



A crosslinguistic and acquisitional perspective on intonational rises in French

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Abstract

This study compares rising contours produced in the context of *contrastive topics* by French natives and by low and high proficient learners of French with German as mother tongue. Results show a systematic pattern for French natives who mostly produced a final rise LH*, and hardly ever a bridge accent on the whole phrase. Our results on French natives seem to support earlier claims that tonal patterns with late dip alignments may be recruited for encoding contrast meaning. Results on French learners show a development in the acquisition of the prosody-semantics mapping principles (shifting the accent position from the phrase-initial *mon* to the phrase-final *image*) and, not surprisingly, differences in the phonetic implementation of the final rises. Crucially, the impact of phonological and phonetic transfer is more complex than expected: text-to-tune associations are not easy to re-programme when a new accent location has to be learnt. However, once the phonology is learnt, the phonetic implementation starts being problematic.

Index Terms: French rises, contrastive topics, tonal alignment, L2 intonation

1. Introduction

French rising accents differ in a number of aspects from pitch accents of other stress-to-accent languages like German [1, 2]: they are not ‘prominence-lending’ and part of a tonal set of pitch accents holding a contrastive function. Despite its association to the last metrically strong syllable of the *accentual phrase* (AP henceforth, cf. [2]), the final rise mainly functions as an edge-tone marker, and so does the initial rise (see [3] for a review). In addition, in a language like German, depending on the scaling and alignment of the low and high tonal targets, a rising accent can signal whether information structural constructs like topics are contrastive [4]. Compared to non-contrastive topics, contrastive topics are realized with later and higher peaks [5].

Yet, it is still an open issue whether a different scaling and/or alignment of the tonal targets in French final rises conveys pragmatic meaning differences. For instance, [6] suggests that continuation rises with ‘late’ timings of the dip (i.e. within the stressed syllable) sound more assertive than continuation rises with ‘early’ timings (i.e. before the stressed syllable). [7] observed that the timing of the dip does not have a phonologically contrastive distinction but can however affect the attitudinal meaning of an utterance. The first aim of this study is to contribute to such a debate by showing preliminary production data on the distribution of French rises elicited in the context of a widely discussed yet little empirically investigated information structure construct, i.e. contrastive topics [4]. More specifically, we performed a tonal analysis on a corpus of (segmentally and pragmatically) identical utterance-initial prepositional phrases (i.e. *Sur mon image...* “In my picture...”) elicited with a picture-difference task.

Even though the experiment was designed for other purposes (for details, see [8]), it allowed to address the question of whether French speakers produce final rises with late dips when expressing pragmatic contrast.

In French, pragmatic contrast can be additionally conveyed by a bridge accent (or *arc accentuel*, [9], e.g. *BEAUjolaïs nouVEAU*, 10: 41). Previous studies have shown that initial accents occur often (along with final accents) at the left-edge of an AP in presence of a pragmatic contrast [11]. A similar feature (the so-called C-accent) is produced in specific cases of contrastive topics [12], although this observation requires more systematic evidence. The status and function of the initial accent are still matter of debate: authors maintain that *rhythmic* initial accents should be distinguished from functional/pragmatic initial accents (e.g. *accent de focalisation* or *accent d’insistance*, see [13]), but such a distinction is not so straightforward when analysing production data [14-16]. The realisation of a bridge accent is also accounted for by structural factors. Beyond a strong predictor like the AP number of syllables, a bridge accent is less likely to be produced with APs starting with monosyllabic and grammatical words [8]. Our dataset allowed us to address the issue of whether a pragmatic contrast on the phrase-initial word *mon* induces the presence of an initial accent, irrespective of factors like phonological weight and/or word status.

Our paper is structured as follows: in the first part we present data analyses on French rises produced in the context of contrastive topics and address the question of whether there exists a relation between intonation and meaning in French. Given the different status of French rises compared to pitch accents in languages like German, in the second part we present French rises produced by learners with German as mother tongue (L1). It is well-known that the interface between prosody and information structure works differently across these two languages (see [8] for evidence): In comparable contexts German speakers produce a prominent rising accent (i.e. more typically an L*+H pitch accent) on the contrastive word *meinem* (i.e. *Auf MEINem Bild...* “In my picture...”). Hence, we explored accent distribution and phonetic implementation in comparable productions by L2 French learners.

2. Data analyses on French rises

Productions analysed in the study were extracted from a dialogue-game corpus (for details, see, [8]). This allowed for the systematic elicitation of utterance-initial prepositional phrases (i.e. *Sur mon image...*) containing a pragmatic contrast on the adjective *mon* (“my”). Note that due to the nature of the design, we did not have a comparable control condition elicited in non-contrastive cases.

2.1. Participants

We analysed utterance-initial prepositional phrases produced by seven French native speakers (3 males, 7 females, age average=28.1). Participants were tested in a quiet room at the UMR 7023 (CNRS Pouchet) in Paris. They were all naïve with respect to the purpose of the experiment and were given a small fee for their participation. None of them had any known speech or hearing problems.

2.2. Material

The dataset consisted of 32 utterance-initial prepositional phrases produced by each speaker (32 phrases x 7 speakers=224 items). For the sake of comparability, we discarded those cases in which participants produced elliptical structures (e.g. *Sur la mienne* - “On mine”, 66 occurrences). This left 158 data points for the analysis.

2.3. Procedures

Utterance-initial prepositional phrases were manually coded at a phrase, word and syllable level. Tonal patterns were labelled following a ToBI-style annotation based on the Auto-segmental metrical framework proposed by [2]. According to the model, an AP bridge accent is featured as LHiLH*, which contains both an initial (LHi) and a final rise (LH*); allophonic variants of the full tonal pattern can either contain an initial rise (i.e. LHiH*, LHi) or a final rise (i.e. LH*, LLH*, L2H*). Within the phrase-final patterns a distinction should however be made between final rises with early alignment of the dip (i.e. LH*) - the rise starts gradually from the left-edge of the AP - and those ones with a late dip (i.e. LLH*, L2H*) - the rise starts from the penultimate syllable or within the accented syllable of the word at the right-edge of the AP. As mentioned in section 1, the realisation of these patterns is strongly influenced by structural factors [1]. Our dataset offered the advantage of comparing phrases with the same number of syllable (i.e. 4-to-5 syllables depending on the pronunciation of the final schwa) and segmental make-up. On the basis of work reviewed earlier (cf. section 1), we tested whether due to the presence of a pragmatic contrast on the word *mon*, French speakers produce patterns containing an initial rise on the word *mon* and/or a final rise on the word *image*, with early or late dip alignments.

2.4. Results

Table 1 shows the distribution of tonal patterns produced by French natives (average in % over speakers and standard deviation). These patterns are classified according to the presence of an initial and/or a final rise, and to the form of the final rise (with early vs. late dip).

As we can notice from Table 1, French natives mostly produced a final rise on the stressed syllable of *image*. The most frequent tonal pattern was represented by L2H* followed by LLH*. In both patterns the alignment of the dip occurs late, either within the stressed syllable or right before it. Other patterns containing initial (i.e. LHiLH*, LHiH*) or final rises with early dip (i.e. LH*) occurred only rarely, contrary to what was found in previous studies [1, 14].

2.5. Interim discussion

The tonal analyses revealed that French speakers mostly produced utterance-initial contrastive topics with final rises

containing late alignments of the dip (i.e. L2H*, LLH*). Crucially, previous studies have shown that these two types of rises are the least frequent within the French tonal inventory (see, among others, [1, 2]): [1] reported that the bridge accent (i.e. LHiLH*) or other allophonic variants (i.e. LH*) accounted for most of the data. Similar findings were also found in [14] in which the LH* turn out to be the most frequent pattern in 3-to-4 syllable APs. Conceivably, these distribution differences may be due to the fact that in both studies [1, 14], frequency of tonal patterns were based on productions elicited in non-contrastive contexts. It is hence possible that the high occurrences of L2H* and LLH* found in our data is due to pragmatic factors (i.e. the presence of a contrastive topic): Since the observed patterns are characterized by late alignments of the dip, it is likely that French speakers recruit such tonal feature for encoding the contrast here at issue, thus lending support to previous observations [6, 7]. However, in the future, more systematic comparisons with a controlled condition (i.e. non-contrastive contexts) are necessary to validate these findings.

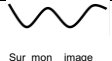



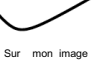
Tonal pattern		French native M% (SD)	Stylized contours
Patterns with initial rise (on <i>mon</i>)	LHiLH*	5.4 (14.0)	 Sur mon image
	LHiH*	0.0	 Sur mon image
Patterns with final rise only, and late dip (on <i>image</i>)	L2H*	55.7 (15.6)	 Sur mon image
	LLH*	37.0 (19.0)	 Sur mon image
Patterns with final rise only, and early dip (on <i>image</i>)	LH*	1.9 (3.0)	 Sur mon image
Total		100.0	

Table 1: Average in % (over speakers), standard deviation, and stylized contours of tonal patterns produced by French natives on the phrase ‘*Sur mon image*’... (“In my picture...”).

On the other hand, the scarce occurrence of the bridge accent (i.e. LHiLH*, [12]) can be attributed to our specific material, which may call for the interaction of different factors. Since initial rises are less likely to occur on monosyllabic words and in short APs (e.g. [1, 3]), conveying a contrastive meaning in a short AP is perhaps amounted up to using another strategy, namely late dip alignment of the final rise instead of an initial rise. If structural factors had such a strong impact, our French participants could instead produce a final rise with early dip (i.e. LH*). Note however that this option was only rarely exploited (1.9% of the cases).

Alternatively, it is possible that an initial rise might be more specifically recruited for signalling a contrastive focus and/or an intermediate phrase break at the juncture between major syntactic constituents [15]. The interplay between structural and pragmatic factors should thus be taken into account in follow-up studies on topic-marking in French.

3. Encoding contrast meaning in L2

Languages differ in the inventory of accent patterns, in the phonetic implementation of these patterns, and in the way these are used to convey certain pragmatic functions. Working out such differences is a complex learning task for a second language adult learner. Previous studies have shown that L1 prosodic transfer plays a crucial role in the acquisition of intonation [16]. Transfer can occur at a phonological and phonetic level [17, 18] and in the way prosody is exploited for the accomplishment of certain information structure distinctions [19]. Of our interest is the study by [19] in which it was found that in contrastive focus contexts, Dutch learners of L2 French were not able to refrain from reproducing form-to-function mappings guided by the L1 focus projection rules. Similar results were also reported in [20, 21]. Our study contributes to lend more evidence on effects of L1 prosodic transfer at the interface with information structure by investigating two language systems (French as L2, German as L1) that are phonologically and phonetically different.

Crucially, transfer effects seem to be stronger in cases of *perceived similarity* [16, 22] between the L1 and the L2. But what this implies at a suprasegmental level is still far from being understood. Though existing models of speech production mostly account for segmental aspects of L1 and L2 speech, it is conceivable that at the interface between prosody and information structure, typological similarity effects [16, 22] or *perceptual assimilation* principles [23] mainly apply when learners deal with familiar form-to-function mappings (e.g. a rising accent on the topicalized constituent). As learners are busy in reprogramming new text-to-tune associations, dictated by the focus projection rules of the target language, transfer might not be the only factor accounting for the learner performance. This working hypothesis was analysed by looking at similar productions performed by two groups of German learners of French with different proficiency levels and lengths of stay in France.

4. Data analyses on L2 French rises

We adopted the elicitation procedure described in section 2.

4.1. Participants

Seven low-proficient learners (1 male, 6 females, age average=24.5) and 7 high-proficient learners (1 male, 6 females, age average=39.4) participated in the study for a small fee. At the time of the study the low-proficient learners had been living in Paris for one year and three months on average ($SD=7.2$); the high-proficient learners had been living in Paris for 15 years on average ($SD=6.6$). To further assess proficiency level, learners performed a written test before participating in the study. Low-proficient learners had an average score of 63.8 (out of 88, $SD=10.1$); high-proficient learners had an average score of 85.6 points (out of 88, $SD=1.5$; $t(13)=-4.84$, $p<.0001$). Participants were tested in a quiet room at the UMR 7023 (CNRS Pouchet) in Paris. None of them reported speech disorders and had learned a language other than their L1 before the age of 10.

4.2. Material and Procedures

Each learner dataset consisted of 224 prepositional phrases each (32 phrases x 7 learners=224). For the same reason described in section 2.2, we discarded elliptical phrases from

the dataset (22 items out of the low-proficient dataset and 27 out of the high-proficient dataset). This left 202 and 197 data points respectively, for the analyses. The procedure was the same as described in section 2.3.

4.3. Results

From Table 2, which summarises the distribution of the learners' tonal patterns, we can observe a high occurrence of final rises with late dips in both learner groups. However, in comparison to natives (cf. Table 1), learners produced more often initial rises (i.e. LHiLH*, LHiH*). We tested these differences by performing a multinomial logistic regression analysis [24] with TONAL PATTERN (as listed in Table 1 and 2) as function of LANGUAGE GROUP (native, low-proficient, high-proficient). The model confirmed that on the whole, final rises were significantly more frequent than initial rises (LHiLH*: $\beta=-3.07$, $SE=0.38$, $t=-7.94$, $p<.0001$; LHiH*: $\beta=-5.01$, $SE=1.00$, $t=-5.01$, $p<.0001$). Additionally, compared to French natives, both learner groups produced significantly more initial rises (low-proficient: $\beta=3.53$, $SE=1.02$, $t=3.45$, $p<.0001$; high-proficient: $\beta=1.74$, $SE=0.42$, $t=4.10$, $p<.001$). Figure 1 shows a pitch track example of LHiH* produced by a low-proficient.

Tonal pattern		Low-proficient M%(SD)	High-proficient M%(SD)
Pattern with initial rise (on <i>mon</i>)	LHiLH*	10.5 (16.8)	18.7 (28.8)
	LHiH*	16.9 (23.6)	0.0 (0.0)
Pattern with final rise only, and late dip (on <i>image</i>)	L2H*	11.6 (8.4)	57.9 (34.8)
	LLH*	44.0 (30.9)	23.4 (19.9)
Pattern with final rise only, and early dip (on <i>image</i>)	LH*	17.0 (18.9)	0.0 (0.0)
Total		100.0	100.0

Table 2: Average in % (over speakers), standard deviation of the tonal patterns produced by L2 French low- and high proficient speakers on the contrastive topic phrase 'Sur mon image'.

We now turn to the phonetic analysis of the most frequent tonal patterns found across all language groups: the final accents with late dips (i.e. L2H* and LLH*). In particular, we measured some of the (acoustic) prominence parameters that are common in both languages (cf. [1] for French, and [25] for German): the excursion of the rise in semitones, the slope of the rise in semitones/seconds, the latency of the elbow (in sec) from the beginning of the stressed vowel *a* of the word *image* [1]. We performed three linear mixed effects regression models [26], each containing PITCH EXCURSION, SLOPE of the rise, LATENCY of the elbow as function of LANGUAGE GROUP (native, low-proficient, high-proficient). The models revealed that the PITCH EXCURSION of the high-proficient rises was higher than that of the native rises (5.9 st vs. 3.6 st respectively; $\beta=2.3$, $SE=0.7$, $t=3.14$, $p<.001$). By contrast, low-

proficient excursions were shorter than native ones, but this difference was not significant ($p=.1$). The SLOPE of the high-proficient rises was steeper than that of the native rises (35.4 st/sec vs. 22.9 st/sec respectively; $\beta=11.8$, $SE=2.8$, $t=4.24$, $p<.001$). Low proficient slopes were less steep than native ones; however, this difference was not significant ($p=.2$). Finally, high-proficient latencies of the elbow were on average 0.105 sec farther within the stressed vowel than those found in native rises ($\beta=0.024$, $SE=0.009$, $t=2.49$, $p<.05$), whereas there was no difference between the low-proficient and the native group ($p=.3$). Figure 2 plots the average curves of the final rises split by the three groups.

Finally, to investigate whether pre-programmed text-to-tune associations (i.e. an initial rise on *mon*) are more sensitive to L1 transfer than new associations (i.e. a final rise on *image*), we compared the slopes of the initial rise in LHiH* (30.4 st/sec on average) to the slopes of the final rise with late dips (i.e. L2H*: 22.9 st/sec. on average) produced by the low-proficient group. The statistical analysis confirms that initial rises were steeper than final ones ($\beta=7.46$, $SE=2.43$, $t=3.06$, $p<.0001$). A comparison with the slope values of the initial rises produced by natives was not possible as there were not enough data points (cf. Table 1) that could be statistically modelled. Slope values of these few instances were on average smaller (16.9 st/sec, $SD=5.7$) than the ones produced by low-proficient learners.

4.4. Interim Discussion

The comparison between native and learner data confirms what found in previous studies (cf. section 3) and, in addition, reveals a few interesting issues on the acquisitional aspects of French rises. First of all, our findings show differences between learner and native productions at a *phonological* level: low-proficient learners tend to produce more initial rises than natives, thereby mirroring prosody-information structure mapping principles found in their L1 (e.g. the LHiH* was never produced by natives); not surprisingly, differences also applied at a *phonetic* level: despite the similar phonological distribution, the phonetic implementation of the final rises with late dip produced by high-proficient learners was not target-like.

Surprisingly, the analysis on the phonetic implementation of the final rises across all groups revealed that low-proficient final rises were much closer to the target than high-proficient ones. This apparent similarity revealed by the statistic analysis does not reflect the different competence of the low-proficient learner, probably originating from other levels of the prosodic structure (rhythm, phonotactics). In fact, when locating the rise on *mon*, low-proficient learners produced a phonological category that was never realized by natives (e.g. LHiH*); in addition, their initial rises had much steeper slopes than their final rises. Conceivably, due to a perceived similarity, familiar text-to-tune associations may be more sensitive to effects of L1 transfer. On the other hand, learners “do less” when associating a new phonological category (i.e. final accent) to a new segmental landmark (i.e. on the last word *image*). We plan to test this working hypothesis more specifically in the future.

Once the prosody-semantic principles are mastered, learners show a target-like distribution of accent patterns but a different phonetic implementation (i.e. higher scaling, steeper slopes and later alignments of the dips). Note that, different from the high-proficient learners, French native elbows were

never aligned after the beginning of the stressed vowel *a* (of *image*) but always before it. This shows that learner rises were characterized by a more concave trajectory. These alignments properties are usually associated to a more emphatic/affective meaning, also in languages like German [25]. Whether the phonetic implementation of the learner rises should be interpreted in terms of L1 (negative or positive) transfer or not, it is interesting to ask if the observed differences mean that learners were not successful (or ‘French-like’) in the realization of the French rising tunes; and, if not, what other aspects contribute to make their rising contours not target-like from a perceptual viewpoint. Future work could test whether gradient phonetic variation between learner and native rises conveys different pragmatic meanings to French native listening.



Figure 1: Pitch track example of LHiH* tonal pattern realized by a low-proficient learner of French.

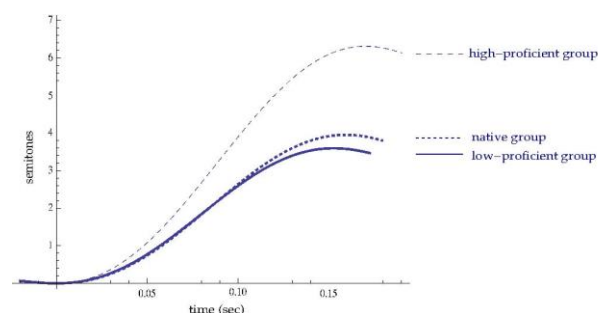


Figure 2: Average curves of the final rises (L2H* and LLH*) produced by French natives, low-proficient and high-proficient French learners.

5. Discussion and outlook

Our cross-linguistic and acquisitional study contributed to shed light on a few aspects of French intonation. First, it revealed interesting findings on the relation between intonation and meaning in French: subtle changes in the alignment of the final rises may play a role in conveying pragmatic meaning (here, contrast) when no other strategies can be used (e.g. the initial rise). Second, L2 data from high-proficient German learners of French offered a window on cross-linguistic differences concerning prominence-lending properties of French rises. Third, acquisitional data suggest that transfer alone cannot account for the complex behaviour of the interlanguage. In the future, descriptions of L2 prosody should look more closely at the complex interaction between segmental and suprasegmental aspects of L2 speech (*dynamic modelling*, [27]).

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