



## Effects of Dialectal Origin on Articulation Rate in French

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### Abstract

This paper compares the articulation rate of 4 varieties of French: Parisian French (PA); Swiss French spoken in Neuchâtel (NE) and French spoken by Swiss German speakers (BE and ZH) who have been living in a French-speaking environment (in Neuchâtel) for 20 years at least. The objective is twofold: to assess the differences in articulation rate between native French speakers of a standard variety (PA) and native French speakers of a regional variety (NE), and to address whether the non-native speakers (BE and ZH) exhibit a different behavior regarding their articulation rate compared with the native speakers of the corresponding variety (NE). Aside from the "regional" factor, this study takes into account additional factors that may have an influence on articulation rate: the gender and age of the speakers, the speech style (reading or conversational) and the number of syllables within the Accentual Phrase.

**Index Terms:** prosody, articulation rate, standard French, non-native French, regional French, accentual phrase.

### 1. Introduction

Articulation rate refers to the pace at which speech segments are produced. Contrary to speech rate, it does not take into account the pauses produced by the speaker (see [1] for a detailed description of temporal variables). Although articulation rate has been studied under different perspectives, very little work has dealt with the comparison of articulation rate in different varieties of French, and with the question of whether native and non-native speakers of different varieties of French exhibit distinct behaviours regarding articulation rate. The aim of this paper is to examine the issue of dialectal origin on articulation rate with new data, where variables such as the gender, and the age of the speakers and the speech style, are also taken into account, as all of which are known to be important factors on articulation rate in French (see [2] for an overview). The paper is organized as follows: first we resume the main results of the previous studies dealing with dialectal variation and articulation rate in French (§2). We will then present the data and the methodology we used to process them (§2), and we will present the results (§4) before the discussion (§5) and the conclusion (§6).

### 2. Previous Studies

What follows is organized in two sections. In the first one, we summarize the main results reported in the studies dealing with articulation in L1 French. In the second, we briefly describe the results obtained by authors comparing articulation rate in L1 and L2 French.

### 2.1 Articulation rate in L1 French

The only existing studies comparing articulation rate of French native speakers from different French-speaking areas lead to contradictory results.

On the one hand, some researchers have observed differences between "standard" and "regional" varieties, but they were not statistically significant. This is the case for example in [3], where the oral productions (spontaneous and read texts) of 24 speakers from Lyon and Tournai (2 standard varieties in France and in Belgium, respectively) were compared with the productions of 24 speakers from Nyon and Liège (2 regional varieties spoken in Switzerland and in Belgium, respectively). The authors found an articulation rate of 5.48 syll/sec and 5.38 for Lyon and Tournai, respectively, and 5.25 and 5.02 for Liège and Nyon, respectively. Similar results are observed in the study of [4], where the authors compared conversation samples extracted from the recording of 30 Parisian speakers and 40 speakers from the Vaud canton in Switzerland; French speakers present an articulation rate of 5.66 syll/sec and Swiss speakers an articulation rate of 5.29 syll/sec. Working with reading productions, [5] reported an articulation rate of 6.15 syll/sec for Parisian speakers and an articulation rate of 5.70 syll/sec for the Swiss speakers (from Nyon). In summary, some differences in articulation rate between standard and regional varieties are observable in the data, but they are not statistically significant.

Where statistical testing has been conducted, scholars like [6] and [7], working with read speech only, found significant differences between speakers from France and speakers from Switzerland. French Speakers (Paris and Lyon) do articulate faster than Swiss speakers (Nyon, Neuchâtel and Geneva).

### 2.2 Articulation rate in L2 French

Regarding L2 French, to our knowledge, only three studies compare articulation rate of L1 French speakers with articulation rate of L2 speakers of French. And like the previous studies dealing with L1 French, these studies lead to contradictory results. On the one hand, some authors conclude that L2 speakers articulate slower than the L1 speakers. These conclusions are drawn by [8], who compare read productions of native speakers from Paris and Neuchâtel (Switzerland) with reading productions of 3 groups of L2 speakers of French: Central-African speakers having Sango (a tonal language) as an L1, Senegalese speakers having Wolof as an L1 and Swiss German speakers having a Swiss German dialect as an L1. These are also the results reported in [9] where read productions of Spanish learners of French are compared with the productions of L1 native French speakers from Geneva: the former do articulate slower than the latter. Let us note here that such results are consistent with those

that have been found for other cases of language acquisition contexts (see [10] for an overview).

On the other hand, [11] compares the reading and the spontaneous productions of elderly speakers from Paris, from Neuchâtel and Swiss-German French speakers living in Neuchâtel. Their conclusions are the following: Parisian speakers articulate faster than Swiss L1 and L2 speakers, but the authors underline that there are no significant differences between the native and the non-native Swiss speakers.

### 2.3 Summary and research questions

Whether the studies deal with articulation rate in L1 or in L2 French, research in the field leads to contradictory conclusions. These non-consistent results can be explained by the fact that sociolinguistic factors, such as the age of the speakers, their gender and the speech style (conversation versus reading), are not always systematically controlled, which makes the comparisons between the studies quiet hazardous.

The objective of this research is twofold: to assess the existence of differences in articulation rate between native French speakers of a standard variety and native French speakers of a regional variety, and to address whether the non-native speakers exhibit a different behaviour regarding their articulation rate compared with the native speakers of the corresponding variety. Aside from the "regional" factor, this study takes into account additional factors that may have an influence on articulation rate: the gender and age of the speakers, the speech style (reading or conversational) and the number of syllables within the Accentual Phrase.

## 3. Data

### 3.1 Participants

In order to address the effect of dialectal origin on articulation rate, we compare four varieties of French, divided into two groups: 2 groups of native French: Parisian speakers (henceforth PA) and Neuchâtel speakers from Switzerland (henceforth NE) and 2 groups of non-native French: Swiss German speakers from the Emmental-Oberaargau area in the canton of Bern (henceforth BE) and Swiss German speakers from the city of Zurich (henceforth ZH). The Swiss-German speakers have all been living in a French-speaking environment (in Neuchâtel) for at least 20 years.

In this study, we recorded 16 elderly speakers (2 males and 2 females per variety, all of them older than 55 years, to avoid a possible effect of age on articulation rate, see [2] and [7] for the argumentation) in reading and conversation tasks. Each speaker received the instructions to read carefully a journalistic text (the text used in the PFC project, see [12]) including 22 sentences (398 words) at normal speech rate. Speakers were then recorded in pairs; they received instructions to converse freely for 20 minutes, without the experimenter.

### 3.2 Annotations

The entire read text and 3 minutes of continuous speech for each speaker were semi-automatically processed under the Praat software [13]. Speech samples were first orthographically transcribed, and automatically aligned with the EasyAlign script [14]. All the alignments were manually verified and corrected by one of the authors. Pitch accents were perceptually identified

independently by two experts (two of the authors), with a substantial inter-annotator agreement ( $\kappa = 0.71$ ). A third expert intervened in cases of disagreement between the two annotators and decided the final value of the syllable (+/- prominent). Accentual Phrase (henceforth AP) boundaries (clitic groups carrying a pitch accent on their rightmost syllables, see [15] among others) were then identified by one of the authors. Disfluencies (syntactic breaks, elongations due to a hesitation, etc.) were also coded by the two experts (disagreements were corrected by the third expert) and excluded from the analysis. Then, the number of syllables was counted per each AP, excluding disfluencies.

Articulation rate (expressed here in ms/syll) for each AP were finally computed. We found it more relevant to consider articulation rate in ms/syll (as in [16]) instead of syll/sec, given that some short APs (2 syllables) were examined. Note that articulation rate expressed in ms/syll corresponds to the mean syllabic duration within the AP. Data were analyzed by means of a generalized linear model (with repeated measures) with syllabic duration as a dependent variable and with the following predictors: speaker variety (PA, NE, BE, and ZH), gender (male/female), speech style (reading/conversation) and number of syllables within the AP. The means presented in the following section are the means estimated by the model.

## 4. Results

This section is organized as follows: First, we present the results about only the speaker's origin factor (§4.1), then the results including the gender of the speakers (§4.2), the effect of speech style (reading versus spontaneous) and the number of syllables within the accentual phrase (§4.3).

### 4.1 Effect of speaker's origin

As can be seen in Figure 1, results show first an effect of variety ( $\chi^2(3) = 80.30, p < 0.001$ ): PA speakers present a shorter syllabic duration (i.e. a higher articulation rate) than Swiss speakers ( $p < .001$ ), regardless of the French being an L1 (i.e. NE) or an L2 (i.e. BE and ZH). Surprisingly, non-native Swiss speakers (BE and ZH) show similar articulation rate as native NE speakers, although the difference between NE and ZH just fails to reach significance ( $p = .055$ ). In other words, Swiss speakers (native and non-native) show a longer articulation rate than Parisian speakers.

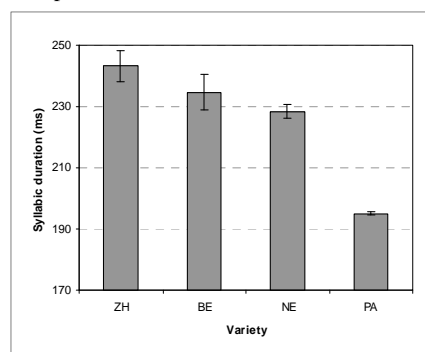


Figure 1: Estimated syllabic duration (in ms) as a function of the variety (ZH, BE, NE and PA). Error bars are standard error of the mean.

## 4.2 Effect of gender

Syllabic duration is shorter in male (215ms) than in female speakers (235ms) ( $\chi^2(1) = 24.14, p < 0.001$ ). However, as can be seen in Figure 2, the difference between syllabic duration in males and females is not similar across the four varieties ( $\chi^2(3) = 46.29, p < 0.001$ ). While males present a shorter syllabic duration than females (i.e. a higher articulation rate) in PA speakers ( $p < 0.001$ ), the difference is not significant in NE and ZH speakers. Although we observe, a difference between males and females in BE speakers in Figure 2, it is not significant ( $p = .097$ ). This is probably due to the high variability in BE females (i.e. error bar).

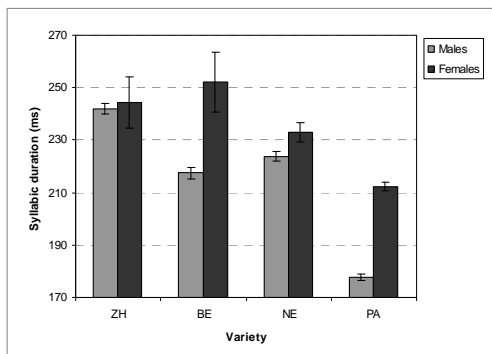


Figure 2: Estimated syllabic duration (in ms) as a function of the variety (ZH, BE, NE and PA) and gender (males and females). Error bars are standard error of the mean.

## 4.3 Effect of speech style and number of syllables

As for speech style (see Figure 3), speakers present shorter syllabic duration (i.e. higher articulation rate) in conversation (211ms) than in reading (239ms), whatever the variety may be ( $\chi^2(1) = 46.27, p < 0.001$ ).

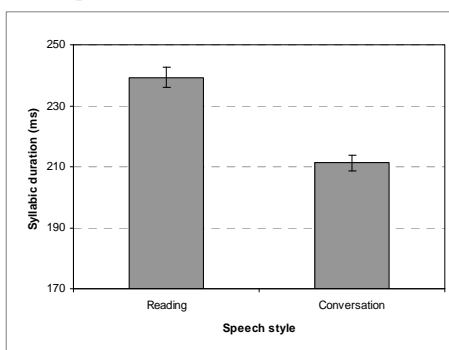


Figure 3: Estimated syllabic duration (in ms) as a function of the speech style. Error bars are standard error of the mean.

In addition, we observe that syllabic duration decreases (i.e. articulation rate increases) when the number of syllables within the AP increases ( $\chi^2(1) = 395.80, p < 0.001$ ). As can be seen in Figures 4 and 5, the effect of syllable number is stronger in reading (see Figure 4) than in conversation (see Figure 5), irrespective of the variety ( $\chi^2(1) = 34.39, p < 0.001$ ).

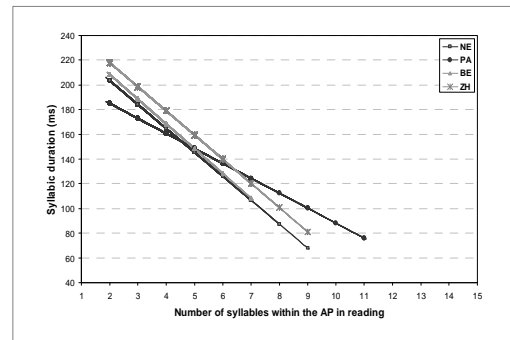


Figure 4: Estimated syllabic duration (in ms) as a function of the variety (ZH, BE, NE and PA) and the number of syllables within the AP in reading. Error bars are standard error of the mean.

It is also interesting to note that the influence of the number of syllables varies across the three varieties ( $\chi^2(3) = 16.68, p < 0.001$ ), whatever the speech style may be. While it is similar in the three Swiss varieties (native and non-native speakers), it is weaker in the PA. This last observation strengthens the fact that Swiss speakers, whether they are native or non-native, behave in a same way

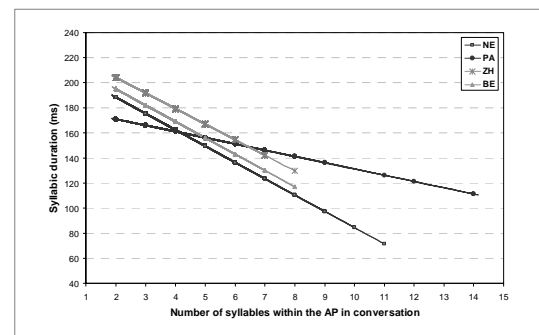


Figure 5: Estimated syllabic duration (in ms) as a function of the variety (ZH, BE, NE and PA) and the number of syllables within the AP in conversation. Error bars are standard error of the mean.

## 5. Discussion

Our findings are not only consistent with those reported for reading speech style in [6] and [7] for NE and PA varieties, which shows that PA speakers articulate faster than NE speakers, but they also confirm the existence of significant differences in articulation rate between NE and PA speakers in spontaneous speech. Thus, the differences between the articulation rate in Parisian and Swiss speakers are not task-dependent. As stated in [7], these differences could partly be explained by the use of duration as a distinctive feature in Switzerland (*il vit* [vi] *he lives* opposed to *la vie* [vi\_], *life*, [17]) and/or by the large number of prominent penultimate syllables (mainly realized by means of duration) found in Swiss varieties, as reported in [18].

Moreover, our results support the conclusion that males articulate faster than females (see [7] for similar results in French, [19] in English and [20] in Dutch). Nevertheless,

contrary to [7], we found no difference between males and female in NE group. This discrepancy can be explained by the age range of the speakers in both studies, as it is known that age affects articulation rate ([2]): while speakers were between 27 and 75 years old in [7], they were all older than 55 years in the present study.

Regarding the effect of speech style, our findings are consistent with those reported in [11], i.e. speakers articulate faster in conversations than in readings. Nevertheless, taken together, these results do not support the conclusions of previous studies (see [2] for a review), which showed that speech rate is faster in reading than in spontaneous speech. Further studies are needed to identify the reasons for such inconsistency (i.e. examination of the number and duration of pauses, complexity of the read text, etc.).

In addition, contrary to what has been claimed for other L2 situations (see for example [8]-[10]), but in the same line than our previous study [10] in which the origin of the Swiss German speakers was not controlled, our data do not confirm that L2 speakers articulate slower than the native speaker of the corresponding variety. The fact that these observations apply to both speech styles (read speech/spontaneous speech) indicates that the absence of differences between native and non-native Swiss speakers does not depend on the task. Moreover, it is also interesting to underline that the origin of the Swiss German speakers does not affect their articulation rate in French. Regarding previous studies dealing with articulation rate variations in Swiss German dialects, one could have expected that speakers from Bern to articulate slower than speakers from Zurich (see [21], who shows that native BE speakers articulate roughly 5 syll/sec in spontaneous speech, while native ZH speakers 6 syll/sec). In fact, our data do not show any difference in articulation rate between the BE and the ZH speakers while they speak French. Such results could be a consequence of the long exposition the Swiss German speakers had. Further analyses implicating other speakers with a lesser degree of knowledge of French are required in order to validate and interpret these results.

## 6. Conclusion

The aim of this study was, in the light of new data, to examine the question of the influence of dialectal origin on articulation rate in French. For this, we compared read and spontaneous productions from two groups of native speakers (speakers coming from Paris and from Neuchâtel) and two groups of non-native speakers who have been living in Neuchâtel for at least 20 years (Swiss German speakers having a Bernese dialect and a Zürich dialect as L1). To avoid a possible bias of age, we selected speakers who were at least 55 years old. Reading and spontaneous productions of 2 groups of 4 non-native speakers were analysed, and factors, such as the number of syllables in the accentual phrase, were also taken into account. Taken together, our results lead us to conclude that (i) native speakers from Paris, representing the standard variety, articulate faster than the speakers from the Swiss varieties, native and non-native, and (ii) that articulation rate is not a good discriminating cue to distinguish between native and non-native speech when the level of the non-native speakers is advanced. Future work should consider a larger number of speakers and should include other temporal features such as the pause distribution and duration,

and rhythmic variations (expressed in terms of consonant and vocalic variability) to assess the conclusions drawn in this study.

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