

REGIONAL BACKGROUNDS AND DISCRIMINATION PATTERNS: A PRELIMINARY PERCEPTUAL STUDY IN QUEBEC FRENCH

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ABSTRACT

This contribution focuses on the effect of geographical origin on perceptual patterns shown by naïve French-speaking listeners from two urban centers in the province of Quebec (Canada). Participants took part in an AXB discrimination task. The stimuli were naturally produced words ending with /ɛ/, the quality of which ranged from close to very open. Quebec City listeners obtained significantly higher results than Saguenay listeners and proved to be more sensitive according to a calculation of d' . We argue that this difference in the naïve listeners' perception is linked to differences in production, since regional variation was also found in the corpus: a group of experienced judges perceived tokens produced by Saguenay speakers as more open than tokens produced by Quebec City speakers.

Keywords: speech perception, sociophonetics, regional variation, Quebec French, /ɛ/ vowel

1. BACKGROUND

Since Labov's groundbreaking study of Martha's Vineyard (cf. [10]), linking external factors and phonetic variants has been one of the main concerns of variationist sociolinguistics. In recent years, a growing body of research has shown that speech perception could also be influenced by numerous external factors, such as exposure to variation [3], what listeners are told about the aim of the experiment [15], the presence of an iconic stuffed toy in the experiment room [4], etc. Another external factor known to affect listeners' perception is their geographical origin [7, 11, 12, 17, 21].

Among the researchers who addressed the issue of a potential link between geography and perception, Jacewicz and Fox [7] and Labov [11] had American listeners from various states take part in word identification tasks in which tokens had been produced by speakers with diverse regional backgrounds. Both experiments demonstrated that listeners performed better at the task when they were from the same area as the speakers. Subjects from different parts of Wales tested by Williams et al. [21] exhibited a similar local advantage in

identifying speakers' regional origin. According to these authors, a familiarity effect due to constant exposure could explain the fact that subjects recognized their own variety or words spoken in their own variety more accurately.

Williams et al.'s [21] results also suggest that listeners from different regions did not perform equally at the perception task. Overall, listeners from some areas had better correct identification rates than listeners from other areas. A comparable tendency was observed by Preston [17] whose listeners from Michigan and Indiana had to identify the origin of American speakers along a north-south axis ranging from Michigan to Alabama. Preston's [17] listeners' perceptual boundaries appeared to differ slightly according to their origin. Among other things, some Michiganders established a distinction between their own variety and that of the Indiana residents that the latter did not seem to perceive. In the same vein, in a study about the /e/-/ɛ/ merger in Philadelphia [12], listeners seemed to lose the ability to discriminate between two sounds: when listening to continuous speech produced by a non-Philadelphian, some Philadelphians could not distinguish between the /e/-/ɛ/ pair, even if the speaker did maintain the contrast. Unsurprisingly, listeners from other cities had no difficulty in perceiving a difference when listening to the same stimuli.

These findings raise questions about the perceptual patterns of listeners from geographical areas known to exhibit phonetic differences. Of particular interest is that not only identification abilities vary by regional background; discrimination capacities are also affected.

2. SELECTED VARIABLE AND GOAL

Therefore, from what can be gathered in the literature, experiments comparing perception according to geographical origin appear to be fairly frequent in English. However, they are scarce in European French [22] and, to our knowledge, nonexistent in Quebec French. Our study focuses on the latter variety.

In the province of Quebec, a series of recent studies reveals that the French spoken in Saguenay and Quebec City (two urban centers in eastern

Quebec separated by 200 kilometers of wildlife reserve) present some slight but regular acoustic differences. It has been found that the speakers' geographical origin significantly affects several acoustic properties of some diphthongized vowels [13], high vowels /iyu/ [1] and word-final /ɛ/ [18]. Listeners from Saguenay and Quebec City were therefore selected for this experiment.

We chose to study their perception of one of the phonetic characteristics that has been found to vary regularly between speakers from Saguenay and Quebec City, namely, the word-final /ɛ/. We chose this variable first of all because it has not yet been studied perceptually. Secondly, in a previous acoustic study [18], we showed that up to 90% of word-final /ɛ/s spoken by young adults from Saguenay and Quebec City could be automatically classified according to their regional origin by taking into account duration and the temporal evolution of F_1 , F_2 and F_3 . Our study has also revealed that tokens vary substantially on the F_1 dimension, though the acoustic continuum evidenced appears to be highly organized, with Saguenay speakers producing vowels with a higher mean F_1 (i.e. more open) than Quebec City speakers. Given these results, an important range of vowel qualities could be expected in the corpus, which would allow for the design of a discrimination task using natural speech.

The aim of this study is to explore if discrimination of word-final /ɛ/ variants is different between Saguenay and Quebec City listeners.

3. METHODS

3.1. Speech material

We used the same speech material as in our previous study [18]. It consisted of isolated words ending with /ɛ/ produced by 40 speakers born and raised in Saguenay (20) and Quebec City (20). All speakers were 20 to 29 year old full-time graduate or undergraduate students, with an equal division of males and females. They were digitally recorded in an anechoic room (44.1 kHz, 16 bits, mono) reading over 500 meaningful carrier sentences that included a monosyllabic or bisyllabic target word in final position (e.g. *Les ours aiment les baies* [Bears like berries], where "baies" is the target word). They were then brought to repeat each target word in isolation once after the experimenter pretended she did not hear it properly. A similar prosodic focus was thereby expected on each target word. Among the 500 target words produced by each subject, 12 ended with /ɛ/, while the remaining ones were used as fillers.

3.2. Labeling

The target words were extracted and submitted to five experienced listeners for labeling. These judges were graduate students, native French speakers with advanced knowledge in phonetics. Based on the acoustic tendencies previously evidenced [18], they were instructed to label each word according to the perceived openness of its final /ɛ/ vowel using the following phonetic symbols: [ɛ̞] for close, [ɛ] for canonical, [ɛ̝] for open and [æ̝] for very open. The majority answer determined the words' final label. This procedure allowed us to pool the tokens into perceptually distinct categories that would serve as a basis for a discrimination task, while reducing some of the issues with transcriptions made by a single listener [19]. Of the 480 words (12 words × 40 speakers) included in the corpus, 17 (3.5%) did not receive one of the four labels the judges were instructed to choose from and were therefore rejected. The remaining 463 were labeled as follows: 66 [ɛ̞], 225 [ɛ], 121 [ɛ̝] and 51 [æ̝] (see Table 2).

3.3. Listeners

Twenty-six listeners whose profiles were similar to the speakers' were recruited (though no subject served as both speaker and listener). These listeners were 19 to 29 year old undergraduate or graduate students born and raised in either Saguenay (13) or Quebec City (13). In each city, 9 women and 4 men took part in the experiment. All were naïve listeners, meaning they did not have extensive experience in transcription and phonetics in general, although about half had followed an introductory course. None reported hearing impairment.

3.4. Discrimination task

The experimental design chosen was the AXB task. Triads were hand-created according to the labels attributed to each word: A and B were labeled differently and X was labeled like either A or B. Listeners then had to decide which flanking sound was the most different and were explicitly informed to base their judgment on their perception of word-final /ɛ/. To make sure listeners would not judge that a token was different because of the speaker's sex or for lexical reasons, the three tokens of a triad were the same word produced by three different speakers of the same sex. Moreover, as the duration of the task needed to be limited to prevent fatigue in the subjects [19], a selection had to be made from the 463 available tokens. The pilot testing we conducted showed that the optimal number of triads for a 10 to 15 minute trial was 40. We decided to create 20 different triads that would be presented twice, once

in AXB order and once in reverse BXA order, thus requiring a subsample of 60 tokens. To select this subsample, we met the following constraints in addition to the previously mentioned criteria regarding sex and lexicon: every speaker is represented at least once but not more than twice, and all four labels are present in the subsample in similar proportions to that found in the corpus.

The test ran on Praat [2]. Stimuli were presented randomly over headphones and listeners were tested individually in a quiet room. They could hear each triad as many times as they wished before making a choice. The intensity of the tokens was normalized (60 dB SPL) and a 0.5 second silence was inserted before each one. A test phase using unselected tokens was initially used to help familiarize listeners with the task.

4. RESULTS

The naïve listeners' performance was first evaluated by calculating correct answer rates (out of 40). Mean results presented in Table 1 suggest that Quebec City listeners performed better at the task (77.9%) than Saguenay listeners (68.9%). The highest score is 35/40 (two Quebec City listeners) and the lowest 20/40 (one Saguenay listener), basically chance level. However, a Mann-Whitney test indicates that the difference between Saguenay and Quebec City listeners' correct answer rates is not statistically significant ($U=121.5, p=0.056$). Note that the results were analyzed using nonparametric tests since the data are not normally distributed and sample size is relatively small.

Table 1: Mean results at discrimination task according to listeners' geographical origin

	Quebec City (13)		Saguenay (13)	
	Score	Rate (%)	Score	Rate (%)
Correct answ.	31.2/40	77.9	27.9/40	69.8
Congruence	15.8/20	78.8	12.5/20	62.7
d'	2.29		1.74	

Table 1 also reveals that different mean congruence scores were obtained by listeners from Quebec City and Saguenay. "Congruence" here means recurrent answers to an AXB-BXA pair. For example, a listener who gave the wrong answer to an AXB triad (eg. A where B is expected) and the same wrong answer (A) to the corresponding BXA triad would score 0/2 for correct answers but 1/1 for congruence. The highest congruence score is 20/20 (one Quebec City listener who only scored 26/40 on correct answers) and the lowest is 6/20 (the Saguenay listener who also scored lowest on correct answers). A Mann-Whitney test indicates that the

difference between Quebec City and Saguenay listeners' congruence scores is statistically significant ($U=148.5, p=0.001$).

For each listener, we also calculated d' , a sensitivity measure that takes into account both hit and false alarm rates (cf. [14]). The mean d' scores shown in Table 1 underline a greater sensitivity among Quebec City listeners, although a Mann-Whitney test indicates that the difference is not statistically significant ($U=121.5, p=0.058$). The Saguenay listener who scored lowest on both correct answers and congruence showed no sensitivity at all with a d' value of 0 (which can also be interpreted as chance-level sensitivity), while the highest d' value obtained is 3.19 (one Quebec City listener).

In summary, results reveal that Quebec City listeners performed better at the discrimination task than Saguenay listeners. They obtained higher mean correct answer and congruence rates, along with a higher d' , suggesting a greater sensitivity to the variation they were exposed to.

5. DISCUSSION AND CONCLUSION

The aim of this study was to explore potentially differentiated perceptual patterns shown by listeners with different geographical origins since a growing body of evidence suggests this external factor may influence speech perception. Our study focused on the variation in perception among French-speaking listeners from the province of Quebec, as so far, the topic has been largely ignored in studies about this variety. As with English-speaking listeners [7, 11, 12, 17, 21], an effect of geographical origin on perception was found among our participants, with Quebec City listeners performing better, in many respects, than Saguenay listeners.

Obviously, some limitations should be taken into consideration regarding our results. First of all, very few listeners took part in the experiment (26). They were all graduate or undergraduate students, but they were not screened for socioeconomic background. The extent to which similar tendencies would be observed among larger samples with different characteristics remains unknown. In addition, the number of male (4) and female (9) participants in each city was unequal, and for this reason we did not take sex into account in our analyses. Although it is not impossible that this variable might yield different results, recent studies have found no significant effect of sex on mean scores at word identification tasks [7, 16]. A further limitation is that the methodology underlying the discrimination task is based on auditory labeling. Despite the fact that labels were attributed by inter-judge agreement, we cannot exclude the possibility of labeling errors

that might invalidate or shadow some contrasts that listeners were asked to establish. Furthermore, even if participants were explicitly instructed to answer according to their perception of word-final /ɛ/, they may well have relied on other cues to make their judgments.

Notwithstanding these limitations, our results give further evidence that listeners' geographical origin can affect how they perceive speech. This is consistent with conclusions arising from previous studies, in which it turned out identification abilities [21], perceptual boundaries [17] and discrimination of the very same stimuli [12] could vary between listeners from different regions. Our interpretation of this perceptual pattern is that it might be linked to production. Indeed, in addition to revealing a wide range of phonetic variation in the corpus, results of the inter-judge agreement show that vowels' perceived openness strongly depends on the speakers' geographical origin. As can be seen in Table 2, Quebec City speakers' productions were almost exclusively perceived as canonical or close (227/235), while Saguenay speakers' productions were perceived more open (164/228), with the exclusivity on the [æ] category, which is consistent with our aforementioned acoustic study [18].

Table 2: Labels according to speakers' geographical origin

	[e]	[ɛ]	[ɛ̃]	[æ]	<i>n</i>
Quebec City	65	162	8	0	235
Saguenay	1	63	113	51	228
Total	66	225	121	51	463

Preston [17] evokes prestige reasons to explain why some listeners do or do not perceive their variety as different from another, but our knowledge of the studied variants' status is still too limited to posit such an explanation.

In recent years, the theory that speech perception is exemplar-based has gained popularity with sociophoneticians [8, 20]. As a matter of fact, the relevance of exemplar models in explaining variation in speech perception has been convincingly pointed out by many authors (eg. [5]). But even if we assume that Saguenay listeners might have access to a shorter exemplar list due to less exposure to variation (which is improbable given the geographic proximity of the two urban centers and the fact that Saguenay speakers actually produced a wider range of variants than Quebec City speakers), it does not explain why they did not perceive differences between stimuli in a seemingly objective and straightforward task like AXB, where no social judgment of any kind was required.

In this specific situation, a theory that might account for the patterns observed is the Perceptual

Magnet Theory [6, 9]. If the Saguenay and Quebec City listeners' prototypical representations of word-final /ɛ/ are unlike, the range and quality of variants they are in a position to differentiate in the corpus should differ, leading to distinct results.

However, we do not dismiss the idea of the exemplar models on the sole basis of our preliminary results; they could strongly reflect our methodological choices. In further contributions, we intend to address whether naïve listeners taking part in an *identification* task recognize more or less open word-final /ɛ/ as specific to Saguenay or Quebec City speakers. If so, such an outcome would support the exemplar models and perhaps call for hybrid models. Moreover, since the gradated auditory categories resulting from the inter-judge agreement appear to be consistent with our previous study [18], it is our intention to link them to a detailed acoustic analysis in order to better describe the observed phonetic phenomenon. In any case, our results give further evidence that controlling for external factors such as listeners' geographical origin is essential when conducting perception experiments and does shed light on this promising field in (Quebec) French studies.

6. ACKNOWLEDGMENTS

This project was funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and the Fonds de recherche du Québec – Société et culture (FRQSC). We are grateful to Élise Mitchell for proofreading the manuscript and to Johanna-Pascale Roy for her valuable comments.

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