondary associations depending on whether they accompanied primary or secondary stresses [3]. As Ontario French is genetically related to these two dialects and dominated by the majority English language, it is necessary to understand the extent of tonal variation in contact: does it concern the tonal alignment only or tonal alignment and association?

Considering low and high tonal targets, this pilot study suggests that high tones have the same association in all three datasets but appear more peripherally in Ontario. The low tones appear to demonstrate differences in association and alignment in the contact dialect. Thus, intonation of French spoken in a majority and a minority settings shows phonetic and phonological differences.

Index Terms: language contact, tonal alignment, tonal association, intonational variation, minority French

1. Introduction

This paper presents the preliminary findings of an analysis examining the alignment and association of low and high tonal targets in a fully realized underlying tonal pattern L1hL2H [4] in three varieties of Canadian and European French that are historically related: Ontario, Québec, and Vendée (text readings, database of the *Phonologie du français contemporain project*, [5]). In addition to providing details to description of these varieties, this analysis explores the effect of the intense contact with English in the Ontario dataset.

In my previous work comparing Québec (QUE) and Vendée (VEN) varieties [3], I examined realizations of the high tones h and H. No significant difference in tonal alignment were found, and the results suggested that the two tones have different secondary associations, i.e., phonological anchoring to prosodic edges [6, 7]. Thus, although being primarily attached to the stressed syllables, the initial h tone appeared regularly aligned with the onset and the final H tone with the nucleus of the respective syllable. Unlike in other languages, in French, the secondary association does not serve to account for various contour realizations (e.g., for phrasal tones [6]) and shapes (for pitch accents [7]) but emphasizes phonological differences between the two high tones.

The present analysis extends the research on low tonal targets and on a third dialect, Ontario French (ONT), which is geographically distant from VEN and QUE and is spoken in an intense contact with English. The main objective is to understand how ONT compares with the two historically related dialects and to identify aspects of intonational grammar that are different, and, thus are supposedly permeable to transfer in a contact situation. To test the hypotheses that 1) ONT shares the same intonational phonology and shows the same tonal associations and 2) ONT demonstrates phonetic differences in tonal realizations (different alignment), I analyze text readings by three francophone speakers from each dataset. The results partially confirm these hypotheses and suggest that h and H have the same associations in all three varieties but have different alignment in the ONT dataset, that L1 demonstrates a later alignment in QUE and shows the same association as in VEN and that L2 has different alignment and appears to have a different association in the minority (ONT) dataset.

2. Tonal realizations in French: previous studies

Realizations of tonal targets have been explored in various languages since Bruce [8] but are lacking in French. This is due to several challenges presented by French prosody, such as a non-contrastive group stress, meaning that there is no inventory of pitch accents, that tonal associations can be difficult to establish, and the alignments can be difficult to compare [9]. Thus, the stress group in French is the minimal prosodic unit with the underlying tonal specification L1hL2H, in which the initial rise L1h corresponds to the initial (secondary) stress, when it is realized, and the L2H rise corresponds to the final (primary) stress [4]. The first account of the association and realization of tones in French was proposed by Welby [10], who established that, in this underlying tonal pattern, L1 has a double association with the start of the group and the beginning of the first lexical word, in which we also find h. H is attached to the end of the (final) syllable that bears the primary stress. L2 often appears on the same syllable as H. None of the tones were found to show stability in their alignment, except for H, which is realized within a 'zone' at the end of the stressed vowel and is 'anchoraged' [11].

Among the dialects that have been compared with the Standard French, Vaudois Swiss French [1] and South-Eastern varieties of Hexagonal French [2] showed some phonetic differences in tonal realizations. For example, Swiss varieties showed a less peripheral alignment of tones whereas in southeastern varieties, the peaks appeared later than in Standard French. No regional variation was found in the alignment of the two high targets h and H in the comparative study of the Vendée variety of French with the related Québec dialect; instead, differences in the secondary association of the initial and the final peaks were proposed [3, see above].

2.1. Objectives and questions

Ontario French spoken in intense contact with English demonstrates characteristics in morpho-syntax, morpho-

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phonology, lexicon, and pronunciation [12-14]. Studies of the intonation of this variety show the following characteristics that are not proper to standard French: upstep [15], a well-defined declination line [16], a high frequency of falling continuation contours, and a different phonetic realization of the same contours by speakers belonging to different age groups [17].

By undertaking this analysis, I aim to discover new prosodic features attributable to the situation of contact by comparing the data from French spoken in a minority setting with the two related varieties. With the goal of providing a detailed description of the ONT prosody, I focus on the realization of tones associated with the group initial stress (L1 and h) and group final stress (L2 and H). The analysis aims to answer the following questions: Will ONT show a peak alignment that is different from that in VEN and QUE? Will it show the same association of the tones as in VEN and QUE? It is expected that the differences found in ONT compared to VEN and QUE data will be phonetic and not phonological. I anticipate observing the same tonal associations with a different alignment of the targets.

3. Data, speakers, and procedures

To compare the three related varieties, text readings by nine female speakers of various ages from QUE, VEN and ONT corpuses were analyzed (three speakers from each dataset). The analysis was completed in Praat [18]. The initial transcription and segmentation of the data were performed using EasyAlign [19] and were followed by manual verification and corrections. The samples were phrased into stress groups and tonal specifications were assigned to these groups following Jun and Fougeron [4].

For the analysis, only L1hL2H contours were selected. Following prior research [3 and 5], stress groups in which h or H occurred before a coda ending with [n, m, l, j] or the apical [r] were excluded from the analysis because they can delay peak realization. Using Praat functions, the F0max and F0min [20] points were identified and the following tags were added:

- F0max values corresponding to the group initial and final rises (h and H).
- F0min values corresponding to the group initial and final valleys that precede h and H (L1 and L2). When needed, Praat functions "Smooth" and "Down to Pitch" were applied to reconstruct curves with interruptions due to the phonotactic composition of the utterances (e.g., voiceless stops).
- The start and the end of the syllable (s1, s2) and of the vowel (v1, v2) bearing the initial stress.
- The start and the end of the syllable (S1, S2) and of the vowel (V1, V2) bearing the final stress.
- The beginning of the following components: the stress group (P1); the first lexical word in the stress group (Lex); the second syllable in the stress group (syl2); the penultimate syllable and vowel (Sp and Vp); and the final stressed syllable and vowel (Sa and Va).

The time values corresponding to these tags were extracted and the following intervals (latencies, or time distances) were calculated based on the earlier reports on alignment in French [1, 2, 10, 11]:

- The intervals from the high tonal targets to the beginning of the respective syllables and vowels (h-s1, H-S1, h-v1, and H-V1) and from the end of the syllable bearing initial or final stress to the respective peak (s2-h, S2-H, v2-h, and V2-H).
- The intervals between the initial valley and the beginning of the stress group (L1-P1), the initial valley and the beginning of the first lexical word (L1-Lex), and the initial valley and the start of the second syllable in the group (L1-syl2).
- The interval between the final valley and the beginning of the penultimate syllable (L2-Sp) and vowel (L2-Vp), or the beginning of the stressed syllable (Sa-L2) and vowel (Va-L2).

To manage the variation caused by articulation rate differences, the intervals and durations were recalculated in %: their values were divided by the duration of the respective stress group and multiplied by 100. Some of the intervals showed moderate positive (L2-Sp), substantial positive (S2-H), or substantial negative (Va-L2) skewness. These values were transformed using LG10 or SQRT functions [21].

The following durations were also recorded: the stress group, the stressed syllables and vowels, the penultimate syllable, the second syllable in the stress group, and the first syllable of the first lexical word in the stress group. These durations were used for correlation tests to establish stronger relationships between them and the intervals (sec) and to allow for determination of the associations between the targets and the landmarks. Time intervals with substantially positively skewed distribution (S2-H, L2-Sp, and L2-Vp) were also transformed following Tabachnick and Fidell [21].

To evaluate the alignment differences for a three-way comparison between the dialects, nonparametric Kruskal-Wallis tests were conducted and, when they were significant, the Games-Howell post hoc test in one-way ANOVA was applied to identify or confirm the dialect that stood out. Nonparametric Spearman correlation tests were used to evaluate the relationship between the intervals and durations and provide insight into tonal associations.

4. Results

The results are based on measurements of 166 stress groups with the L1hL2H intonational contour: 29 in ONT, 66 in QUE, and 71 in VEN. The lower number in ONT dataset was determined by the overall low number of rising contours in this contact variety and of the L1hL2H contour [17]. The intervals measuring the alignment of the tonal targets are shown in Tables 1 and 2, in which all numbers are reported in proportional values (%). The statistical results are reported based on proportional or transformed values, if a transformation was applied.

4.1. Peak alignment

Table 1 presents the results of analysis of the alignment of peaks h and H and the articulation rate. The average articulation rate for the stress groups with the L1hL2H contour is the fastest in VEN (6.2 syll/sec) and the slowest in ONT (4.5 syll/sec). The rate differences were significant for all three datasets ($p \leq .004$).

The h-v1 and h-s1 intervals suggest that the alignment of the peak associated with the initial stress is the earliest in ONT, because the distance between the target and the beginning of the vowel or of the syllable is the shortest in this dataset (5.06% and 12.36%). In QUE, it is the longest (6.44% and 14.59%). Regarding the right boundaries (v2 and s2), the results are

mirrored and the greatest values in ONT suggest the earliest alignment of the initial rise: 5.88% and 6.69% compared with 3.42% and 5.06% in QUE and 3.68% and 4.89% in VEN. Kruskal-Wallis tests confirmed that this earlier alignment of the initial high tone (h) relative vowel and syllable end in ONT is significant ($p \leq .003$) (Table 1).

The alignment of the final peak H with respect to the left boundaries V1 and S1 is slightly delayed in QUE (11.82% and 21.83%) compared with VEN (10.55% and 23.44%); in both, it occurs significantly earlier than in ONT, in which the H-V1 interval is 16.94% and H-S1 is 29.58% (p = .006). The differences in alignment suggested by the intervals measured for the right boundaries V2 and S2 indicate different trends but they were not significant ($p \geq .713$).

Table 1: *Rate (syll/sec) and alignment of the peaks. Significantly different results are highlighted.*

		ONT		QUE		VEN	
		Ave	std	Ave	std	Ave	std
	Rate	4.50	*0.89*	5.67	*1.01*	6.20	*0.85*
h	**h-v1**	5.06	*4.40*	6.44	*4.05*	5.54	*3.77*
h	**v2-h**	5.88	*3.90*	3.42	*2.69*	3.68	*2.98*
h	**h-s1**	12.36	*6.31*	14.59	*5.68*	14.31	*5.72*
h	**s2-h**	6.69	*4.35*	5.04	*4.51*	4.89	*3.99*
H	**H-V1**	16.94	*5.67*	11.82	*4.98*	10.55	*4.93*
H	**V2-H**	3.50	*3.08*	2.79	*1.95*	2.97	*2.59*
H	**H-S1**	29.58	*8.70*	21.83	*7.13*	23.44	*8.18*
H	**S2-H**	8.21	*7.99*	7.64	*5.55*	7.09	*5.25*

4.2. Valley alignment

The results of the analysis of the realization of the low tonal targets L1 and L2 are presented in Table 2. For the beginning of the stress group, the initial valley L1 appears later in ONT (16.7%) than in QUE (15.56%) or VEN (13.13%). For the second syllable of the group (syl2), both Canadian varieties realize the valley near its beginning (-.028% in ONT and .027% in QUE) whereas it appears noticeably earlier in the VEN dataset (-2.8%). These differences were not statistically confirmed ($p \geq .07$). The alignment of the initial low target with respect to the beginning of the first lexical word occurs significantly later in QUE (.90%) than in ONT (-2.82%) or VEN (-3.35%).

Table 2: *Valley alignment. Significantly different results are highlighted.*

		ONT		QUE		VEN	
		Ave	std	Ave	std	Ave	std
L1	**L1-P1**	16.70	*9.67*	15.56	*8.16*	13.13	*9.31*
L1	**L1-Lex**	-2.82	*11.88*	0.90	*11.75*	-3.35	*7.83*
L1	**L1-syl2**	-0.28	*9.12*	0.27	*10.54*	-2.80	*9.67*
L2	**L2-Sp**	31.53	*16.93*	18.59	*9.82*	18.84	*9.29*
L2	**L2-Vp**	23.15	*14.72*	11.02	*8.54*	9.81	*7.03*
L2	**Sa-L2**	-9.83	*12.75*	0.22	*7.60*	0.55	*6.48*
L2	**Va-L2**	3.74	*12.17*	9.89	*7.61*	13.21	*7.86*

As for the alignment of the L2 tone (Table 2), highlighting the ONT values. First, they are the greatest when the realization of the L2 tone is considered relative the beginning of the penultimate syllable (L2-Sp) or vowel (L2-Vp): 31.53% and 23.15%, respectively (cf. with 18.59% and 11.02% in QUE and 18.84% and 9.81% in VEN). L2 appears much further to the right from the beginning of the penultimate syllable in the minority variety. L2 is realized within the stressed syllable: after the stressed syllable boundary (Sa-L2 = -9.83%) and before the beginning of the stressed vowel (Va-L2 = 3.74%). In the two majority varieties, the L2 tone appears just before the beginning of the stressed syllable (Sa-L2 = .22% in QUE and .55% in VEN) and before the vowel (Va-L2 = 9.89% in QUE and 13.21% in VEN). All ONT intervals for L2 are significantly different ($p \leq .001$).

In addition, the differences in alignment of L2 with respect to the beginning of the stressed vowel are significant in all three datasets: in ONT, L2 appears closest to the vowel beginning and, in VEN, it is realized utmost to the left, before the beginning of the stressed syllable. In the QUE dataset, the values are similar to those of VEN.

4.3. Tonal associations

In an earlier analysis of the realizations of high tones in QUE and VEN, it was suggested that, although being primarily attached to the stressed syllables, h and H have different secondary associations: h appears more regularly aligned with the left syllabic boundary and H appears with the left vowel boundary [3]. For a systematic comparison, a similar analysis was performed on the ONT data. The associations of the low tones were explored for each sub-corpus. This portion of the analysis relies on the results of Spearman correlation tests.

4.3.1. Associations of the peaks

The h-v1 and v2-h/h-s1 and s2-h intervals were correlated with the duration of the vowel/syllable bearing the initial stress. The strongest correlation (r = .877) between the syllable duration and the h-s1 interval was interpreted as a (secondary) association of the h tone with the left syllable boundary.

The H-V1 and V2-H/H-S1 and S2-H intervals were correlated with the respective vowels and syllables bearing the primary final stress. The strongest correlation was observed between the vowel duration and the H-V1 interval (r = .704). This suggests that the H tone is more regularly aligned with the vowel onset.

The results for the ONT dataset agree with earlier observations made on data from QUE and VEN [3].

4.3.2. Associations of the valleys

The association of the initial low tone was tested by correlating the L1-P1, L1-Lex and L1-syl2 intervals with the durations of the stress group, of the first syllable of the lexical word, and of the second syllable of the stress group. The VEN and QUE dataset results suggest that the strongest relationships exist between L1-P1 and the duration of the stress group (r = .372 in QUE, and r =.376 in VEN) and between L1-syl2 and the duration of the second syllable of this group (r = -.295 in QUE and r = -.414 in VEN). These results may be interpreted as a double association of the L1 with the left edge of the prosodic unit and with its second syllable, as previously described [1, 4, 10, 11].

In ONT dataset, there was only one significant correlation: between L1-syl2 and the syl2 duration (r = .448). In this variety, it appears that the L1 is only associated with the second syllable of the stress group.

To examine the regularity of the realization of the L2 tone, several intervals and durations were tested. First, to examine the

relationship between L2 and the penultimate syllable, the duration of this syllable was correlated with the L2-Sp and Sa-L2 intervals (Sa marks the beginning of the stressed syllable and the end of the penultimate one). Both intervals showed a strong correlation with the syllable duration in QUE (r = .395 for the regularity of the realization of L2 with respect to the end of the penultimate syllable and r = .598 for the regularity of the realization of L2 with the beginning of the penultimate syllable). In VEN, such a regularity was confirmed only for the alignment of L2 with respect to the left edge of the penultimate syllable (r = .598). In ONT, no correlations between L2 and the landmarks related to the penultimate syllable were observed.

To further explore the regularity of realization of L2, given the inconclusive results for ONT, intervals measuring its realization with respect to the start of the stressed syllable (Sa-L2) or vowel (Va-L2) were correlated with the durations of the stressed syllable and vowel. No significant correlations were observed across the three datasets.

5. Discussion

The results of this pilot study confirm some of the proposed hypotheses and invite further exploration of intonational variation in French and in French in contact. The timing and association of four tonal targets of the underlying pattern L1hL2H in the three varieties of French compared suggest that they share some intonational specifics and that the contact variety differs the most. In ONT, we observed the same regularity of the realization of the high targets: h appears more regularly aligned with the left boundary of the syllable that bears the initial stress and H demonstrated more regularity of alignment with respect to the left vowel boundary. This was interpreted as a secondary association of the high targets, the primary being the association with the stressed syllables. This phonological similarity between the dialects is accompanied by phonetic variation in the realization of the two high tones: in ONT they are more peripheral, as the h tone appears earlier and the H appears later than in the other two datasets. In addition, both high targets are realized later in QUE than in VEN (closer to the vowel end, but this was not confirmed statistically). The alignment of the H tone in ONT suggests that the proportion of the duration of the syllable and vowel bearing the final stress is greater here than in VEN and QUE. Further investigation will elucidate this.

The low targets L1 and L2 showed more regional variation, from both phonetic and phonological perspectives. First, L1 appears to have the same association in VEN and QUE and its realization in ONT shows both similarities with and differences from VEN and QUE, depending on the landmarks. For example, the alignment of the initial valley appears similar in VEN and ONT because it is realized before the beginning of the first lexical word in both varieties whereas it appears after in QUE. It appears before the second syllable of the group in VEN and around its beginning in the two Canadian varieties. One can speculate that, in the QUE dataset, the second syllable of the group was also the first syllable of the first lexical word more often than in the other two datasets. Investigating the morpho-syntactic structure of the stress group will help determine the origin of these results.

In the correlation results, L1 appears to have a double association with the left edge of the stress group (P1) and with the beginning of the second syllable (syl2) in QUE and VEN. This association is stronger with P1 in QUE and with syl2 in VEN. In ONT, L1 appears more regularly aligned with respect to syl2 only and has the highest r value (r = .448).

These results partially corroborate earlier observations by suggesting a double association of the initial low tone in the two datasets from majority settings. However, according to the results, L1 appears linked to the beginning of the stress group and its second syllable rather than the beginning of the first lexical word. This difference may originate from variation in methodologies: carefully designed sentences controlled for structure and segmental content in prior research [4, 10, 11] but had variable composition in the current analysis.

In ONT, the L2 tone demonstrated both phonological and phonetic differences in comparison with the datasets from majority contexts. Here, it appears after the start of the stressed syllable right before the stressed vowel, while in the majority varieties it is realized on the penultimate syllable before the beginning of the stressed one. The regularity of the realization of the intervals pertaining to the alignment of the L2 tones in QUE and VEN suggests that it is associated with the left edge of the penultimate syllable in these datasets. There were no significant correlations in ONT, which suggests that L2 has a different association in the minority variety than the two majority ones. Because L2 was regularly realized near the beginning of the stressed vowel, it is possible to hypothesize its association with this landmark. However, the realization of the L2 tone requires further exploration. The results support previous findings reporting that L2 appears on the penultimate or final syllable and provide additional details regarding regional variation.

6. Conclusions

This pilot study aimed to compare the alignment and association of tonal targets in a fully realized underlying pattern L1hL2H in three varieties of French, one of which is spoken in intense contact with English. The results show that high tones demonstrate similar associations in all three datasets and the initial rise appears more regularly relative to the syllable onset and the final rise appears relative to the syllable nucleus. The alignment of the peaks is more peripheral in the contact dialect.

The L1 tone shows a double association with the beginning of the stress group and the second syllable in the majority varieties but it appears associated only with the second syllable in the contact dialect and is realized there later. The L2 tone is associated with the penultimate syllable in the non-contact varieties, but not in Ontario. Moreover, its alignment with respect to the stressed vowel was significantly different in all three datasets.

Variation observed in the ONT dataset must originate from the contact with English. An analysis taking into consideration data from both languages spoken by bilingual participants will help understand the exact nature of this prosodic transfer.

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8. References

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