

Phonological Analysis of Schwa and Liaison within the PFC Project (Phonologie du Français Contemporain): how Determinant are the Prosodic Factors?

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Abstract

The influence of prosody on segmental phenomena such as French schwa and liaison has been pointed out, but never systematically studied on speech data. In this paper we propose a comprehensive coding system to be used on a large oral corpus. Such a system aims at providing explicit and robust data which can serve as a solid base to test the different claims which have been put forward in the literature.

1. Introduction

For several decades, a number of phonologists working with French based their theoretical claims on normative data and paid lip service to ‘real’ data. Modern technologies currently available renew the phonologists’ interest for oral corpora which provide more solid grounds for theoretical analyses. In the case of French, a major project, *Phonology of contemporary French : usage, varieties and structure*, aims at building a large database, gathering numerous varieties of French which will then be explored and compared. The construction of such a database presupposes that the exploitation domains have been clearly defined.

This paper aims at proposing a prosodic coding system which will supplement segmental data. The paper is structured as follows: First, in section 2, we will present the PFC project, its objectives and its partners. In section 3, we consider two central phonological phenomena in French phonology, namely schwa and liaison, and their links to prosody. Section 4 presents a coding system for prosody, and section 5 investigates how the prosodic information can supplement the segmental one. Finally we conclude the paper in section 6.

2. The PFC research project

The project *Phonology of contemporary French : usage, varieties and structure* (PFC) is an international project pursuing the tradition of linguistic description carried out over at least the past hundred years.

2.1. Main objectives

The primary objective of the project is to gather robust data in an effort to obtain a more accurate picture of both the similarity and diversity of varieties of French spoken today. About 50 investigation points have been devised within France and within the French-speaking world with an average of 10 speakers recorded in each investigation point. The strength of

the project lies in its rigorous protocol strictly applied in each investigation point, and which requires four distinct tasks providing information on four different speech registers:

- A word list of 94 items including 10 minimal pairs.
- A small text shaped as a newspaper article and incorporating a number of the items from the word list.
- A directed conversation between the subject and an interviewer
- An informal conversation between two persons belonging to a dense social network.

The word list, the text and ten minutes of each conversation are transcribed within the software PRAAT which provides sound-text alignment.

In this survey, we are concerned with avoiding the pitfall of dealing with ‘idealized’ speakers who do not occupy a position in the social and geographical spheres, and, consequently, we take into account standard parameters such as sex, age, profession, educational attainment. PFC can best be described as a structuralist corpus where “a systemic control is applied to a cross-linguistic objective stemming from the generative movement”¹ [14]. The project claims however to provide at best a socio-phonological study, but sound enough so as to allow a variety of phonological analyses, not excluding other types of analyses (syntactic or sociolinguistic). Three main areas of investigation have been singled out at the start of the project: (i) a phonemic inventory of each subject leading to a characteristic of the phonemic system of the investigation point; (ii) schwa; (iii) liaison. The phonemic inventory can be sketched out on the basis of the word list and the read passage supplemented by observations carried out throughout the two conversations. These findings can be confirmed and extended by accurate phonetic analyses and formant charts extracted by a team of collaborating phoneticians [12]. It was decided at the outset of the project that information on schwa and liaison behavior could best be obtained through a systematic coding scheme. As a number of the project partners pointed out to the need to go beyond the segmental and to incorporate a study of prosody, several attempts were made to define a coding system for prosodic factors as well.

¹ Our translation.

2.2. The partners

PFC is a federate project led by J. Durand (Toulouse), B. Laks (Paris) and Ch. Lyche (Oslo/Tromsø), supported by the CNRS, the Center for Advanced Studies in Theoretical Linguistics (Tromsø), l'Institut de Linguistique Française l'Institut Universitaire de France, and a large number of Universities both in France and outside of France: Aix-en-Provence, Nantes, Saint Denis (la Réunion), Calgary (Canada), London (Canada), Louvain-la-Neuve (Belgium), among others. The detailed protocol, publications, conference/workshop announcements and programs are available on the project web site <http://www.projet-pfc.net/> (see also among others [4], [6]).

3. Schwa and liaison

French, especially through studies of schwa and liaison, has long been a favourite testing ground for theoretical claims concerning phonological structure, but a high number of analyses rest on spurious data [11] or on repeated conservative descriptions of French, some of which are explicitly aimed at teachers of French as a foreign language [8]. As [11] observed, sound theories can only be based on sound data. A project like PFC, thanks to its geographical spreading and the high number of recorded subjects, provides a mass of new data, solid data on which phonological analyses can safely rely.

3.1. An simple coding system

The PFC approach has been to code lexical items for the presence/absence of schwa and liaison together with a number of crucial elements. The coding is alphanumerical, theory independent, and it offers a preliminary sorting out of the rough data. In coding schwa for example, attention is given to location of the schwa site within the syllable and to the right and left context. The adopted criteria are uncontroversial throughout the community and compatible with any phonological theory. The same can be said for the coding system devised for liaison. We are nevertheless aware of the limitations of such a system which concentrates on the most 'obvious' factors. Attention should equally be paid to prosodic influence. It has been shown already by [5] and then by [10] that stress location could influence the presence/absence of schwa. Just like schwa, liaison has also been claimed to be sensitive to stress placement, although, for both phenomena, these questions have not been integrated into theoretical considerations and not even pursued further.

3.2. How does prosody affect schwa and liaison ?

The PFC prosody team follows two distinct paths: a group of researchers study the prosodic characteristics of geographically defined varieties of French, while another group aims at investigating whether and how prosody can affect schwa and liaison. We share the belief that segmental and prosodic phenomena are intertwined, thus influencing each other, and propose to examine systematically this interconnection through the elaboration of a coding system, more specifically aimed at testing:

- The prosodic characteristics of word initial position, defined as a strong position [1].

- The pertinence of the distance of main stress on the realization of schwa and liaison.
- The distinction between final schwas and hesitation markers.

4. Coding prosody

Coding prosody should proceed from the same principles as coding schwa and liaison, but our first attempts showed that it requires from the coder a much greater expertise than when coding segmental phenomena. To bring a partial solution to this dilemma, we propose two coding systems, the first of which will be detailed in this paper: a standard coding system (SC) which can be performed by non-specialists and an advanced coding system (AC) which calls for a certain level of phonetic sophistication, supplemented by strong instrumentation.

4.1. Preliminaries

In this section, we consider a few problems which arise when attempting to code prosody. We first need to ponder on the following question: how can we handle simply and efficiently prosodic data in big oral corpora? Our goal is to gather relevant and robust data which will serve as a solid base for phonological analyses. It entails that the prosodic information should be made available to an heterogeneous community of researchers who are not prosody specialists, but who need to manipulate prosodic events in relation with their interest domains. As an example, let us recall that the link between morphosyntax, prosody, schwa and liaison has long been seen as essential. The development of the standard coding system follows directly from these considerations: it cannot be theory dependent, it must provide basic information, pertinent for a wide array of analyses. The information should not be trivial either, but it cannot attain a level of complexity that will repel a non specialist. The task proves to be much more intricate than when coding segmental phenomena. To develop fine criteria that the prosody community can agree upon is beyond immediate reach, considering the large number of prosodic models currently used [9]. There exist nevertheless a few spheres of convergence, one such area being the pertinent segmentation domains. We observe community consensus that both the lexical word and the syllable are relevant segmentation units. Even if French is usually presented as a language without lexical stress, the lexical word is encoded in the brain of the speaker and easily retrievable. As for the syllable, it is altogether a production unit, a perceptual unit of prominence and a phonological unit [3], [7], [13], [15].

The coding procedure established requires that the coder segments the signal into syllables, which will then be transcribed on a new tier in PRAAT, a prosodic tier.

4.2. Standard coding : general principles

SC includes a total of 6 fields and is organised as follows: fields 1 & 2 are linked to the domain of coding, the remaining fields (3 through 6) providing prosodic information.

- Field 1 indicates the number of syllables of the word which is processed: one, two, three or more, respectively codes '1', '2', '3', '4'. Consider for example the sentence *je connais pas... euh... le chemin* ('I don't know... euh... the way') preceded by a pause. The first code is given below the transcription in SAMPA.

Field 1

#	Sko	nE	pa	2	l@	Sme~
	2	2	1		1	1

• Field 2 provides information on the location, within the lexical word, of the syllable under consideration: '1' for the first syllable, '2' for an internal syllable, '3' for the last one. Further information is given through '0', which indicates the presence of an unexpected final schwa (*bonjour-e*, *minis-tre*). In order to distinguish final schwas (a sociolinguistic marker¹ common in certain varieties of northern French) from hesitation markers (see also field 5), we chose to appeal to vowel length (a final schwa <200ms, [2]).²

Field 2

#	Sko	nE	pa	2	l@	Sme~
	1	3	1		1	1

• Field 3 indicates the perception of a prominence in the following way: '0': not perceived, '1': perceived, '2': not perceived and following a vowel elision (*r(e)prendre*, *m(i)nistre*), '3' perceived in the same context. Codes '2' and '3' will help determine whether the deletion/absence of a segment reinforces (probably through a heavy syllable onset) the pronunciation of the following vowel.

Field 3

#	Sko	nE	pa	2	l@	Sme~
	2	0	1		0	2

• Field 4 gives information about syllabic length: '0' for a short syllable, '1' for a long syllable. We adopt a classical approach to syllabic length, considered as relative and measured in comparison with the neighbouring syllables: every syllable at least 50% longer than the preceding one is marked as a long syllable.

Field 4

#	Sko	nE	pa	2	l@	Sme~
	0	0	0		0	0

• Field 5 codes pauses, and 3 prototypical configurations can be found :

- a short silence (≤ 300 ms) or long (>300 ms)
- a hesitation marked by 'euh'
- a syllabic repetition (*c'est in/incroyable*)

The different codes are as follows:

- '0': the syllable (whatever its distribution in the word) is followed by a syllable different from 'euh'
- '1' the syllable is followed by a short silence
- '2' the syllable is followed by a long silence
- '3' the final syllable of a word is followed by 'euh'
- '4' the initial syllable of a group is preceded by 'euh'³
- '5' The syllable is repeated ('4' is marked on the first syllable)

¹ A better understanding of this marker calls for psycho-acoustic information provided by the advanced coding.

² For clarity reasons, the tableaux exemplify the fields under consideration. For a global view, see the last tableau.

³ The hesitation marker 'euh' can indicate the beginning of a conversation turn or follow a long pause ('euh' *c'est difficile à dire*).

Field 5

#	Sko	nE	pa	2	l@	Sme~
	2	0	3		0	0

• Assuming that a word initial position is a strong position, we can hypothesise that we will observe different degrees of strength according to the location of the syllable within a sequence (initial in a new turn⁴, initial or internal of a prosodic group). The purpose of our last field is to provide the relevant data:

- '0' : the syllable is neither at the beginning of a new turn, nor at the beginning of a prosodic group (it does not follow a long pause)

- '1' the syllable follows a long silence

- '2' the syllable corresponds to a new turn.

Field 6

#	Sko	nE	pa	2	l@	Sme~
	1	0	0		0	0

The final coding of our example will be:

#	Sko212001	nE230000	pa111030	2	l@110000	Sme~112000

Our work in progress includes coding 5 speakers recorded in a small community in Normandy (Brécéy): 3 men (age 80, 50, 20) and 2 women (age 60 and 40). A number of passages of the text have been selected and coded for all speakers. In addition, we code one minute of each conversation (already coded for schwa and liaison) per speaker. The results will be presented and commented at the conference.

5. Schwa/liaison and prosody

PRAAT allows the multiplication of tiers and each coding is proposed on a separate tier: schwa-coding, liaison-coding and prosodic coding. As an example of the putative influence of prosody on schwa, we will consider initial syllables, a strong position site. On the schwa-coding tier, we search all word initial syllables with a schwa realised or not, and calculate the percentage of realisations vs. absences. The interpretation of the results requires the exploration of a number of factors, factors which will have been coded within different fields. This leads to two types of requests: simple requests (work on one field) and cross requests (where two fields or more are simultaneously explored).

5.1. Simple requests

The span of simple requests is limited one lexical item, and simple requests do not take into account the distribution of a word in a sequence.

• Field 1 will be questioned to obtain information regarding the link between the length of a word and schwa's realisation. This simple questioning will allow us to test whether an initial schwa is more likely to be absent in longer words. Note that such a request does not provide information on the phonetic environment, which, for the time being, will have to be examined manually.

• Field 2 will allow us to confirm different strategies of realisations according to the distribution of schwa within the word

⁴ We refer here to the concept of turn-taking commonly used in conversation analysis where speakers are seen as alternating on the conversation floor.

(initial, median, final), regarding the median position as an unstable one.

- Field 3 indicates whether or not a syllable is perceived as prominent. If an initial syllable is always a strong position, we would expect an indication or prominence both when schwa is realised and when it is absent. If furthermore it is true that complex onsets attract stress, a syllable surfacing as initial because of schwa deletion should be systematically perceived as prominent (ex. *Il va r'travailler, he's going to work again*).

5.2. Cross requests

Cross requests refine the lexical information provided by simple requests, but in addition, they represent a first step in studying the behaviour of schwa in a discourse.

- Fields 3, 5 & 6 taken together specify the nature of the initial position viewed as a strong position (see above). Does the initial position vary prosodically according to the distribution of a word in a sequence : initial in a turn, median but initial of a prosodic group (following a pause longer than 300 ms), median of a prosodic group? In other words, the degree of strength of the initial syllable of a word fluctuates depending on its position. For instance, we predict that the same syllable will be more marked (schwa is pronounced and prominent (field 3)) when it is initial in a turn (field 6) than when it is in a median position (field 5).

- Questioning fields 2, 3 & 4, provides data about the distribution of long syllables, and allows us to test the hypothesis that in French, lengthening is associated to a prominence (fields 3 and 4) which might affect initial syllables as well (field 2 and 4, ex. *C'est remarquable*).

6. Conclusion

The PFC project adopted a policy of coding aiming at facilitating the access to data gathered in the database. Coding segmental phenomena such as schwa and liaison constituted a relatively simple task since the system devised could rest on a consensus within the linguistic community. Coding prosody on the other hand, proves to be a complex endeavour mostly due to the intricateness of the objects under scrutiny and to the divergent current theoretical models. We propose nevertheless a system aimed at providing data pertaining to the relationship between segmental phenomena such as schwa and liaison, and prosody. Coding prosody is no doubt a time consuming enterprise, this step must however be taken if phonologists are to base their analyses on reliable data going beyond the normative descriptions to be found in the literature. The approach we proposed here will be supplemented by crossing the different tiers. We saw that the conversation extracts selected for coding prosody have already been coded for schwa and liaison. Future work includes crossing the different types of information provided by each coding system which will lead to a refinement of our results.

7. Acknowledgements

The authors would like to thank all the members of the PFC's prosody group, and in particular Geneviève Caelen-Haumont, François Poiré, Anne-Catherine Simon, who through their own work and stimulating discussions, contributed largely to the content of this paper.

The authors are particularly grateful to Atanas Tchobanov and Richard Walter, Modyco, Université de Paris X, who wrote all the programs allowing the different requests.

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