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Author

Dil, Sofea

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Effects of Learning Strategies on Perception of L2 Intonation Patterns

Sofea Dil
University of California, Berkeley

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Abstract

This paper examines the role that learning strategies play in L2 acquisition by comparing students learning French in a Second Language Acquisition (SLA) or immersion setting and those learning French in a Foreign Language Acquisition (FLA) or classroom setting. These students were tested on their ability to distinguish common French rising intonation patterns, the polar question and the continuation rise, by their conversational significations. After hearing a sentence that had been manipulated by the researcher to follow a standardized contour that matched either the polar question or continuation rise, the subjects were asked to judge whether the sentence ended the speaker's turn or instead whether the speaker had not finished speaking. Since unfinished speech is characteristic of the continuation and not of the polar question, this allowed the researcher to determine the subjects' ability to identify the two similar patterns. The FLA students outperformed the SLA students by a small margin in identification of both patterns, suggesting that perception of L2 intonation is not improved by immersive learning contexts.

Introduction

Non-native language acquisition is defined by a large set of factors, ranging from age at which a speaker begins learning the L2 to input quality and quantity. Extensive research has been done to understand what aspects of exposure to an L2 are most influential and what kinds of effects each of these aspects has in application. The goal of this study is to further explore this process by examining several of these aspects from a new point of view: a comparison of learning strategies and all of the various factors that they involve.

L2 learners acquire their second language through one of two strategies: Second Language Acquisition (SLA) and Foreign Language Acquisition (FLA) (Best & Tyler, 2007). FLA is the strategy of classroom learning; FLA learners' primary exposure to a language is through a teacher and commonly other students at or near their level of ability. The L2 is more or less confined to the room of instruction, and the L1 retains an inescapable presence. On the other hand, SLA refers to acquisition through immersion, so SLA learners are exposed to the L2 in a setting that may or may not involve instruction. The L2 is the first language of the environment they are in and is not limited by situation. Learners' primary exposure to the L2 is not through an instructor but instead is defined by a variety of inputs.

The environments in which FLA and SLA learners are exposed to an L2 involve numerous important differences that affect the acquisition of the L2. First, SLA learners are exposed to the L2 more often in a day than FLA learners and therefore use the L2 both as a

listener and as a speaker more frequently than do FLA learners. There is an inverse effect on the frequency of their use of their L1, which has been shown to influence foreign accent phonemically (Flege et al, 1997) and prosodically (Cavone & D'Imperio, 2016). Secondly, their L2 input is different. FLA learners have few if any sources of native-accented L2 input, and those native accents often vary in dialect. They are also exposed to a large amount of foreign-accented L2 input from fellow students in addition to their self-produced input. SLA learners primarily receive input with a single native accent. Like FLA learners, they meet other accents including foreign ones, but their environment is defined by immersion in a community of like native speakers of the L2 so that the specific native accent of that community is constantly reinforced. Finally, the nature of the L2 input is different between the two strategies. FLA learners interact with L2 speakers in specific and limited ways, as in a teacher giving them directions or asking a question or another student participating in a scripted exercise with them. SLA learners' L2 input is more varied, as the L2 is not limited to the classroom context. Conversational speech in the L2 produced by both the speakers around the L2 learner and by the L2 learner is more common in an SLA context.

Frequency of use, source of input, and type of input are therefore the factors that this study targeted for comparison in examining their effects on L2 fluency. They were united under the umbrellas of FLA and SLA based on the ways in which they pattern together in these contexts. FLA learners have lower frequency of use of the L2, more varied sources of input, and less varied types of input (Piske, 2007). SLA learners have higher frequency of use, less varied sources of input, and more varied types of input.

As stated above, much research has been done in this field into these and other factors. Most research that has approached the FLA/SLA distinction in L2 acquisition uses the factors of source and type of input to separate subject groups along similar lines. This previous research has largely focused on the concept of the "foreign accent" and therefore on how these factors affect production. For examples of this, we look to Flege and Liu (2001) and Winitz et al (1995). These studies looked into how length of residence in an L2 speaking country (an immersive or SLA context) correlates to overall quality of production. Their results taken together suggest that SLA exposure has significant effects only when specific limitations are applied. Winitz's study contrasts the massive, rapid improvement in the L2 accent of one student with a relative lack of improvement in that of other students of the same age with the same length of residence in the L2 speaking country. Winitz posits that his improvement is produced by his increased exposure to native speech due to the fact that he lived in a town too small to have English as a Second Language (ESL) courses separated from the mainstream students. Unlike the other students studied, this student did not interact with other foreign speakers of the L2 outside of his home. The other students came from larger urban areas and therefore interacted with like foreign-accented students when not at home. We can conclude from this that source of input is important in the shaping of an L2 learner's accent. A similar conclusion was drawn in Flege and Liu (2001), which showed that Chinese L2 learners of English showed larger improvement (in English word-final stop identification among other things) if they were students than if they were not, due to the interactional requirements of being a student at the university level.

Studies in the field that look into perception instead of production show a different effect. In Levy and Strange (2008), experienced SLA L2 learners performed worse than the inexperienced subjects at discriminating certain French front vowels. Though those researchers exclusively looked at French L2 learners with immersion experience, another study by Levy in 2009 expanded the targeted subject group to include L2 learners with exclusively French FLA experience as well as SLA learners. That study had a similar result; the SLA L2 learners had the hardest time distinguishing French /y/ and /u/, behind the subjects without any French

experience. An interesting development, however, was the fact that FLA L2 learners of French performed the best, as they were the most often able to identify the frontness of /y/. There was therefore an effect based on source and type of input on perception that comes in stark contrast to the SLA advantage in production observed above.

These studies present an interesting dichotomy—SLA as a learning strategy appears to improve production but detract from perception of L2 phonemic differences. Several of the production studies mentioned look into overall sentence production and so touch on other aspects of speech like stress and intonation. They suggest a similar pattern in the effect of learning strategies on acquisition of prosodic features of the L2 as opposed to phonetic features of the L2, at least on the side of production. Perception studies to date have not thoroughly explored this, so a conclusion cannot be drawn about whether the dichotomy stated above holds true for acquisition of prosodic rules and structures. While phonemic contrasts are an essential part of all spoken language without regard to source or type of input, prosodic features can vary in their frequency by context. That is to say that the phonemic contrasts that are used in conversational and classroom contexts do not differ, but intonation patterns that are common in conversational speech may not be common in the speech representative of a lecture or general classroom setting. It is thus conceivable that SLA L2 learners would have an advanced acquisition of prosodic features used more commonly in immersion settings than would FLA L2 learners.

The goal of this study is to explore this possibility. It targets perception of French intonation patterns that are specific to conversational contexts by American English speakers with varying levels of experience with French. Despite the phonemic evidence that suggests that the SLA group will continue to underperform the FLA and non-French-speaking groups, I hypothesize that the type of input to which the SLA subjects have been exposed and the difference in frequency of these intonation contours in the two contexts will cause them to outperform the other groups in the identification of these patterns.

Methods

1. Choice of Conversational Patterns Used

In order to test my subjects' perception of French intonation, I searched for contrastive intonation patterns with similar traits whose distinction is characteristic of French but not of English. A great example of this is French's polar question and continuation rise contrast, as continuation rises are an uncommon intonation pattern in English relative to French. To make clear the phonetic value of using these patterns in this study, I will illustrate them in turn.

The polar question is a standard in both languages. In French, polar questions can be posed in a variety of ways including using syntactic inversion of the subject and verb and using the functional phrase "est-ce que." However, in their most informal form, polar questions can be created by the simple adjustment of the speaker's intonation without any change in the surface syntax of the sentence. This consists of an utterance-final rise with its peak on the final vowel. The fact that this contour used without any syntactic change is very informal contributes to its decreased usage in a classroom setting while other more formal options are available. In contrast, it is highly prevalent in informal French conversation (Abeillé et al, 2013).

The continuation rise, on the other hand, is importantly specific to French and less prominent in English. It is a conversational tool that is used to convey to a listener that the idea communicated in an utterance is unfinished, that it will be continued, despite the speaker

reaching the end of a phrase or sentence that may otherwise seem complete. In French, it consists, again, of an utterance-final rise with a peak on the final vowel. It is extremely common, both in a minor form that occurs mid-phrase and a major form that occurs at the end of a phrase or sentence (Martin, 2004). In English, it can be formed through multiple different contours with varying boundary tones (Cruttenden, 2001, Wells, 2006, Delattre, 1965), though the best attested patterns have a high boundary tone and low phrase accent despite some variation in the sentence-final contour itself (Pierrehumbert & Hirschberg, 1990). Additionally, continuation signaling in English does not affect lexical stress to the same degree as the French continuation rise affects the state of the entire rhythmic group, the base of French prosody (Martin, 2009, Vaissière, 2002). Thus the continuation rise is more common, more prominent, and better defined in French than in English. It is an established pattern that is necessary for conversational French speech and therefore must be learned during the course of French L2 acquisition. We should therefore expect French learners to have some knowledge of it.

It is clear that the two patterns are exceedingly similar. There is some debate as to what exactly their distinguishing features are in French. Valtersson and Torreira (2014) performed an extensive review of possible defining characteristics of these two patterns in order to determine whether they could be phonetically distinguished. They found several factors that were reasonably reliable in telling the two patterns apart, in particular the minimum and maximum pitch values were both higher for questions than for continuations, and final vowels were consistently longer for continuations than for questions. They noted that vowel duration as a factor is likely conditioned by the discourse functions of each pattern, in that questions normally cede the floor to another interlocutor, while continuations by definition do not. Thus questions end more quickly because they take place at the end of a speaker's turn. This is confirmed by the fact that previous studies, like that done by Rossi et al (1981), focus on read speech and come to different conclusions as a result. Valtersson and Torreira focused on spontaneous speech, and their analysis is therefore more relevant to the French learned by the subjects in my study.

Because of the lack of a consensus on what the defining phonetic characteristics of these patterns are, I concluded that the best way to produce a viable standard for each of the two patterns would be to model them off of the natural speech of the French speaker whose voice produced the stimuli that were used in this study while comparing his measurements to what was found in previous studies of spontaneous French speech. I recorded him speaking freely and extracted examples of him producing these patterns. The results of my measuring this were almost identical to the observations of Valtersson and Torreira, with one important difference. Among the similarities, I found that his polar questions had a higher starting pitch point and peak than his continuation rises. Also, the final vowel in his continuation rises was consistently longer by about 60 milliseconds than that of his polar questions. On the other hand, the one major difference that I found consistently was that his pitch during polar questions rose throughout the final syllable, in contrast with a late plateau in the continuation rises. This suggests that the contour of the final rise is itself important in distinguishing the two patterns, something that Valtersson and Torreira found to be of negligible importance. As this trait recurred reliably in this data, I included it in the final model of each pattern to be used in stimuli. The values used in these models can be found in Table 1 in Section 2 below.

Finally, to illustrate these two patterns, I have included two Figures 1 and 2, which are representative examples of a polar question and continuation rise respectively. They show the last two syllables of two different sentences. By following the blue pitch trace, we are able to see how the height and the contours of the two patterns differ.

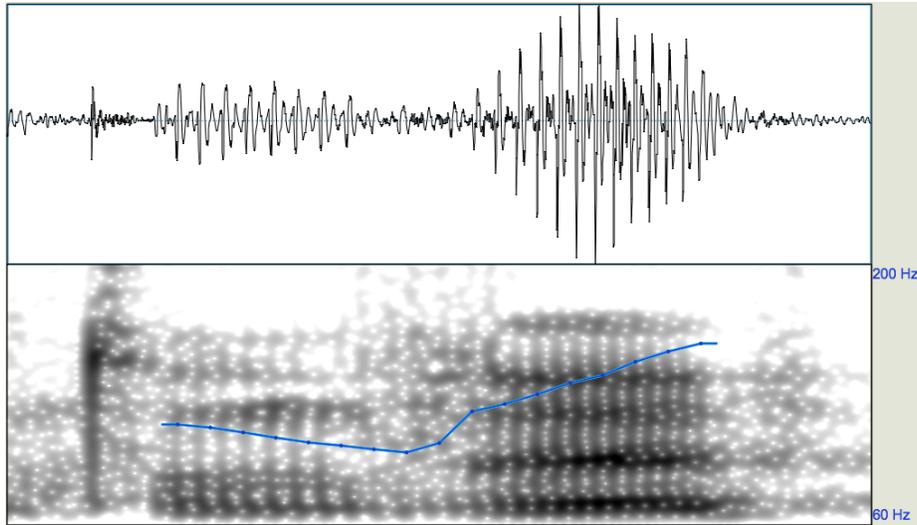


Figure 1: Example Polar Question
“On entre et on sort quand on veut ?” [tɔ̃vø]

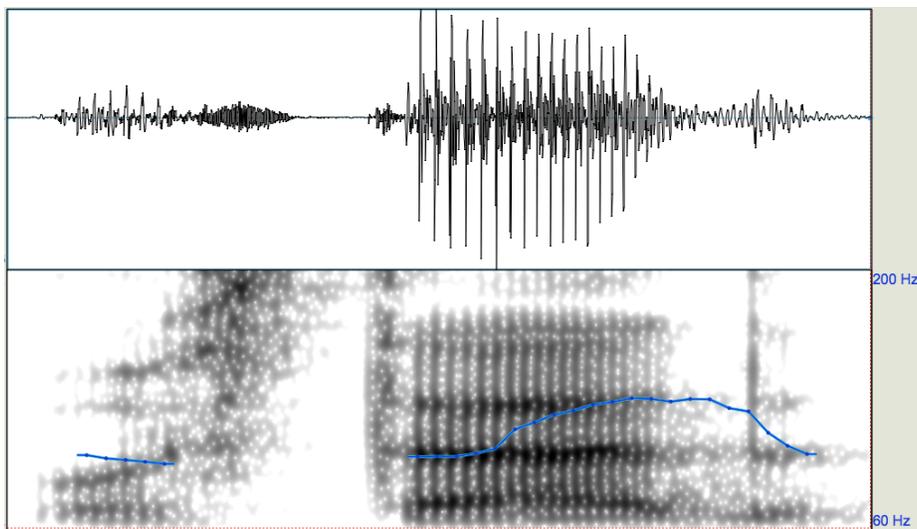


Figure 2: Example Continuation Rise
“Qui m'a amené au stade.” [ostæd]

2. Creation of Stimuli

The stimuli used were created through a process of recording and pitch manipulation in order to produce standardized versions of sentences following each intonation pattern. First, they were written as sentences of six to nine syllables where the final two syllables were composed exclusively of voiced sounds, preferably also continuants or nasals. This was done to ensure that the utterance final pitch contour could be easily manipulated without voicelessness or interruption creating noticeable discontinuity. These sentences had to be amenable to both of the intonation patterns in question. That is, they had to be comprehensible as polar questions and as

statements that could later be expanded upon. To avoid bias toward the question interpretation that could result from sentences written in the second person and bias against the question interpretation that could result from sentences written in the first person singular, they were all written in the third person or in the first person plural. Below are a few examples of stimuli used in this experiment and their English translations.

French stimulus	English translation	Transcription of final two syllables
Il va souvent au cinéma	He goes to the movie theater often	/nema/
L'aîné est ingénieur	The oldest is an engineer	/ʒenjœR/
Henri habite vraiment loin	Henri lives very far	/mãlwẽ/

Second, recordings were produced of these stimuli being read by a Native French speaker, a 21-year-old male student of French descent born and raised in Lyon, France. His demographics confirm the fact that he speaks the Metropolitan variety of French, the standard taught widely across the world and in particular in California where this study's Anglophone subjects began their studies of French. Thus, the French that subjects heard would not be expected to include dialectical variation that would contrast with their learned perception of all aspects of the French language. The speaker read the sentences during the recording as polar questions to minimize the magnitude of the required manipulation that would result in the normalized polar question and continuation rise patterns. In short, the sentences started as already having a rising contour so that they would not have to be changed from a static to a rising contour for which a natural-sounding file may have been more difficult to produce.

Finally, these recordings were manipulated in Praat (Boersma & Weenink, 2018) with the goal of producing two iterations with distinct final pitch contours for each sentence: a polar question and a continuation rise. To do this, as was stated in Section 1, averages were produced of the speakers' natural pitch contours for these two patterns that were compared to previous literature on the subject to confirm their viability. These averages came from recordings of him speaking spontaneously to mimic real French conversation. The values used for manipulation into these two patterns are listed in Table 2.

	Avg. pitch of sentence before last 2 syllables	Pitch - penultimate syllable	Pitch – peak in final syllable	Peak time before end of final vowel	Length of final vowel
PQ	120 Hz	110 Hz	175 Hz	0 ms	80 ms
CR	120 Hz	105 Hz	165 Hz	30 ms	140 ms

The final product of this process was two standardized files with polar question and continuation rise intonation respectively for each of fifteen sentences. Fifteen unaltered recordings of the same sentences spoken as statements were added to these files as stimuli to be played in order to avoid the possibility of creating an obvious dichotomy for participants between the two standardized patterns that would correspond to the two possible answers to the

question posed in the experiment. The final stimuli added up to forty-five spoken sentences, where thirty provided the structure of the experiment itself.

3. Subject Divisions

Four groups of fifteen subjects were sought out for this experiment. The first group (1) contained native French speakers from France (abbreviated NFS in data), all of whom were living in Lyon, France, while the experiment was conducted. The other three groups were composed of native Californian English speakers. This restriction of dialect for the English-speaking participants was necessary due to the evidence of increased use of rising intonation in Californian English (Ritchart and Arvaniti, 2014) and the resulting possibility that speakers of Californian English are more perceptive to differences in rising intonation patterns.

The three native Anglophone groups were (2) Second Language Acquisition (SLA) French learners, (3) Foreign Language Acquisition (FLA) French learners, and (4) a control group of speakers with no knowledge of French (abbreviated NFK in data). Subjects of groups 2 and 3 were required to have spent at least two years learning French, while subjects of group 3 were required to have never spent more than a consecutive month in a French-speaking country adding up to a total of no more than three months spent in that context. Subjects of group 2 had spent at least 3 consecutive months in a Francophone country.

4. Experiment Procedure

All subjects completed background questionnaires about their knowledge of language in general and experience with French before participating to ensure that they fit into the delineated categories. Once these were complete, they proceeded to the actual experiment. During this, the forty-five stimuli were each played twice and in random order for subjects. Subjects were asked to indicate whether they believed that the speaker was cut off at the end of that recording, or whether they believed that he had finished speaking where the recording ended. The standardized polar questions should have, based on their conversational function, communicated that the speaker was finished speaking and was waiting for a response from another interlocutor. On the other hand, the continuation rises should have suggested that the speaker was not done speaking and therefore was cut off at the end of the recording.

The experiment was always run in the participant's native language, either English or French, depending on what category the participant belonged to. All materials were originally written in English and then translated literally to French by the researcher for the native French-speaking participants.

Results

Data from fifteen members of each subject group were collected. One subject in the NFS group's data was thrown out due to her having spent a large part of her childhood in Algeria and therefore not speaking a Metropolitan dialect of French, leaving data from fourteen total Native French speakers to be analyzed. Additionally, data from a subject in the FLA group was discarded because of the speaker having only studied French for a year, an outlier in the group of French learners who had all studied French for at least two years. This left again a total of fourteen subjects in the FLA category.

Table 3 lists the results of each of the four groups by presenting their number of correct identifications per category and in total as an average and as a percentage success rate.

Group	Polar question		Continuation rise		Total	
	Avg number correct of 30	Percent correct	Avg number correct of 30	Percent correct	Avg number correct of 60	Percent correct
SLA	16.6	55.33	15.93	53.1	32.53	54.22
FLA	17.4	58	17.87	59.57	35.27	58.78
NFS	18	60	21	70	39	65
NFK	14.67	48.9	18.4	61.33	33.07	55.12

The Native French speakers were the most successful in correctly distinguishing the two patterns. Following them, in order, were the FLA French learners, then the subjects without any knowledge of French (NFK), and finally the SLA French learners by a very small margin. The difference between the SLA and NFK subjects is negligible, especially in the overall tally, as both groups identified each pattern as both a polar question and a continuation rise a near equal number of times. The FLA subjects were slightly better overall, yet indeed in the continuation rise category they also just barely underperformed the NFK subjects. The low performance of the SLA subjects is contrary to my hypothesis, which predicted that the SLA group would outperform the FLA group. It is, however, consistent with the effects on phonemic perception discussed in the introduction.

Both the NFS and NFK groups were approximately 10% better at identifying the continuations than the polar questions. The NFK group leaned toward identifying all stimuli as continuations and so saw a natural increase in the actual continuation rise group. The NFS group was good at identifying both patterns but found the continuations easier to label correctly. The French-learning groups did about equally well in both categories.

In looking more closely at the data and at patterns specific to each subject group, we find that there are important differences in the strategies employed by each group that may reflect their perception of the stimuli. First, I looked at how consistent each participant's answers were for each stimulus. Each subject heard the fifteen sentences six times, including two repetitions of three different intonation patterns on the same words. Ignoring the filler stimuli, I tallied how many times their responses differed between the first time they heard a stimulus and the second time that they heard the same stimulus with the same intonation. The results can be found in the table below.

Group	Polar question		Continuation rise		Total	
	Avg. inconsistent responses	% correct that were inconsistent	Avg. inconsistent responses	% correct that were inconsistent	Avg. inconsistent responses	% correct that were inconsistent
SLA	5.53	37.94	4.87	39.89	10.4	32.55
FLA	5.14	31.04	4.14	24.47	9.29	24.39
NFS	6.29	34.76	5.86	28.29	12.21	30.06
NFK	6.8	47.9	6.33	37.65	13.2	40.72

This table presents a different picture from that of the average correct responses in Table 3. The NFK subjects were clearly the most inconsistent, particularly in the polar question category but also by a significant amount overall. On the opposite end of the spectrum were the FLA subjects whose responses changed the least between the first round of the experiment and the second round for both patterns. The Native French speaking subjects tended to have more total inconsistent responses than the French learners but due to their superior number of correct answers, the percent of their correct responses that were inconsistent was still lower than the SLA group. The NFS group having more inconsistent answers than the FLA group but a higher number of correct answers reinforces their superiority in the overall task by showing that they were correct in their response at least once for more total stimuli than all the other groups. The inconsistency of the NFK group paired with their low success rate in the overall task reflects a lack of familiarity with the pattern contrast used and therefore confirms what was expected of the group. Figure 3 shows a comparison of the four groups in terms of their consistency and overall correctness.

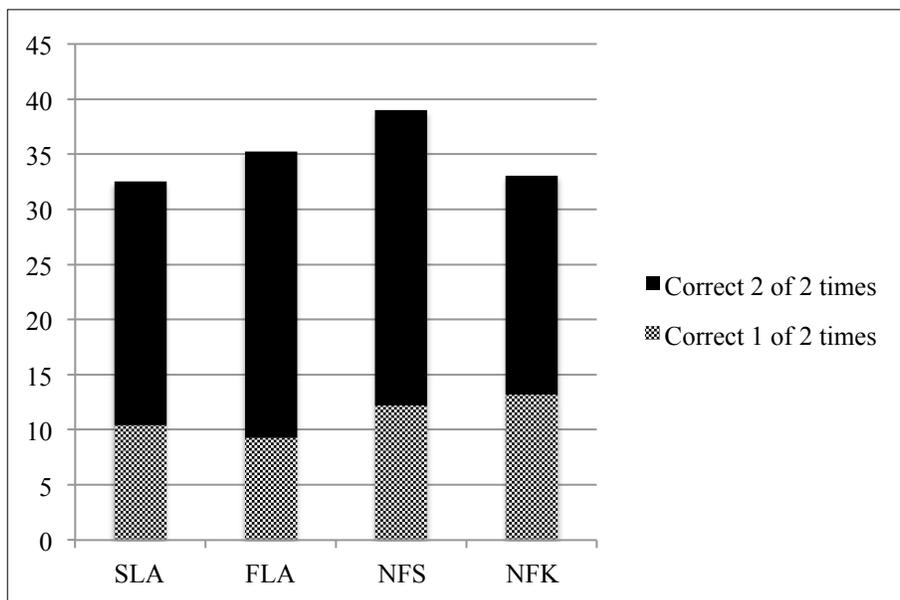


Figure 3: Correct answers by consistency

To further explore the issue of consistency, I calculated on average how many times each group of subjects identified all instances of the same sentence as the same pattern, regardless of whether it had question or continuation intonation. The results are in Table 5 below.

Group	# Stimuli marked all PQ	# Stimuli marked all CR	Total
SLA	3.47	2.13	5.6
FLA	2.79	3.07	5.86
NFS	0.64	2.14	2.79
NFK	1.13	2	3.13

There is a clear distinction between the French learning groups and the other two groups. The French learning groups judged more than a third of the sentences uniformly regardless of

intonation change. This is possibly due to other cues like grammar that the NFK subjects would not have had access to and that the NFS speakers would have prioritized below the intonation patterns that they were more clearly able to perceive than the French learners. Thus the French learners may have relied on cues that the other groups did not rely on due to a lack of ability to easily perceive the prosodic differences between patterns.

Discussion

This study investigated three divides in the field of L2 acquisition, each of which will be discussed in turn. First of all, the results show a small difference in the abilities of SLA and FLA learners to perceive L2 intonation patterns. The FLA students slightly outperformed their SLA counterparts in identifying both patterns, a fact that is contrary to my original hypothesis which predicted that the higher frequency of use of the L2, lower frequency of use of the L1, and source of type of input of SLA learners would give them an advantage in perceiving conversational aspects of speech like these selected intonation patterns. Instead, they appear to be at a disadvantage, the reasons for which will be discussed shortly.

Secondly, the results of this study, when compared with studies into production, suggest that the input that is characteristic of SLA experience does not improve perception of the L2's prosodic patterns in the same way that it has been shown to be able to improve production of the L2. It is important to note however that studies have not been conducted of exclusively prosodic L2 production based on SLA and FLA experience. Cavone and D'Imperio (2016) showed that decreased L1 use as is common in an SLA setting leads to improved production of the L2 prosodic system, but the other factors that are important in the SLA/FLA distinction have not been directly studied in this way. This comparison is drawn instead through studies that test overall foreign accent as foreign accent contains a prosodic element and these therefore present the closest data that we have at this time.

Thirdly, the improvement in production and lack of improvement in perception of intonational contrasts follow the same pattern outlined by other studies in the acquisition of phonemic contrasts. This, again, is contrary to my hypothesis, as I had expected that the higher frequency of these conversational intonation patterns in the input characteristic of the SLA context would cause them to be better recognized by SLA learners. Phonemic contrasts are equally common in both SLA and FLA inputs and so seem to be less likely to be learned differently based on learning experience. Their equivalency suggests a parallel in the way that intonational and phonemic contrasts are learned.

Knowing that the results disproved my original hypothesis, we now turn to a discussion of why this occurred. First, I will address why the SLA and FLA results despite the small divide between them were both so near to the NFK group and therefore did not show as large of an advantage over the NFK subjects as one might expect. As noted above, the French learning subjects identified all four instances of the same sentence (two of each intonation contour) in the same way for over a third of the sentences. This is nearly double the number of times that the NFS and NFK groups did this. Thus the French learners more commonly grouped stimuli by properties other than intonation. These properties—the sentences' grammar, word choice, and semantic meaning—are distinct from intonation in that they are essential to the sentences' meaning. Someone listening with the goal of comprehension must pay attention to these factors. In the case of people learning French as an L2, comprehension is of the utmost importance—it is what they are taught to strive for in class, and it is what stands in the way of them being able to

use the L2 like a native speaker. In comparison, intonation is less important to meaning, especially as similar L1 intonation patterns in the case of English-speaking learners of French can be substituted without necessary loss of meaning (though there is an addition of foreign accent). A French learner prioritizes learning the French lexicon and French grammatical structure over learning intonation. This is especially likely in the case of the continuation rise as it is not necessary to convey meaning. There are many things that a speaker can do to convey the fact that they are not finished speaking other than change their pitch. In addition, there are many ways that a polar question can be posed in French other than using the polar question contour (“est-ce que,” inversion). French learners with classroom experience are also trained to listen to French with a focus on comprehension. They complete exercises, take tests, and respond to their teachers all while being graded on their comprehension of the sentences in question.

The French learners who participated in this study, therefore, could have been distracted by their habit of straining to comprehend the base meaning of the utterance. This is in stark contrast to what we would expect of the NFK and NFS groups. The NFK subjects didn’t have access to any of this kind of information as their lack of knowledge of the French language leaves them unable to perceive grammatical structure or even parse out words from the utterances that they hear. They are left with prosody as an accessible source of information and might therefore be better able to focus on its patterns. The NFS subjects on the other hand do have access to all of that information, but unlike the French learners do not have to strain to collect it. Comprehension is natural to them and therefore not something that would take energy away from being devoted to observing intonation. With all of the information available to them, they are able to make a judgment without missing the patterns that define the differences between these stimuli. This would explain why they were more successful with the least number of sentences marked as all the same across intonation contours, but of course this must be further investigated.

Next, why does there exist the small advantage of FLA subjects over SLA subjects? When this difference was observed for phonemic contrasts by Levy in 2009, she explained that it was partly the result of learned orthographic contrasts. For example, French /u/ and /y/ are spelled as “ou” and “u” respectively. An FLA learning experience would provide an advantage in that it emphasizes reading and writing and so subjects would have an increased familiarity with the difference between the two sounds and how they appear in the language. This cannot be extended to intonation because intonation does not have an orthographic representation in French. Levy also mentions the possibility of a “learned helplessness” when it comes to the /u/ and /y/ distinction due to its difficulty (more information in Hsu, 2011). This could translate to a prosodic distinction as in the case of this study; perhaps SLA subjects who are more exposed to French and in particular are more exposed to these patterns give up on learning the difference and instead learn to rely on other contextual clues that were intentionally not made available to them in these stimuli (inverted structure in questions, question words, second person pronouns, etc.). Second person pronouns, for example, are much more common in French in polar questions marked solely by intonation than in any other type of polar question (Abeillé et al, 2013) and therefore might be expected by the French-learning subjects as a marker of a polar question when there is no syntactic marking.

The small distinction between the two French-learning groups could also be the result of them having a different average number of years spent learning French. Though all subjects in both groups had studied French for at least two years, it happened that there was about a two-year difference in their average number of years of study. The FLA subjects on average had studied French for 6.86 years, while the SLA subjects had only studied for 4.87 years. It is unclear how this difference in experience would affect perception of intonation. It has been

shown that total experience can be significant in certain tests of perception of phonemic contrasts (Gottfried, 1984, Politzer, 1961), and this is consistent with Flege's Speech Learning Model (Flege, 1995). It is therefore possible that those two years of experience played a role in separating their success rates. I will note however that when asked to judge their own ability in listening comprehension of French, the SLA subjects reported a slightly higher confidence—on average 2.4 out of 3 versus 2.29 out of 3 from the FLA subjects—though this perceived skill could be contributing to their straining for comprehension over perception of all available information and therefore part of what dragged down their performance in the task.

There is therefore much that still needs to be studied in this field. The goal of this study was to examine the effects of how the L2 is learned on what the learner actually gains from the process. The main takeaway is that the seeming benefits of immersion—increased L2 usage, decreased L1 usage, varied input from mostly uniform native-speaking sources—do not have a profound effect on the ability of the speaker to perceive contrasts in L2 intonation.

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