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Chapter 4

Rhythm Types and the Speech of Working-Class Youth in a Banlieue of Paris: The Role of Vowel Elision and Devoicing

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1. Introduction

1.1 From teenage talk to "French of the suburbs"

Adolescents in multi-ethnic working-class suburbs (henceforth, *banlieues)* of Paris have been repeatedly portrayed as the "movers and shakers" of language change in French. The recurrent theme of "French being in the process of giving birth to a new language" (Gadet 2003: 85), however, raises many issues that are seldom examined. One such issue is the notion of novelty.

Verlan,[1] the most salient example of adolescent language use in France and, reportedly, a hallmark of innovation by the multi-ethnic working-class youth, goes back several centuries in the history of French as a type of word-formation process based on the inversion of syllables and segments within the word (Antoine 1998). Voltaire (1694–1778), the famous 18th-century French writer and philosopher, resorted to this process to form his pseudonym from the place name *Airvault*, the closest city to the village of Saint-Loup-sur-le-Thouet in the Poitou region where his grandfather was born (Merle 2000). Hiding the writer's humble origins[2], the "verlanized" pseudonym seems to have defined the symbolic boundaries of an individual social self within the larger community in much the same way as *verlan* is used today by the multi-ethnic urban youth, reportedly "twisting French in every direction, modifying, splitting, and inverting its words"[3] (Goudailler 1997: 9). Thus, rather than a symbol identifying one social group at one point in time, *verlan* is probably better understood as a way of indexing in the lexicon one's adherence to, or denial of, certain group values at a given time in the history of the language.

The "recycling" of old linguistic material in teenage talk is not unique to French. Stenström et al. (2002: 158–159) analyze the use of *well* as an adjective modifier (e.g., *well bored, well hard)* in the speech of London teenagers as

a feature that goes "all the way back to *Beowulf* and the eighth century [but] in dormant existence until the late 20th century when it was taken up again and revived in the London teenage talk." Known as *exaptation* in historical linguistics, the recombination of former linguistic processes was attested in tense marking in Old-High German (Lass 1990) and in rhythm in English poetry (Haverkort and De Roder 2003). Thus, when measured on an extended time-scale, new is not always as novel as it might appear. Why is it, then, that despite the age-old processes it employs, adolescent language use in the French *banlieues* is consistently perceived as innovative?

One answer could be age. Newly (re)discovered structural features of the language in teenage talk have been argued to serve the purpose of stylistic distinctions in social interactions within and between adolescent peer groups. Of all periods of life, the adolescent years[4] in Western cultures are a time of self-invention, during which "young people continue a process, begun in late childhood, of equipping themselves to be full members of society" (Brown and Larson 2002: 6). Children begin to experiment with variable speech patterns for their own needs of self-expression long before puberty. Through gradual adjustments in their ways of conveying social-indexical meaning through language in the broader community, children begin to probe the limits of their participation in local social categories during the adolescent years. Adolescence is a coming of age of full sociolinguistic competence (Eckert and Rickford 2001), characterized by an intense quest for self-expression through the discovery of new, and the rediscovery of old, styles in language, dress (Eckert 2000), adornment (Mendoza-Denton 1999), and music (Epstein 1995). Invented and reinvented by each generation, these means of self-expression can signal distinctive social practices within the broader community, referred to as youth culture.[5] Thus, rather than novelty, distinctiveness in interactions is what seems to underlie perceptions of innovative language use in adolescence; it seems that something new is only as novel as it can be distinctive in everyday local practice.[6] And yet, the distinctiveness of age-related linguistic behavior does not explain why teenagers in the French *banlieues* are perceived as altering the structure of French as we know it today.[7]

Patterns of variation foreshadowing future change (in apparent time), rather than variation related to a specific period in life (age-grading), have been concurrent interpretations in many longitudinal studies of variable speech phenomena, with age-grading almost invariably turning out to be the best interpretation. "Teenagers use slang items that they will not use when they become adults," Preston (2004: 152) argues, and youth language "is not necessarily the way in which "the youth" will speak when they will reach their forties,"[8] according to Carton (2000: 25–26). While panel studies of

generational change indicate that the speech of older speakers, often times individuals with unique personal histories, can show important changes over time as these speakers become late adopters of the innovative variant in the community (Sankoff and Blondeau 2007), such lifespan changes seem to be "the exception rather than the rule" (Sankoff 2004: 136).

How is it, then, that locally distinctive linguistic patterns of teenage talk in the Parisian *banlieues* are unanimously considered as signs of on-going language change in the broader speech community?

Reasons could be related to contact. Sankoff's (2004) review of well-known longitudinal studies reveals that virtually all observations of long-term stability of phonemic patterns over the life course of individuals had been made in some of the wealthiest Western societies. Social-demographic conditions in these nation-states can be rightly considered "remarkably stable", as Sankoff (2004: 136) observes with respect to Brink and Lund's studies of phonetic variation in Copenhagen. Often conducted over a relatively short time period, speech communities in countries such as Denmark, Switzerland, the UK,[9] and even the United States in the nineteen sixties and seventies,[10] were not subject to "catastrophic" societal changes such as massive population movements or conquests and subsequent long-term colonization. Language varieties spoken by "speakers who are fairly well-settled" or by speakers living in more or less "insular societies" (Chambers 2003: 108) not exposed to intense contact with other populations are considered "stationary" dialects by historical linguists (Hock 1991). In such communities, characterized by relatively little mobility and primary reliance on natural birth rate for population growth, age-grading could appear more salient than slow incremental changes observed over a relatively short time period. But what happens in communities known to have been affected by large-scale social-demographic changes? How are we to build into models of language variation and change the effect of sudden massive alterations of local dynamics of language use and related patterns of first language acquisition?

Working-class suburbs of Paris have been targeted by several large waves of immigration throughout the 20th century. The relatively late and rapid industrialization of France, combined with massive immigration of low-skilled foreign labor, altered social structures and modes of production in a country that was still predominantly rural after World War II. During the three prosperous decades (*les Trente Glorieuses*) following the war, for the first time in the history of the country, large populations from outside Europe settled in the peripheral urban working-class neighborhoods, traditionally home to newcomers integrating into French society at the bottom of the social hierarchy. These immigrants came predominantly from rural

areas of Portugal and North Africa. As opposed to the Portuguese who were the most numerous but who spoke a Romance language, North Africans, the second most numerous group, had the disadvantage of what Chambers (2003: 97) calls "the language gap": although they came from former French colonies, being mostly illiterate, they did not speak French. Their native Semitic languages, typically dialects of spoken Arabic and Berber, were typologically different from Indo-European languages with which Metropolitan varieties of French had been previously in contact[11] (see Lodge 2004). A final factor singling out North Africans as "focal points [with] disparate bonds to the social mainstream" is "the integration gap" (Chambers 2003: 102–103), i.e., "the immigrants' attitudes toward the national language" and various cultural attributes that define membership in the host society. This factor could be of particular importance in a country like France where full-fledged membership in society is tied to the endorsement of specific cultural values in the public sphere. As Posner (1997: 48) reminds us, "Frenchness is not a question of genetics but of cultural allegiance." France is known to have rejected throughout its history regional and ethnic communities and local languages (*patois*) that could have represented viable alternatives to its political and linguistic unity. Despite the successful assimilation of immigrant groups in the past (see Noiriel 1988), the "anxiety of national fragmentation" (Mathy 2000: 142) in the face of multiculturalism is real, going back at least to the French Revolution. Thus, demonstrating one's allegiance to the rules of "appropriate cultural behavior" in public, among them standard language use or the lack of display of religious symbols,[12] is expected of all newcomers wishing to integrate into French society.[13]

At the local level, the newcomers have the burden of embedding themselves into tightly knit networks "based on sentiment, trust, and sharing of lifestyles" (Lin 2001: 66), and favoring the maintenance and reinforcement of existing resources, among them local vernaculars (Milroy 1980). The populations at the receiving end have to expect to loosen up some of these strong ties, and learn to communicate, live, and compete for resources with the newly arrived. The influx of a large number of immigrants showing significant linguistic homogeneity and receiving institutional help to integrate into French society could, in principle, favor the borrowing and blending of indigenous and incoming linguistic features in neighborhoods where these populations settled down. If, on the other hand, the newcomers were kept in relative isolation from mainstream society with other immigrants and/or locals because of numerous "gaps" hindering their immediate integration, then Chambers' (2003: 105–107) "inverse assimilation" hypothesis would apply: "certain variants in the native speech of (otherwise) assimilated second-generation

speakers" diffused beyond the incoming ethnic group and became a marker of region or neighborhood. Confirming this interpretation is the fact that the variety of French spoken by descendents of North African immigrants is commonly referred to by the type of neighborhood in which these populations reside: *le français des banlieues* (*banlieue* French).

1.2 The talk of the suburbs

Cités 'housing projects' and *banlieues* 'suburbs' are some of the bywords that proverbially represent "socially disadvantaged peripheral areas of French cities containing relatively dense concentrations of minority ethnic groups" (Hargreaves and McKinney 1997: 12). Three decades after the end of the last waves of immigration from outside Europe, these areas of the French capital found themselves at the bottom of the social spectrum. According to the 1990 census data, residents of the department of Seine Saint-Denis, northeast of Paris, had the lowest annual income of all departments (Soulignac 1993). The global impoverishment of the population further deteriorated a decade later, with residents earning six to fifteen times less than those in the wealthiest areas southwest of the capital (ORGECO 2001). Social separatism, a term that French sociologists have long preferred over ghettoization,[14] has become apparent in urban areas where "disadvantaged neighborhoods [. . .] are considered, and rightly so, enclaves of foreign populations of recent immigrant origin,"[15] according to Maurin (2004). These signs point to a highly polarized outcome of contact between the locals and the newly settled immigrants. Polarized settlement patterns, with "the rich and the educated on the one side, and the poor immigrant on the other forming the two extreme poles of territorial segregation"[16] (Maurin 2004: 17) are known to have had lasting consequences on language use and the formation of new dialect varieties in many other contexts around the world (see e.g., Mufwene 2001).

But does the speech of second generation speakers from North Africa carry traces of heritage language[17] use strong enough to spread beyond working-class neighborhoods, as folk reports of on-going language change seem to predict?

1.3 Linguistic features

The emergence of specific lexical and phonetic features in the Parisian *banlieues* is frequently evoked. Christian Bachmann, the first ethnographer to

conduct participant observation in some of the poorest housing projects of the town of *La Courneuve*, perceived a whole-scale restructuring of spoken French of the "youth of the *cités*": "the whole linguistic system is affected: intonation, lexicon, and even syntax, which is the most difficult to imitate,"[18] he insisted already in the 1980s. Evoking social isolation of peer groups, Bachmann suggested that male speakers using *verlan* (*keum* inverted from *mecs* 'guys') could be the loci of innovation and transmission of this massive change. Linguists upheld some of these claims but rejected others. Gadet (1998: 22), for instance, considers lexical and prosodic features the most innovative in the "new version of working-class French", but rejects hypotheses of a whole-scale restructuring of the vernacular. Duez and Casanova (2000: 69) note rhythmic irregularities, and a "specific use of the rhythmic properties of French", but they insist that these represent a recognizable part of the "French substrate" and therefore cannot be considered innovations. Recently, Cerquiglini (2001: 62) proposed that the perception of an uneven speech rhythm and the predominantly consonantal character of what he called the *talk of the cités* could come from the nativization of certain phonological features borrowed from French spoken by descendants of immigrants from North Africa, called *Beurs*:[19]

> "Certain vowels tend to fall. Consonants, on the other hand, particularly among Arabs in the *banlieues*, become more explosive. This is a type of pronunciation that rap musicians [. . .] have picked up. For instance, instead of *partir*, one says *p'r't'r*: the vowels disappear almost completely. And the consonants explode, like in *Rrrspect*! (*Respect*). This is the *Beur* way of speaking. French is perfectly well integrating this new influence, just as it had integrated Italian, English, and came out with even more vitality as a result."[20]

While rap musicians' use of certain pronunciation features might point to salient stereotypes (Fagyal 2007), the idea that local features of working-class Parisian French show traces of contact with immigrant languages from North Africa is noteworthy. The description of phonetic phenomena is especially revealing: "instead of *partir* one would say *p'rt'r*: vowels disappear almost entirely" seems to point to extreme vowel reduction, perhaps even elision of full (non-schwa) vowels, not yet reported in European varieties of French. One would, consequently, expect consonants to play a more predominant role, which is confirmed in the next phrase: "and consonants explode, such as in *Rrrspect!*" Knowing that the lack of vowel reduction and the tendency to equalize the duration of unaccented syllables (*l'égalité syllabique* 'isosyllabicity') has been reported for all varieties of French spoken in Europe (see

e.g., Valdman 1993), one could hypothesize that contact with Semitic languages of north-west Africa, languages with a strong tendency towards vowel reduction, could alter some of these well-known characteristics of French. The goal of this paper is to measure these effects empirically.

1.4 Empirical measurements of speech rhythm

Empirical studies of speech rhythm have a tumultuous history marked by attempts at finding the best acoustic phonetic measures, allowing the classification of languages in distinct rhythm types. The most recent approaches to rhythmic typology have focused on perception. Psycholinguists observed that young infants could discriminate between their mother tongue and another language before even developing the ability to segment speech. Infants' discrimination patterns closely matched dichotomous distinctions proposed earlier between so-called syllable-timed and stressed-timed languages. The former were characterized by syllables that "tend to come at more-or-less evenly recurring intervals so that, as a result, phrases with extra-syllables take proportionately more time" (Pike 1945: 35), while the latter were thought to display uniform spacing of metrically strong, accented syllables. Mora-timing, with Japanese as the most well-known representative of this third rhythm class, was later added to this dichotomy.

Approaching the issue from its perceptual underpinnings, recent psycholinguistic experiments have shown that infants can successfully discriminate between a stress-timed and a mora-timed language, e.g., English and Japanese, but are less able to discriminate between two stressed-timed languages, such as English and Dutch (Mehler et al. 1996, Nazzi, Bertoncini, and Mehler 1998). Taking these studies as their input, Ramus, Nespor, and Mehler (1999) (henceforth, RNM) hypothesized that infants' perception of rhythm types is centered on the alternation of vocalic intervals of variable length with "noisy" portions of the speech signal. However, rather than computing a raw measure of sonority derived from spectral information, RNM resorted to identifying and then collapsing into longer stretches of vocalic and consonantal intervals discrete phonological units, i.e., vowels and consonants.[21] They claimed that "a simple segmentation of speech into consonants and vowels" is all that is needed to arrive at language-specific auditory patterns reminiscent of the syllable- vs. stress-timed distinction that forms the basis of infants' successful discrimination between various languages. Rhythm types were conceived as a continuum. It was hypothesized that languages with predominantly simple CV-type syllable structure, absence of vowel reduction, and relatively little

variation in vowel durations produce a speech signal that contains more vocalic than consonantal material. This would translate in an overall higher ratio of vocalic intervals per utterance. Such languages were expected to pattern separately from languages with complex syllable structure and a strong tendency towards vowel reduction.

The measure capturing the ratio of vocalic portions in the signal was %V, the sum of vocalic interval durations divided by the total duration of utterances. ΔC, the standard deviation of consonantal intervals, indicated a greater variety of syllable types in a language (i.e., light and heavy onsets and codas), resulting in greater variation of consonantal interval durations. These measures allowed RNM to distinguish between the clearest cases of rhythm type. English and Dutch patterned together with Polish, all three having complex codas and onsets, which resulted in the expected high ΔC but low %V values. Italian, Spanish, Catalan, and French, although showing variable tendencies within the group, exhibited the opposite tendency. Japanese patterned separately from both types, showing low ΔC and high %V values, pointing to simple onset and coda structures, as well as the absence of diphthongization.

The third dispersion measure, the standard deviation of vocalic interval durations, or ΔV, was expected to be low in European varieties of French with no diphthongization and/or vowel reduction. ΔV was expected to be high, on the other hand, in languages like Dutch or English that showed a wide dispersion of vocalic interval durations, indicating the presence of short, reduced vowels as well as long diphthong-like segments. This measure, however, proved to be less successful than %V and ΔC in differentiating between rhythm types, which led RNM to conclude that "the ΔV scale seems less related to rhythm classes," although it "still reflects phonological properties of the language" (RNM 1999: 275). Based on utterances elicited in tightly controlled conditions, RNM's findings empirically confirmed the existence of rhythm types and clusters of languages patterning along a continuum of main phonotactic characteristics.

There seemed to be only one caveat: %V, ΔC, and ΔV are continuous measures of phonotactic differences between languages. In less tightly controlled corpora, standard deviation was argued to be sensitive to "spurious variability introduced by changes in speaking rate" (Grabe and Low 2002: 521). A formula by Grabe et al. (1999), used in many subsequent studies, proposed to normalize vocalic and intervocalic interval durations in order to minimize the impact of speech rate.[22] As we shall see, however, neutralizing rate-induced variation could result in the loss of socially meaningful variation.

2. Method

2.1 Questions and hypotheses

Recordings from five French speakers of European origin (henceforth, EF speakers) and five French speakers of North-African origin (henceforth, AF speakers), born in the same community, were examined. It was hypothesized that the speech of AF speakers would show influence from their heritage languages, and thus characteristics of stress-timed languages. EF speakers were expected to pattern with syllable-timed languages, thus separately from both AF speakers and stress-timed languages. If rhythmic patterns of heritage languages from North Africa were the main factor influencing AF speakers' rhythm type in French, then the patterning of the ten speakers in two distinct groups should not be obscured by individual speaker differences.

Vernacular Arabic spoken in Western parts of North Africa, the dialect area of origin of AF speakers in the corpus, has been classified as stress-timed. These dialects exhibit "short vowel deletion in open syllables, resulting in various consonant clusters and types of syllables with complex onsets and codas" (Ghazali et al. 2002: 332, Miller 1984). Stress is lexically distinctive, heavy syllables tend to attract it (weight-sensitivity), and syllables are parsed into trochaic feet with the metrically strong syllable on the left. Dialects of Berber, in contact with Arabic in North Africa, could also be a factor in comparisons of rhythm type, because of their well-known characteristics of licensing long voiceless obstruents in both onset and coda positions. In some dialects, entire words can be composed of voiceless segments (Dell and Elmedlaoui 1985, Ridouane 2003). Northern varieties of French, on the other hand, show widely different characteristics. They are considered syllable-timed, marking accentual prominence at the phrase level, and showing no weight-sensitivity with a tendency to parse predominantly light (CV) syllables into iambic feet, i.e., with the metrically strong syllable on the right.

Thus, if AF speakers' speech shows heritage language influence, it can also be expected to show signs of vowel deletion and/or reduction, which might lead to a preference for heavy and closed, rather than light and open, syllables. Substantial vowel reduction, if present, should be manifest in low %V values, indicating that AF speakers' readings are more "consonantal." The alternation of full and reduced vocalic intervals is expected to be manifest in high ΔV values, and similar degrees of alternation between the duration of consonantal intervals should also yield higher ΔC values. AF speakers' speech samples might also show evidence of transfer of other phonological constraints from Arabic. Specifically, they can show the presence of vowel

epenthesis breaking up consonant clusters, as well as the insertion of glottal stops. Vowel epenthesis could parallel findings from second-language acquisition, such as Youssef and Mazurkewich's 1998 study of Cairene Arabic L2 learners of English, whose readings showed traces of epenthetic vowels, analyzed as "phonological transfer" from Arabic. Shortening and/or deletion of vowels in stressed or unstressed positions in the word would confirm previous reports of "high frequency of consonants" and "staccato rhythm" in the speech of multi-ethnic working-class youth by Duez and Casanova (2000) and Cerquiglini (2001) (see previous discussion).

2.2 Speakers and community

Recordings were made during fieldwork, which was carried out in educational settings (tutoring) in a *collège* 'middle/junior high school' in *La Courneuve*, a working-class suburb near Paris, between 2000 and 2002. Speakers are represented in Table 4.1 by their pseudonyms chosen randomly by the researcher from the fifty most frequent Arabic and European French first names. These ethnically easily identifiable names bear no resemblance to speakers' real names, places of residence, or exact geographic origins. They merely provide shortcuts to speakers' reported language use: 'AF' for Arabic/Berber[23] and French, 'EF' for French only.

Speakers were between eleven and fifteen years of age. The youngest speakers were sixth graders, the oldest third graders.[24] On average, AF speakers were a year older (4th grade) than EF speakers (5th grade). Students' standing in school was based on their *moyenne générale*, obtained from school officials at the end of the semester when the recordings took place. Sixth graders' *moyenne générale* was based on their first semester-final grades.

AF speakers were heritage speakers of a Semitic language from North Africa, to which they unanimously referred as Arabic. Four speakers' parents came from Algeria, and one speaker did not wish to communicate information about his parents' country of origin. The speakers were at least passive bilinguals,[25] i.e., they understood their heritage language but did not necessarily speak it natively. EF speakers reported that their family members have been monolingual speakers of French for more than three generations. All speakers were born in the immediate vicinity of *La Courneuve*, a town of about thirty-five thousand people and one of the poorest peripheral areas of the French capital. About 23% of the town's population is younger than 14-years-old, and almost as many are children of recent immigrants.[26] Between 30 to 38% of the

Table 4.1 Demography of Speakers of North African (AF) and European (EF) Descent

Speaker (code name)	Grade in school	Age	*Moyenne générale**	Parents' birth country
AF				
Khatib	4	13	8.30	Algeria
Laith	5	12	9.20	
Mousa	5	13	9.93	
Yasin	3	14	15.90	
Ramey	4	13	8.90	*NA*
mean	*4.2*	*13.0*	*10.45*	
EF				
Alain	6	11	13.73+	France
Chris	6	11	10.77+	
Jacob	6	11	10.86+	
Octave	4	13	12.96	
Karl	4	13	8.66	
mean	*5.2*	*11.8*	*11.4*	

*(*Moyenne générale* is based on average grade in school from the preceding year or, for the 6th graders (+), on the first semester in middle school +).

active population are regularly out of work, 59% of them for a year or longer. The town is known for its housing projects, among them *La Cité des Quatre-Mille,* infamous for riots that shook France for the first time in the 1980s. Its residents are routinely depicted in the French and foreign media as involved in drug dealings, clashes with the police, collective rape, and even Islamic Jihad.[27] Several speakers from both ethnic groups in the corpus live in one of the many housing projects in town.

2.3 Task, corpus, and measurements

The short paragraph in Appendix A was submitted to each of the speakers at the end of a picture-naming task. The speakers were recorded individually and instructed to read the text in a natural fashion. They could study the text prior to reading it in order to minimize hesitations and false starts that would have made it impossible to obtain continuous speech data.

Since speakers in this study were recorded reading the same text in the same language and in the same dialect area, RNM's central and dispersion measures were used to examine individual and group rhythm type characteristics. These measures were used to relate acoustic properties of the speech signal to phonotactic constraints observed in the speakers' speech.

Although RNM implicitly resorted to a joint phonemic and acoustic segmentation of the speech signal into "vocalic" and "consonantal" portions, they qualified the segmentation process "straightforward with the exception of glides" (p. 271). But many phonetic phenomena, among them vowel devoicing, challenge this assumption. Should a devoiced high vowel uttered with a friction-like noise be considered vocalic based on phonemic analysis or consonantal because of its acoustic characteristics? Furthermore, segmentation issues related to allophones of /r/ that surface as approximants in various languages are also omitted. The most frequent approximants, /j/ and /w/, are singled out, but the steps taken to segment these continuous articulations into discrete units are not explained. RNM specify, for instance, that prevocalic glides are segmented as consonants and post-vocalic glides are treated as vowels, but they provide no indications as to how the acoustic boundaries of these segments were determined. Delimiting approximants in intervocalic positions can be a dubious process, as formant movements and voicing are continuous, and therefore often leave no discontinuities that can be taken as boundary cues on the spectrogram.

In the present study, devoiced vowels were considered consonantal when voicing was undetectable through most of the duration of the vowel. Boundaries of glides were determined by joint acoustic and auditory evaluation. The palatal front glide /j/ was considered consonantal whenever its presence was indicated by a clear formant and/or amplitude change in the speech signal. The front and back glides /ɥ/ and /w/ were considered vocalic, and included with the following vowel. Pauses and marks of hesitation were excluded.

Although the %V, ΔC, and ΔV indices were intended by RNM to be relative measures, values calculated for each individual utterance or phrase were averaged out to yield one measure per speaker in most earlier studies.[28] Since average values are highly sensitive to major deviations from central tendencies in a distribution, phrase length could become an issue when calculating these indices. This is especially problematic when length is not measured in number of syllables, but in absolute duration of a phrase or an utterance. RNM controlled for the average duration (about three seconds) of the isolated utterances in their corpus by selecting utterances of roughly comparable length. However, such a control is impossible in fieldwork data with speakers freely selecting their articulatory rates. The present study follows Grabe and Low's (2002: 525) in taking as few "subjective and intuitive decisions as possible when taking measurements." However, since %V, ΔC, and ΔV indices were calculated on utterances or prosodic phrases in previous studies, the present study aimed at replicating calculations of these indices on prosodic domains of similar length. Individual intonation phrases delimited by silent pauses and major pitch movements in the text systematically overlapped with syntactic clauses and short utterances, representing the closest possible approximation to units over which rhythm type indices were calculated in RNM's (1999) and Ghazali et al.'s (2002: 332) studies. Whenever disfluencies occurred, phrases shorter than five syllables were collapsed with the shortest surrounding phrase. The length of phrases obtained in this way ranged from 13 to 17 segments.

3. Results

3.1. %V, ΔV, ΔC indices

Table 4.2 shows the total durations, the total number of intonation phrases, vocalic and consonantal intervals, the mean articulatory rates and lengths of phrases with standard deviations for each speaker. The total number of measurements varied across speakers.[29] The difference between the highest and lowest numbers of vocalic intervals was comparable to inter-speaker differences in RNM's 1999 study. Inter-speaker differences in the number of consonantal interval measurements, however, were more than three times higher than in their study. Possible reasons for this will be discussed later in the study.

Articulatory rates varied between 10 and 13 segments per second for most speakers. Since previous studies, including RNM's, gave no information about individual speakers' articulatory rates, it is difficult to compare the extent of these differences to previous observations. On average, speakers in the AF group were one year older, articulated two segments per second faster, and completed the reading task in average four seconds faster than speakers in the EF group.[30] Laith, an AF speaker, had the longest intonation phrases and Jacob, an EF speaker, had the shortest intonation phrases in the sample.

Average %V and ΔC values for AF and EF speakers together with average values of various languages representing main rhythm types in RNM's study are represented in Figure 4.1. Since standard error values were not published by these authors, they could not be represented on the figure.[31] AF and EF speakers patterned closer to syllable-timed languages, such as Italian, Spanish, French,

Table 4.2 Total Durations, Total Number of Intonation Phrases, Vocalic Intervals, Consonantal Intervals, Mean Articulatory Rates, Length of Phrases, and Their Standard Deviations for Speakers of North African (AF) and European Descent (EF)

	Total duration (sec)	N of intonation phrases*	N of vocalic intervals	N of consonantal intervals	Articulatory rate (interval/sec)		Average length of intonation phrases (N intervals/phrase)	
					Mean	Std	Mean	Std
AF								
Khatib	27.66	20	136	183	11.53	2.05	16	6
Laith	24.30	17	139	159	12.91	1.86	18	7
Mousa	26.69	23	136	134	10.45	1.35	12	5
Yasin	17.87	15	144	109	14.25	2.33	17	8
Ramey	23.98	17	133	139	11.08	1.77	16	7
mean	*24.10*	*18.40*	*137.60*	*144.80*	*12.04*	*1.87*	*15.80*	*6.60*
EF								
Alain	29.44	18	133	137	9.71	2.00	18	8
Chris	27.92	22	140	140	10.17	1.44	13	5
Jacob	30.64	31	149	151	10.02	1.88	10	5
Octave	25.81	20	144	144	11.24	1.36	14	5
Karl	26.71	24	137	134	10.24	1.39	12	6
mean	*28.45*	*22.75*	*141.50*	*143.00*	*10.29*	*1.67*	*13.75*	*5.75*

*Phrases with less than five segments were collapsed with the preceding phrase.

and Catalan than to stress-timed languages, exemplified by English, Dutch, and Polish, with the latter representing a different rhythm type.

The speakers' readings appeared to be more vocalic (higher %V values) but roughly as consonantal (similar ΔC values) as some of the Romance languages are in RNM's study. Having uttered more vocalic sequences, and uttered them more slowly then AF speakers, the EF group had higher average %V than the EF group. There were no differences in terms of ΔC values.

As for average ΔC and ΔV values, Figure 4.2 reveals that AF and EF speakers patterned closer to each other and the Romance language group than to any of the stress-timed languages or Japanese. EF speakers exhibited slightly more vocalic duration variations (ΔV). As in RNM's study, within-group variations for languages and speakers in this corpus seemed more prevalent when plotted as functions of %V and ΔV. Rather than isolated subgroups, however, the main rhythm types appeared as a continuum. Figure 4.3

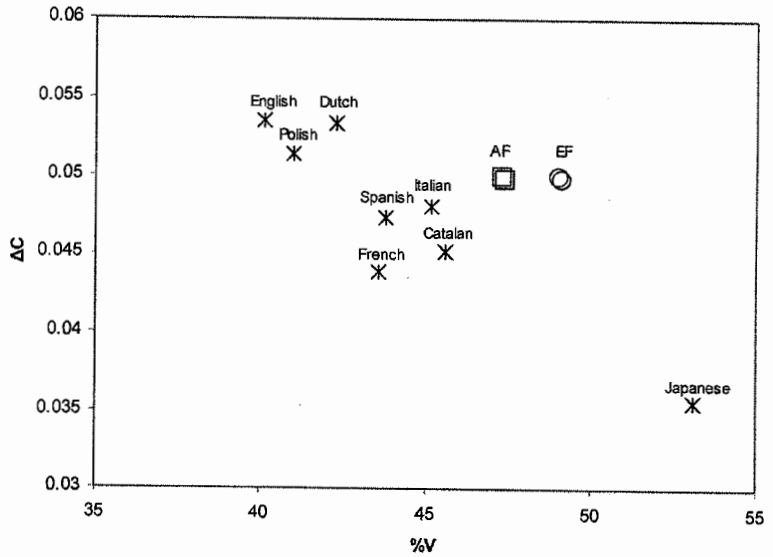

Figure 4.1 Average %V and ΔC values for French speakers of North African (AF) and European descent (EF) and languages representing main rhythm types (Ramus et al. 1999: 273).

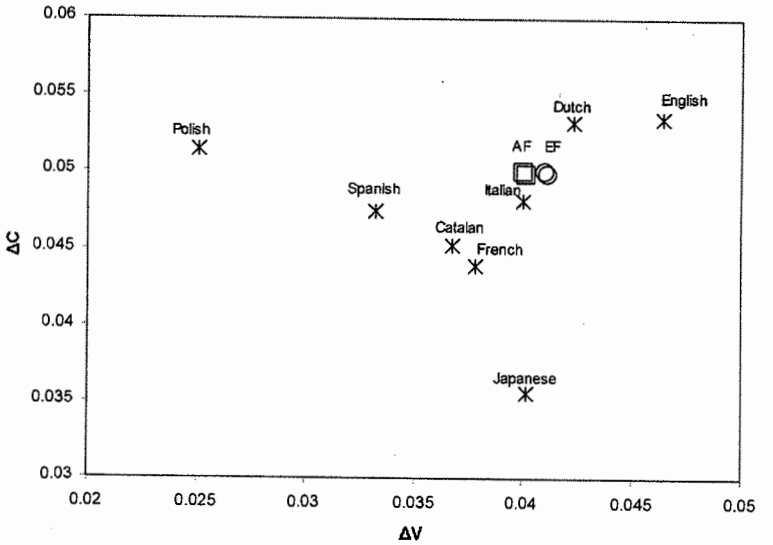

Figure 4.2 Average ΔV and ΔC values for French speakers of North African (AF) and European descent (EF) and languages representing main rhythm types (Ramus et al. 1999: 274).

indicates that AF and EF speakers patterned again with the Romance group and differed from the Germanic group that had overall higher ΔV values. The ten speakers' speech samples were more vocalic, however, than previously measured for French. The EF group again appeared more vocalic, but vocalic interval durations (ΔV) varied to the same extent in both groups.

Neither vocalic nor consonantal durations varied homogenously in this sample.[32] While a log transformation of measurements rendered the variance of consonantal duration measurements more homogenous, and therefore allowed the use of parametric statistical tests, no mathematical trick could accomplish the same for vocalic durations.[33]

The non-parametric version of one-way ANOVA, the Kruskal-Wallis test, with speaker as the grouping variable indicated significant inter-speaker differences with respect to the length of vocalic intervals (H=191.635, median=8.85, df=9, p<0.001) and consonantal intervals (H=27.299, median=9.41, df=9, p<0.001). The longest vocalic and consonantal intervals were measured in the slowest speaker, Alain's reading, followed by four other EF speakers: Chris, Jacob, Karl, and Octave. They were followed by all AF speakers who tended to have short vocalic and consonantal intervals. Yasin's reading showed the shortest vocalic and consonantal interval durations, and he was also the fastest speaker in the corpus. Notice, however, that this ranking only partially overlapped with speakers' articulatory rate: Octave from the EF group for

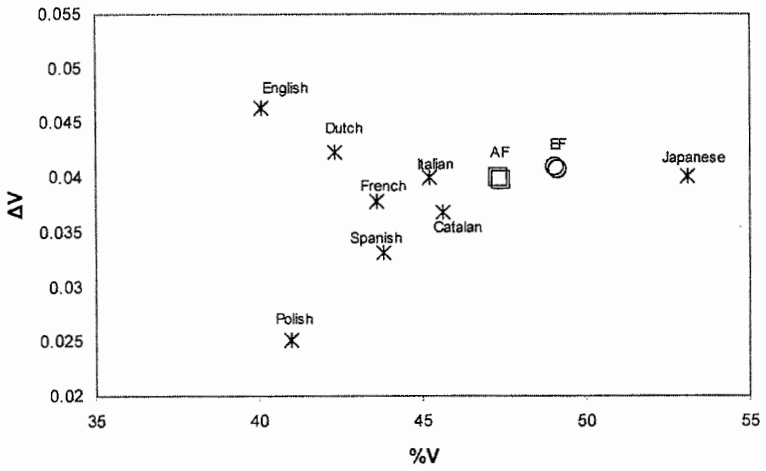

Figure 4.3 Average %V and ΔV values for French speakers of North African (AF) and European descent (EF) and languages representing main rhythm types (Ramus et al. 1999: 273).

instance read overall faster that Ramey and Mousa from the AF group (Table 4.2). The U Mann-Whitney non-parametric t-test for vocalic intervals as dependent variable and ethnicity as grouping variable also showed significant differences (U=165432.00, z = 4.249, p<0.001, two-tailed). The EF group's mean duration (778 ms) was significantly higher than the AF group's (582 ms). As for consonantal interval length, there were also significant differences between the two groups (U=210862.00, z = -3.175, p<0.001, two-tailed), with the EF group's mean consonantal durations (718 ms) significantly higher than the AF group's (650 ms).

3.2 Rhythm type and inter-speaker variation

Regression analyses were carried out to explore what information about the speakers and their speech led to their grouping in two distinct categories. In the first stepwise analysis, the dichotomous outcome variable, ethnicity, was tested against five rhythmic predictor variables: the three rhythm type indices %V, ΔV, and ΔC, speakers' articulatory rate, and the total number of segments per phrase. In a second series of analyses, two external predictor variables, age (as grade in school) and performance in school (*moyenne générale*), were added (see Table 4.1). These variables have been introduced, since speakers' degree of proficiency and/or choice of a more or less careful reading style could be expected to have an effect on the hyper- vs. hypo-articulation of vowels and consonants. Grade in school (approximate age) was expected to inversely correlate with reading proficiency and the ability to reproduce a careful reading style learned in school. Overall performance in school, based on the official score *moyenne générale* put out by the school each year, could also show positive correlation with reading style, as better students could be expected to read more carefully and thus have a lesser tendency to reduce or elide vowels. In the third stepwise regression analysis, the speaker as an additional source of variations was added to the model.

Three backward stepwise regression analyses were performed. The first was carried out with five rhythmic predictor variables, the second and third were performed with grade in school (approximate age) and *moyenne générale*, respectively, added to the model. The fourth analysis combined rhythmic predictors with grade in school and *moyenne générale*, while the fifth analysis added speaker to all the other predictor variables. The initial step in each analysis consisted in building a model with all available predictor variables included. After this initial step, several runs were carried out to test whether any of the predictors could be removed from the model without

having a substantial effect on its fit of the observed data. The predictor variable removed first was the one that had the least impact on the model, while the predictor removed next was, each time, the one without substantial contribution. The elimination criterion at each step was statistical significance, with a cut-off point of $p<0.05$. The analyses ran until the best possible fit (no more improvement) was obtained.

Among all predictors, five were significant at the initial step. These were: number of segments in the phrase, articulatory rate, grade-level in school, *moyenne générale*, and speaker. The initial fit of the observed data, however, was barely above chance: 54.3%. After three consecutive runs with several iterations each, this picture improved. Analyses performed with five rhythm type predictor variables resulted in an overall fit of 68.6% of the model, with only articulatory rate contributing significantly (cut-off $p<0.05$) to the overall improvement ($r^2 = 0.521$). The addition of grade in school as the first and only external variable produced a 67.1 % overall prediction accuracy, while the addition of *moyenne générale* alone produced a ratio of 73.1 %. The combination of the last two variables resulted in 75.9 % accuracy. The addition of speaker as an independent variable alone led to 80.1 % accuracy in predicting what speaker belonged to the EF or the AF group.

Table 4.3 shows correlation coefficients for all predictor variables.[34] Out of five rhythmic predictors, only articulatory rate and the number of segments in the phrase correlated significantly and positively with the outcome variable ethnicity.[35] These two variables also showed co-linearity: their positive relationship means that the higher was the articulatory rate, the more intervals (vocalic and consonantal) speakers tended to include in a phrase.[36] Thus, AF speakers tended to speak faster and inserted overall more segments in their phrases than EF speakers.

Although none of the rhythm type indices (%V, ΔC or ΔV) predicted significantly which speakers can be grouped in which of the two categories of ethnic origin, the inverse correlations of %V and ΔC values with ethnicity indicate that as the outcome variable increases speakers' %V and ΔC values would decrease. AF speakers, although slightly, tended to have less vocalic intervals (low %V) and less variation in the duration of consonantal intervals (low ΔC values) in their readings. They also showed slightly greater ΔV values, which is indicative of greater vocalic interval duration variations.

Speakers' grades in school (approximate ages) and *moyennes générales* were statistically significant and showed inverse correlation with ethnicity. Thus EF speakers who were slightly younger, that is enrolled in at a younger grade level, also tended to be better students than AF speakers. The individual speaker as a predictor variable brought the single most important

Table 4.3 Linear Regression Coefficients with Eight Predictor Variables and "ethnicity" (AF or EF) as Outcome Variable[37]

Pearson correlation coefficients (*p<.05, **p<.001)	ethnicity	N of segments in phrase	articulatory rate	%V	ΔV	ΔC	grade	GPA	*individual speaker*
ethnicity EF (1) AF (2)	1.000	.184*	.323**	-.053	.080	-.004	-.459**	-.234**	*.580***
N segments in phrase	.184**	1.000	.280**	-.245**	-.107	.045	-.158*	.064	*.106*
articulatory rate	.323**	.280	1.000	-.219**	-.321**	-.256**	-.278**	.164**	*.205***
%V	-.053	-.245**	-.219*	1.000	.297**	-.125*	.136*	-.284**	*-.070*
ΔV	.080	-.107	-.321**	.297**	1.000	.109	-.096	.068	*.058*
ΔC	-.004	.045	-.256**	-.125*	.109	1.000	.050	.052	*-.092*
age (as grade in school)	-.459**	-.158*	-.278**	.136**	-.096	.050	1.000	.114	*-.841***
GPA (*moyenne générale*)	-.234**	.064	.164**	-.284*	.068	.052	.114	1.000	*-.357***
individual speaker	*.580***	*.106*	*.205***	*-.070*	*.058*	*-.092*	*-.841***	*-.357***	1.000

contribution to the model (r^2=0.58). It was positively correlated with ethnicity, which means that, individually, AF speakers contributed more to the observed variations than EF speakers. The main question, however, still remained: did the three rhythm type indices account for any variation in any way at all in the sample?

Residual variations of %V, ΔV, and ΔC not accounted for by the regression model showed a normal but bimodal distribution, split in two parts respectively at +1 and -1 standard deviation from the sample mean. Since %V, ΔV, and ΔC were inversely correlated with articulatory rate (see Table 4.3), this split could be due to some extent to fast speech processes, known to induce the compression of segmental durations, and thus making AF speakers pattern differently from the more "slowly articulating" EF speakers.

The general conclusion is that ethnic origin and related heritage language use in this sample is tied to a large extent to differences in articulatory rate, splitting speakers in two well-defined groups: the group of the younger, more slowly articulating EF speakers who also tended to be better students, and the group of the somewhat (one grade) older, fast articulating AF speakers who also had overall lower average grades in school. As it turns out, these parameters proved to be meaningful within the adolescent male peer-group social order (see Discussion).

What remains of heritage language influence? One can hypothesize that AF speakers' readings were slightly more consonantal (see negative correlation with %V), because these speakers tended to elide more vowels, and therefore had more complex onsets and codas than EF speakers. Since devoiced vowels were considered consonantal, the slight amount of devoicing could have reduced the number of syllables in the AF group, and contributed to a decrease in %V and an increase in ΔV values. This hypothesis was examined next.

3.3 Beyond global measures: Syllable structure

Figure 4.4 shows the number of different types of syllables in EF and AF speakers' speech. The magnitude of differences between the categories was reduced on a logarithmic scale for easier reading. As one would expect it in French, CV syllables were the most numerous (61%) in both groups' readings. They were four times more frequent than the next most frequent type of syllable: CVC (14%). With the exception of complex codas (CVCC), found only in the syllable /jabl/ of the word *incroyable* 'incredible' in two EF speakers' readings, all other types of syllables showed virtually identical percentages:

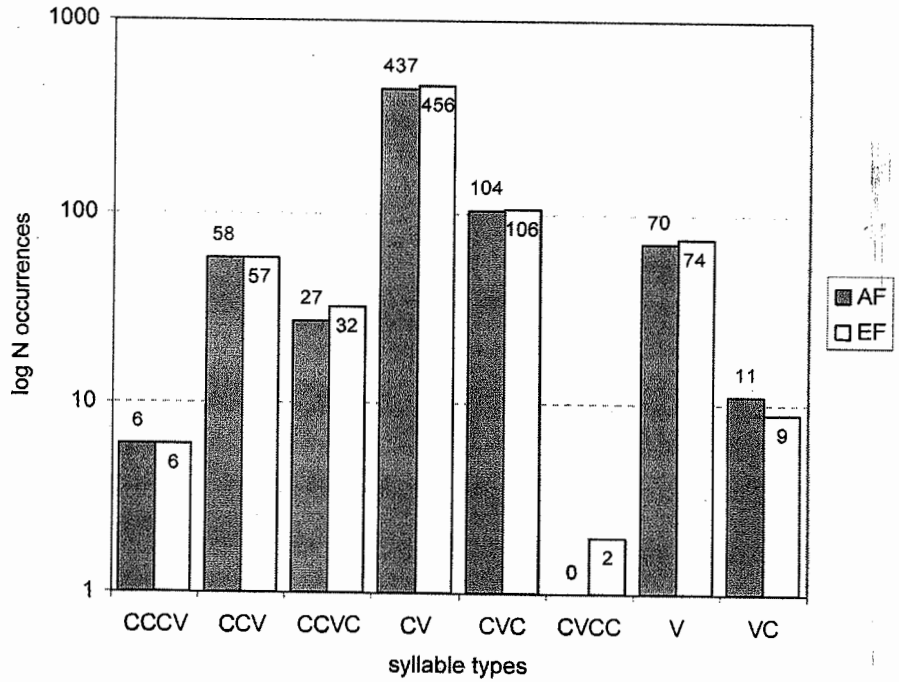

Figure 4.4 Types of syllables in the readings of French speakers of North African (AF) (N=713) and European (EF) (N=742) descent.

V (10%), CCV (8%), and CCVC (4%). This suggests that speakers in the two groups did not differ with respect to the type and complexity of the syllables that they used. If vowel elision, insertion, or reduction occurred in AF speakers' speech, it did not lead to substantial inter-group differences. Numerical differences between the two groups were, in fact, so small that inferential statistics were not computed.

And yet, near-dichotomous differences exist between the two groups at a lower level of phonetic contrast. This level of allophonic differences usually remains unexplored in studies of rhythm type distinctions, because contrasting patterns are often too scarce to be modeled statistically. But, as we shall see, even a few percent of variability at perceptually salient points in the acoustic signal can carry important information.

Figure 4.5 shows that four out of seven acoustic variables, although numerically not substantial to account for statistically significant effects,

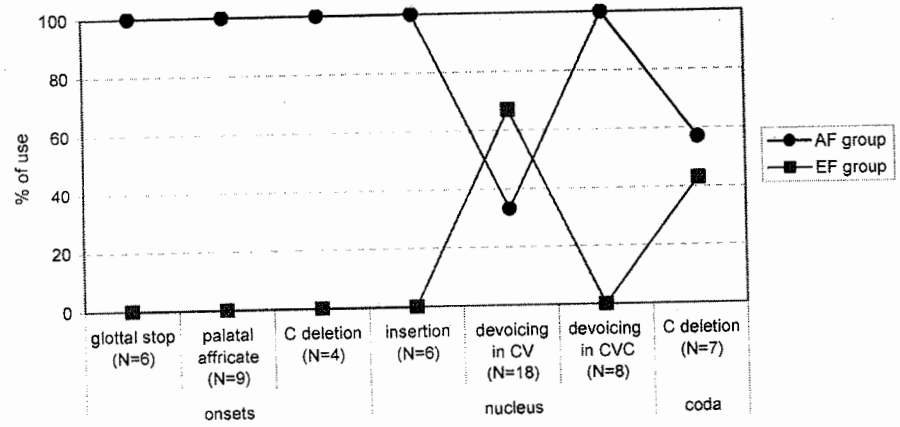

Figure 4.5 Types of onset, nucleus, and coda in the readings of French speakers of North African and European descent (N of total syllables =1455).

allow a clear separation of the speakers in two groups. About 89% (N=1293) of syllables in the sample had at least one onset consonant, but only AF speakers realized these consonants, in about 2.6% of cases, as glottal stops or palatalized affricates. Deletion of onset consonants occurred only in AF speakers' speech (0.15%). Similarly, schwa insertion and vowel devoicing in CVC syllables only characterized AF speakers, while there were nearly identical proportions of coda deletion in the two groups. Devoicing of syllable nuclei in CV syllables, on the other hand, was twice as frequent in the EF group (67%) than in the AF group (33%).

While deletion and, perhaps to some extent devoicing, could be considered fast speech processes, i.e., resulting from the fact that AF speakers, overall, articulated somewhat faster than EF speakers, it is unlikely that schwa insertion, glottalization, and the affrication of palatalized stop consonants could be attributed to rate differences. Clearly, something else other than articulatory rate must lie behind AF speakers' tendency to dissolve consonant clusters with epenthetic vowels, and to prevent vowel coalescence (*enchaînement vocalic*) through the insertion of glottal stops.

Figure 4.6 shows intra-speaker variations in the frequency of onset, nucleus, and coda types. Ample variations within the AF group (the first five speakers from the top), contrasting sharply with a greater uniformity of allophonic realizations in the EF group (the last five speakers), can be observed. Speakers in both groups resorted to coda consonant deletion (1) and devoicing of syllable nuclei in CV syllables (2):

(1) *c'est une histoire incroyab**(le)*** (Karl, EF)
'this is an incredible story'

(2) *ce qu'il est deve**nu*** (Khatib, AF)
'what happened to him'

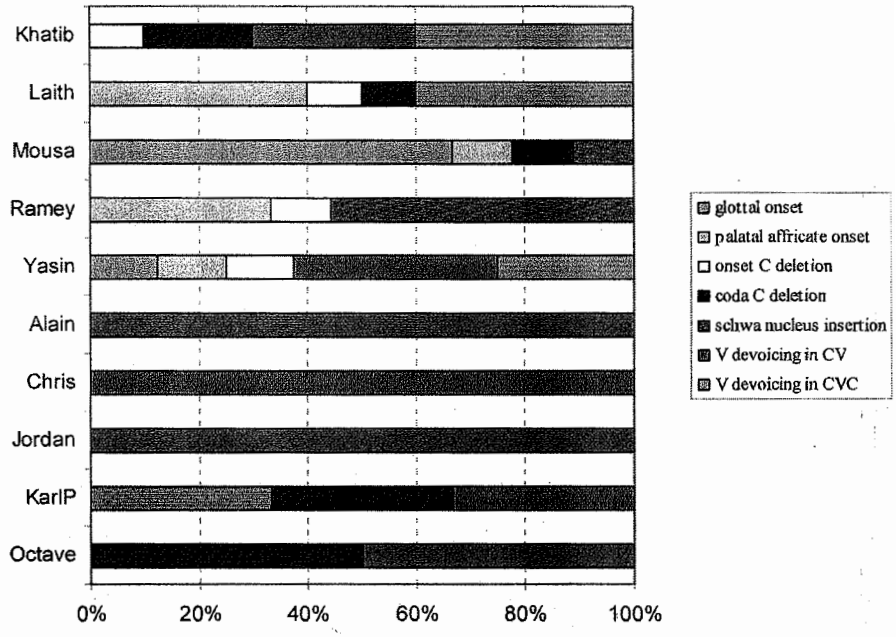

Figure 4.6 Intra-speaker variations in the frequencies of onset, nucleus, and coda types for French speakers of North African (top five) and European (bottom five) descent.

Yasin, the fastest speaker in the sample, combined as many different allophonic realizations as Mousa, Laith, Karl, and Khatib who articulated more slowly. Schwa insertion (examples (3) and (4)) have also occurred, which goes against the logic of fast speech processes that tend to reduce and compress rather than increase vocalic segment durations:

(3) *c'est sûr* [schwa] *qu'on ne l'a plus jamais revu* (Ramey, AF)
'it is certain that he has not been seen ever since'

(4) *notre prof d'anglais a disparu* (Octave, EF)
'our English teacher has disappeared'

The affrication of stop consonants, as in example (5), arising from the lengthening of the friction phase following the closing gesture of stops (see Corneau 2000), represents a well-known characteristic of Canadian French, and was reported in the vernacular of working-class youth of North African descent and their peers (see Jamin 2005, Jamin, Trimaille, and Gasquet-Cyrus 2006). Thus their occurrence cannot be attributed to fast speech processes or individual speaker characteristics:

(5) *alors qu'un élève l'a vu descendre* ***du*** *RER* (Laith, AF)
'even though a student saw him get off the RER'

Similarly, vowel devoicing in CV and CVC syllables, illustrated in examples (2), (6) and (7), has been shown to occur in informal and formal contexts in Parisian French, with no known or obvious link to differences in articulatory rate (Fagyal and Moisset 1999, Smith 2003):

(6) *il est* ***dis****paru sans laisser de traces* (Yousfi, AF)
'he has disappeared without a trace'

(7) *il (n')est jamais arrivé à l'****école*** (Khatib, AF)
'he has never arrived at school'

And finally, glottal onsets similar to example (8) in Mousa's speech, also appeared in Karl's reading who articulated slightly more slowly (1.39 segments/second) than the average speaker in the corpus (1.67 segments/second):

(8) *il n'est jamais ?arrivé ?à l'école* (Mousa, AF)
'he has never arrived at school'

Not only there was a greater variety of acoustic means used by AF speakers in producing syllable onsets and nuclei (Figure 4.6), there was also a greater variety of prosodic positions affected by this wider inventory of phonetic realizations. Even though vowel devoicing in CV syllables was common in both groups (see Figure 4.5), it was applied variably by AF and EF speakers. While devoicing occurred only in word-final high vowels in EF speakers' readings, it affected both high vowels (*dis* of *disparu* 'disappeared') and low vowels (*cole* of *école* 'school') word-initially (7) and word-finally (3) in AF speakers' speech. One such contrasting context is shown by the spectrograms in Figure 4.7 (see also Fagyal 2007).

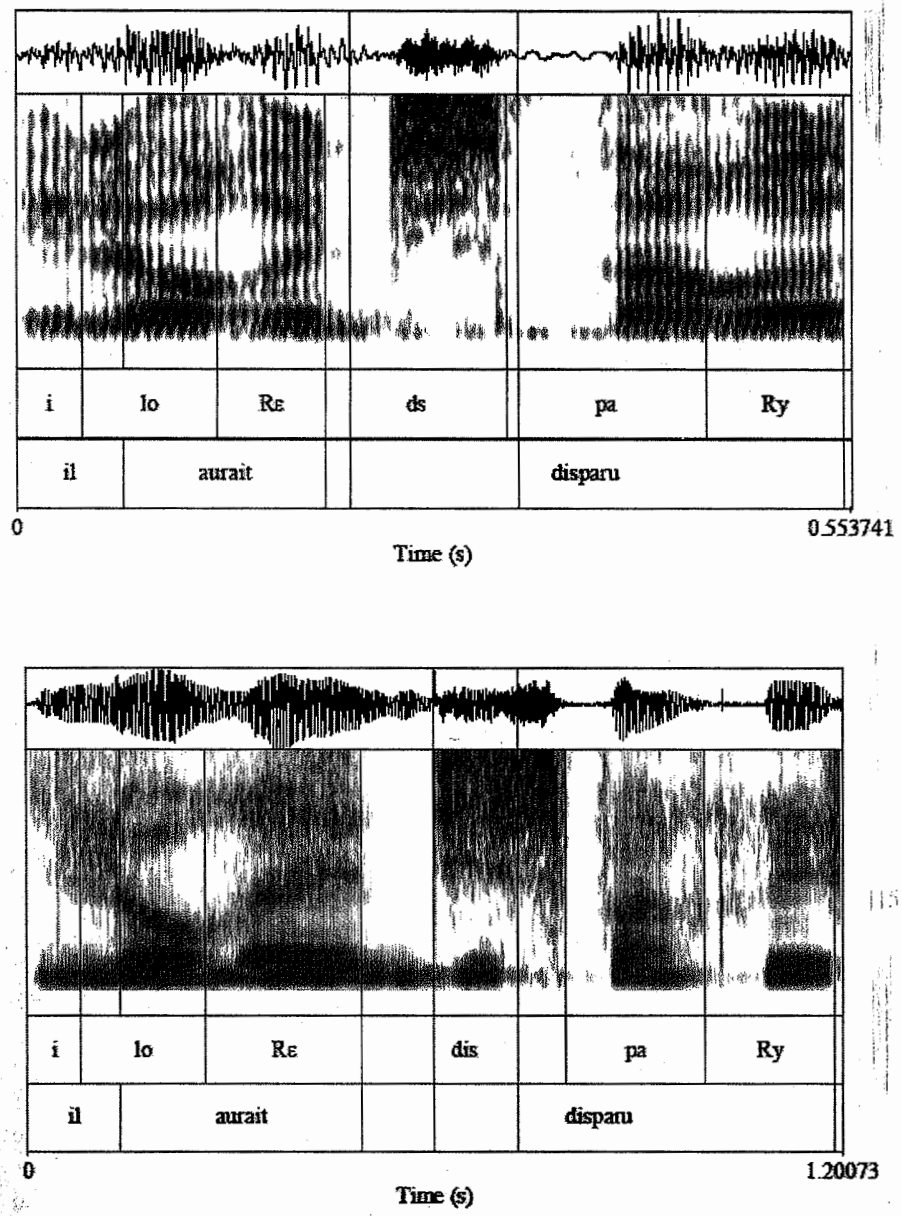

Figure 4.7 Devoicing of *dis* in *disparu* 'disappeared' in the reading of Yousfi, an AF speaker (top spectrogram), and the same unaccented closed syllable in an all-voiced rendition by Alain, an EF speaker (bottom spectrogram).

Schwa insertion also applied variably. As one would expect it in Northern varieties of French in France, AF and EF speakers inserted schwas phrase-medially to prevent three consonants to cluster in a single onset, e.g., in *notre prof* 'our teacher' in example (4), but only AF speakers inserted schwas between two single consonants, such as between the words *sur* 'certain' and *que* 'that' in example (3). Not altogether foreign to French, such patterns of schwa insertion are typical in Southern French varieties. Finally, glottalized onsets that prevent the linking of adjacent vowels (*enchaînement vocalique*) within the same accentual phrase are also possible in Northern varieties of French, but reserved exclusively to emphatic contexts, referred to as 'emphasis by expressive juncture' (*emphase par joncture expressive*) (Léon 1993: 143–144). The fact that glottal stops occurred several times in the speech of AF speakers in the reading of a text, a relatively neutral speech performance elicited in a relatively formal context, points to possible contact features retained from the heritage language.

4. Summary of findings

This study revealed uniformity and differences in the segmental components of rhythm type distinctions in the readings of two groups of male adolescents recorded in a French working-class suburb of Paris. The hypothesis that readings of native French heritage speakers of Arabic (AF speakers) would show influence from the heritage language was confirmed, but contrary to expectations it was not borne out by statistically significant central and dispersion measures of variation. It was detectable only in greater allophonic variation, fine-grained acoustic characteristics of segments that constitute the essential building blocks of syllables in these speakers' speech.

Central and dispersion measures revealed uniformity between bilingual heritage speakers (AF group) and monolingual speakers of French (EF group): both groups patterned closer to each other and syllable-timed languages than to any of the stress-timed languages on the rhythm type continuum established in previous studies. Thus, the hypothesis that AF speakers' readings would pattern closer to stress-timed languages had to be rejected: their rhythm were just as characteristically syllable-timed as EF speakers'.

Significant differences were found in the distribution of vocalic and consonantal interval durations, and regression analyses revealed that the contribution of fine-grained rhythm type predictors was outweighed by social-demographic and performance-related factors. One year of average grade (approximate age) difference and a one point average difference in students' average grade (*moyenne générale*) in school were better predictors of their patterning in two groups than either %V, ΔV, or ΔC. Articulatory rate and the number of segments in a phrase, with the two factors tied together, were the only individually significant predictors.

AF speakers' readings appeared slightly less vocalic (low %V values) than non-heritage speakers', while both groups showed similar amounts of consonantal duration variations (ΔC). AF speakers showed somewhat more variability in the length of vocalic intervals (higher ΔV values). Thus, the hypothesis that AF speakers' speech would be more consonantal was confirmed, but greater ΔV or ΔC variations, as one would have expected it in stress-timed languages with more complex syllable structure, were not found. All these effects were not statistically significant.

Traces of heritage language use were found in vowel epenthesis, unusual in Northern varieties of French, glottal onset consonants that appeared in three AF and one EF speakers' readings. Contrary to predictions, all speakers showed strong tendencies towards open syllabicity, and heritage language influence did not extend beyond the acoustic realizations of individual sounds. Closed syllables with non-branching onsets, nuclei, and codas were the second most frequent syllable type in both groups. These patterns of uniformity were statistically more important than differences in vowel epenthesis and types of onset realizations. Thus, the hypothesis that AF speakers would prefer heavy and closed rather than light and open syllables was not confirmed.

The most unexpected finding was the tendency of AF speakers to devoice vowels in closed syllables in word-initial positions where EF speakers did not show such tendency. This might be part of the factors that lead to the slightly more consonantal character of AF speakers' speech. Since devoicing can drastically reduce the amplitude of vowels, from a perceptual point of view it represents a type of vowel reduction. Thus some degree of vowel reduction was present in AF speakers' readings. But to what extent should such fine details of acoustic realization be worthy of our attention?

5. Discussion

Fine-grained acoustic characteristics of speech segments are rarely examined in studies of rhythm type distinctions, because such distinctions are often not salient enough to be detected by averages and dispersion measures. On the basis of non-normalized vocalic and consonantal duration distributions, Ghazali et al. (2002) showed evidence of rhythm type distinctions between Western and Eastern dialects of Arabic. Based on normalized and non-

normalized measures, Low, Grabe, and Nolan (2000) and Deterding (2001) concluded that Singapore English is more syllable-timed than British English, as the latter shows greater amount of vowel reduction. Other studies, however, found only slight differences or concluded on negative results. With respect to rhythm type differences in Spanish, English, and Hispanic Spanish spoken in North Carolina, Carter (2005: 72), for instance, noted that "no clear pattern [was] easily discernible, but some trends [could] be noted." Thomas and Carter (2006) also found that present-day African Americans' and European Americans' spontaneous speech samples did not differ significantly in their degrees of stress- or syllable-timing.[38]

Compared to previous studies, speakers in this study were maximally similar: they shared the same socio-demographic background, grew up in the same neighborhood, and spoke the same dialect of the same language natively. Heritage language influence, if any, was expected to be subtle, and it was indeed found to be subtle. Neither patterns of schwa insertion, nor glottalized onsets or high vowel devoicing in closed syllables were prevalent enough to be statistically significant. Therefore, one might ask: was a digging down to such "atomic" levels of phonetic contrast useful at all?

Fine-grained phonetic details of rhythm type distinctions are more important than they might appear at a first glance. Phonetic realizations, i.e., the precise acoustic make-up of the segmental components of speech rhythm, have been claimed to play an important role in sound change, and perhaps in linguistic change in general. With respect to various patterns of cliticization that could be induced by shifts in syllabicity "along with [the] a vast body of segmental changes." Labov (2001: 12) states: "[. . .] it can be argued that change in the surface phonetics remains the driving force behind a very large number of linguistic changes, perhaps the majority." Alone or in competition with indigenous features, phonetic features borrowed in contact with other varieties and recycled at the lowest segmental level of speech rhythm could act, if not as triggers, then as catalysts in on-going change: "*adstratum* effects that appear to motivate or accelerate language change in progress" Labov (2001: 246). Minute acoustic differences have also been shown to trigger correct identification of a speaker's dialect, as convincingly demonstrated, for instance, by Graff, Labov and Harris (1986) in their classic study of /aw/ fronting in Philadelphia speech. Purnell, Salmons and Tepelli's (2005) work on word-final obstruent devoicing in a German-speaking community in Wisconsin brought evidence for a similar role played by fine-grained, allophonic realizations of consonants: in their study gradient cues to laryngeal constriction did allow the identification of the German-English bilingual speakers' heritage language.

Let us consider the case of allophonic variations in French. Glottal stop as onset consonants, presumably left over from contact with heritage languages from North Africa in this corpus, are not altogether foreign to French vowel-initial words with emphatic phrase-initial accent (*accent initial*) can have glottalized onsets, as in the often-quoted example of the single-word utterance *ʔIncroyable!* 'Incredible' or another example from Léon's (1993: 144) radio corpora: *des documents ʔimportés* 'imported documents.' "More or less perceptually salient depending on the degree of emphasis", Léon (ibid.) notes, glottal stops are part of an arsenal of means (together with silent pauses and *accent initial*) conveying emphasis by breaking the "expected linking of [consecutive] vowels at the word boundary" (p. 144). If novelty is defined as suggested in the Introduction, i.e., something new and not "recycled," than the novelty in the phonetic system of AF speakers in this corpus is not the mere occurrence of glottal stops, but their contextual polymorphism in these speakers' speech, glottal stops appeared in non-emphatic readings of a text elicited in a school-like setting. In all but one case, EF speakers' readings showed seamless linking of two adjacent vowels (*enchaînement vocalique*). Unless one considers the unlikely case of speakers' greater emotional involvement in discourse triggering the realization of some onsets as glottal stops, such segments are not bound to appear in middle-class varieties of Parisian French, and they remain unattested in working-class varieties (*français populaire*).

Vowel devoicing shows a different type of remotivation, and could have even more important implications, as it could be a contributing factor in prosodic change, whose phonetic underpinnings in languages have so far been "only dimly perceived" (Labov 2001: 12). Devoicing has been shown to occur in open and closed syllables in Northern Metropolitan varieties of French, but only in word-final positions (Fagyal and Moisset 1999, Smith 2003). As Smith (2003: 177) points out, this is a relatively atypical phenomenon: "From a cross-linguistic perspective, the distribution of devoicing in French is unusual. Final position is prosodically prominent in French, whereas in many languages devoicing is a form of vowel reduction associated with lack of prominence." As a relative novelty, bilingual heritage speakers in this corpus applied devoicing word-initially and word-finally, regardless of the type of syllable. Thus, contrary to the laxing and devoicing of high vowels that occurs word-medially in unaccented positions in Canadian French (see Martin 2004), vowel reduction occurred in metrically strong prosodic positions in AF speakers' speech.[39] One can speculate that such joint patterns of devoicing, if spread beyond the speakers' inter-language, can have important implications for the future development of the accentual system.

If devoicing amounts to vowel reduction, as argued before, then devoicing in these prosodic positions could interact, and to some extent even compete, with each other. Their on-going competition within the system could mean that not only unaccented word-medial syllables but also metrically strong word-final syllables could occasionally be heard as reduced, leaving the penultimate syllable the perceptually most salient full syllable in the accentual phrase. Accentual shift onto the penultimate has, indeed, been one of the most widely discussed features of working-class Parisian French (Straka 1952) and French spoken in the *banlieues* (Conein and Gadet 1998, Fagyal 2003, 2005). Louder and longer syllables in prosodic positions where one would not expect them in middle-class varieties of Parisian French, reinforced by the reduction of prominent (final) syllables, could therefore lend support to previous observations of stress-timed characteristics of French spoken in the Parisian *banlieues*.

Thus, North African heritage language influence in the form of widespread vowel devoicing brought into working-class neighborhoods by recent waves of immigration could act, just as Labov had speculated, as catalysts. In this case, through allophonic enrichment, they would reinforce patterns of accentual shift onto the penultimate, already attested in the local vernacular.

Schwa insertion and the affrication of palatalized onset consonants also show a two-way split between speakers in this study and also have a long history of variation and change in many French varieties. Following their subsequent evolution in working-class Parisian French could provide an opportunity for the observation of the recombination of these features. "Speakers exhibit variations in their pronunciation which they and the listeners do not recognize as variations," Ohala (1989: 175) argues, but these variations represent the pool of synchronic variations from which future changes might draw. The affrication of palatalized stops in present-day working-class Parisian French, also a known feature of French spoken in North Africa (Lanly 1962), seems to be already engaged on the path of incipient change, indexing class and ethnic origin, but also widening in scope and spreading beyond working-class neighborhoods (Jamin et al. 2006).

To return to one of the burning questions raised in the Introduction: could the widening separation between the 'rich districts' (*les beaux quartiers*) of the White upper- and middle-classes and the 'suburbs' (*les banlieues*) of the multi-ethnic working-classes put Parisian French on two separate paths of evolution? Findings in this study point to slight differences in acoustic realizations. Still very much "under the radar," these features seem to have been reanalyzed at the lowest, allophonic level of speech rhythm. Glottalization seemed to have spread to non-emphatic contexts, while devoicing seems to

have affected high and non-high vowels in a variety of prosodic positions. These findings, however, remain indicative.

In certain circumstances, that are likely to be the exception rather than the rule, to reiterate Sankoff's (2004) conclusion, these features could spread "as the combined results of numerous individual acts of 'misapprehended pronunciation' by listeners" (Ohala 1989: 177–178). Folk linguistic reports (see Introduction) already provide useful indications that devoicing, the acoustic aspects of syncopation, is recognized as a marker of heritage speakers in the community, but also as an index of the neighborhood itself. Thus, Chamber's (2003) scenario of "inverse assimilation" seems to apply: certain linguistic features "in the native speech of (otherwise) assimilated second-generation speakers, in later generations, leads to the establishment of these features as markers of region (community) rather than ethnicity." Do these features characterize only the speech of non-heritage speakers of Arabic or they appear as aerial features because of the numerical dominance of North Africans and their descendents in the community? This question remains to be investigated. If the first scenario is true, then the next question to ask would be: who holds the key to the spreading of such potential innovations?

In this study, Karl deserves particular attention, as he is the only EF speaker whose reading shows several instances of glottal onsets. He, on the other hand, shows no traces of devoicing in closed syllables in unaccented accentual phrase-medial position. The fast-speaking Yasin, on the other hand, does combine several novel accent features. Ethnographic evidence established independently from this investigation shows that motor skills such as faster articulatory rate is a highly prized verbal skill in adolescent peer-groups in this community. Lepoutre (1997: 132), in his extensive ethnography of pre-adolescents in *La Courneuve*, notes the following:

> To make oneself be heard in the peer group, one must not only speak loud but also speak fast. The speaking rate of certain adolescents in this respect is quite astonishing. This fast pace is apparent not only in articulation, but also the linking of words, phrases, and even turn taking [. . .]. On the other hand, a speaker who is much too slow and lets his syllables drag out too long [. . .] exposes himself to systematic sarcasm and laugher. . . . [40]

Interestingly, or perhaps quite predictably, leaders tend to belong to the first, while the followers in the second category. In Yasin's case, there is all the more reason to retain articulatory rate as a meaningful sociophonetic variable, as this AF speaker was one of the uncontested leaders recorded during fieldwork. A third grader (last grade in middle school), whose strong and tall body and low voice already showed signs of full maturity, was also one

of the best students in school, with an average grade (*moyenne générale*) so high that most students can only dream about receiving such a grade for a single assignment in a single subject matter (15.9 out of 20). Respected by all, Yasin was in the same time one of the most brilliant public speakers, readily engaging adults (among them the fieldworker) in political debates and, if necessary, putting down youngsters who dared to tease him (see the practice of *vannes*, a type of crude joking, in Lepoutre 1997). Yasin was well aware of his charisma and age, the oldest possible in middle school, and a pivotal age between intense focusing on peer group membership as opposed to a future professional life. Doran (2002), who studied the use of *verlan* in working-class middle schools and high schools, concludes:

> [. . .] whereas in *collège*, youths are mainly focused on the immediate peer universe and their place in it, as they enter high school years, they begin to think more about how their educational choices will impact on their future social and economical lives in the larger society. (247)

It is through "stylistic icons" like Yasin, who fulfill rather than challenge institutional requirements of brilliant school performance and peer-group practices, that new and novel patterns of phonetic variation could become "noticed" and imitated by peers. In the EF group only Karl comes close to the uncontested status of Yasin as a leader. All other EF speakers, younger than Karl and Yasin, could at this specific age in their pre-adolescent years, pretend to nothing more than the role of followers. It comes as no surprise that they do not even try (yet) to embody the *personae* of fast speaking popular leaders like Yasin and Laith in the EF group. If complex rhythmic phenomena, such as articulatory rate, indeed carry information about the leadership status of a speaker in the local community of practice, as they seem to in adolescent peer groups in *La Courneuve*, then there are good reasons not to discard them early in the analysis as "spurious" variations of speech rhythm (see e.g., Grabe and Low 2002). Thus, the normalization of interval durations is only desirable once one made sure that no potential source of meaningful social variations would be eliminated.

But what kind of social meaning should be attributed to fast-articulatory rate and many other phonetic features displayed by Yasin and other leaders? "By virtue of their location in time and social and cultural space, immigrant adolescents have special knowledge, and in working with this knowledge—in making new meanings—they construct authenticity of a new kind," Eckert (2003: 115) reminds us. When thinking about Yasin, it would be tempting to think of a bridge between two cultural spheres, i.e., the monolingual mainstream society and the multilingual peer group. It could be that novel phonetic

features, such as the ones shown in this study, are imitated and spread through the daily actions and interactions of leaders like Yasin, negotiating fast and with brilliant efficiency their positions of intermediaries between two cultures, while embodying an authentic social *persona* of a new kind.

Appendix 4.1

Text read by the speakers in French

C'est une histoire incroyable. Notre prof d'anglais a disparu. Il n'est jamais arrivé à l'école, alors qu'un élève l'a vu descendre du RER le matin. Il aurait disparu sans laisser de traces. Il n'est plus jamais revenu. Sur le chemin de la gare, plusieurs l'avaient reconnu, mais personne ne sait ce qu'il est devenu. En tous cas, c'est sûr qu'on ne l'a plus jamais revu. Et toi, qu'est-ce que tu en penses ? Qu'est-ce qui lui est arrivé ? Invente la suite de l'histoire, imagine que tu es le principal ou l'inspecteur de police. Qu'est-ce que tu ferais ?

Translation of the text to English

This is an incredible story. Our English teacher has disappeared. He has never arrived at school, even though a student saw him get off the RER in the morning. He has disappeared without a trace. He's never come back. On the way from the station [to school], many recognized him, but nobody knows what happened to him. In any case, it is certain that he has not been seen ever since. And you? What do you think? What might have happened to him? Invent the end of the story. Imagine that you are the principal or a detective from the police. What would you do?

Notes

1 *Verlan* (from *envers* 'backwards'): *bizarre* → *zarbi* 'strange' (Méla 1991, 1997; Azra and Cheneau 1994).
2 Contrary to many royal courtiers, Voltaire was of non-noble, provincial origin (Gay 1965: 117).
3 "*faire usage d'une langue française qu'ils tordent dans tous les sens et dont ils modifient les mots en les coupant.*"
4 Adolescence is defined as the period "extending from the first notable changes of puberty to the attainment of adult status [. . .] i.e., from age 10 to the end of secondary school at 18 or 19" (Arnett 2002: 309–310).

5 The central role of peer groups and the notion of youth culture seem to be a Western specificity. Peers still contribute little to adolescent development, for instance, among girls in the Arab world (Booth 2002).
6 Lexical "innovations," ephemeral in nature, are frequent in peer group interactions. They can take as input foreign-sounding words or existing words fallen out of use, but "recycled" in playful interactions, teasing, and verbal sparring matches between peers (Fagyal 2004).
7 Certain aspects of adolescent language use were perceived as age-related behavior several decades ago, but the focus had shifted to social and ethnic factors (Boyer 1994).
8 *Ce n'est pas forcément ainsi que les "jeunes" parleront quand ils seront quadragénaires.*
9 Besides studies in Montreal and Brink and Lund's study of phonetic variation in Copenhagen (cited in Sankoff 2004), the following projects are singled out: Gauchat's (1905) research in Charmey, Switzerland and its restudy by Hermann (1929), Labov's department store study in New York City (Labov 1972) and its restudy by Fowler (1986), and Trudgill's (1974, 1988) study in Norwich. Cedergren's (1973, 1988) Panama City location is the only fieldwork site outside Europe and the United States.
10 Compared to mass immigrations during "The Great Deluge" (1879–1920), the period after 1920 is characterized by a low influx of immigrants, and is thus a period of relative stability, according to the social geographer W. Zelinsky (2001: 23).
11 Languages that are thought to have massively affected working-class Parisian French prior to the latest waves of immigration from outside Europe are Picard, an *oïl* dialect, and Breton, a Celtic language.
12 See the full-fledged national debate known as "the battle of the veils", when "three female Muslim students were expelled from a middle school north of Paris for having gone to class wearing a *hidjab* or *khiemar*, a religious veil/scarf/headdress" (Mathy 2000: 109).
13 Immigration with assimilation into mainstream French society is institutionally supported by the Department of Immigration, Integration, National Identity, and Codevelopment since June 1, 2007.
14 Sociologists first doubted the reality of social-territorial segregation (Wacquant 1989), then came to see it as an "undeniable dimension" (Lepoutre 1997), to finally call it "ghettoization" (Maurin 2004).
15 *Les quartiers défavorisés sont considérés à juste titre comme des enclaves où se massent les populations étrangères ou issues de l'immigration.*
16 *Riches et diplômés, d'un côté, et pauvres et immigrés, de l'autre forment donc les pôles extrêmes de la ségrétation territoriales.*
17 Heritage speakers are people raised in a home where one language is spoken who subsequently switch to another dominant language" (Polinsky and Kagan 2007: 368)
18 *Tout le système linguistique est affecté: intonation, lexique, et même la syntaxe qui reste la moins imitable.*

19 *Beur, -ette* (n.m./f.) descendent of immigrants from North Africa, born in France,
20 *Certaines voyelles ont tendance à tomber. Mais les consonnes—c'est manifeste dans les milieux arabes des banlieues—deviennent beaucoup plus explosives. Un type de prononciation que les rappeurs [. . .] ont reprise. Par exemple, au lieu de "partir", on dira " p'rt'r": les voyelles disparaissent presque totalement. Et les consonnes explosent, comme dans "Rrrspect!" (respect). C'est l'accent beur. Le français intègre parfaitement cette influence nouvelle, comme il a intégré celles de l'italien, de l'anglais, pour sa plus grande vitalité!*
21 The idea of raw spectral measures of sonority was explored recently by Galves and his colleagues (2002) who found that such measures lead to the same clustering of rhythmic classes conjectured by Pike, first shown by Ramus and his colleagues' 1999 study.
22 White and Mattys (2007) have proposed the VarcoV and VarcoC indexes, accomplishing essentially the same task as Grabe et al.'s various PVI indexes. These two measures were tested on an extended corpus of speech samples recorded in *La Courneuve* in Fagyal (in press).
23 AF speakers in this corpus referred to their heritage language as "Arabic," and reported to have at least passive knowledge of the language. Although none of them reported speaking Berber, some speakers might have used "Arabic" as a unifying label for a language from North Africa (see Fagyal in press).
24 Some of the students might have repeated classes, and did not communicate this information during or after the interview. Therefore, their exact age might not always correlate with their grade.
25 The terms active or productive vs. passive or receptive bilingual refer to an active vs. passive knowledge of languages, following established terminology in studies of bilingualism (see Romaine 1989).
26 These numbers are based on the 1999 census data, analyzed and publicly available in the *Centre de Documentation* of La Courneuve (ORGECO 2001).
27 Headline in *The New York Times* published on October 16, 2001.
28 Ramus et al. (1999) and Ghazali et al. (2002) measured vocalic and consonantal intervals in utterances, while Low et al. (2000) did so in intonation phrases. Grabe and Low (2002) later broke this tradition, and computed rhythm type measurements on the entire paragraph, regardless of the length of prosodic units.
29 Despite the instructions, some of the speakers omitted the title and the last sentence in the text. Tiredness and informality with the fieldworker (speakers were volunteers and knew the fieldworker well) might be among the reasons why not all speakers stayed on task until the end of the recording session.
30 The two speakers who omitted the reading of the title and/or the last sentence came from the AF group.
31 The graphical representation of means and standard errors in the Ramus et al. (1999: 273) article, however, suggests relatively normal distributions, without substantial skewing to higher or lower %V and ΔC values, close to the distribution of measurement points for AF and EF speakers.

32 Thus, contrary to RNM who were able to compute single-factor ANOVAs with rhythm type as their main factor, such a comparison could not be carried out here. Levene's test of equality of error variances was non significant ($F(9,1359) = 1.632$, $p < 0.101$).

33 Levene's test of equality of error variances was non significant ($F(9,1359) = 1.632$, $p < 0.101$).

34 Stepwise regression analyses in SPSS do not return correlation coefficients allowing to check for cross-linearity effects. For this reasons, Pearson linear regression analyses were conducted (see Field 2005).

35 EF speakers were coded with value 1, AF speakers with value 2 for the dichotomous variable "ethnicity."

36 The possible impact of this co-linearity effect on the model can be evaluated by other statistical means.

37 Model summaries:
—5 predictors (rhythmic variables only): adjusted $r^2 = 0.156$, standard error of estimate = 0.464, F change $(5,210) = 7.783$, $p<0.01$.
—6 predictors (rhythmic variables and grade): adjusted $r^2 = 0.256$, standard error of estimate = 0.430, F change $(6,209) = 13.329$, $p<0.01$.
—6 predictors (rhythmic variables and GPA): adjusted $r^2 = 0.253$, standard error of estimate = 0.431, F change $(6,209) = 13.130$, $p<0.01$.
—6 predictors (rhythmic variables and speaker): adjusted $r^2 = 0.393$, standard error of estimate = 0.410, F change $(6,209) = 24.194$, $p<0.01$.
—7 predictors (rhythmic variables, grade, and GPA): adjusted $r^2 = 0.324$, standard error of estimate = 0.410, F change $(7,208) = 15.731$, $p<0.01$.
—8 predictors (all predictors in): adjusted $r^2 = 0.413$, standard error of estimate = 0.435, F change $(8,207) = 19.890$, $p<0.01$

38 However, such differences existed in archival recordings of speakers born in the 19th century.

39 In Northern varieties of European French, both syllables can be accented (*accent initial* and *accent final*).

40 "*Pour se faire entendre dans les groupes des pairs, il faut non seulement parler fort, il faut aussi parler vite. La rapidité d'élocution de certains adolescents est en ce sens tout à fait étonnante. Cette vitesse s'applique aussi bien à l'articulation qu'à l'enchaînement des mots et des phrases, et au rythme des échanges. [. .] A l'inverse, un locuteur trop lent, qui s'exprime en faisant traîner ses syllabes [. . .] s'expose de façon quasi systématique aux sarcasmes appuyés, aux éclats de rire . . .*"

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Chapter 5

The Sociophonetics of Prosodic Contours on *NEG* in Three Language Communities: Teasing apart Sociolinguistic and Phonetic Influences on Speech

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1. Introduction

Negatives provide cognitively critical information and are also interactively significant. The present study compares the prosodic realization of negatives in three languages, and in two social settings for each language. The study will provide evidence for three loci of prosodic variation in negatives as they are used in amicable social interactions and in informative newscasts in American English, Latin American Spanish,[2] and Japanese. Comparative evidence from adversarial interactions will be cited where relevant.

1.1 Language

Each of these three languages shows unique patterns for how prominence is acoustically accomplished (Pierrehumbert and Beckman 1988; Hirst and Di Cristo 1998; Grabe et al. 2003; Jun 2005). Each has its own default negative morphology with a given default syntactic position, and it is that most common form of negation that will be studied here. Rather than refer to each specific lexical item in this discussion, each language's 'default' lexical negative will be referred to as *NEG*.

1.2 Social situation

Within a given linguistic community, prosody varies radically with the social situation. This chapter will discuss parallel results for the three languages it