Implicit Memory Affects Sociolinguistic Processing: Evidence from Ethnic Cues and Prosodic Perception in Parisian French

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The effect of exposure to aspects of speaker identity like dialect group affiliation (Niedzielski, 1999) or age (Drager, 2005) on speech perception has been used to argue for exemplar-based models of representation (e.g., Mendoza-Denton, Hay & Jannedy, 2003: 135). The effects of more sensitive information, like cues to ethnicity, remain unexplored. In this study, Parisian listeners were exposed to implicit visual cues related to ethnicity prior to hearing prosodic patterns ranging from an unmarked phrase-final prominence to a penultimate prominence found primarily in ethnic minority youth speech. While listeners were generally slower to process this marked contour, they did so more quickly when it was preceded by a masked cue to ethnic minority group affiliation. Listeners' ethnic bias, measured in a questionnaire, was a significant predictor of this effect. Results are discussed in relation to sociolinguistic processing and implicit memory, social cognition concepts and potential future processing studies. (148 words)

Mental representations of variation constitute a recurrent theme in the sociolinguistics literature. The perceptual boundary between /s/ and /ʃ/ in American English, for example, has been shown to vary based on the prototypicality of male or female voices and also as a function of accompanying male or female faces (Strand, 1999). In addition to pointing to the multimodal nature of perception, this finding indicates that "stereotypes have a strong influence in perceiving social information… [and] also play a role in perceiving speech" (94). In the context of variable chain-shifting among ethnic groups, Philadelphians indicated that productions of /aw/ and /ow/ with a higher F_2 sounded "white", but that the same productions sounded more "black" when resynthesized to contain a lower F_2 (Graff, Labov & Harris, 1986). This finding suggests that perceptions of ethnicity are subject to manipulation via speech resynthesis.

Evidence for theoretical accounts of such representations can be found in studies suggesting that expectations related to a speaker's dialect background can affect how listeners hear related segmental variation. In Hay, Warren & Drager (2006), New Zealanders heard minimal pairs containing /ɪə/ and /ɛə/, vowels currently undergoing a merger in New Zealand English led by younger, lower class speakers. Productions were accompanied by photographs showing male and female, older and younger, and higher and lower social class speakers. Although the photo manipulation produced several effects, listeners were generally better at distinguishing the centering diphthongs when they expected to hear an older, upper-class speaker, indicative of the group for whom these contrasts remained distinctive. Findings from this and similar studies have been used to argue that "encountered speech is stored as exemplars, which are indexed for both linguistic and social information" (Hay, Warren & Drager, 2006: 480).

Similarly, Labov and colleagues (2011) have investigated how listeners evaluate speakers by referencing linguistic forms known to index stable social meanings. In their studies, listeners assessed the degree to which the presence of /in/ versus /ing/ affected professional suitability for news broadcasters. Results indicate that mental representations of speakers are constantly updated and that women in particular are more sensitive to marked forms than unmarked forms. These trends hold across dialectal boundaries and age groups, leading these researchers to posit the existence of a "sociolinguistic monitor", a mental faculty that "observes, processes and stores social information" contained in speech (Labov, 2006: 512).

While both groups of studies focus on the interplay of social and linguistic processes during speech perception, they differ in at least two respects. First, while sociolinguistic monitor research has only investigated speaker evaluation as a conscious process, exemplar theorists have posited that speech is represented similarly in implicit and explicit memory (Lachs, McMichael & Pisoni, 2003). Other sociolinguists, however, have hypothesized that socio-indexicality must utilize implicit memory "given how rapidly it can be carried out and [given] the disconnect between online reactions and explicit discussions" (Campbell-Kibler, 2009: 151). Second, while exemplar theorists have concentrated on the encoding of phonetic tokens with social information, examination of the sociolinguistic monitor has focused explicitly on listeners' conceptualizations of speakers. If sociolinguistic perception is tightly intertwined with mental processes related to speaker identity, the effects of social cognition on the processing of speech with social meaning may be more extensive than previously thought. More generally, both groups of studies have tended to concentrate on segmental variation in English, usually American, and relevant social categories for (American) Anglophone listeners. Comparable

categories are perceived differently and sometimes even contested in other contexts, indicating that variation may be represented differently according to varying cultural norms.

The present study measured the effect of visual cues related to ethnicity on the processing of a phrase-final rise associated with "Reference French", an unmarked, non-regional accent spoken by most educated people (c.f. Morin, 2000; Lyche, 2010), versus a rise-fall pattern indexing Parisian multiethnic youth speech. Previous studies (Stewart & Fagyal, 2005) found that Parisian listeners objected to specifying the ethnic connotations of the rise-fall pattern due to the sensitivity surrounding the concept of ethnicity in France. Thus, openly indicating ethnic group affiliation would not have been desirable in this context, so ethnic cues were presented subconsciously using masked primes. Masked priming has been acknowledged as "potential tool for investigating relationships between sociolinguistic variables and other social and linguistic structures" and may be particularly useful for examining those relationships which individuals are unwilling to address explicitly (Campbell-Kibler, 2010: 36).

The structure of this article is as follows. The next section introduces the context in which the study took place. A review of the masked priming literature then precedes a description of the approach used. A fourth section lays out results. A discussion is then presented of the results' implications for the role of implicit memory in sociolinguistic processing, models of sociolinguistic perception and future directions for processing studies in sociolinguistics.

BACKGROUND

Large, mostly extra-European immigration to urban centers played a formative role in intergroup relations in post-World War II Europe. In France, linguistic and religious differences

slowed the integration of ethnic minorities from former French colonies, who were met, on occasion, with open hostility. Goubert's preface to Noiriel's (1988:51) history of French immigration highlights, for instance, how immigrants from outside of Europe have been viewed as "'new foreigners'" who have "bothered us [the French] the most, by a color or a belief far from that to which we are accustomed"[1] (51). The difficulty of assimilating these large, working-class immigrant groups has since contributed to the persistence of the *banlieues* ("suburbs"), isolated communities on the peripheries of urban centers marked by high unemployment, prevalent crime, urban poverty and certain marked language practices.

In a society in which official language use is also "the central criterion of 'Frenchness', the badge of French nationhood, the symbol of rationality and patriotic values" (Lodge, 2004: 207), multiethnic and multilingual suburban communities stand out. Their exceptionality with respect to this rigidly monolingual society was underscored in commentaries on French youth language practices originating in the *banlieues* in the 1990s (Boyer, 2001: 77). While some focused on lexical novelty, many reported on contact-induced changes in French phonology (for a review, see Pooley, 2007; Fagyal, 2010). The contact-induced phonological feature targeted in the present study, intonation, was singled out by the earliest observations. Christian Bachmann, a prominent French sociologist, observed that "the average French citizen feels harassed by this language, by its particular intonation curves that sound like a verbal slanging match"[2] (Genin, 1995: 2). Several French sociolinguists have subsequently argued that one of these "particular intonation curves" might index an ethnically-marked instantiation of working-class Parisian

[1] "*Ce sont désormais les 'nouveaux étrangers' qui nous dérangent le plus, par une couleur ou une croyance éloignée de nos habitudes.*"
[2] "*le Français moyen se sent agressé par cette langue, dont les courbes intonatives spécifiques sonnent comme des engueulades…*"

French (Conein & Gadet, 1998; Fagyal, 2003; Lehka-Lemarchand, 2007).

The markedness of this intonation pattern can only be interpreted with respect to the inventory of intonation contours reported in Reference French. In neutral, utterance-medial phonological phrases in Reference French, metrical prominence is realized on the final full syllable via increased duration, intensity and a steep F_0 rise (Di Cristo, 1998; Jun & Fougeron 2000, 2002). A similar pattern obtains in utterance-final positions for continuation rises (Delattre, 1966), such as listing contexts (Guaïtella, 1991). In a picture-naming task recorded during an ethnographic study in the Parisian *banlieue* of *La Courneuve*, listing contours were recorded in which phrasal prominence was shifted to the penultimate with a fall in the final syllable, a "rise-fall" contour (Fagyal, 2003). This unfamiliar rise-fall contour was most often found in the speech of young, working-class Arabic / Berber heritage speakers, frequently referred to as *Beurs*. Unlike the use of a marked rising interrogative contour by Turkish-German bilinguals in Queen (2001), however, non-*Beur* also occasionally used this contour. All speakers who produced this marked contour alternated between it and the canonical phrase-final F_0 rise during the picture-naming task, the former apparently constituting a style feature indexing in-group identification (Fagyal & Stewart, 2011).

Verifying this contour's precise social meaning via perception studies has proven difficult. In Stewart & Fagyal (2005), Parisian listeners openly objected to identifying speakers' ethnicity on the basis of a four word recording in which some productions contained the rise-fall contour. Listener feedback suggested that this resistance was due to the fact that the concept of ethnic differences is considered taboo in France. The French have historically skirted explicit identification of individual ethnicities, preferring to frame questions of ethnic relations in terms

of integration into French society (Hargreaves, 2007: 9). Mainstream left and right-wing French political ideologies have even rejected the legitimacy of the phrase "ethnic minority" as it was historically "held to be devoid of meaning… only citizens were recognized, and, since 1789, those free citizens were supposed to have been immune from discrimination on account of their origins" (Begag, 2007: 110). Unfortunately, as Juteau (1996: 97) notes, this official policy of disavowing overt ethnic group identification "does not curb discriminatory practices aimed at immigrants and their descendents"[3].

As such, perception studies targeting ethnic cues in spoken French have had to proceed cautiously. In a perceptual study of prosodic variation recorded in a *banlieue* near the Norman city of Rouen, Boula de Mareüil & Lehka-Lemarchand (2011: 349) "warned" participants that they would be evaluating stigmatized speech. Subsequently, both Rouennais and Parisian participants reported the phrase-final F_0 fall as being most evocative of a *banlieue* accent. In a perception study of the rise-fall contour in the Paris region, participants evaluated the linguistic prestige of towns prior to using them to "place" speech samples with variable prosodic configurations (Stewart, 2009). These studies revealed that the salient portion of this contour may actually be the absence of acoustic cues to phrase-final prominence.

These perceptual studies give some insight into the phonological composition of this prosodic marker, but do relatively little to probe the type of social meaning it connotes. For example, although the contour may not be used exclusively by *Beur* speakers, there is considerable evidence that listeners still make this association: "much of the literature points to an identification with the so-called *Beur*" (Pooley, 2007: 322). One could hypothesize that this

[3] "*Le rejet si répandu du concept d'ethnicité, en France notamment, n'enraye pas les pratiques discriminatoires envers les immigrés et leurs descendants…*"

association may be indicative of a broader pattern in which the frequently sensationalized coverage of the *banlieues* has contributed to the "resurgence of the emblematic 'deviant Other', exclusively masculine and very often of Maghrebi heritage"[4] (Fagyal, 2010: 31). In the French context, "Maghrebi" (*maghrébin*) typically refers to the ethnic group affiliation of successive generations of immigrants from Morocco, Algeria and Tunisia.

The delicate nature of these questions in the French setting contrasts markedly with other contexts in which sociolinguistics have studied ethnicity, suggesting a potentially novel mental representation of ethnic speech markers. As implied by participants' negative reactions to experimental tasks requesting overt identification of speakers' ethnicities, this context also necessitates a different kind of approach for a study targeting the effect of cues to ethnicity on speech perception, one that could be useful for collecting evaluations of similarly sensitive language practices elsewhere. Following the methods of a hiring discrimination study that used Moroccan names as a "foreign" guise to imply candidates' ethnic minority group membership (Duguet, Leandri, L'Horty & Petit, 2007), the present experiment uses one Moroccan first name and one ethnic majority first name as masked primes to covertly activate mental representations of ethnic group affiliation.

Implicit Experimental Techniques: Masked Priming

Masked priming studies present subconscious visual cues to test their effect on the processing of subsequently presented target stimuli. In an early demonstration of semantic activation via masked priming, for instance, Meyer & Schvaneveldt (1971) found that

[4] "*le thème des banlieues fait ressurgir la figure emblématique de l'Autre délinquant (*the deviant Other) *exclusivement masculin et bien souvent maghrébin* "

participants were quicker to identify the word “NURSE” when it was preceded by “doctor” as compared to “butter”. This lower “reaction time” (RT), measured in milliseconds (ms), indicates increased activation of the semantically related “NURSE” following “doctor”, a congruent trial, as opposed to the incongruent “butter”.

Masked priming has been used to establish how individuals automatically process orthographic, phonological, morphological and semantic properties of words (Forster, 1998). This method has been extended to cross-modal studies which examine the effect of a visual masked prime on the processing of an auditory target. While evidence for cross modal masked priming has been claimed to be more tenuous than unimodal priming (see Kouider & Dupoux, 2001), proof of its effectiveness has been established using both reaction time methodologies (Grainger et al., 2003) and psychophysiological approaches (Kiyonaga et al., 2007).

Masked priming studies in social psychology have focused on the automatic activation of attitudes (e.g., Fazio et al., 1986). Numerous studies have demonstrated that activating attitudes implicitly through priming facilitates the processing of affectively related targets (Fazio & Olson, 2003). In studies of racial attitudes, this finding has led to a proliferation of implicit approaches designed to prevent prejudiced subjects from reporting less biased, more socially desirable attitudes. The “Implicit Association Test” or “IAT” (Greenwald, McGhee & Shwartz, 1998) is one such technique that has recently been used by sociolinguists (Campbell-Kibler, forthcoming).

Although it is relatively uncommon, priming has been used in sociophonetic perception studies. Rae & Warren (2002) used a semantic priming task with auditory primes and targets to study the EAR/AIR merger in New Zealand English. Masked priming represents a much less

prevalent methodology and with the exception of few isolated studies, e.g., the expansion of IAT-based methods (e.g., Babel, 2010), reaction time paradigms in general are rare in the socio-perceptual literature (Thomas, 2011: 87). As calls to use masked priming are issued (Campbell-Kibler, 2010), though, interest in its potential applications has been piqued. In Squires (2011), for example, the effects of speaker gender and socio-economic status on syntactic processing are studied with a masked prime-target method. The following section describes an adaptation of the cross-modal masked priming task used here to examine the effect of ethnic cues on the perception of prosody in Parisian French.

METHOD

Participants

Twenty-three native speakers of Parisian French (8 males, 15 females) with no reported visual or auditory impairments were recruited using the "friend of a friend" method. Participants were first contacted via an email asking them to complete an online background questionnaire. Afterwards, participants met with the author to complete a cross-modal masked priming task. Each received 10€ upon completing this task.

Background questionnaire

The background questionnaire yielded data ensuring that participants were native speakers of French and educated in the French system, an indication that they may abide by similar sociolinguistic norms. Participants ranged in age from 19 to 57 years old and tended to be fairly young, as seen in the age breakdown in Figure 1 (left panel). Of the 23 participants, 17 lived in

Paris proper, the rest residing in suburban Paris. Only four had lived elsewhere in the previous 5 years. Six of the 24 had lived abroad at some point and 10 participants reported using a language other than French at home. Eight participants reported having at least one foreign-born parent and 15 had one grandparent from another country.

Participants' socio-economic statuses (SESs) were determined using education level and occupation[5], two key determinants of social class (Ash, 2003). These two components were combined into an index with a range of 2.5-4.5. To improve the clarity of the results, participants' scores on this index were divided into three groups: "lower SES" (score of 2.5), "middle SES" (score of 3.5-4) and "upper SES" (score of 4.5). The samples' grouped scores are shown in Figure 1 (right panel).

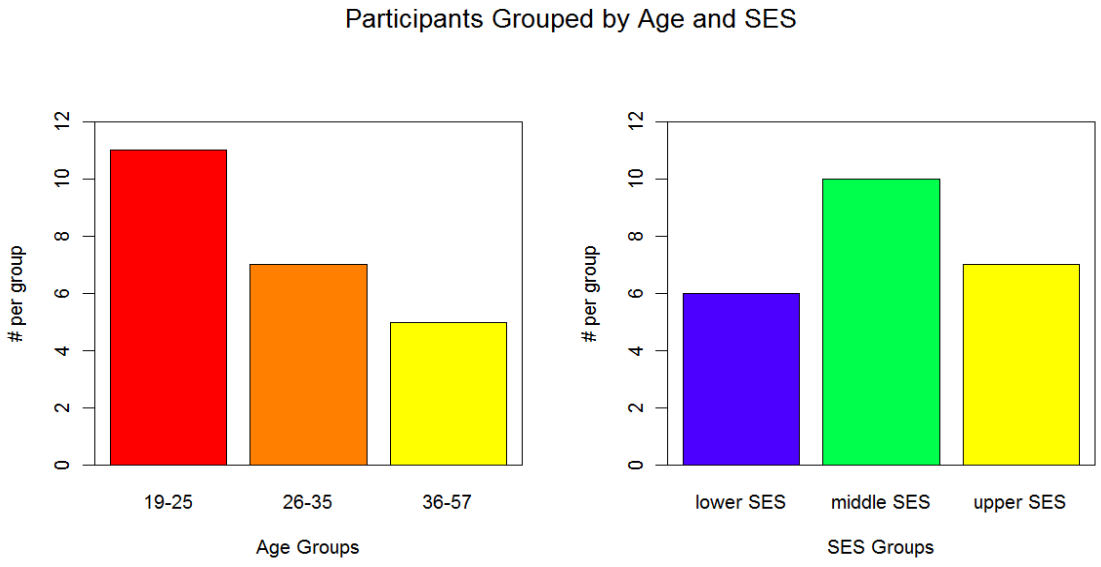

Figure 1 Breakdown of study sample by age groups and SES (*n*= 23).

[5] Occupations were classified using a three-way breakdown of the French census bureau's 42 socio-professional categories. Participants' education levels were also divided into three groups: those not having earned a bachelor's degree (BAC +2, +3, +4), those only having earned this degree and those having received superior degrees.

Anti-Immigrant Bias Scale

The questionnaire also contained a scale originally developed by social psychologists working in France to measure attitudes towards immigrants (Dambrun & Guimond, 2001, 2004). A version of this scale was used here to determine if anti-immigrant attitudes could predict how listeners process a speech marker related to immigration. In order to mitigate potential response biases, references to specific ethnicities in the original scale were removed, and the items used refer only to "immigrants". In the French context, however, discussions of "immigration" typically do not refer to the concept as a whole, but to the immigrant groups associated with the multiethnic and multilingual *banlieue* phenomenon (Amselle, 2001; Archibald & Chiss, 2007). This scale's items were also presented within the larger questionnaire with the aim of passing them off as mere additional questions on social and political views. It was hypothesized that these measures would make the items in the scale (Table 1) benign enough to allow participants to respond honestly.

Positively-Worded Items	
1. *La diversité qu'apportent les étrangers est un enrichissement pour le pays*.	1. The diversity brought by foreigners enriches our country.
2. *Il faudrait donner plus de droits aux immigrés*.	2. More rights should be given to immigrants.
3. *Les étrangers qui vivent en France devraient avoir le droit de vote*.	3. Foreigners living in France should have the right to vote.
4. *Je ne serais pas inquiet (inquiète) si la plupart de mes amis étaient d'origine étrangère*.	4. I would not be worried if most of my friends were foreigners.
Negatively-Worded Items	
1. Il est normal que les étrangers en situation irrégulière soient renvoyés dans leurs pays d'origine.	1. It is normal that foreigners in France illegally be sent back to their country of origin.

2. *On devrait limiter plus strictement l'entrée des familles étrangères en France*.	2. One should more strictly limit the entry of foreign families coming into France.
3. *On ne devrait pas accorder aussi facilement la nationalité française*.	3. One should not accord the French nationality so easily.
4. *Le problème de chômage en France est lié aux étrangers qui prennent le travail des Français.*	4. The problem of unemployment is linked to foreigners who take jobs away from French people.

Table 1 Positively-worded and negatively-worded items in the anti-immigrant bias scale

Participants indicated their endorsement of these statements using a 7-point Likert-type scale ranging from 1 ("completely agree") to 7 ("completely disagree"). Scores on this scale ranged from 8 to 30 (α= .68), with higher scores indicating greater prevalence towards anti-immigrant attitudes. Figure 2 illustrates that participants did use a large portion of the scale, suggesting that the steps taken to lessen its directness were relatively successful.

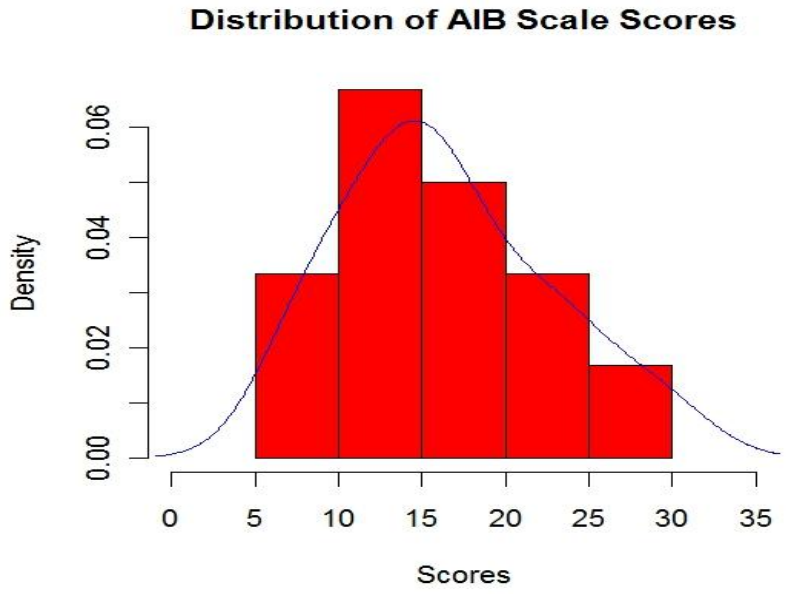

Figure 2 Distribution of anti-immigrant bias scale scores (*n*= 23).

Design

After completing the online questionnaire, the author of this paper met with participants who then completed the experimental task in a quiet room using a Thinkpad X201 with 2.53 GHz Intel Core i5 processor. The experiment generator DmDX (Forster & Forster, 2009) presented stimuli and collected responses and RTs. Auditory stimuli (described below) were heard through Beyerdynamic DT 770 Pro headphones set at a comfortable listening level, approximately 75 dB SPL. Participants responded to stimuli using a LogiTech Precision gamepad.

In the experimental task, listeners worked through a practice block and five experimental blocks in which they heard resynthesized variants of six stimulus words with four different intonation contours. In all items in the five experimental blocks, auditory stimuli were preceded by a visual priming sequence made up of a forward mask, a prime consisting of an ethnic minority or an ethnic majority first name and a backward mask. In the practice block, this sequence contained no prime. In all trials, after the visual priming sequence, participants heard three auditory stimuli and had to decide if the third was identical to the first or second stimulus, a design referred to as the ABX paradigm (is “X” identical to “A” or “B”?). Trials were blocked by word and stimuli were separated by a 1.5 second interstimulus interval. Listeners were instructed to respond as accurately and quickly as possible and all trials timed out after 3 seconds. All experimental variables not under examination were randomized. The auditory target and visual priming sequence are described here in greater detail.

Auditory Targets

In experimental block items, after the visual priming event (described below), participants

heard three acoustically resynthesized variants of a single production of five words: *animaux* ("animals")*, bagages* ("luggage")*, bijoux* ("jewelry")*, image* ("image") and *légume* ("vegetable"). Variants of each target word featured one of four accentual patterns in which syllabic duration and F_0 had been modified such that prosodic prominence ranged from penultimate to phrase-final. The practice block featured resynthesized variants of the word *animal* ("animal") with the same prosodic characteristics heard in the experimental blocks, though it had only half as many items as this block's priming sequences contained no masked primes.

For each of the six stimulus words, two productions were excised from recordings of a picture-naming task conducted with middle school students in *La Courneuve*, a *banlieue* in the Paris region (Fagyal 2003, 2005). Although both productions occurred as these students identified images in comparable pragmatic contexts, acoustic realizations were different. Statistical analyses pointed to distinct penultimate and final syllable durations and pitch peak alignment patterns (see Appendix).

For each word, the first rendition had a rising tonal movement beginning in the penultimate syllable and culminating in a pitch peak near the end of a lengthened final syllable. This pattern instantiated the contour shape described in the literature as that used in Reference French to mark continuation rises, specifically in contexts of list-making (Guaïtella, 1991). In the second production, the rising pitch movement typically occurred earlier in the penultimate with a fall in the final syllable whose duration was shorter compared to the relatively long penultimate. This production closely resembled the prosodic pattern documented primarily in the speech of young, working-class Arabic / Berber heritage speakers in *La Courneuve* (Fagyal, 2003). These productions were also very similar to the contours shown to index speakers from the *banlieues*

both for Parisian (Stewart, in press) and Parisian / Rouennais listeners (Boula de Mareüil & Lehka-Lemarchand, 2011). To facilitate reference to these two configurations, they will henceforth be referred to as the "rise" and "rise-fall" contours.

For the twelve renditions excised, penultimate and final syllable durations and F_0 movements were targeted in a series of acoustic resynthesis manipulations using PRAAT (Boersma & Weenik, 2012). "Short" and "long" penultimate and final syllables were built for all 12 productions. The "short" duration was equal to the mean duration of penultimate and final syllables in the rise and rise-fall contours. A "long" syllable lengthened this duration by 50%. After this first step, resynthesized variants of the rise and rise-fall contours differed only in terms of segmental make-up and F_0. All prosodic configurations were eventually inserted into the rise contour, eliminating segmental variation as a potentially confounding variable.

In order to make a stimulus with the segmental characteristics of the rise contour and the shape of the rise-fall contour, the latter productions' pitch ranges were resynthesized to fit that of the rise contours. In this way, stimuli were built with the pitch range of the rise rendition, but the penultimate and final syllable pitch movements of the rise-fall contours. Together with the rise contours' original shape and the duration conditions, this process then yielded the four variants of the two original listing contours illustrated in Figure 4. #1 closely resembles the rise contour's configuration, #4 the rise-fall contour pattern. Contours #2 and #3 are intermediate forms. Subsequent reference to these resynthesized contours will use the numbers indicated in Figure 3.

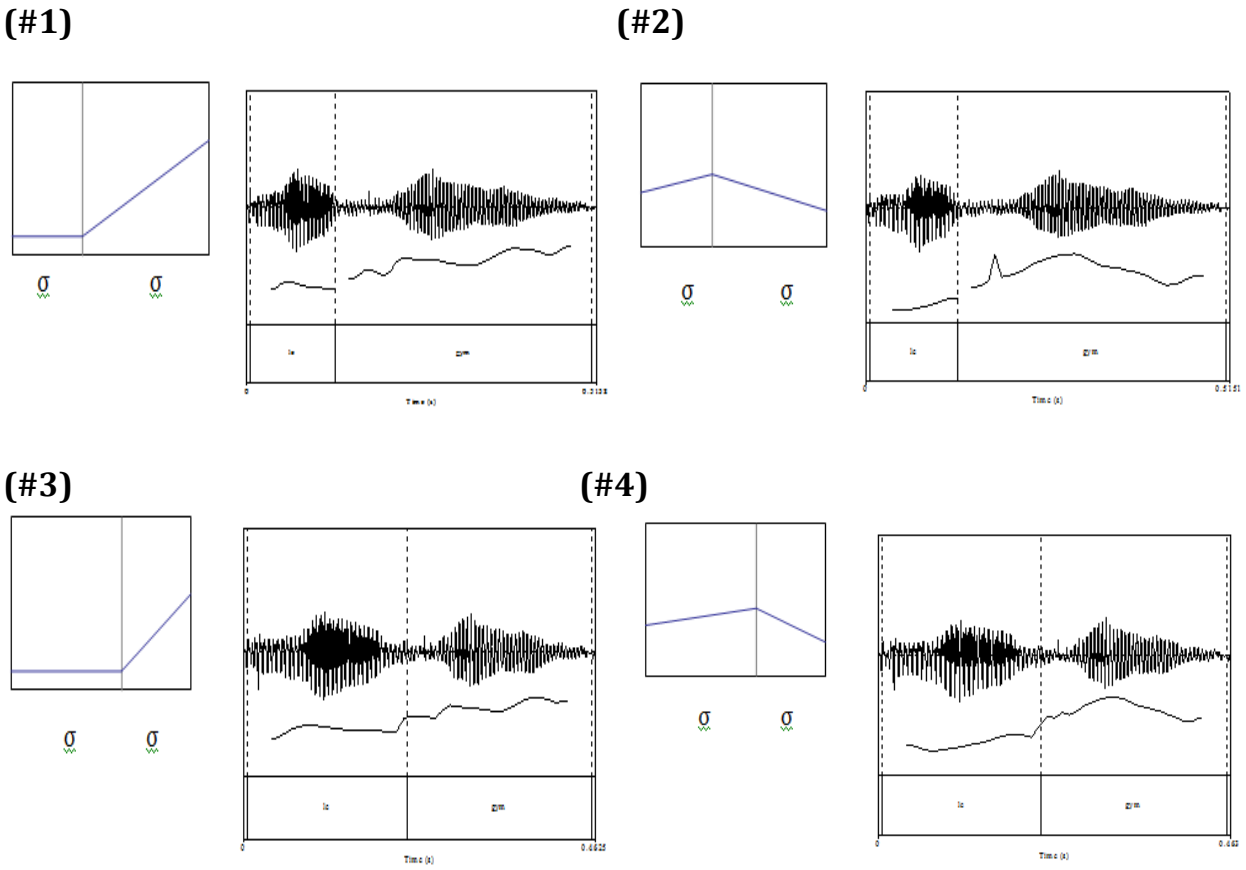

Figure 3 Schematic and illustration of resynthesized listing contours contained in auditory targets (here: *légume*): (#1) short penultimate / long final with F_0 rise throughout final syllable, (#2) short penultimate / long final with F_0 rise throughout penultimate and fall in final, (#3) long penultimate / short final with F_0 rise throughout final syllable, (#4) long penultimate / short final with F_0 rise in the penultimate and fall in final.

Visual Priming Sequence

In the five experimental blocks, a visual priming sequence including an ethnic minority or ethnic majority first name preceded the auditory target. This sequence contained a forward mask, a masked prime and a backward mask (Figure 4). The priming sequence began with a 500 ms blank screen, followed by 500 ms fixation cross orienting participants' gaze to the middle of the laptop screen. After the disappearance of the fixation cross, a forward mask immediately

appeared consisting of one of 8 random letter strings made up of the 11 most common French characters. Forward masks appeared in red, black or green lower case letters.

Immediately following the forward mask, a prime was displayed for 45 ms, a duration indicated in the literature to be sufficient for visual apprehension but not conscious processing (Kinoshita & Lupker, 2003). This prime consisted of one of two first names indicated in a separate study to imply Maghrebi (MEHDI) versus ethnic majority (VINCENT) group affiliation in the Parisian context (Duguet, Leandri, L'Horty & Petit, 2007). The prime appeared in upper case letters that were the same color as the forward mask. Immediately following the prime, a backward mask appeared on screen for 500 ms. This backward mask was identical to the letter string of the forward mask; however, in half of the trials, the backward mask was a different color (red, black or green).

The color manipulation was introduced as keeping listeners' attention focused on the screen during the priming event proved problematic in a pilot study. For each trial, after matching the auditory target, participants indicated whether or not the letter string had changed color over the course of the priming sequence. This sequence gave the appearance of a series of letters that often changed colors with a slight flicker occurring as the color change did or did not transpire[6]. In the sample sequence illustrated in Figure 4, the fixation cross and forward mask would appear in red, followed by the prime, also in red, and then the backward mask in black.

[6] At the time of writing, a demonstration of masked priming could be found at http://www.u.arizona.edu/~kforster/priming/masked_priming_demo.htm

	Blank screen	Fixation cross	Forward mask	Prime	Backward mask
On screen *	N/A	+	suéajcèruàh	MEHDI	suéajcèruàh
Color *	N/A	red	red	red	black
Duration	500 ms	500 ms	500 ms	45 ms	500 ms

Figure 4 Example of visual priming sequence, advancing temporally from left to right. Row names marked with an asterisk (*) are elements of the priming sequence that changed across trials.

Predictions

Although DmDX captured both responses and RTs, a pilot study indicated that auditory targets were discernible. RTs were, then, anticipated to yield greater insights into the processing of the prosodic configurations in Figure 3. For each block, participants would quickly deduce the relevant lexical item and recover the corresponding phonological form. Once this form had been activated, the auditory targets in successive trials would be compared to it, with reaction times indicating the ease or difficulty with which they were accessed. The experimental task provided no pragmatic context for the contours heard. Results were, thus, limited to the extent to which the decontextualized contours activated distinct mental representations.

Contours #1 and #4 (Figure 4) were the only resynthesized variants based on naturally occurring productions. They were also the most acoustically distinct, differing both in terms of syllabic duration and intonation contour. As such, participants would likely process these two

contours more quickly than contours #2 and #3. Among contours #1 and #4, two factors indicate that participants should be slower to process the latter. First, because #1 is most similar to the canonical listing contour in Reference French, and thus a very accesible prosodic pattern, the contour most distinct from it should elicit the longest processing lag. Faster reactions to contour #4 when paired with the ethnic minority prime, however, would suggest that slower processing may be related to the activation of representations related to ethnic minority identity.

Third, trials in which an ethnic majority prime (VINCENT) preceded contour #1 or those in which an ethnic minority prime (MEHDI) preceded contour #4 were predicted to elicit lower RTs than incongruent pairings. Implicitly presented attitude objects are known to facilitate or hinder retrieval of evaluatively related or incongruent targets, respectively (Fazio & Olson, 2003). If these two contours index ethnic majority and ethnic minority speakers, primes evoking congruent meanings should expedite their recognition. Evidence of such an effect would suggest that the processing of speech markers may be influenced by implicit memory.

Fourth, RTs for trials in which listeners saw an ethnic minority prime, attended to contour #4 or both were hypothesized to be related to listeners' anti-immigrant bias. The AIB scale's items were intended to capture, to some extent, participants' attitudes towards Maghrebi immigrants. In the presence of visual or auditory cues to Maghrebi ethnic group affiliation, more biased listeners would likely be quicker to activate mental schemas regarding this group, leading to overall faster processing of such items. Such a result would warrant further investigation into the relationship between social cognition and sociophonetic processing.

RESULTS

Data trimming

The experimental task necessitated a heavier cognitive load than typical speech processing studies. Participants had to decide if the third auditory stimulus was identical to the first or second while recalling whether or not they had seen a color change during the priming sequence. This design also differed from other cross-modal masked priming experiments in that auditory targets were not simply acoustic renditions of the visual primes. Finally, auditory targets were not contrastive. A relatively high overall error rate (16.2%) in experimental blocks was, then, expected.

An ANOVA with stimulus word as the between-subjects factor indicated significant differences in error rates among word blocks [F (4,235) = 9.35, p <.001]. Although not readily explicable, a 27.4% error rate suggested that errors might have been concentrated in the *légume* (“vegetable”) block. A Tukey HSD indicated that this error rate was significantly different from that of the other stimulus blocks [for all pairwise comparisons, p <.01]. Eliminating the *légume* block rendered the ANOVA non-significant [p >.05].

Stimuli were then pooled for the four remaining blocks. Trials with errors and timeouts were eliminated. RTs indicative of irrelevant experimental effects, those less than 700 and greater than 2500 ms, were eliminated, following standard psycholinguistic practice (Baayen, 2008: 280). This resulted in a loss of 4.6% of the data. Prior to submission to statistical modeling, all remaining RTs were reciprocally transformed to correct a pronounced positive skew (Ratcliff, 1993), although untransformed RTs were kept and will be referred to facilitate models’ interpretations.

As predicted, participants appeared to process contours #2 and #3 differently than #1 and #4. In the practice block, items with #1 or #4 as the X stimulus had significantly lower RTs than those in which listeners attended to #2 or #3 [$F(7,1) = 8.98$, $p < .05$]. In the experimental blocks, items in which participants matched #1 or #4 had significantly lower error rates (M = 7.08%) than those with contour type #2 or #3 (M = 14.67%), [$F(7,1) = 8.98$, $p < .05$]. These patterns are depicted in the box plots in Figure 5.

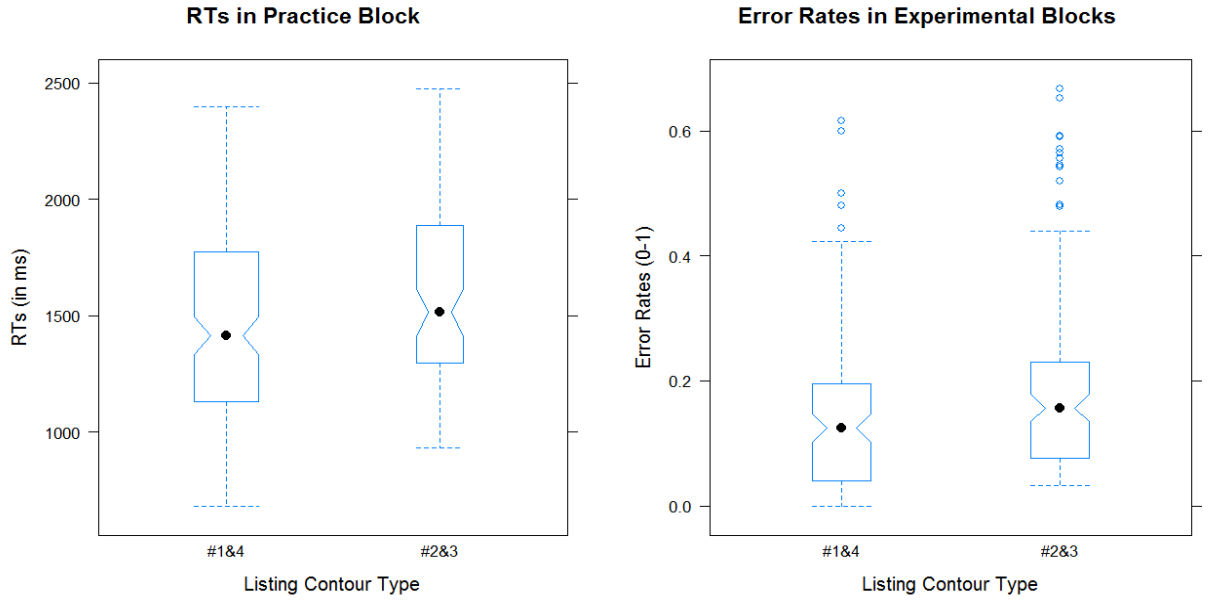

Figure 5 Reaction times for contours #1 & #4 versus #2 & #3 for items in practice block (left) and error rates for contours #1 & #4 versus #2 & #3 for experimental block items (right).

Slower RTs and higher error rates suggest that contour types #2 and #3 were less familiar to listeners. Generally, perceptual boundaries separating meaningful prosodic units may be less discrete than segmental boundaries as prosody is thought to constitute a "more continuous phonetic scale" (Fox, 2000: 275). Because the prosodic configurations in #1 and #4 also most closely resemble descriptions of Reference French's archetypal rising listing contour and the

prosodic marker associated with speakers from the *banlieues*, respectively, it is probable that these two represent more prototypical and, thus, more meaningful configurations. Because the goal of this study was to test how implicit cues to ethnic group affiliation affect listeners' processing of socially relevant prosodic variation, items in which the X stimulus featured contours #2 and #3 were set aside and those with #1 and #4 retained for further analysis.

Linear Mixed-effects Models

In order to glean insights into the processing of these two patterns, a series of linear mixed-effects models were built in R (R Core Development Team, 2006). Mixed-effects models have recently been introduced into the variationist toolbox (Ezra Johnson, 2009) and for repeated measures in psycholinguistics, they offer a parsimonious approach in that they combine the random effects of subjects (traditionally referred to as F_1) and words (F_2) into a single analysis. Probability values pertaining to models' fits are not always given in mixed-effects model summaries, but can be derived from Markov chain Monte Carlo (MCMC) simulations[7].

Before specifying the models' structures in the current study, a cursory inspection of RTs indicated a probable interaction between masked prime and contour type. Mean RTs for contour #1 were lower when preceded by the ethnic majority name masked prime (1232 ms vs. 1301 ms) and, similarly, lower for contour #4 when the preceding prime was MEHDI (1261 ms vs. 1307 ms). These trends are depicted in the box-and-whisker plots in Figure 6.

[7] For more information on modeling repeated measures data in R using this procedure, see Baayen, Davidson & Bates (2008) or Quené & Berg (2008).

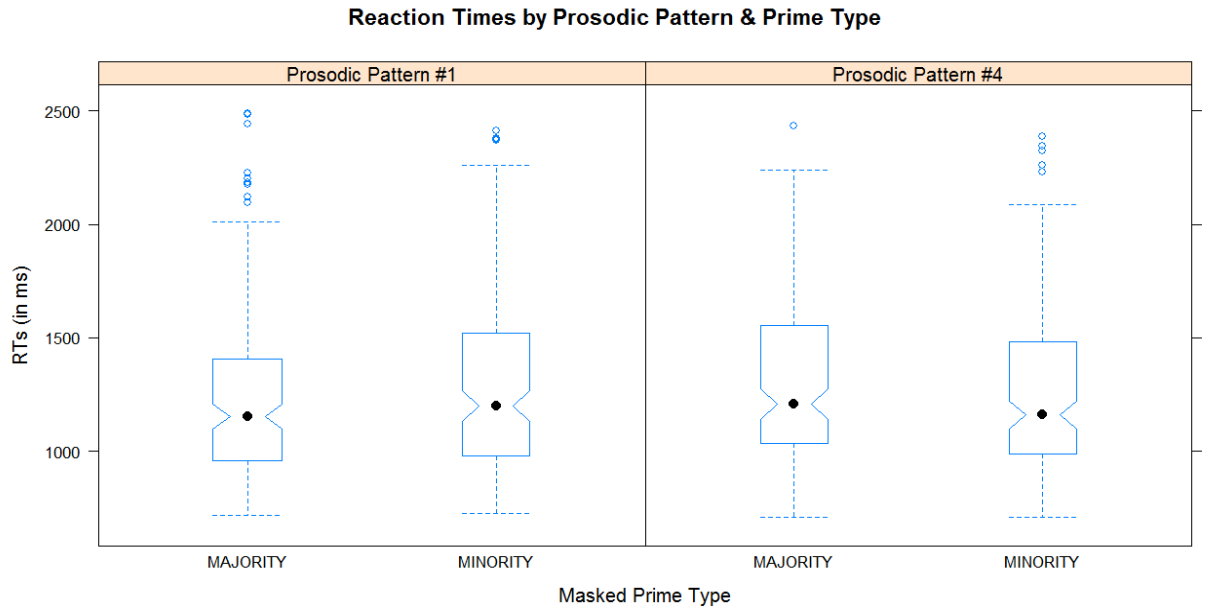

Figure 6 Box-and-whisker plots of reaction times to contours #1 and #4 according to preceding masked prime type

In order to evaluate potential relationships between fixed effects and RTs, an "intercept-only" model, i.e., one with no predictors, was first constructed. Next, a mixed-effects model was built that posited that RTs for items in which X had contour #1 or #4 could be predicted by an interaction between the fixed effects of prime (ethnic minority / ethnic majority) and listing contour type (#1 / #4), with subject and stimulus word as random effects. A series of models were then built identical to this second model, but incorporating participants' age, SES, gender and finally anti-immigrant bias scale score as additional fixed effects. Only one model, that including the fixed effects of prime type, contour type, their interaction, and anti-immigrant bias scale scores, was a significant improvement on the intercept-only model [χ^2 (4) = 9.88, p< .05].

This fitted model included four parameters, one approaching statistical significance and three statistically significant at the α = .05 level. Untransformed RTs were submitted to an identical

model, yielding identical and more readily interpretable results. The parameters for the model with untransformed RTs are provided in Table 3.

	Estimate	SE	*t*-value	*p*-value (Pr>|t|)
(intercept)	1586.52	157.58	10.2	.00
Prime				
MEHDI	59.59	34.42	1.73	.08
Contour				
#4	73.86	34.72	2.13	.03
Prime * Contour				
MEHDI * #4	-107.95	49.12	-2.2	.02
AIB scale score	-18.73	8.47	-2.21	.02

Table 3 Fixed effects summaries from mixed-effects model predicting RTs by contour type, masked prime, their interaction and anti-immigrant bias scale scores (*n*= 23). Positive coefficient estimates indicate higher RTs, thus slower reactions. NOTE: *p*-values are computed using a 10,000 sample MCMC simulation with degrees of freedom equal to the number of observations minus the number of fixed-effects coefficients (here: d.f. = 634).

First, respondents were on average 13.04 ms slower to respond to contours #1 and #4 when they were proceeded by the ethnic minority masked prime (MEHDI) as opposed to the ethnic majority masked prime. This effect only approached statistical significance [t = 1.731, p = .08].

Second, the model indicated that participants were on average 17.73 ms slower to correctly identify contour #4, regardless of the preceding masked prime [t = -2.181, p< .05]. Practice block items contained no masked primes and mean RTs were also higher for contour #4 (1749.16 ms) than contour #1 (1275.7 ms). Slower processing of this contour was expected, given that once the phonological form of the relevant stimulus word had been activated, the prosodic pattern

most distinct from it should elicit the longest lag.

Third, listeners were on average 46.61 ms faster to classify contour #4 when it was preceded by the ethnic minority masked prime (MEHDI) than when the masked prime was VINCENT, the ethnic majority masked prime [$t = 2.143$, $p < .05$]. Thus, a masked priming effect for congruent prime-target pairs was found, but only for items in which the ethnic minority prime preceded the marked contour #4. Although listeners were overall slower to recognize the contour most closely resembling the prosodic marker of ethnic minority youth speech, both without a prime in the practice block and with a prime in the experimental blocks, this lag was significantly shortened by implicit visual cues to Maghrebi ethnic identity.

Fourth, the model showed that higher levels of anti-immigrant bias were connected to overall faster reaction times [$t = 2.092$, $p < .05$]. The correlation between untransformed RTs and AIB scores was, however, relatively weak [$r(636) = -.21$, $p < .01$]. Because RTs for trials including both ethnic majority and minority prime type and contours #1 and #4 were being modeled, it was plausible that one or more of the model's fixed effects or interactions were behind this result. As such, prime types, contour types and combinations thereof were tested in smaller linear-mixed effects models with AIB as an additional fixed effect.

Of these, anti-immigrant bias only predicted significantly faster reactions for trials in combination with the ethnic minority masked prime [$t = 2.223$, $p < .05$], contour #4 [$t = 2.263$, $p < .05$] and the combination of these two [$t = 2.221$, $p < .05$]. Stronger correlations between untransformed RTs and AIB scores for these three conditions [ethnic minority prime: $r(316) = -.26$, $p < .01$; contour #4: $r(310) = -.25$, $p < .01$; ethnic minority prime * contour #4: $r(156) = -.28$, $p < .01$) suggest that they were behind AIB's significance in the larger model. Higher levels of

anti-immigrant bias, then, appear to predict processing advantages for trials with visual and auditory cues to Magrebi ethnic identity.

DISCUSSION

Implicit memory and prosodic processing in Parisian French

Although ethnic group affiliation represents a contentious issue in France, the masked priming effects described above show that implicit visual cues related to Maghrebi ethnic identity speed up the recognition of a prosodic marker of multi-ethnic youth speech associated with the *banlieues*. This result indicates that some types of ethnic cues, even when subconsciously delivered, can facilitate the retrieval of related speech markers. It is conceivable that such a processing advantage triggered by explicit visual cues to speaker identity may have led to the perceptual biases demonstrated in Niedzielski (1999) and Drager (2005), among others. Because this study's results suggest that implicit memory does influence sociolinguistic processing, methods like masked priming could be useful for collecting similarly unbiased data on the social meanings that speech markers index in other sensitive contexts.

Of the variables tested here, it is notable that all but one of the predicted results obtained: lower RTs for items in which the ethnic majority prime preceded contour #1. In contrast, although participants were significantly slower to respond to the marked contour #4 with no prime or with the ethnic majority prime, they did so more quickly when it was preceded by a visual cue to ethnic minority identity. The lack of a similar facilitation effect for the ethnic majority prime and contour #1 might suggest that contour #1 does not index any particular social information related to ethnicity, but is rather just a default listing contour. Similar

processing studies with marked and prestige variants in other sociolinguistic contexts are needed to determine to what extent these indexical relationships are commonplace or particular to this setting.

The disparity between the social meanings of these two contours likely originates in the dissimilar socio-pragmatic contexts in which individuals typically encounter them. Podesva (2011: 237) observes that whereas high frequency forms "are expected… [and thus] poor carriers of relatively marked social meanings", low frequency patterns "are unexpected and are therefore more marked, which enables the social meanings they carry to be noticed." In this case, contour #1 is very similar to descriptions of Reference French's default listing contour, so it is probably highly familiar to listeners and, thus, not available to index any particular social meaning. Contour #4, on the other hand, occurs in stylistic variation in which it indexes affiliation with the *banlieues*, as well as in Quebec and Belgian varieties of French (e.g., Hambye & Simon, 2004). It is likely to be infrequently encountered and, thus, more difficult to recognize. Because it does appear to index Maghrebi ethnic group affiliation, however, congruent ethnic cues appear to facilitate the recognition of an otherwise unanticipated linguistic form.

The Influence of Social Cognition on Sociolinguistic Processing

In turning to the fixed effect of anti-immigrant bias, it is first important to consider that this result is generally in line with social psychological research on the role of stereotype activation in perceptual encoding (see von Hippel, Sekaquaptewa & Vargas, 1995). Under this view, more biased listeners would be more likely to activate stereotypes in the presence of input indicating an ethnic minority speaker, thus facilitating the processing of information that aligns with these

stereotypes, so-called “stereotype congruent” information. In the current study, both visual and auditory cues to speaker’s ethnic minority status constitute such cues, so it is logical that trials with either are processed faster by those more likely to activate stereotypes pertaining to ethnic minority “immigrants”.

In conceiving of how to model such an effect linguistically, it is useful to look at what cognitive sociolinguistic models might bring to sociolinguistic monitor and exemplar-based accounts. One such model, laid out in Kristiansen (2003), proceeds from the idea that the same mental machinery that drives cognition related to language and social information also processes socially meaningful language. In sociophonetic terms, this model posits that allophonic variation may be socially distinctive with listeners subconsciously attaching social meanings to productions falling on either side of an acoustic threshold. Such thresholds would vary between listeners and may be influenced by relevant social cognition concepts.

Under this account, then, processing differences linked to participants’ anti-immigrant bias may be due to disparate mental representations of speaker identity and related sociophonetic variation. From the perspective of exemplar-based accounts, if social cognition concepts alter how listeners encode related sociophonetic variation, such differences could, over time, lead to differing thresholds on acoustic continua, on either side of which listeners would attach different social meanings to incoming speech tokens. This would explain how anti-immigrant bias could be related to the processing of phonetic variation indexing ethnicity.

Although a warping of the perceptual space by social cognition concepts may appear drastic, there is a growing perception that “group-based stereotypes are not add-ons to the perceptions of individuals but rather fundamental elements of the perception process” (Campbell-Kibler,

2010: 36). Similar effects have also been documented in a recent study of event-related brain potentials (ERPs) in which listeners' empathy was found to predict their ability to attend to socio-indexical information conveyed in speech (van den Brink et al., 2010). Despite these indications, this hypothesis clearly insinuates a strong claim and it is only described here as a potential explanation of the current finding. More research will be needed to tease out the mental representations underlying these findings.

Modeling Sociolinguistic Perception with Evidence from Processing

Taken together, these results provide a degree of insight into the mental processes underlying sociophonetic perception, which appear to consist of a mixture of top-down and bottom-up processes. Effects induced by the Maghrebi masked prime suggest that listeners track speaker identity in the service of processing related speech markers, an expectation-driven, top-down type of processing. Given the prime's extremely short duration, it is highly probable that it escaped conscious awareness. Thus, the masked priming effects uncovered strengthen claims of a "separate processing and storage module" (Labov et al., 2011: 434) akin to the sociolinguistic monitor and capable of referencing social information stored in implicit memory.

Slower reactions to contour #4 appear to occur as this contour indexes ethnic minority group affiliation, leading to a processing lag as listeners reference unexpected representations. Reliably slower processing of this contour suggests that sociolinguistic processing can also be characterized by "the capacity to do a calculation 'on the fly' at any time by an inspection of remembered tokens" (Labov et al., 2011: 434). This data-driven, bottom-up account, then,

involves listeners comparing incoming speech tokens to previously formed mental structures to arrive at a social identification, similar to the type of processing proposed by exemplar theorists.

Although the results of the current study suggest that sociolinguistic perception is likely to be characterized by these types of processing, the specific approach used does not allow for the testing of potentially crucial pieces of the puzzle. Isolation of prosodic processing, for example, ignores the fact that language comprehension involves "taking information from anywhere it can find it to construct a linguistic percept of the acoustic signal" (Fernandez & Smith Cairns, 2011: 179). Tasks in which listeners are asked to engage in more natural language processing may arrive at different conclusions, even pertaining to the processing of similar kinds of linguistic forms.

In an ERP study of semantic and prosodic processing in French, for instance, Magne et al. (2007) demonstrated that penultimate prosodic prominence may "interfere with lexical access and thereby hinder access to word meaning" (Magne et al. 2007: 8). In the current experiment, however, items in stimulus blocks contrasted prosodic realizations of only one word, minimizing the type of lexical access required in natural language processing. As such, listeners may not have needed to tap into lexical meaning in the same way that listeners did in Magne et al. (2007), so differential lexical processing may not have slowed identification of the penultimate prominence contained in contour #4.

To this end, the top-down / bottom-up processing of speech markers suggested by the current study calls for further refinement by studies focusing on cognition. Because ERP studies in particular have excellent time resolution (Luck, 2005), they afford the possibility of defining the precise aspects of processing impacted by linguistic variants with social relevance. Future

studies may look beyond the cognitive processes that underlie variation indexing speaker's ethnic identity to examine how various types of language attitudes are activated, or even the factors behind stylistic variation during speech production.

CONCLUSION

Thomas (under review) notes that while "sociolinguistics has usually shied away from cognition", it is also the case that "cognitive accounts of language address variation poorly if at all" (1). To the extent that language comprehension typically encompasses sociolinguistic processing, elucidating the mental representations underlying language variation and change stands to clarify the mechanisms involved in decoding language more generally. Because ethnic group affiliation is a contested construct in the French context, this study used an implicit approach to activate representations of Maghrebi versus ethnic majority identity prior to listeners hearing prosodic configurations with variable social meanings in Parisian French. Results demonstrate that although participants are slower to react to a known prosodic marker of ethnic minority youth speech, they do so more quickly when presented with subconscious cues to ethnic minority group affiliation. Participants' scores on an anti-immigrant bias scale were a significant predictor of reaction times for items with visual or auditory cues to ethnic minority identity. These findings characterize the perception of social markers contained in speech as a mixture of top-down and bottom-up processing capable of capitalizing on implicit memory and subject to social psychological concepts like ethnic bias.

APPENDIX

Penultimate syllable durations in rise productions (*Mdn* = 34.75% of total duration) were significantly shorter than penultimate syllable durations in the rise-fall productions (*Mdn* = 43.94%), [$W = .5$, $p < .05$]. Rise productions' final syllables (*Mdn* = 62.78%) were longer than those in rise-fall productions (*Mdn* = 53.3%), though this difference did not reach statistical significance at the $\alpha = .05$ level [$W = 13$, $p = .1$]. Finally, rise-fall productions were shown to have a pitch peak occurring at a point significantly earlier in the word (*Mdn* = 59.78%) than the rise productions (*Mdn* = 84.63%), [$W = 24$, $p < .01$], pointing to a realization of the sharp phrase-final fall that Boula de Mareüil & Lehka-Lemarchand (2011) describe as distinctive. These acoustic differences are summarized in the following table.

	Rise productions	Rise-fall productions	Wilcoxon rank sum test	
			W-value	*p*-value
Penultimate duration	34.75 %	43.94%	.5	< .05
Final duration	53.3%	62.78%	13	= .1
% utterance duration at overall F_0 peak	84.63%	59.78%	24	< .01

REFERENCES

Amselle, J.-L. (2001). Vers un Multiculturalisme français, l'empire de la coutume. *Champs 1996*, 158-175.

Archibald, J. & Chiss, J.-L. (2007). Introduction: Langue(s) et immigration(s). In J. Archibald, & J.-L. Chiss (Eds.), *La langue et l'intégration des immigrants: sociolinguistique, politiques* (pp. 1-9). Paris: L'Harmattan.

Ash, S. (2003). Social Class. In J. K. Chambers, P. Trudgill, & N. Schilling-Estes (Eds.), *The Handbook of Language Variation and Change* (pp. 402-422). Hoboken, NJ: Wiley-Blackwell.

Baayen, R. H., Davidson, D. & Bates, D. (2008). Mixed effects modeling with crossed random effects. *Journal of Memory and Language 59*, 390-412.

Babel, M. (2010). Dialect divergence and convergence in New Zealand English. *Language in Society 39*, 437-456.

Begag, A. (2007). *Ethnicity and Equality: France in the Balance.* Winnipeg: Bison Books.

Boersma, P. & Weenik, D. (2012). Praat: doing phonetics by computer (Version 5.3.04). *[Computer program]* . (http://www.praat.org/).

Boula de Mareüil, P. & Lehka-Lemarchand, I. (2011). Can a prosodic pattern induce/reduce the perception of a lower-class suburban accent in French? *Proceedings of the 17th International Congress of Phonetic Sciences*, (pp. 348-351). Hong Kong.

Boyer, H. (2001). Le français des jeunes vécu/vu par les étudiants. *Langage et société 95*, 75-87.

Campbell-Kibler, K. (2009). The nature of sociolinguistic perception. *Language Variation and Change 21*, 135-136.

Campbell-Kibler, K. (2010). New Directions in Sociolinguistic Cognition. *University of Pennsylvania Working Papers in Linguistics 15(2)*, 31-39.

Campbell-Kibler, K. (forthcoming). The Implicit Association Test and sociolinguistic meaning. *Lingua*.

Conein, B. & Gadet, F. (1998). Le "français populaire" des jeunes de la banlieue. In K. Androutsopoulos, & A. Scholz (Eds.), *Jugendsprache / Langue des jeunes / Youth language* (pp. 105-123). Frankfurt: Peter Lang.

Dambrun, M. & Guimond, S. (2001). La théorie de la privation relative et l'hostilité envers les Nord-Africains. *International Review of Social Psychology 14*, 57-89.

Dambrun, M. & Guimond, S. (2004). Implicit and explicit measures of prejudice and stereotyping: Do they assess the same underlying knowledge structure? *European Journal of Social Psychology 34*, 663-676.

Delattre, P. (1966). Les Dix Intonations de base du français. *The French Review 40(1)*, 1-14.

Di Cristo, A. (1998). Intonation in French. In D. Hirst & A. Di Cristo (Eds.), *Intonation System: A Survey of Twenty Languages* (pp. 195-218). Cambridge: Cambridge University Press.

Dovidio, J., Kawakami, K. & Gaertner, S. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology 82(1)*, 62-68.

Drager, K. (2005). The influence of social characteristics on speech perception. *Unpublished MA Thesis* . University of Canterbury, New Zealand.

Duguet, E., Leandri, N., L'Horty, Y. & Petit, P. (2007). *Les jeunes français issus de l'immigration font-ils l'objet de discrimination à l'embauche ? Une évaluation expérimentale sur la région Ile de France.* Evry: Centre d'étude des politiques économiques de l'Université d'Evry.

Ezra Johnson, D. (2009). Getting off the GoldVarb standard: introducing Rbrul for mixed-effects variable rule analysis. *Language and Linguistics Compass 3(1)*, 359-383.

Fagyal, Z. (2003). The Matter with the Penultimate: Prosodic Change in the Vernacular of Lower-Class Immigrant Youth in Paris. *Proceedings of the 15th International Congress of Phonetic Sciences, Volume 1*, (pp. 671-674). Barcelona.

Fagyal, Z. (2003[2005]). Prosodic consequences of being a Beur: French in contact with immigrant languages in Paris. *Selected papers from NWAV 32, Philadelphia, 2004* (pp. 91-104). Philadelphia: Working Papers in Linguistics 10(2).

Fagyal, Z. (2010). *Accents de Banlieue: Aspects prosodiques du français en contact avec les langues de l'immigration.* Paris: L'Harmattan.

Fagyal, Z. & Stewart, C. (2011). Prosodic style-shifting and peer-group solidarity in a multi-ethnic working-class suburb of Paris. In F. Kern. & M. Selting (Eds.), *Ethnic Styles of Speaking in European Metropolitan Areas* (pp. 77-101). Amsterdam: John Benjamins.

Fazio, R. & Olson, M. (2003). Implicit measures in social cognition research: Their meaning and uses. *Annual Review of Psychology 54*, 297-327.

Fazio, R., Sanbonmatsu, D., Powell, M. & Kardes, F. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology 50*, 229-239.

Fernandez, E. & Smith Cairns, H. (2010). *Fundamentals of Psycholinguistics* . New York: John Benjamins.

Forster, K. (1998). The Pros and Cons of Masked Priming. *Journal of Psycholinguistic Research 27*, 203-233.

Forster, K. & Forster, J. (2009). DmDX (Version 4) [Computer Program].

Forster, K.,& Veres, C. (1998). The prime lexicality effect: Form-priming as a function of prime awareness, lexical status and discrimination difficulty. *Journal of Experimental Psychology: Learning, Memory and Cognition 24*, 498-514.

Fox, A. (2000). *Prosodic features and prosodic structure: the phonology of suprasegmentals.* Oxford: Oxford University Press.

Genin, C. (1995, September 2). Les jeunes des cités ont inventé leur propre langue. *Le Monde*.

Graff, D., Labov, W. & Harris, W. (1986). Testing listeners' reactions to phonological markers of ethnic identity: A new method for sociolinguistic research. In D. Sankoff (Ed.), *Diversity and Diachrony : Current Issues in Linguistic Theory, Volume 53* (pp. 45-58). Philadelphia: John Benjamins.

Grainger, J., Diependaele, K., Spinelli, E., Ferrand, L. & Farioli, F. (2003). Masked Repetition and Phonological Priming Within and Across Modalities. *Journal of Experimental Psychology: Learning, Memory and Cognition, 29(6)*, 1256-1259.

Greenwald, A., McGhee, D. & Schwartz, J. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology 74*, 1464-1480.

Guaïtella, I. (1991). Rythme et parole : Comparaison critique du rythme de la lecture oralisée et de la parole spontanée. *Thèse de doctorat (Doctoral Thesis)*. Aix-Marseille, France.

Hambye, P., & Simon, A.-C. (2004). The Production of Social Meaning via the Association of Variety and Style: A case study of Liège Belgian French vowel lengthening. *Canadian Journal of Linguistics 49(3/4)*, 1001-1025.

Hargreaves, A. (2007). *Multi-ethnic France: Immigration, Politics, Culture and Society.* New York: Routledge.

Hay, J., Warren, P., & Drager, K. (2006). Factors influencing speech perception in the context of a merger-in-progress. *Journal of Phonetics 34*, 458-484.

Jun, S. & Fougeron, C. (2000). A Phonological Model of French Intonation. In A. Botinis (Ed.), *Intonation: Analysis, Modeling and Technology* (pp. 209-242). Norwell, MA: Kluwer Academic Publishers.

Jun, S. & Fougeron, C. (2002). Realizations of accentual phrase in French intonation. *Probus: International Journal of Latin & Romance Linguistics 14(1)*, 147-172.

Juteau, D. (1996). L'ethnicité comme rapport social. *Mots (49)*, 97-105.

Kinoshita, S. & Lupker, S. (2003). *Masked Priming: The State of the Art.* New York: Psychology Press.

Kiyonaga, K., Grainger, J., Midgely, K. & Holcomb, P. (2007). Masked cross-modal repetition priming: An event-related potential investigation. *Language and Cognitive Processes 22(3)*, 337-376.

Kouider, S. & Dupoux, E. (2001). A functional disconnection between spoken and visual word recognition: evidence from unconscious priming. *Cognition, 82*, B35-B49.

Kristiansen, G. (2003). How to do things with allophones: Linguistic stereotypes as cognitive reference points in social cognition. In R. Dirven, R. Frank & M. Pütz (Eds.), *Cognitive Models in Language and Thought* (pp. 69-120). New York: Mouton de Gruyter.

Labov, W. (2006). A sociolinguistic perspective on sociophonetic research. *Journal of Phonetics 34(4)*, 500-515.

Labov, W., Ash, S., Ravindranath, M., Weldon, T., Baronowski, M. & Nagy, N. (2011). Properties of the sociolinguistic monitor. *Journal of Sociolinguistics 15*, 431-463.

Lachs, L., McMichael, K. & Pisoni, D. B. (2003). Speech perception and implicit memory: Evidence for detailed episodic encoding of phonetic events. In J. Bowers & C. Marsolek (Eds.), *Rethinking implicit memory* (pp. 215-235). Oxford: Oxford University Press.

Lehka-Lemarchand, I. (2007). Accent de banlieue: Approche phonétique et sociolinguistique de la prosodie des jeunes d'une banlieue rouennaise. *Doctoral Dissertation* . Université de Rouen.

Lodge, R. A. (2004). *A Sociolinguistic History of Parisian French.* Cambridge: Cambridge University Press.

Luck, S. (2005). *An introduction to the event-related potential technique.* Cambridge, MA: MIT Press.

Lyche, C. (2010). Le français de référence : éléments de synthèse. In S. Detey, J. Durand, B. Laks & C. Lyche (Eds.), *Les Variétés du français parlé dans l'Espace Francophone : Ressources pour l'enseignement* (pp. 143-165). Paris: Editions Ophrys.

Magne, C., Astésano, C., Aramaki, M., Ystad, S., Kronland-Martinet, R. & Besson, M. (2007). Influence of Syllabic Lengthening on Semantic Processing in Spoken French: Behavioral and Electrophysiological Evidence. *Cerebral Cortex 17(11)*, 2659-2668.

Mendoza-Denton, N., Hay, J. & Jannedy, S. (2003). Probablistic Sociolinguistics: Beyond Variable Rules. In R. Bod, J. Hay, & S. Jannedy (Eds.), *Probablistic Linguistics* (pp. 97-128). Cambridge, MA: The MIT Press.

Meyer, D. & Schvaneveldt, R. (1971). Facilitation in recognizing pairs of words: Evidence of a dependence between retrieval operations. *Journal of Experimental Psychology (90)*, 227-234.

Morin, Y.-C. (2000). Le français de référence et les normes de prononciation. In M. Francart (Ed.), *Le français de référence : Constructions et appropriations d'un concept 26 (1-4)* (pp. 91-135). Louvain: Cahiers de l'Institut de Linguistique de Louvain.

Niedzielski, N. (1999). The effect of social information on the perception of sociolinguistic variables. *Journal of Language and Social Psychology 18*, 62-85.

Noiriel, G. (1988). *Le creuset français: Histoire de l'immigration XIXe-XXe siècles.* Paris: Éditions du Seuil.

Podesva, R. (2011). Salience and the social meaning of declarative contours: Three case studies of gay professionals. *Journal of English Linguistics 39.3*, 233-264.

Pooley, T. (2007). Analyzing urban youth vernaculars in French cities: Lexicographical, variationist and ethnographic approaches. In D. Ayoun (Ed.), *French Applied Linguistics* (pp. 317-344). Amsterdam: John Benjamins Publishing Company.

Queen, R. (2001). Bilingual intonation patterns: Evidence of language change from Turkish-German bilingual children. *Language in Society 30(1)*, 55-80.

Quené, H. & Berg, H. (2008). Examples of mixed-effects modeling with crossed random effects and with binomial data. *Journal of Memory & Language 59*, 413-425.

R Development, C.-T. (2006). R: Language and Environment for Statistical Computing [Software Program].

Rae, M. & Warren, P. (2002). Goldilocks and the three bears: sound merger and word recognition in NZE. *New Zealand English Journal 16*, 33-41.

Ratcliff, R. (1993). Methods for dealing with outliers. *Psychological Review 114*, 510-532.

Squires, L. M. (2011). Sociolinguistic priming and the perception of agreement variation: Testing predictions of exemplar-theoretic grammar. *PhD Dissertation (University of Michigan)*.

Stewart, C. (2009). Perceptions of Parisian French: From Langauge Attitudes to Speech Perception. *PhD dissertation*. University of Illinois at Urbana-Champaign.

Stewart, C. (in press). On the Socio-Indexicality of a Parisian French Intonation Contour. *Journal of French Language Studies* .

Stewart, C. & Fagyal, Z. (2005). Engueulade ou énumération ? Attitudes envers quelques énoncés enregistrés dans les « banlieues ». In M.-M. Bertucci & V. Houdart-Merot (Eds.), *Situations de banlieues : enseignement, langues, cultures* (pp. 241-252). Paris: Institut National de Recherche.

Strand, E. (1999). Uncovering the Role of Gender Stereotypes in Speech Perception. *Journal of Language and Social Psychology 18(1)*, 86-100.

Thomas, E. (2011). *Sociophonetics: An Introduction.* New York: Palgrave.

Thomas, E. (under review). Sociolinguistic Variables and Cognition. *Wiley Interdisciplinary Reviews: Cognitive Science* .

van den Brink, D. et al. (2010). Empathy matters: ERP evidence for inter-individual differences in social language processing. *Social Cognitive and Affective Neuroscience*, [Epub ahead of print].

von Hippel, W., Sekaquaptewa, D. & Vargas, P. (1995). On the role of encoding processes in stereotype maintenance. *Advances in Experimental Social Psychology 27*, 177-254.