

# Bilingual adolescent vowel production in the Parisian suburbs

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**Margaret Cychosz**

University of California, Berkeley, USA

## Abstract

**Aims and objectives:** The study examines how bilingualism and adolescent identity interact to influence acoustic vowel patterns. This is examined in students at a secondary school in the socially and economically disadvantaged working-class Parisian suburbs.

**Design:** The front, round vowels /y/, /ø/, and /œ/ were analyzed in the speech of ( $N = 22$ ) adolescents. Three student groups were juxtaposed: monolingual Franco-French ( $N = 9$ ) and two simultaneous bilingual groups, Arabic-French ( $N = 6$ ), and Bantu-French ( $N = 7$ ). Crucially, unlike French, these contact languages do not have phonemically round front vowels.

**Data and analysis:** To elicit naturalistic speech, sociolinguistic interviews were conducted with students speaking in dyads or small groups. Vowel roundedness, derived from acoustic measurements of the third formant and the difference between the third and second formants, was compared across speaker groups.

**Findings:** Results show an effect of bilingual status for male speakers – monolingual speakers pattern differently from both bilingual groups. Still, bilingual Bantu-French and Arabic-French speakers show some distinct patterning. This suggests influences beyond first-language phonology on bilingual speakers' production of French.

**Originality:** This is one of the first studies to look beyond Arabic substrate influence in emerging Hexagonal urban youth vernaculars. It contributes naturalistic data from those most prone to language change, adolescents, for the study of French in contact. Finally, the study proposes a type of 'laboratory in the field': because none of the contact languages contrast vowels by roundedness, first-language influence is controlled for and the effect of social stigmatization upon speech can be isolated.

**Implications:** The findings suggest that the social and ethnic divisions between dominant ethnic groups and minorities of immigrant descent may even be reflected in their phonetic patterning. Because these patterns are present in adolescents, who are the source of much language change, a connection between segregation and language change is drawn.

## Keywords

Sociophonetics, simultaneous bilingualism, language contact, acoustic phonetics, vowel production, French

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## Corresponding author:

Margaret Cychosz, Department of Linguistics, University of California, Berkeley, 1203 Dwinelle Hall, Berkeley, CA 94720, USA.

Email: [mcychosz@berkeley.edu](mailto:mcychosz@berkeley.edu)

## Introduction

Often the object of parody and social commentary, youth language – and its ramifications for linguistic change – is of interest to sociolinguists and phoneticians alike (Foulkes & Docherty, 2006; Kerswill, 1996; Rampton, 2011; Romaine, 1989; Sankoff, 2004; Tagliamonte & D'Arcy, 2009). Many sociophonetic works have focused on adolescent language as a source of innovation or display of identity (Eckert, 1989, 2004; Mendoza-Denton, 2014) and have determined that adolescent speech is not simply an improper vernacular indicative of teenage rebellion. Rather, this age group is in a constant state of constructing a linguistic identity, rendering them more prone to adopt innovative variants.

Nowhere is this construction of youth identity more apparent than the often-fraught *banlieues*, or suburbs, of Paris, France. Rife with socioeconomic disparity and disempowerment, the *banlieues* have become infamous as hotbeds of discontent where immigrant communities and the working-class manifest political strife. Since the 1970s, post-colonial immigration to the French capital has resulted in an influx of immigration (Hargreaves & McKinney, 1997). This, combined with a nationalistic proclivity to use only French in the public sphere, to the exclusion of immigrant languages, has led to a series of sociolinguistic studies on Arabic-French contact in the *banlieues* (Armstrong & Jamin, 2002; Conein & Gadet, 1998; Fagyal, 2003, 2005, 2010a, 2010b; Gadet, 2003; Jamin, 2005). This is in addition to a rich literature documenting adolescent vernaculars emerging from language contact in other Western European capitals (Cheshire, Nortier, & Adger, 2015; Dorleijn & Nortier, 2013; Freywald, Mayr, Özçelik, & Wiese, 2011; Quist, 2008; Rampton, 2011; Svendsen & Røyneland, 2008, among others). Still, with regard to French, it remains unclear how adolescents of backgrounds other than North African pattern and how these speakers contribute to innovation in Hexagonal French.

Beyond documenting new languages in contact, this study also juxtaposes speakers' social experience. Much research into second and heritage languages has focused upon the predictive role of self-identification with a dialect or community of practice for phonological acquisition (Isabelli-García [2006]; Lybeck [2002] for second language and Alfaraz [2011] for bilinguals). Consequently, here the linguistic patterns of monolingual and two bilingual speaker groups are compared to study if social inclusion manifests at the phonetic level.

Two corpora of adolescent *banlieue* French are analyzed: the Multicultural Parisian French (MPF) Corpus (Gardner-Chloros, Cheshire, & Secova, 2010–2014) and Le Kremlin-Bicêtre (LKB) Corpus that I collected. All bilingual speakers studied were sequential bilinguals, having acquired French upon entering school. Consequently, they are not second language learners, instead identifying as native speakers of French and another language. The phonological features studied were the roundedness and advancement of the front, round vowels /y/, /ø/, and /œ/. The lack of contrastive vocalic roundedness in the bilingual speakers' home languages (HLs) may manifest in reduced rounding of these vowels in French. Differences between monolingual French and bilingual French speakers are anticipated. But I also predict that the two bilingual speaker groups will diverge. These differences can be chalked up to more than the first language phonology because the HLs do not contrast by roundedness. I ground this hypothesis in the differing in-country experiences of certain immigrant groups in France.

## Previous work

### Youth language

Sociolinguistic research has long documented adolescent influence on language variation and change (Eckert, 1989; Mendoza-Denton, 2014; Romaine, 1989). Children acquire most of their

language patterns and communicative competence during early childhood as caretakers in the home transmit community-wide and adult speech patterns (Kerswill, 1996; Labov, 1969). Except for external interruption, such as immersion in a new variety due to relocation, these early language patterns remain relatively unchanged over the lifespan.

However, for diachronic language change to occur, children must acquire speech patterns external to primary caretakers in a phenomenon known as *VERNACULAR RE-ORGANIZATION* (Labov, 2001: 416). This restructuring typically begins upon starting school as children converge to peer-group norms (Kerswill, 1996). Such changes occur once again at the onset of puberty with its accompanying adolescent independence. During adolescence, linguistic practices converge even closer to peer network patterns that are stronger than those of early childhood (Tagliamonte & D'Arcy, 2009). Teenagers take their peers, rather than adults, as linguistic models and deviate from adult norms as they use more innovative forms (Romaine, 1989). This is also partly the result of adolescents' tolerance for large amounts of linguistic deviation and variation between speakers (Cheshire et al., 2015).

Finally, in early adulthood, often around age 17/18, an individual's linguistic repertoire stabilizes – that is to say becomes more resistant to innovation – for the remainder of his/her life.<sup>1</sup> Studies of generational change that include late adolescents, whether in real or apparent time, consistently observe peaks in adolescent usage of innovative forms at around 17 years, with both pre- and post-adolescents adopting innovative variants less frequently than adolescents in their mid-teens. Similarly, Rampton (2011) remarks that the stylized linguistic practices that characterize 'youth language' are merely the building blocks for language change. However, he also argues that as speakers of the vernaculars age, they often maintain their earlier language patterns, a fact that puts the entire notion of youth language into doubt.

The concept of vernacular re-organization, and its consequences for language change, is perhaps nowhere more pertinent than in situations of immigration. This is because children commonly acquire the local vernacular at the expense of their parents' variety (Labov, 2001: 423). Although Labov referred to second dialect acquisition, the pattern does not vary greatly for immersion in a new language: children acquire the language or variety of the host community, often to the detriment of the HL. Additionally, because 'adolescents may be the most influential transmitters of change' (Kerswill, 1996: 177), any physical displacement of these adaptable 'linguistic movers and shakers' (Eckert, 2004: 8) could have significant consequences for language change within the new host community. And this potential impetus for change could be particularly ignitable when adolescent interactions take place within dense, multiplex networks with limited access to prestige or standard variants of the host language – such as the *banlieues* of Paris.

## Language in the *banlieues*

Urban vernacular French spoken in the *banlieues* has long attracted attention. Since the 1980s, French media outlets, notoriously sensitive to any linguistic deviation from the normative Parisian variety, have spoken of a new, impure dialect, characteristic of young, French men of North African heritage (Fagyal, 2004). These urban *MULTIETHNOLECTS*<sup>2</sup> are 'contact' languages derived from the social interactions of adolescents from myriad sociolinguistic backgrounds (Dorleijn & Nortier, 2013). They are characteristic of both bilingual and monolingual adolescent speakers, the children of immigrants and non-immigrants alike (Cheshire et al., 2015; Clyne, 2000; Dabène & Billiez, 1987). And they are not unique to Paris, with emerging vernaculars reported in the French cities of Grenoble (Trimaille, 2003) and Marseille (Gasquet-Cyrus, 2004; 2013; see Jamin, Trimaille, & Gasquet-Cyrus, 2006 for overview) as well as the European

capitals of London (Cheshire, Kerswill, Fox, & Torgersen, 2011), Oslo (Svendsen & Røyneland, 2008), and Copenhagen (Quist, 2008), among others.

A foundational study on the social organization and linguistic practices of a single *banlieue* school, LePoutre (1997) found that not only did the adolescents' prestige forms differ from those of Paris proper, but their language also differed from the surrounding adults. This suggests that urban vernacular French in the *banlieues* could stem as much from adolescents' desire to differentiate themselves from the bourgeoisie of Paris as from the 'foreign' French of their guardians.<sup>3</sup> And it is this differentiation that could drive linguistic change from the adolescent.

*Phonetic characteristics.* Although there are often numerous substrate languages that comprise multiethnolcts, most studies of *banlieue* French have examined Arabic-French contact. Duez & Casanova (1997) found that French-Algerian nationals spoke faster than their non-Algerian contemporaries and with the 'perception of a staccato rhythm' (Duez & Casanova, 1997: 68, my translation). Duez & Casanova suggest that these characteristics were already present in the French language and did not originate from external sources such as Arabic.

At the level of the phone, Conein & Gadet (1998) found evidence of word-final consonant cluster simplification (e.g. *quatre* 'four' [katʁ] → [kat]), consonantal assimilation, and a distinctive prosody in recordings of *banlieue* youth. Gadet (2003) points out additional characteristics, although notes that they also manifest in other hexagonal varieties: glottalized /Ɂ/, addition of pre-pausal [ə], and velar and dental plosive affrication.

Armstrong & Jamin (2002) and Jamin (2004) examined 32 *banlieue* speakers of different backgrounds (metropolitan France, North Africa, and elsewhere). Speakers' innovative variants also included glottalized [Ɂ] as well as velar and dental plosive affrication, a prominent stereotype of *banlieue* speech (Trimaille, Candea, & Lehka-Lemarchand, 2012). Jamin (2004) reports that affrication was most prevalent amongst young speakers of North African heritage and was a change in progress. It had spread from youth of North African heritage, to adolescents from other countries, and finally to those from metropolitan France. Jamin et al., (2006) also found strong evidence of dental and velar stop affrication. Although some of these variants, such as affrication, were stigmatized in Paris proper, within the speech communities, the markers held prestige. This was patently clear, Jamin et al. argue, because several social clique leaders at the school recurrently used the markers.

Turning to acoustical studies, Fagyal (2010b) examined vocalic elision and rhythm type from the read speech of 10 male adolescents: Arabic-French (AF) for those of Arabic/Berber linguistic heritage and European-French (EF) for those of European heritage. AF speakers exhibited widespread vowel devoicing, replicating the staccato rhythm of Duez & Casanova (1997). Fagyal attributes this to the students' Arabic dialects that favor open syllable vowel deletion. AF speakers also spoke significantly faster than EF. Variables such as the glottal stop, palatal affricate, and consonantal deletion differed between groups – AF speakers favored such constructions. However, Fagyal did not find differences regarding type and proportion of syllable structure at the phonological level, only the phonetic. Yet she argues that such fine allophonic differences between groups are often catalysts for sound change.

In Fagyal (2005), 12 AF and EF participants completed a picture-naming task to elicit intonational contours. Ratios of penultimate syllable duration to word duration were measured and results did not reveal large inter-speaker group differences. In addition to the anticipated LH\* contour of monolingual French, the AF speakers employed rise-fall intonation patterns LH H-L% and LH HL%. Fagyal (2010a) found Arabic influence in the French speech of bilingual students, particularly their increased usage of word-initial glottal stops. However, bilingual students did not exhibit the vocalic reduction that Fagyal had anticipated and no clear influence of the *banlieue* vernacular upon monolingual students emerged.

Fagyal has argued that evidence of HL manifesting in a variety of the host language (Parisian French), and potentially propelling language change, is unexpected. This appears to be the case in

Fagyal's analyses because significant HL influence was apparent at the segmental and prosodic level. At least in the United States, macro-level studies remain inconclusive concerning the role of immigrant languages on majority language change (Fagyal, 2005: 92; Labov, 2001).

The adstrate linguistic influence in immigrant communities in France and the US is hardly comparable (the latter has seen immigration steadily ebb and flow for over three centuries, whereas it is a relatively recent, i.e. postcolonial, phenomenon in France and with actors who could rightly claim French citizenship from the time of arrival). However, in the context of Paris, the effect of vernacular varieties on French has not been thoroughly teased apart (Gardner-Chloros, Gadet, & Cheshire, 2011). This is likely due to the dearth of quantitative sociolinguistic research on Hexagonal French. Consequently, beyond surface characteristics, this study examines the sources of differences within a 'single' multiethnolect, casting doubt, as other works have, upon the idea of these vernaculars as a single stable communicative style (Dorleijn, Mous, & Nortier, 2015). This contributes to our growing understanding of language change stemming from adolescents in large, European metropolises.

## This study

### *The communities*

The MPF Corpus was collected at several public secondary schools in communes outside of the Parisian periphery, within the Ile de France region (shaded black in Figure 1). LKB interviews were conducted at a public secondary school in Le Kremlin-Bicêtre, a town that borders Paris to the south-east (also Figure 1). Le Kremlin-Bicêtre is a traditionally working-class suburb (Pierrat, 2007). Today it is one of the most densely-populated communes surrounding Paris with a fast-growing population of 26,119 (Institut National de la Statistique et des Études Économiques (INSEE), 2012). Like many of the departments of Paris' periphery, Le Kremlin-Bicêtre has hosted significant post-colonial immigration since the 1970s. It is currently home to large populations of first- and second-generation immigrants from sub-Saharan Africa, Northern Africa, Southeast Asia, and the Iberian Peninsula.

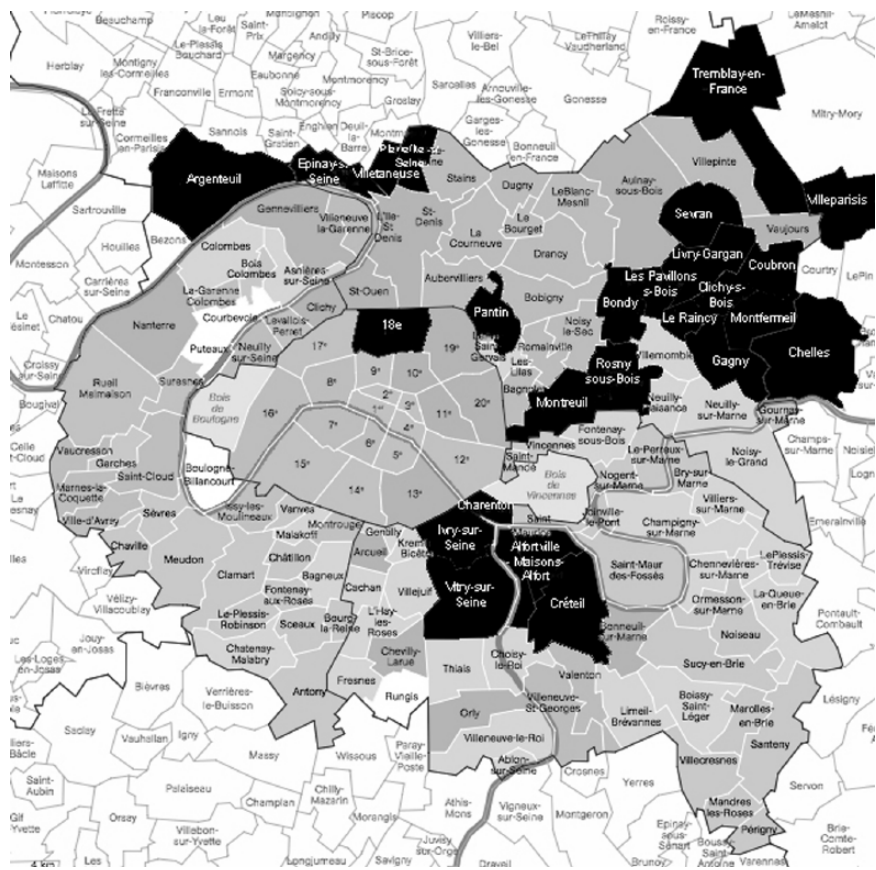
The constituency of Le Kremlin-Bicêtre differs from more affluent areas of Paris. Table 1 outlines several statistics that juxtapose Le Kremlin-Bicêtre with Boulogne-Billancourt, a wealthy suburb west of Paris, and the upscale 16th *arrondissement* (district) of northwest Paris. Note that the French census does not collect data pertaining to ethnicity, religion, or linguistic knowledge.

At 13.6% unemployment amongst active constituents<sup>4</sup> aged 15–64, the unemployment rate in Le Kremlin-Bicêtre is approximately 4% higher than in Boulogne-Billancourt. In addition, compared to Boulogne-Billancourt and the 16th Arrondissement, roughly 10% less of the population in Le Kremlin-Bicêtre has a high school diploma. These demographic differences highlight some critical economic differences between Le Kremlin-Bicêtre and other affluent areas.

Although the French census does not collect linguistic data, the multilingual nature of Le Kremlin-Bicêtre also distinguishes it from Paris proper. Bi- and multilingualism is far from the norm in France and languages other than French are isolated to the home. As an instructor at the secondary school in Le Kremlin-Bicêtre, I was warned that the student body was highly 'multicultural' – a negative descriptor in French educational institutions. Regardless, the *banlieues* are marked not simply for economic or religious differences, but also the linguistic upbringing and practices of many of their residents.

### *Contact languages studied and hypotheses*

The segments analyzed are the round vowels /ø, œ, y/ because the contact languages do not contrast by vocalic roundedness and are, consequently, interesting sites to test for HL phonological influence. In addition, previous work did not examine vowel quality in *banlieue* French. For this



**Figure 1.** Geographic origin of corpora used.

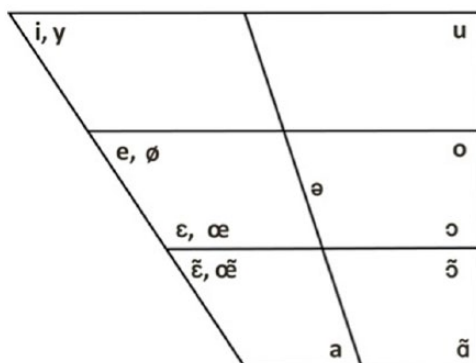
**Table 1.** Demographic detail of Le Kremlin-Bicêtre.

Description	Le Kremlin-Bicêtre (%)	Boulogne-Billancourt (%)	Paris, 16th Arrondissement (%)
Unemployment rate	13.6	9.5	9.9
Constituents holding at least a <i>Baccalauréat</i>	61.3	72.5	71.3

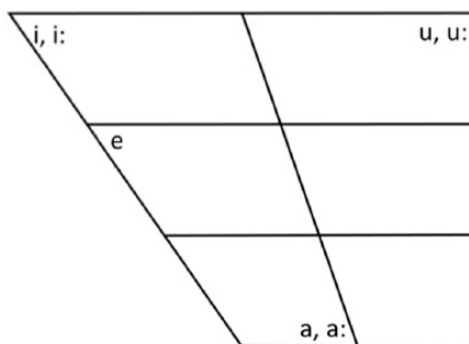
Le Kremlin-Bicêtre: a town bordering Paris. Boulogne-Billancourt: a suburb of Paris. *Arrondissement*: French word for 'district', in this case, the 16th, a district of Paris. Data is from INSEE, 2012.

study, the round vowels /ɔ/, /o/, and /u/ were not analyzed because they are phonemic in several of the contact languages. /œ/ was excluded due to its low type frequency; the singular masculine indefinite marker *un* [œ̃] made up most of the tokens.

Three linguistic groups are juxtaposed: monolingual French, bilingual AF, and bilingual Swahili/Lingala-French. French has a phonemic system of 11 oral and four nasal vowels (Figure 2). This contrasts the four-vowel North African Arabic system (Figure 3) (seven



**Figure 2.** French vowel inventory.



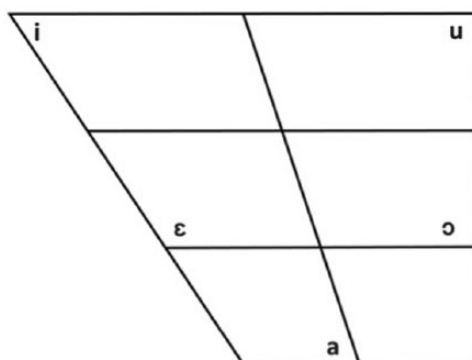
**Figure 3.** North African Arabic vowel inventory.

including length contrasts), five-vowel Swahili system (Figure 4) and seven-vowel Lingala system (Figure 5) (Chanard, 2006; Hartell, 1993). Crucially, whereas Arabic, Swahili, and Lingala have back round vowels, none of these languages have contrasts that rely upon the feature [+/- round] alone, as the language inventories do not contain any front round vowels. Vowel roundedness is realized via several articulations including, primarily, lip rounding, but also larynx and tongue body lowering. The result of these articulations is an elongated vocal tract with the acoustic consequence of lower formant frequencies.

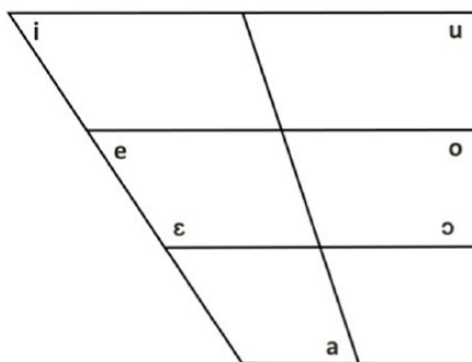
Because the contact languages do not have a roundedness contrast, there may be a HL effect upon the round vowels in the bilingual speakers' French. Specifically, the speakers may round their vowels less than monolinguals. Finally, because HL influence is controlled for, the effect of societal exclusion upon speech can be isolated in a laboratory in the field design.

#### Hypothesis 1.

AF and Bantu-French (BF) bilingual speakers' round vowel production will differ from Franco-French (FF) speakers. Bilingual speakers will not employ the roundedness to the same extent as monolingual speakers; they will produce a higher F3 because this acoustic dimension is not contrastively employed in their HLs.



**Figure 4.** Swahili vowel inventory.



**Figure 5.** Lingala vowel inventory.

Although this HL influence on vowel production is anticipated, the relationship between a bilingual speaker's HL and phonetics in the majority language is rarely so straightforward – sociolinguistic factors typically intervene (Cheshire et al., 2015). The experience of AF students is markedly different from that of even BF speakers. Recent scholarship on the integration of second and third generation immigrant descendants in France draws a connection between the descendants' exclusion from Arabic-speaking communities and feelings of alienation (Samata, 2016). And whereas immigrant descendants of many backgrounds face barriers to workplace participation and fair remuneration (Boumahdi & Giret, 2005), workers with Maghrebi-appearing last names in particular are systematically discriminated against in the labor market (Duguet, Leandri, L'Horty, & Petit, 2010; Foroni, 2008). From adolescents' divergent in-country experiences, I hypothesize that the bilingual groups will not pattern the same.

#### Hypothesis 2.

AF and BF bilingual speakers' F3 and F3-F2 patterns will differ. The bilingual speakers' phonetic patterns will reflect their differing relationship to the monolingual, FF community. AF speakers will differ more from FF speakers than BF speakers differ from FF speakers. This is due to the stigmatization that AF speakers face as a daily reality. If differences between bilingual groups do not emerge, then socialization patterns may not be playing a role on production.



Neither Arabic nor the Bantu languages contain vowel contrasts relying solely on rounding, so differences in vowel production between groups cannot simply be accounted to a HL effect. Rather, it may reflect different socialization experiences.

## Methodology

### Data

Two corpora supplied interview data: the LKB Corpus, which I collected in the 2014–2015 school year when I was employed as a teaching assistant at a public secondary school, and the MPF Corpus (Gardner-Chloros et al., 2010–2014), which MPF creator Maria Secova collected between 2010 and 2014. LKB interviews took place in quiet areas of empty classrooms and were conducted with a stationary microphone at a 44.1-kHz sampling rate. Although I guided the interviews, most interaction took place in student dyads to mitigate incidence of ‘observer’s paradox’. MPF interviews were conducted in groups of 2–5 students under similar conditions. Interviews in both corpora were 25–75 min in length and students discussed a range of topics including school activities, family, and plans for studying for the French *Baccalauréat* exam. The interviews concluded with pointed questions concerning linguistic practices of the *banlieues* and differences between the *banlieues* and central Paris. Additionally, each participant completed a background questionnaire.

The ( $N = 22$ ) participants, ranging in age from 14 to 19 (average = 16.18,  $SD = 1.55$ ), represent a myriad of backgrounds (Table 2). Speaker background is reported exactly as participants described it (e.g. Algerian vs. Algeria). The ( $N = 9$ ) monolingual FF speakers grew up in monolingual households with parents born in France. This group is juxtaposed with bilingual BF speakers ( $N = 6$ ) and bilingual AF speakers ( $N = 7$ ) who were born in France but grew up speaking a language other than French in the home. Participant names have been changed for confidentiality.

### Analysis

A native French speaker research assistant and I transcribed the LKB interviews by hand. MPF Corpus creators transcribed MPF interviews. I then force-aligned all interviews from both corpora with SPLAligner (Milne, 2014). With the assistance of two research assistants, both fluent in French and trained in phonetic analysis, I hand-corrected each interview in Praat (Boersma & Weenik, 2016). The onset and offset of a periodic signal indicated vowel boundaries. Formant transitions were studied to delimit vowels from sonorants. Vowel tokens deemed too short (<10 ms) or fricated for spectral analysis were not measured. In cases of immediate word repetition, only the first instance was measured.

Information on vowel roundedness was derived from the third formant and the difference between the third and second formants. These metrics were chosen because lowered formant frequencies, particularly the second and third, result from the lip rounding required of rounded vowels. Formant frequencies for the front round vowels /y, ø, œ/ were automatically measured with the ESPS program ‘formant’ (Talkin, 1987) at seven evenly-spaced time points within each vowel. To ensure vowel formant differences were not simply due to differences between individual speakers and instead reflected differences by speaker group, formant measurements for a subset of peripheral vowels /i, a, u/ were also collected (approximately 30 unique tokens per speaker). Following the automated measurement, I hand-corrected each formant measurement by comparing with and without formant overlay in spectrograms displayed in Praat. I discarded an additional  $N = 52$  tokens during this process because they were too short or fricated to adequately track the formant, even manually. The final token count was 34,629 ( $N = 4,947$  unique  $\times$  7 time points). Count by

**Table 2.** Participant demographics.

Name <sup>a</sup>	Age	Gender	Ethnic Origin <sup>b</sup>	Home Language	Corpus
Hélène	16	F	Franco-French	French	LKB
Pierre	18	M	Franco-French	French	LKB
Théo	17	M	Franco-French	French	MPF
Thomas	17	M	Franco-French	French	MPF
Victor	17	M	Franco-French	French	MPF
Louis	15	M	Franco-French	French	MPF
Agnès	16	F	Franco-French	French	MPF
Denise	17	F	Franco-French	French	MPF
Élodie	17	F	Franco-French	French	MPF
Jeanne	19	F	unreported	French/Lingala	LKB
Isabelle	15	F	Congolese	Lari/Lingala	MPF
Léo	19	M	Republic of the Congo, Mali	Lingala	LKB
Chloé	19	F	Goma, Democratic Republic of the Congo	Swahili	LKB
François	14	M	Democratic Republic of the Congo	Lingala	MPF
Lina	19	F	Kinshasa, Republic of the Congo	Lingala	LKB
Cédric	18	M	Morocco	Arabic/Moroccan Berber	LKB
Arnaud	17	M	unreported	Arabic	LKB
Anne	16	F	Algerian	Arabic	LKB
Edith	16	F	unreported	Arabic	LKB
Joëlle	16	F	Algerian	Arabic	MPF
Michel	15	M	Algerian	Arabic	MPF
Romain	14	M	Algerian	Arabic	MPF

LKB: Le Kremlin-Bicêtre Corpus; MPF: Multicultural Parisian French Corpus.

<sup>a</sup>Participant names have been changed for confidentiality.

<sup>b</sup>To respect participant identities, I report exactly how bilingual speakers referred to their background (e.g. Algerian vs. Algeria).

vowel was 2,030 [œ], 3,458 [ø], and 12,752 [y] for the vowels of interest and 8,976 [a], 4,900 [i], and 2,513 [u] for the peripheral vowels.

The first and final time points were removed from all analyses as these points are prone to coarticulation. I then calculated the median data values of F3 and the difference between F3 and F2 at each time point (2–6), for each speaker’s front, round vowels. The result is two formant measurements for each vowel token. This method was chosen because certain demographics (male BF speakers) were underrepresented in the corpora; consequently, this conservative statistical technique helps not to overstate the effect of small speaker groups. Median values are more conservative than individual data points because they factor out measurement noise inherent in data point analyses. Differences must be very meaningful to emerge as significant for the acoustic measurements. All statistical tests and data visualization were performed in R (R Core Team, 2015) with the lmerTest (Kuznetsova, Brockhoff, & Christensen, 2013), car (Fox & Weisberg, 2011), spatstat (Baddeley, Rubak, & Turner, 2015), and ggplot2 (Wickham, 2009) packages and the normLobanov function in the phonR package (McCloy, 2016).

# Results

The primary analysis for this paper examines differences between bilingual and monolingual adolescents. Then differences between the bilingual groups, BF and AF, are discussed.

**Table 3.** Summary of F3 model.

	$\beta$	SE	<i>t</i>	<i>p</i>
(Intercept)	2738.5	67.3	40.694	<0.001***
Bilingual	-65.73	82.75	-0.794	0.437
Male	-378.01	88.56	-4.268	<0.001***
Vowel				
[œ]	81.96	29.68	2.762	0.012*
[ɣ]	40.68	24.17	1.683	0.107
Bilingual: Male	270.71	115.08	2.352	0.030*

*p*: *p*-value; SE: standard error.

\*: *p*-value < 0.05.

\*\*\*: *p*-value < 0.001.

Two mixed-effects models, one each for the dependent variables of interest F3 and the difference between F3 and F2, were fit with the fixed effects of **bilingual status** (monolingual or bilingual), **Corpus** (LKB or MPF), **vowel** ([ø, œ, ɣ]), **time point** (2–6), and **gender** (male or female). The random effect structure was random slopes for each **speaker's vowel**. Significance was determined under an alpha criterion of <0.05.

### Effect of bilingualism

*Corpus*. It was not expected that the different corpora would play a significant role upon the acoustic measurements, but this was tested through pair-wise comparisons of models for each acoustic measurement with and without the **Corpus** predictor. This was done before the addition of other fixed effects. Differences between Log Likelihoods of the F3 model were not significant ( $X^2 = 2.492$ ,  $df = 1$ ,  $p = 0.115$ ) – the addition of Corpus did not significantly improve model fit. However, Corpus was a significant predictor for the F3-F2 model: ( $X^2 = 6.092$ ,  $df = 1$ ,  $p = 0.014$ ) and was kept as a predictor for that model.

*Bilingual status*. One of the primary predictors of interest upon the formant measurements was participants' bilingual status. A forwards testing procedure was carried out on each model with the bilingual status variable before examining possible differences between the BF and AF bilingual groups. For each acoustic measurement, a model without interactions was fit containing the predictors **bilingual status**, **gender**, **vowel**, **time point**, and random slopes for each **speaker's vowel**. Pair-wise comparisons were made to ensure the significance of each predictor for the model. Time point was not a significant predictor of F3 and was removed from that model.

Interaction predictors were subsequently added to the model (excluding interactions with time points, as these were deemed irrelevant here). A Log-Likelihood comparison was made between the baseline model and the new model with each new interaction. If a predictor did not lead to a significantly improved model, it was dropped. The three-way interaction of **gender**, **vowel**, and **bilingual status** was significant in the F3-F2 model and the interaction of **bilingual status** and **gender** was significant for F3. The final models for each acoustic measurement are listed in Tables 3 and 4.

Unsurprisingly, men reliably produced vowels with lower F3 values and more condensed F3-F2 values. For F3, the model fit significantly improved with the interaction of bilingual status and gender, suggesting that the different F3 patterning across bilingual and monolingual speakers is dependent upon gender. Specifically, male bilingual speakers produced higher F3 values across all

**Table 4.** Summary of F3-F2 model.

	$\beta$	SE	<i>t</i>	<i>p</i>
(Intercept)	902.185	53.327	16.918	<0.001***
Bilingual	-3.154	60.088	-0.052	0.959
Male	-183.881	61.959	-2.968	0.008**
Vowel				
[œ]	218.936	73.046	2.997	0.008**
[y]	-20.27	46.313	-0.438	0.667
Time Points				
2	6.395	8.591	0.744	0.457
3	18.393	8.591	2.141	0.033*
4	48.695	8.591	5.668	<0.001***
5	60.645	8.591	7.059	<0.001***
MPF Corpus	82.814	34.852	2.376	0.029 *
Bilingual: Male	187.121	80.666	2.32	0.033 *
Bilingual: [œ]	-44.196	91.568	-0.483	0.635
Bilingual: [y]	-20.936	58.056	-0.361	0.723
Male: [œ]	-155.133	98.001	-1.583	0.132
Male: [y]	27.716	62.135	0.446	0.661
Bilingual: Male: [œ]	102.039	128.841	0.792	0.439
Bilingual: Male: [y]	-105.595	80.723	-1.308	0.207

MPF: Multicultural Parisian French Corpus; *p*: *p*-value; SE: standard error.

\*: *p*-value < 0.05.

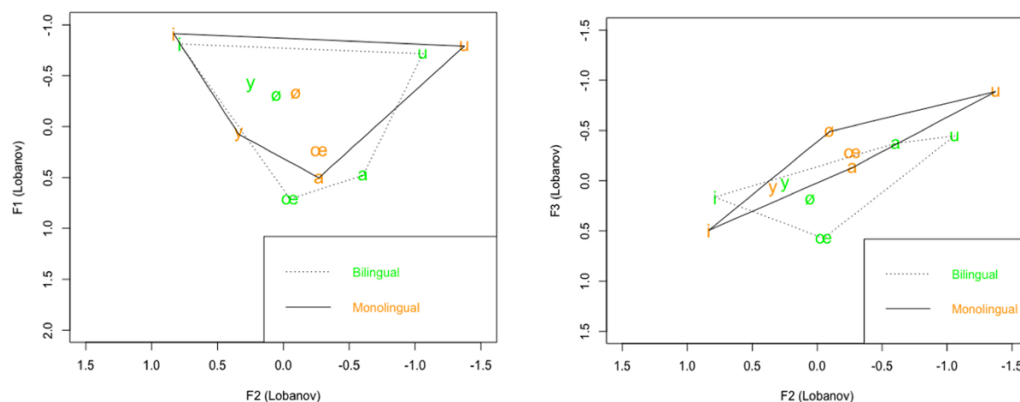
\*\*: *p*-value < 0.01.

\*\*\*: *p*-value < 0.001.

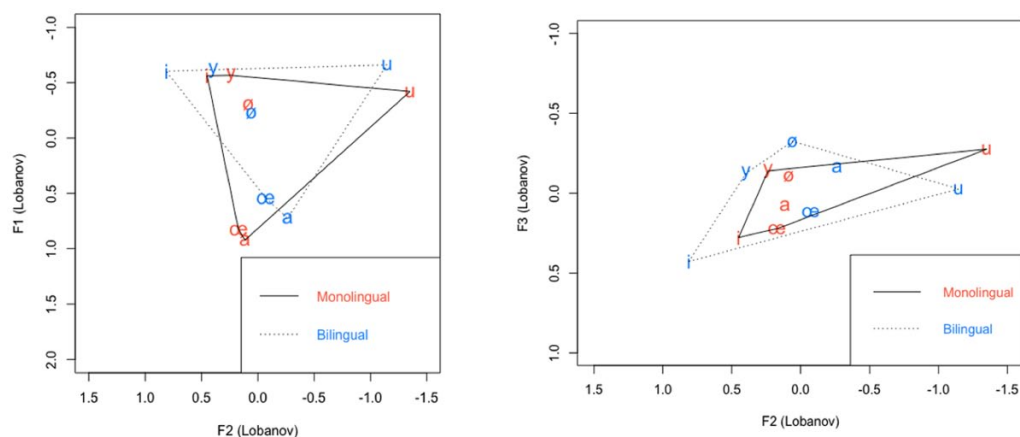
the relevant front, round vowels, whereas the only vowel that female bilingual speakers had higher F3 values for, compared with monolingual female speakers, was /y/. The speakers' acoustic hulls, with peripheral vowels to show a full space, are presented in Figures 6 and 7. To account for biologically inherent, i.e. vocal tract length, differences between participants, all visuals are presented with Lobanov-normalized formants (Lobanov, 1971).

The lower median F3 in monolingual speakers is an anticipated finding: low F3 is a primary cue for roundedness in French. But because languages such as Arabic, Swahili, and Lingala do not have phonemic roundedness, the F3 cue was predicted to be higher. Speakers do not rely upon the feature in their HLs and do not have phonemic front round~unround vowel distinctions. The discrepancy between male and female speakers, however, suggests a social conditioning beyond HL. Furthermore, note that even F3 of the high, back round vowel /u/ – included in the phonemic vowel inventory of French and all the HLs – is also lower for monolingual speakers. This is partly, but not entirely, due to male monolingual's acoustic reduction: the mid vowels /œ/ and /ø/ showed a greater discrepancy between monolingual and bilingual male speakers than did /u/ – a vowel common to French and the HLs.

For the model predicting the difference between F3 and F2, the interaction of gender, bilingual status, and vowel significantly improved fit. Differences are primarily in male speakers: bilingual male speakers had a significantly higher F3-F2 difference than monolingual speakers across all vowels ( $\beta = 187.121$ ,  $t = 2.32$ ,  $p = 0.033$ ), although, as Figure 8 shows, the greatest difference was in mid round vowels /œ/ and /ø/. Female speakers do not demonstrate such stratification by bilingual status.



**Figure 6.** Acoustic dispersion of male speakers.



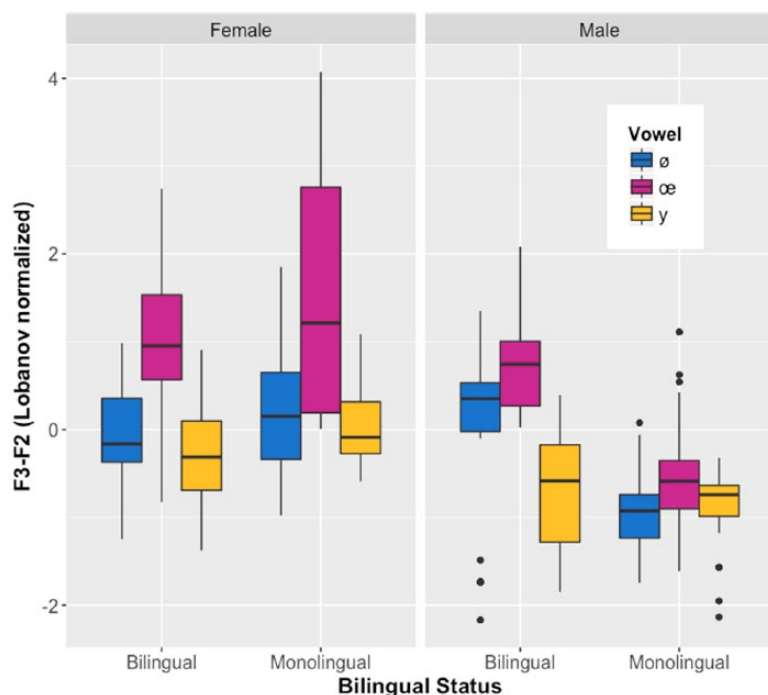
**Figure 7.** Acoustic dispersion of female speakers.

### *Linguistic group*

The second objective was to examine differences between the bilingual speaker groups. Because not all bilingual speakers of French and another language in France have the same linguistic or social experience, it may be that, despite the similarity of the HL vowel inventories, AF and BF speakers show different patterning. This was tested by fitting linear mixed effects models with the same methodologies. The bilingual status predictor now changed to a three-way predictor that included type of bilingual: BF, AF, and monolingual FF.

*Corpus.* Preliminary models were fit to ensure that Corpus did not significantly predict the acoustic measurements. The differences between Log Likelihoods of the F3 model were once again not significant ( $X^2 = 1.517$ ,  $df = 1$ ,  $p = 0.218$ ), but Corpus did significantly improve model fit for F3-F2 ( $X^2 = 4.419$ ,  $df = 1$ ,  $p = 0.036$ ). It was kept as a predictor in that model.

*Bilingual groups.* The same forwards procedure was completed before adding interactions. Pairwise comparisons ensured each predictor's significance. For F3, the interaction of linguistic group and gender was significant and for F3-F2 the interaction of linguistic group, gender, and vowel was

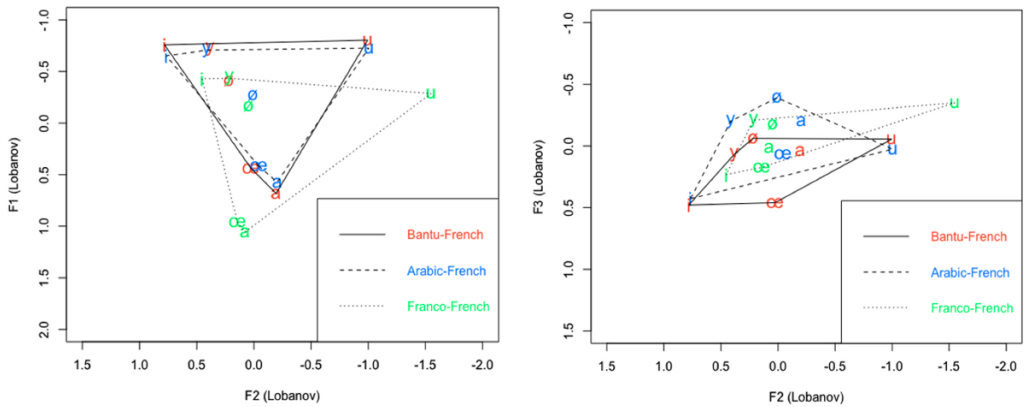


**Figure 8.** F3-F2 by vowel, gender, and bilingual status.

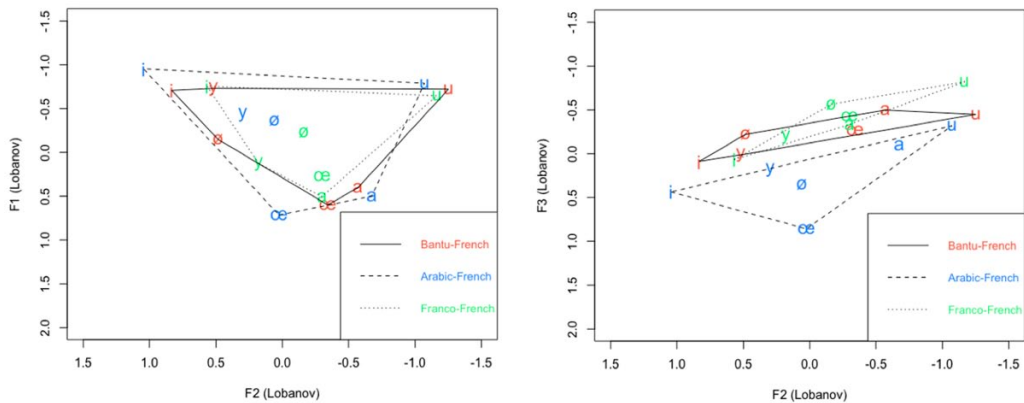
significant. Models with the three-level linguistic group variable differed little from those in Tables 3 and 4, so linguistic group is the only predictor that will be discussed.

The significant interaction of gender and linguistic group for F3 once again demonstrates that differences between bilingual and monolingual speaker groups are highly dependent upon gender. Note though that the low number of male BF speakers ( $N = 2$ ) means that any results that demonstrate an interaction of gender and linguistic group should be interpreted with caution. More reliable differences can be gleaned by bilingual status. For the front, round vowels in question, female BF speakers had consistently higher F3 values than either of the other groups (Figure 9). AF female speakers had consistently lower F3 values, lower even than monolingual speakers, for /œ/ and /ø/. For male speakers, however, AF male speakers differed more from FF male speakers than from BF: AF speakers had higher F3 values for all their vowels (Figure 10). However, just as in the earlier F3 model examining the effect of bilingual status, the mid, front vowels had much higher F3 values in comparison to BF and FF than did /u/. This discrepancy between /u/ and the front round vowels means that it is not the overall acoustic space that differs between male speaker groups, for reasons of reduction, vocal tract anatomy, or otherwise; rather, the speaker groups primarily differ in F3 values of the front round vowels.

For the difference between F3 and F2, the interaction of vowel, gender, and linguistic group was once again significant, suggesting that the effects of the social variables are dependent on the vowel examined and are present in the relationship between vowels. Figure 11 outlines the interaction of vowel, gender, and linguistic group and shows that the differences still rest primarily with male speakers. Whereas male BF and AF speakers pattern similarly for /œ/, monolingual speakers have a smaller difference between F3 and F2 for the vowel. Likewise, the difference between F3 and F2 was larger for AF speakers for /y/ than either of the two other groups and similarly for /ø/. This suggests



**Figure 9.** Acoustic dispersion of female speakers by linguistic group.



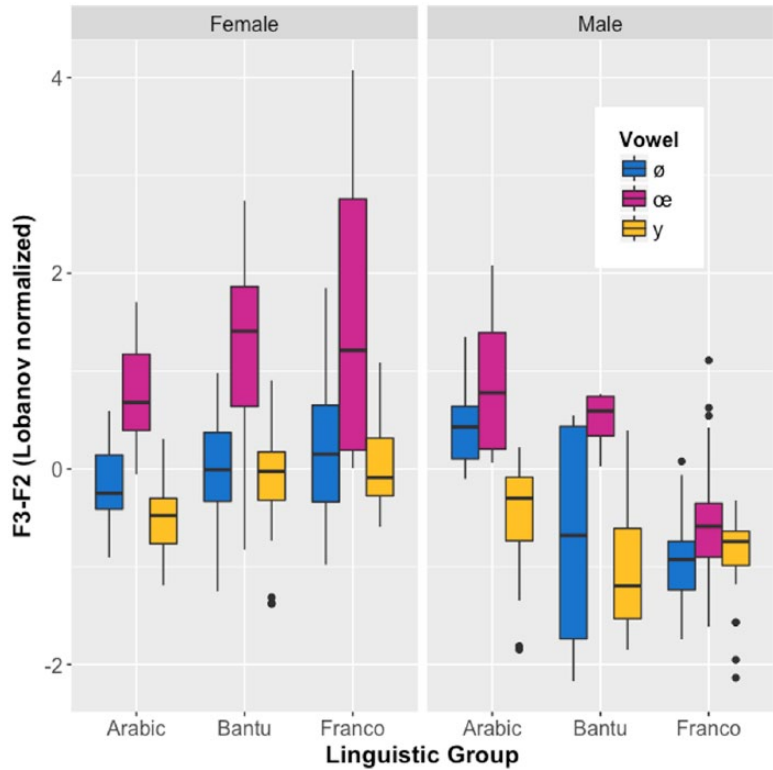
**Figure 10.** Acoustic dispersion of male speakers by linguistic group.

that AF speakers are not lowering their F3, as rounding requires. BF speakers pattern between FF and AF speakers for F3 – AF have a lower F3 and FF higher. Overall, however, particularly in the F1/F2 space, the largest differences are still between bilingual and monolingual speakers.

In sum, results show that the distinction of bilingual versus monolingual is most meaningful. Female bilingual speakers, for example, pattern remarkably close in an F1/F2 space, distinguishing their production from monolingual female speakers. Still, particularly amongst the male adolescents, there are some real differences between the bilingual groups that differences between the HL vocalic phonologies cannot account for. Male AF speakers have higher F3 productions suggesting that these speakers are not rounding to the degree of male BF or FF speakers.

### *Monolingual male patterns*

An additional, unexpected finding emerged from these analyses: monolingual male speakers show more acoustic reduction, in the form of a smaller vowel space, than bilingual male speakers. Many of FF speakers' median vowel measurements are more compact and centralized than either group



**Figure 11.** F3-F2 by vowel, gender, and linguistic group.

**Table 5.** Acoustic dispersion: Male speakers.

	Acoustic Space: Round Vowels Only	Acoustic Space: All Vowels	[y] Dispersion	[œ] Dispersion
Bantu-French	11,066.33 units <sup>2V</sup>	75,505.82	1.651	2.957
Arabic-French	6,149.272	101,708.5	1.608	2.214
Monolingual-French	5,374.63	57,532.4	1.335	1.222

of bilingual male speakers. Table 5 lists the area of each acoustic hull. The overall acoustic dispersion the first two formants of the round and peripheral vowels examined for monolingual male speakers is just 57,532.4<sup>3</sup> units<sup>5</sup> compared to 101,708.5 for AF males and 75,505.82 for BF male speakers. This acoustic reduction is also apparent even when only round vowels are included in the calculation: BF speakers have an acoustic space of 11,066.33 and AF speakers likewise have a larger dispersion of 6,149.272. Monolingual FF speakers, however, still show greater reduction with just 5,374.63 units<sup>2</sup>. Because the three groups pattern similarly for /u/, this is largely attributable to the front vowels studied.

**Discussion**

The goal of this study was to isolate the roles of bilingualism and societal exclusion in the multi-ethnic Parisian suburbs. Male speakers' vowels differ by bilingual status and linguistic group. Male



AF speakers did not lower F3 to the degree of monolinguals or BF. Although this is likely due to the HL influence, the fact that BF speakers differentiated their acoustic patterning from AF suggests that social identity may also be contributing.

### *Dual phonology effects*

Because the contact languages studied do not contrast by roundedness, Hypothesis I (see above) predicted that the bilingual groups would produce unrounded variants via increased F3 values. F3, an acoustic cue that can indicate vowel roundedness, does not have a contrastive function in the contact languages studied. This was confirmed for the male bilinguals, but not female. The interaction with gender suggests that the pattern cannot solely be attributed to speakers' multiple phonologies. This last fact also lends insight into vernacular re-organization, or when children divert from their caregivers' speech patterns to their peers upon entering primary school. The bilingual speakers started acquiring French at approximately the age that re-organization occurs (if they were socialized external to the home). How did this affect the French they acquired? Clearly the students do not simply speak a French influenced by the phonologies of their HLs. Had this been the case, the AF and BF speakers' front vowels would not have differed. But these groups also did not converge upon the vernacular of their monolingual peers, meaning that these groups did not acquire a mutual dialect upon entering school.

Spontaneous production is not the only metric for examining bilingual phonetic production. For example, although Amengual (2016a) found that bilingual Catalan-Spanish speakers accurately distinguished between minimal mid-vowel pairs, the speakers struggled to differentiate between real words and non-words containing these vowels in a lexical decision task. Furthermore, in that study and elsewhere (Amengual, 2016b), Amengual has found that Catalan-Spanish bilingual speakers' language dominance dictated which mid vowel contrasts the speakers maintained and which were more closely merged in acoustic space. Inherent in these results is the fact that establishing unique, language-specific categories may be more difficult for the bilingual speaker when the acoustic categories of their less-dominant language are not substantially distinct from the categories of their dominant language. This will only be exacerbated when the contrasts are also not prevalent in the lexicon, via many minimal pairs, for example. Consequently, the presence or absence of a vowel in the HL inventory cannot likely predict a bilingual speaker's pattern. It is rather the relationship between the two systems. Although this study did not incorporate acoustic data from the students' HLs, it suggests that the importance of an acoustic cue for phonemic contrasts, such as F3 lowering, in a HL may predict how bilingual speakers employ the cue in another language.

Still, male and female bilingual speakers did not pattern in the same way and male bilingual speakers differed by speaker group. These social patterns warrant exploration.

### *Factors beyond bilingualism*

France has a long, sordid history of post-colonial immigration (Hargreaves & McKinney, 1997). Despite gaining rights to citizenship after World War II (Manby, 2014), immigrants from the former French colonies of West and North Africa were not traditionally welcomed to France. And even once descendants of early immigrants from former colonies like Algeria were granted dual-citizenship in 1963 (Dabène & Billiez, 1987), exclusion from the labor market and near-exile into the periphery of major French cities resulted in a cycle of poverty for many immigrant descendants for decades after first arrival. Anne, a student in this study, astutely commented on this, saying:

Anne: But without that I think that in the *banlieues* they put the people who have less money and in Paris they put the people who have more money which makes it so...

M: Why did they do that? And who did it?

Anne: The state. To show the tourists that *voilà*, Paris is great, and everyone is beautiful, everyone is polite, and everyone has money... So the tourists don't generally go outside of Paris, so they don't know how what happens and as a result they don't really know how we live.

(LKB: my translation)

Interest in the topic of immigrant integration in France has recently intensified. This is perhaps due to a rise in extremist ideologies in a small minority of Western European immigrant communities. Samata (2016) suggests that second and third generation immigrants' linguistic exclusion from the monolingual majority community as well as their own monolingual minority communities may incite unrest and sentiments of alienation in adolescents. Additionally, in a series of labor market studies, Adida et al. (2010; 2014) concluded that North Africans experienced more discrimination than other non-European job applicants, particularly when employers assumed applicants were Muslim.

In addition, whereas the role of religion upon linguistic behavior could not be evaluated – France's strict secular ideology in the public sphere discourages discussion of religious affiliation in schools (Laurent, 2015) – the topic arose in conversation. When asked if he used a particular slang term that is unique to the *banlieues*, François responded 'No, no, I'm not Muslim' (MPF: my translation. Later in the interview, François summed up the attitude of many in contemporary France as he confirmed the nationality of another student saying, 'Yeah, yeah French...*but* [he is] Muslim' (emphasis added).

Comments like these suggest that to some in France, French citizens of North African descent, and by extension Arabic speakers in general, are synonymous with Islam. The habits and linguistic patterns of those speakers, particularly young males of North African heritage, are something to be avoided. The adolescents' phonetic patterns even reflect this sentiment. Male AF students differ from male FF and BF – the latter did not differ significantly from one another. Rather, FF speakers differed most from AF with male BF speakers patterning somewhere between. Because the phonetic differences between AF and BF speakers are not due to HL phonology, it could be that BF and FF speakers may attempt to disassociate from a North African linguistic identity. Meanwhile, AF speakers may disassociate from the monolingual French. In both cases, the pattern is attributable to the tendency for French citizens of North African descent to more often be the victim of xenophobia, in particular Islamophobia, in France (Adida et al., 2010, 2014; Boumahdi & Giret, 2005; Duguët et al., 2008; Foroni, 2008). It is little wonder that the children of immigrants from other countries, in addition to monolingual speakers, would not model their speech after these students.

### Gender-specific patterns

An unexpected finding was that monolingual males have a reduced vowel space compared to bilingual male speakers. Why do monolingual, but not bilingual, adolescent male speakers exhibit such phonetic reduction? One explanation could be intra-vocalic dispersion: the reduction may be due to category sharpness attained by monolingual speakers' increased usage of French. If phonological representation isn't a landscape of abstracted categories without encoded phonetic detail, but rather a system of episodes constructed from the bottom up (Johnson, 1997; Pierrehumbert, 2001), then we should anticipate that those speakers whose categories are more reinforced through increased usage – so, monolingual speakers – would have sharper, more defined categories. Specifically, having amassed more episodic traces for these vowels than bilingual speakers simply by virtue of French being the only language that they communicate in, perturbations in the acoustic-auditory signal are

less influential to monolingual speakers' phonological storage and eventual phonetic production. And because recent work has suggested that vocalic dispersion is inversely correlated with vowel inventory size (Recasens & Espinosa, 2006), then those speakers who have tighter, more compact acoustic vowel categories might likewise show acoustic reduction.

To test the hypothesis that bilingual speakers have fuzzier phonological categories than monolingual speakers, particularly when such categories do not overlap with their HL, the relative sizes of the [œ] and [y] vowel categories (dispersion in the F1-F2 acoustic space) for the three linguistic groups were compared. F3 was not included as it does not prototypically serve to distinguish these sounds. If monolingual speakers have smaller vowel dispersion than bilingual speakers for [y] and [œ], it could explain their acoustical reduction. The standard deviation of F1 and F2 values for [œ] and [y] were calculated (see Table 5 in results). These values were then used to calculate the area of each vowel's ellipse via the formula  $area = ab\pi$  where  $a$  is the major radius and  $b$  the minor. Finally, given the monolinguals' reduced acoustic space relative to both groups of bilinguals, the ellipse area of each vowel was normalized by the total area of that group's acoustic space (including peripheral vowels) to give a measurement of vocalic dispersion for [œ] and for [y].

These calculations demonstrate that monolingual male speakers have sharper vowel categories. For the mid front vowels /œ/ and /y/, monolingual male speakers have dispersions of 1.222 and 1.335, respectively. In both instances, the bilingual groups have larger dispersions with BF speakers at 1.651 for [y] and 2.957 for [œ] and AF speakers at 1.608 for [y] and 2.214 for [œ]. In accordance with their overall acoustic reduction, the monolingual male speakers also have tighter categories for the front, mid vowels /œ/ and /y/. This supports a possible explanation of phonetic reduction/expansion via bilingual speakers' category fuzziness.

The finding that monolingual male speakers showed greater overall acoustic reduction, in the form of a smaller vowel space, is notable for several reasons. Sound change derives from an array of speaker variability (Ohala, 1989) and adolescent speakers are the earliest adopters of this variation (Eckert, 2004). As demonstrated above, bilingual adolescent male speakers have more dispersed vowel categories, relative to the size of their overall acoustic space, than monolingual male speakers. So, in accordance with other language contact models that chalk up language change to innovation from bilinguals, or even some proposals of the immigrant community as the source of (some) sound changes (Labov, 2001), this result suggests that in this language contact situation, bilingual (male) speakers innovate sound change. Language contact may not be necessary for a change to occur, but the study of different speaker groups, bilingual and monolingual, permits us to isolate a potential source of the change.

Second, unlike the male participants studied here, the female speakers did not stratify by linguistic group. If we consider the male stratification an innovative characteristic of Hexagonal French dialects, then the male pattern is in line with a number of other studies where male adolescent speakers employed more features of the multiethnolect than female adolescent speakers. In Oslo, male adolescents are the most frequent contact language loanword adopters (Svendsen & Røyneland, 2008) – female speakers hardly employ these borrowed words at all. At the phone level, all adolescents in Cheshire et al. (2011) participate in the vowel changes studied (e.g. fronting and raising of the FACE vowel, fronting of the CHOICE vowel), but these patterns are most prominent in male speakers. Tendencies by gender do not go unnoticed amongst the speakers. One participant in Svendsen & Røyneland (2008: 69) 'project[ed] an imagery of the multiethnolectal user as male, lazy, and with no activities other than girls'. However, elsewhere, the distinction is not nearly so straightforward: the most prominent multiethnolect speakers in Quist (2008)'s study in Copenhagen could not be uniformly defined by gender or ethnicity. It is therefore incorrect to say that multiethnolect speakers tend to be male or male adolescents tend to have more features of their local multiethnolect; rather, the patterns intersect with other many elements of adolescent

identity including gender, but also ethnicity, affiliation to school, friendship network ties, and other languages spoken.

This does not provide an answer to why only monolingual male speakers, but not female speakers, exhibit the acoustic reduction phenomenon. The social network ties of the female adolescents recorded might explain some of the variation. The speakers in this study were neatly binned into groups based on HL. But an important caveat to the results is that of course a speaker's linguistic reality does not necessarily reflect this experimental practice. At the secondary school in Le Kremlin-Bicêtre, students from diverse backgrounds frequently socialized together, with French as the *lingua franca*. One of the main social delimiters at the school was not race or even gender, but the academic tracks (university-bound or technical). This still intersected with HL spoken and gender.

Although this study did not test social network ties, it would be an interesting avenue for future research in this social context. Quantitative information on social ties and connectivity is not available for the LKB Corpus, but the creators of the MPF report on network participation scores. This is especially the case where similar research has demonstrated the importance of peer networks and friendships for multiethnolect practices (Fox, Khan, & Torgersen, 2011).

### *Multiethnolects in other contexts*

This study informs, and complicates, our understanding of phonological dynamics in the multiethnolects of Western European capitals. Previous studies often reported on a diverse population of adolescents, monolingual and bilingual, who spoke the local multiethnolect. However, the bilingual and monolingual speakers in this study have markedly different vocalic patterns, and they are not attributable to HLs. This does not mean that the monolingual speakers do not have some characteristics of *banlieue* French. After all, the students in all three linguistic groups attended the same secondary schools and lived in the same neighborhoods. However, the finding that monolingual speakers differ from both bilingual groups is at odds with some other studies of phonological phenomena in similar social settings. Nortier & Dorleijn (2008) report that a portion of the monolingual Dutch speakers they studied, as well as bilingual speakers, have a 'Moroccan-flavored Dutch' accent (Nortier & Dorleijn (2008): 125) and monolingual German speakers with strong network ties to the Turkish community show similar patterns in Hamburg (Auer & Dirim, 2003).

A recurrent finding in other studies of European multiethnolects is that innovative forms, although they may originate from contact languages, are employed by those who do not speak the contact languages. This is a sign that the forms have taken on sociolinguistic significance, beyond a HL effect (Cheshire et al., 2015). Madsen (2013) goes further and discusses how features formerly ascribed to immigrant communities in Copenhagen now index high or low socioeconomic stratification, regardless of the speaker's migration status. Consequently, the transmission of innovative forms is not strictly vertical – from a contact or HL to the majority language via bilingual speakers – but also horizontal as the forms are transmitted between all multiethnolect speakers, no matter their bilingual status. The results here do not refute this tendency. They just demonstrate that at a fine-grained phonetic level, there may still be differences in how the male speakers adopt innovative variants.

### **Conclusion**

This study showed that bilingual and monolingual adolescents of the French *banlieues* have distinct acoustic vowel patterns. Male AF bilingual speakers showed significantly less rounding for the front, round vowels /y, ø, œ/ when compared to their monolingual peers. This stratification by linguistic group rules out the exclusive role of the bilingual speakers' HL upon their phonetic

patterning because none of the bilingual speakers' HLs contrastively employed the front, round vowels in question. This laboratory in the field design thus permitted isolation of the effect of HL. These results support previous works that have found differences in phonetic patterning that go beyond the first language and are attributable only to speaker identity (Alfaraz, 2011; Lybeck, 2002). Bilingual AF speakers may be constructing a unique identity that incorporates elements of their HLs while distancing their phonetic patterning from monolingual speakers. However, although ethnic heritage and identity do certainly play a role in bilingual phonological behavior, the strongest differentiation may be between monolingual and bilingual speech.

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## Notes

1. That is when accounting for the well-known sociolinguistic phenomenon of AGE-GRADING, or the evolution of linguistic practice across the lifespan accompanied by stability in the community.
2. Cheshire et al. (2015) point out that often adolescent vernaculars express a conscious stance and are not, as such, traditional vernaculars (see also Svendsen & Røyneland, 2008). I did not see evidence of this during fieldwork and use vernacular and multiethnolect interchangeably here.
3. Cheshire et al. (2011: 189) find similar results in Multiethnic London English.
4. Active constituents make up 77.5% of the population.
5. The units of measurement are pixels calculated from the convex hulls in the R programming language using the 'area' function. Note that area was calculated from Hz, not the Lobanov-normalized values that the figures display.

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### Author biography

Margaret Cychosz is a PhD candidate in Linguistics at the University of California, Berkeley. Her research interests include experimental phonetics, child phonology, and psycholinguistics.