Syllable-Based Height Assignment is Productive in Parisian French

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1. Introduction

European Frenches are generally considered to display an asymmetry in the distribution of their mid vowels (e.g. Morin, 1986, 1988; Montreuil, 1995), also called *Loi de Position*, in which they seem to be alternating in height[1] (e.g. Straka, 1981; Spence, 1988), as exemplified by the pair *sot* [so] 'stupid (m.)' *sotte* [sɔt] 'stupid (f.)'[2]. This apparent alternation concerns the pairs /e/-/ɛ/, /ø/-/œ/, and /o/-/ɔ/ which alternate based on syllable structure: the mid-high series (/e/, /ø/, and /o/) is more frequently found in open syllables, and the mid-low series (/ɛ/, /œ/, and /ɔ/) in closed ones.

Many have attempted to pin-point the mechanism responsible for this apparent alternation, and analyses of this phenomenon can be grouped into two categories. On the one hand, we find historical analyses which attempt at explaining the causes for the current distribution (e.g. Morin, 1986, 1988; Spence, 1988). They tend to have different views on how the distribution came about, proposing causes rooted in etymological length (e.g. Morin, 1986, 1988), syllable structure (e.g. Straka, 1981; Spence, 1988) or a mix of both (e.g. Montreuil, 1995). While some remain ambiguous in their view of synchronic productivity (e.g. Straka, 1981); most tend to either consider the phenomenon as not synchronically productive (e.g. Morin, 1986, 1988; Spence, 1988) or avoid discussing synchronic productivity altogether (e.g. Fouché, 1935). Montreuil (1995) gives what is probably the most detailed and nuanced account of the state of the mid vowel system for what he calls "Conservative" and "Regional" Frenches (Montreuil, 1995: 77) and argues for a system resulting from multiple processes affecting different etymological classes of mid vowels separately. On the other hand, we also find analyses centered around synchronic assignment of mid vowel height, mostly for varieties of Midi French (e.g. Durand, 1995; Lenzen, 2008; Eychenne, 2014). Midi French is considered to not have contrastive phonemic height (e.g. Eychenne, 2014) and seems to show syllable-based synchronic assignment of height to the mid vowels (e.g. Eychenne, 2006, 2014; Lenzen, 2008). Finally, Parisian French, the variety in focus in this paper, is showing signs of loss of phonemic contrast for the mid vowels (e.g. Hansen, 2012). Although analyses of a synchronic *Loi de Position* have mostly been established for Midi French rather than septentrional varieties, this loss of phonemic contrast might suggest the existence of a synchronic process of height assignment for this variety as well.

European Frenches are also home to *Verlan* ([vɛʀlɑ̃], from *l'envers* /lɑ̃vɛʀ/ 'the reverse, the inverse, backwards'), a popular language game based on syllable or segment inversion, which has now become part of French slang and colloquial speech in general. *Verlan* is productive and predictable (Sloutsky & Black, 2008) with specific rules (Bachmann & Basier, 1984) that can be difficult to grasp for non-users (Méla, 1997; Black & Sloutsky, 2010). This language game has been used for and the target of linguistic analysis in previous works (including, but not limited to Bachmann & Basier, 1984; Méla, 1988, 1991, 1997; Lefkowitz, 1989; Azra & Cheneau, 1994; Plénat, 1995; Sloutsky & Black, 2008; Black & Sloutsky, 2010), and the use of language games for linguistic analysis in general is well-supported (Davis, 1993; Itô et al., 1996; Crystal, 2001; Kitaoka & Mackenzie, 2021), as they have been found to be systematic, productive, and recoverable (Davis, 1993). *Verlan* itself possesses some characteristics that are advantageous for the analysis at hand here. First, as mentioned above, it is a language game based on syllable or segment inversion, which can change the syllable structure of words. Then, *Verlan* words tend

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[1] In this study, I will use height as the distinctive feature between the series /e/, /ø/, and /o/ on the one hand, and /ɛ/, /œ/, and /ɔ/ on the other. The discussion and the choice of feature to describe the French vowel system is a complex one, with each variant having advantages and disadvantages. The focus of this paper is not to argue for one of them over another, and the choice of a specific feature is not crucial to this discussion. Here, I will be using a distinction in height, following Lyche (2010) and Gess, et al. (2012) among others. In addition, the choice of height matches the methodology of the present study, as described in section 4.b.

[2] Square brackets [] rather than slashes // are used here for [so] and [sɔt] as these pronunciations are phonetic in nature in the context discussed here. The *Loi de Position* is a surface alternation, as such transcriptions of words displaying the *Loi de Position* are best represented using phonetic transcriptions.

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to be treated like any other French word: They are incorporated into colloquial French without specific markings (Plénat, 1995; Méla, 1997), speakers never produce whole sentences in *Verlan*, as no one verlanizes every word in a sentence, and these words are used in otherwise non-*Verlan* French sentences (Méla, 1988; Sloutsky & Black, 2008). These various features interact with the alternation, and as such, they may help further our understanding of it: new words are created through *Verlan* mechanisms of inversions that change syllable structure, and these words are integrated into normal French colloquial speech without being marked differently from non-*Verlan* words.

In this study, I use *Verlan* forms to test synchronic productive *Loi de Position* application. I choose *Verlan* forms containing mid vowels and whose syllable structure changes from their base word, and I compare mid-vowel heights in the base form and in the *Verlan* form. I expect potential productive *Loi de Position* application to be visible as a change in syllable structure would change mid-vowel height.

First, I will be discussing previous literature on mid vowels, as well as detailing *Verlan* mechanisms and how they interact with the topic at hand (Section 2). Section 3 will focus on the methodology, stimuli, and participants to the experiment. Results are provided in Section 4, and they will then be discussed in Section 5, which will also provide general conclusions.

2. Previous Works

This section starts with a general review of mid-vowel alternation (Section 2.1), in which I discuss the historical development of the system (Section 2.1.1) and some of the theoretical propositions for synchronic height assignment (Section 2.1.2). Then, I detail background on *Verlan* and its mechanisms (Section 2.2). Finally, I state my research questions and hypotheses in Section 2.3.

2.1 *Mid-Vowel Alternation.* Most descriptions of the French vowel system propose three oral mid-vowel pairs (/e/-/ɛ/, /ø/-/œ/, and /o/-/ɔ/), with an opposition in height (Lyche, 2010). A 'Standard' French vowel inventory of mid vowels is displayed below in Table 1. We note that Lyche's inventory includes a central mid vowel which we will refer to as schwa in this study, although it has been described in many ways[3] . The status of schwa is a complicated question[4] that is not in the scope of the present study; however, it interacts with the topic at hand. When realized, this vowel is usually pronounced [ø], [œ], or a vowel between the two, depending on the variety (e.g. Dell, 1985; Fougeron et al., 2007). Crucially, despite surfacing as [ø] or [œ], it is not a phonemic /ø/ or /œ/, and as such is not part of the /ø/-/œ/ pair.

Table 1. Standard French mid-vowel inventory (based on Lyche, 2010)

	Front		Central	Back	
	Unrounded	Rounded		Unrounded	Rounded
Mid-high	e	ø	ə		o
Mid-low	ɛ	œ			ɔ

This vowel inventory aims at establishing a point of reference but does not capture the various realities of the situation in different varieties of French, and this constitutes one of the challenges in tackling this issue. While the mid-vowel variants are considered to maintain a phonemic contrast in height in 'Standard' French (e.g. Tranel, 1987), their status is variable from one variety of French to the next. For instance, in Midi French, mid vowels are often considered to be underspecified for height (Durand, 1995) and height assignment is determined by syllable structure: we find the mid-high variant in an open syllable, and the mid-low variant in a closed syllable or an open syllable followed by a schwa-headed syllable (Rizzolo, 2002)[5]. We find similar patterns in African varieties. In Central African Republic French, only the mid-high variant [ø] of the /ø/-/ɔ/ pair is found in open syllables, the /o/-/ɔ/ pair is always determined by syllable structure, and the /e/-/ɛ/ pair is also predictable from syllable structure in non-final syllables (Bordal, 2012). As mentioned in Section 1, Parisian French is also undergoing a gradual loss of phonemic contrast (e.g. Lefebvre, 1988; Landick, 1995; Hansen & Juillard, 2011), and despite a lot of individual variation, Hansen notes "clear signs of ongoing merger processes within the former phonological oppositions […] /e/–/ɛ/, /ø/–/œ/ and /o/–/ɔ/" (Hansen, 2012: 159). The

[3] For instance, as a "mute *e* ('e muet'), feminine *e* ('e feminin'), unstable *e* ('e instable'), fleeting *e* ('e caduc'), and schwa" (Tranel, 1987: 86), among other appellations.

[4] The status of schwa has been debated for a long time, some arguing for its inclusion in the system (e.g. Dell, 1985) and some favoring its absence from lexical representations for instance (e.g. Martinet, 1969).

[5] Contrary to other varieties, Midi French shows evidence for a phonemic schwa (Eychenne, 2014, 2016), which is pronounced except in prevocalic contexts.

signs of an ongoing merger suggest a change towards an allophonic distribution of the pairs [e]–[ɛ], [ø]–[œ], and [o]–[ɔ] rather than a phonemic one[6].

2.1.1 *Historical Analyses.* As mentioned in Section 1, a lot of the literature on the topic of mid vowels in French has centered around the development of the current distribution for 'Standard' French. This distribution was formally studied as early as the beginning of the 20th century (e.g. Dauzat, 1930; Fouché, 1935) and works of the time attempt at describing the influence of syllable structure on the mid vowel system, centered around open syllable favoring mid-high vowels and closed syllables favoring mid-low vowels. This account is supported by examples such as the evolution of a word like *mot* 'word' from Middle French (Mid.Fr.) [mɔ] to Modern French (Mod.Fr.) [mo], and the general tendency for mid vowels to lower in closed syllables and to raise in open syllables. This is the view supported by many works of the 20th century (e.g. Straka, 1981; Spence, 1988) and which has given the name *Loi de Position*.

However, other scholars have offered alternative analyses. Morin's (Morin, 1986, 1988) account[7] offers an explanation in which the distribution of the Mod.Fr. mid-vowel system originates in length values in Mid.Fr. He argues that Mid.Fr. phonemically short vowels have evolved to become phonemically mid-low vowels, whereas long vowels have evolved to become mid-high vowels. He argues that length is a better explanation for the apparent alternation in height, which is confounded by the fact that length and syllable structure interact. Morin's view was further developed by Montreuil (1995), who proposes a more nuanced account of the mid vowel system. He argues that the evolution of the mid vowel system in French may not have been a single unified process and rather treats different etymological classes of mid vowels separately, arguing that they might have evolved in different ways. To start with, he discusses short mid vowels in closed syllables, which display (now complete) diachronic lowering. For this class, the adjustment is not productive anymore and results in lexical distribution. While he does not discuss short vowels in open syllables, he does state that long mid vowels, whether in open or closed syllables, do not exhibit a change. We must note here that the absence of observed change for these two classes at the time of Montreuil's study does not rule out an active and visible change nowadays, which could be analogous to the one he describes for short vowels.

The discussion of Montreuil's work sheds light on another aspect of the evolution of the mid vowel system, which is separate from the causes of the change: the synchronicity of the process and the completeness of the diachronic change. Most of the authors cited above view this process as diachronic only and incomplete. For instance, Morin states that a diachronic evolution of the mid vowel system has a synchronic counterpart, as, at some point in the history of French, mid vowels can partly be described based on their position in the word (Morin, 1986: 201). However, he states that a synchronic and complete *Loi de Position* distribution would be much more complex, and that its analysis would require a specific distribution of each mid vowel. He mentions that other authors, such as Valdman and Casagrande, state the inaccuracy of considering the *Loi de Position* to be synchronic (Morin, 1986: 201), which is a view shared by Spence (Spence, 1988: 223). Straka (1981), on the other hand, argues for a complete process that results in synchronic distribution, as relayed by Morin (Morin, 1986: 202).

2.1.2 *Synchronic Analyses.* While most works on 'Standard' French have focused on a historical phenomenon and the possibility of a resulting distribution of mid vowels, some analyses have emerged to suggest synchronic assignment or change in height based on syllable structure for other varieties. While a strict syllable analysis is still a traditional account for the alternation, a number of other proposals come from the study of Midi French, whose mid vowels have been the subject of many works, as summarized by Eychenne (2014). For instance, we find formal analyses of the mid-vowel system following models such as Dependency Phonology (Durand, 1995), Government Phonology (Rizzolo, 2002), Head-Driven Phonology (Turcsan, 2005), and Optimality Theory (Eychenne, 2006). Lenzen (2008) puts forward three Optimality Theoretic implementations of the syllable analysis for varieties of Southern French, all centering around weight-based constraints and a preference for bimoraicity. Some of these analyses are motivated by trying to work around the strict syllable structure one, which has proven problematic for some words in some varieties (*gauche* [goʃ] 'left', *épais* [epe~epɛ] 'thick', *neutre* [nøtʁ] 'neutral', for instance). All these accounts focus on Southern varieties, which most likely have a process of synchronic height assignment, as the height contrast for mid vowels is not phonemic

[6] Not all varieties of French seem to be undergoing this change. For instance, varieties of French such as those found in Belgium, Switzerland, and Canada do not show the same signs indicative of a loss of phonemic contrast between the mid vowels, and all of them are undergoing their own changes (described in Gess et al., 2012).

[7] Morin gives an overview of the evolution of mid vowels in French from Middle French to the 20th century. He mentions several varieties (e.g. French, regional Frenches, Parisian French, Midi French) and specific processes that took place in these; however, he does not specify which variety of French his analysis applies or does not apply to.

(Eychenne, 2014; Coquillon & Turcsan, 2012). However, they do propose frameworks for the analysis of a synchronic productive process in Parisian French as well, as the phonemic contrast of mid-vowel height seems to be weakening (Hansen, 2012).

2.2 *Verlan.* *Verlan* is a language game, associated with younger speakers in underprivileged *banlieues*, that has become part of the daily slang of many speakers. Here, *Verlan* is only used as a tool to generate new words that interact with mid-vowel alternation; consequently, I will not be discussing *Verlan* word-creation mechanisms in much detail, as it is not the focus of this paper. However, the use of *Verlan* follows specific patterns. First, it is never used categorically across a sentence: selected *Verlan* words are integrated into typical colloquial French sentences, and speakers never produce entire sentences in *Verlan* (Méla, 1988). When integrated in French speech, *Verlan* words are not marked phonologically, for instance through distinct prosody (Plénat, 1995; Méla, 1997). In other words, *Verlan* words are treated like any non-*Verlan* French words in a sentence, and *Verlan* does not constitute its own separate language or dialect. Speakers do not codeswitch between French and *Verlan*, but they rather either use a set of processes to transform existing French words into new French words (*Verlan* word creation) or retrieve already formed *Verlan* words (*Verlan* words stored in their lexicon). As such, a better description of it would be that *Verlan* is both a mechanism of slang word creation as well as a category of words in the speakers' lexicon.

As described by Lefkovitz (1989) among others (e.g. Méla, 1997), *Verlan*'s primary mechanism is inversion of segments (*fou* /fu/ 'crazy' becoming [uf], in Lefkovitz, 1989) or syllables (*bizarre* /bizaʁ/ 'bizarre, weird' becoming [zaʁ.bi], in Méla, 1997). In addition, we also find insertion and deletion of segments (or less commonly whole syllables), usually with a schwa being present in the derivation. For instance, a word like *mère* /mɛʁ/ 'mother' goes through several processes, as shown in Table 2:

Table 2. *Verlan* derivation table for *mère* /mɛʁ/ 'mother'[8]

form	process
/mɛʁ/	*Verlan* underlying form, French surface form
mɛʁə	Schwa epenthesis
mɛ.ʁə	Syllabification
ʁə.mɛ	Syllable inversion
ʁə.m	Final vowel deletion
ʁəm	Resyllabification
[ʁœm][9]	*Verlan* surface form

Some French words have two *Verlan* instantiations, and this allows us to get a glimpse of some of the existing processes in French (for instance, *cité* /site/ 'ghetto, projects' can be [te.si] or [tɛs] after undergoing final vowel deletion[10]). Finally, *Verlan* words tend to be one or two syllables (Lefkovitz, 1989) and can also show rare cases of segment substitution (Méla, 1988, 1991). As shown in forms such as [ʁœm] and [tɛs], base French words can be hard to retrieve from *Verlan* forms due to the use of various processes. Finally, languages games tend to allow four possible mechanisms: insertion, rearrangement, substitution, and deletion (Davis, 1993); however, while most of them only use a subset of these, *Verlan* exhibits all of them, which is unique among language games (Davis, 1993: 8).

2.3 *Research Questions & Hypotheses.* In this study, I ask if Parisian French shows synchronic productive *Loi de Position* application in *Verlan* forms from existing and nonce bases. Synchronic productive *Loi de Position* will be supported by evidence of change in vowel height positively correlated to change in syllable structure. More specifically, I make the following hypotheses:

> H1a: *Verlan* forms from existing forms consistent with synchronic productive *Loi de Position* application will be better accepted than the ones that are not consistent with it.
> H1b: *Verlan* forms from nonce forms consistent with synchronic productive *Loi de Position* application will be better accepted than the ones that are not consistent with it.

[8] The derivation table and the surface form are an expansion from Méla's (1997) derivation of the word.
[9] Schwa surfaces as [œ] or [ø], as detailed in Section 2.1.
[10] The *Verlan* forms for *cité* can be found in sources such as *Le dictionnaire de la zone* (https://www.dictionnairedelazone.fr/dictionary/search), in which we find both *téci* [tesi] (https://www.dictionnairedelazone.fr/dictionary/search/cit%C3%A9/teci) and *tess* or *tèce* [tɛs] (https://www.dictionnairedelazone.fr/dictionary/search/cit%C3%A9/tece), and match my own native speaker judgments.

For both H1a and H1b, consistency with *Loi de Position* application is determined either by a change from a mid-high vowel in the base form to a mid-low vowel in a closed syllable in the *Verlan* form, or by a change from a mid-low vowel in the base form to a mid-high vowel in an open syllable in the *Verlan* form. Schwas are expected to pattern accordingly: realizations that are consistent with the *Loi de Position* ([ø] in open syllables, [œ] in closed syllables) in the *Verlan* form are expected to be better accepted than ones that do not. Crucially, consistency with synchronic productive *Loi de Position* application is then supported by a change in mid-vowel quality between the base form and the *Verlan* form.

H1a focuses on *Verlan* forms from existing bases, some of which are attested in the language. As such, we expect the possibility of a lexical effect, with attested *Verlan* forms possibly being better accepted than unattested ones due to having been heard or used by the participants for instance. H1b complements H1a as it only includes *Verlan* forms from nonce bases, and as such gives a better understanding of the potential productivity of the phenomenon; we expect the lexical effect for these forms to be absent or reduced[11].

H2: Production of *Verlan* forms will show change in mid vowel height from their base form that is consistent with productive *Loi de Position* application.[12]

H2 is tested by comparing F1 measures in open and closed syllables of *Verlan* forms from the same base phone. Consistency with productive *Loi de Position* application is determined by a significant difference in the expected direction between the F1 measures of the same base phone in open and closed syllables.

3. Methods

In this section, I will first discuss experiment design, including the stimuli used (Section 3.1). Then, I will detail the procedures of data treatment (Section 3.2) and the participants to the study (Section 3.3).

3.1 *Experiment design.* For this study, experimental data of *Verlan* words containing mid vowels was collected, as part of a larger data collection on *Verlan* words. It also included words without mid vowels and words with mid vowels testing *Verlan* word formation rather than *Loi de Position* application, which acted as distractors throughout the experiment. The experiment targeted both acceptability and production data, as well as background information on the speaker, in hopes of casting as large a net as possible. Section 3.1.1 will detail the two acceptability tasks (existing bases and nonce bases), Section 3.1.2 will focus on the production task, and Section 3.1.3 centers around the background questionnaire.

3.1.1 *Acceptability tasks.* The experiment conducted in this study is centered around two acceptability tasks: one focusing on *Verlan* forms from existing French bases, and the other focusing on *Verlan* forms from nonce bases. I will first describe the general mechanism of the tasks, before describing stimuli and specificities pertaining to each one.

Both acceptability tasks instructed the participants to listen to oral *Verlan* forms and rate them. The *Verlan* forms presented all showed change in structure around the mid vowel between the base word and the *Verlan* form. In other words, for a base word containing a mid vowel in an open syllable, a *Verlan* form containing the vowel in a closed syllable was used, and vice-versa. These *Verlan* forms were designed in pairs: One form showed a change in mid vowel height consistent with productive *Loi de Position* application, while the other showed no change. Examples for both existing bases and nonce bases are provided below in this section. Participants had to rate the forms on a six-point Likert scale on agreement with the statements *Le mot est une forme typique de Verlan* 'The word is a typical form of *Verlan*' (for *Verlan* forms with French bases) and *Le mot est une forme convenable de Verlan pour le mot écrit* 'The word is an acceptable form of *Verlan* for the word written' (for *Verlan* forms with nonce bases). A six-point scale was chosen to remove the opportunity for a neutral answer and force participants to make a choice, specifically considering they might have never heard some of the forms. The *Verlan* forms

[11] We might consider the possibility of analogy with attested *Verlan* forms for these; however, we expect a reduced effect if that is the case.

[12] Mid-low vowels in the base form that are in open syllables in the corresponding *Verlan* form will show significantly lower F1 values (in the *Verlan* form) than in closed syllables; mid-high vowels in the base word that are in closed syllables in the corresponding *Verlan* form will show significantly higher F1 values than in closed syllables. Schwa will pattern accordingly: schwas in open syllables will show significantly lower F1 values than in closed syllables.

were recorded by two native speakers of French, one male and one female, both from the Paris region and both 26 years old.

Starting with existing bases, a representative example is the base word *cité* /site/ '(neighbor)hood'. This word has two attested *Verlan* forms: [tesi] and [tes~tɛs]. The syllable containing the mid vowel in [tesi] doesn't undergo a change in structure from its base word, and as such it was not included in this study as it does not offer a context that would trigger a change in vowel height. On the other hand, the form [tes~tɛs] does show change in structure from its base word, allowing for analysis of potential productive *Loi de Position* application, and as such was used as a stimulus. In addition, the stimuli were composed of two pronunciations for each *Verlan* form: One consistent with productive *Loi de Position* application (mid-high in open syllables, mid-low in closed syllables) and one not. Thus, the two forms tested for *cité* were [tes] and [tɛs][13]. The stimuli were balanced as much as possible between mid-vowels and frequency, while being constrained by the distribution of mid-vowels in the language. For this task, 14 test base forms with two test pronunciations each were included. In addition, 10 base forms containing no mid vowels and 12 base forms containing mid vowels but not testing the productivity of height assignment were included and acted as distractors.

The acceptability task from nonce bases is similar to the one described above. It included pairs of *Verlan* forms from nonce French words following the same mechanism (change in syllable structure). For these bases, orthographic information of the base form was included as a reference point so that participants were able to rate the *Verlan* forms they heard. The orthographic information was created to be as unambiguous as possible, with the spelling chosen aiming to represent a specific pronunciation for the nonce French word. For instance, nonce word *beude* /bød/ included *Verlan* forms [dœb] and [døb]. The stimuli were balanced as much as possible between mid-vowels. For this task, 18 test base forms with two test pronunciations each were included. In addition, 11 base forms containing no mid vowels and 16 base forms containing mid vowels but not testing the productivity of height assignment were included and acted as distractors.

Crucially, for both tasks, participants only heard one *Verlan* form for each base. This is central to the study; along with the stimuli without mid vowels acting as distractors, making sure participants only ever heard one pronunciation of each word was a way to ensure that they would not be able to guess mid vowels were the point of focus. Finally, participants also unexpectedly produced *Verlan* forms during the acceptability task. Some participants corrected and recast stimuli they considered mispronounced, ill-formed, or simply incorrect. When the *Verlan* stimuli was recast with a different pronunciation by the participant, this production was treated following the description in Section 3.2 to establish an IPA transcription of the word. The transcription of the word produced by the participant was then used as the object of their acceptability rating.

3.1.2 *Production task.* Participants were instructed to record themselves throughout the experiment using their own equipment. The production task focused on *Verlan* spontaneous production of words from pictures. Participants were shown pictures referring to a French word and were instructed to orally produce both a *Verlan* form for the French word and the corresponding base French word. While the *Verlan* form was the target of the task, participants' production of the base French word was used to determine the base form of the *Verlan* word they had produced.

Several pictures were used for the same word to avoid participants focusing on details of one of the pictures. For instance, three pictures were used to target the word *métro* 'metro'. Two pictures showed different metro lines (to avoid participant producing the specific name of the metro line) and one was of a metro station (to avoid participants using words such as *train* 'train' or *voiture* 'car, carriage'). The criterion for the selection of pictures was to be best representative of the word for the participants in order to have a maximal chance of triggering the targeted base French word rather than a competitor.

The objective of this task was to record spontaneous *Verlan* production, without any spelling or aural cues given to the participants, which might prime a specific pronunciation. The words targeted by the pictures were well-known French words but the choice was quite heavily constrained: the base French word needed to be easily represented by pictures and its *Verlan* counterpart needed to offer the specific structure to test *Loi de Position* productivity. As such, not all mid vowel-syllable structure contrasts are included in this task. In addition to these *Verlan* productions from picture stimuli, participants also

[13] We note that the stimuli only tested two possibilities: no change or a change consistent with productive *Loi de Position* application. The stimuli did not include tokens showing a change in opposite direction with the *Loi de Position*. For example, an underlying /ø/ appeared in closed syllables as either [ø] or [œ], but no examples of an underlying /ø/ in an open syllable were included (and as such, not /ø/ -> [œ] in an open syllable, which would be a change in opposite direction). We do not expect a change going in the opposite direction and this is the reason why these forms were not included.

produced a number of spontaneous *Verlan* forms during the experiment. These spontaneous productions were added to the ones targeted by the pictures to form a corpus of *Verlan* productions.

3.1.3 *Background questionnaire.* Participants completed a background questionnaire, divided in two parts. First, before completing the various tasks described in 3.1.1 and 3.1.2, participants were asked to self-evaluate their familiarity with *Verlan* on a 6-point Likert scale. They were presented with sentences targeting their confidence in using, creating, and evaluating *Verlan* words, as well as their frequency of hearing and using *Verlan*. Responses to the *Verlan* familiarity questions were averaged for each participant to be used as an index of *Verlan* familiarity. At the end of the experiments, participants responded to questions pertaining to various socio-demographic information (year of birth, gender, city or cities of origin, socio-economic background), which is not presented here.

3.2 *Data treatment procedures.* The acceptability ratings generated by the experiment was numerical (1-6 rating) and was analyzed without further preparation. As described above, if the participant recast the stimuli they heard with a different pronunciation, then this pronunciation was used for the acceptability judgment. The production recordings were processed using PRAAT (Boersma & Weenink, 2015). Productions were segmented and then forced aligned using the Montreal Forced Aligner (McAuliffe et al., 2017). The alignment for the target words was manually checked to verify correct segmental tagging. Then, formant values were extracted at 50% of the vowel's duration using a PRAAT script. For this study, the dependent variable of height was operationalized using F1 values[14]. Outlier F1 values (beyond 3 standard deviations from the median) were excluded (e.g. due to measurement error).

Each token was coded for a number of relevant potential predictors. The ones used here are participant, stimulus, base type (French or nonce base), underlying[15] mid vowel, surface mid vowel (for acceptability only), surface syllable structure (open or closed), productive *Loi de Position* application (yes = surface mid-high vowel in open syllable, or surface mid-low vowel in closed syllable).

3.3 *Participants.* 143 people started the questionnaire, however only the data of those who completed at least 25% of the questionnaire and whose responses were considered coherent (e.g. reasonable response time) were kept, as the rest was deemed not representative. This brought the number of participants to 52, who generated 1316 acceptability tokens. Out of these 52 participants, 44 also completed the background questionnaire. The retained group having completed the background questionnaire consisted of 32 women and 12 men, covering a 15-year age range (years of birth between 1990 and 2005, skewed towards the younger side, with the median year of birth being 2001). All of them but two were university students, and all of them were from the Paris region, born and raised in the region. Finally, 31 of these participants also provided the audio recording, from which 401 Verlan mid-vowel production tokens were extracted.

4. Results

R Studio (R Studio Team, 2020) and lme4 (Bates et al., 2015) were used to analyze the data, while ggplot2 (Wickham, 2016) was used to generate Figures 1 and 2. I performed linear mixed-effect regression on acceptability ratings and F1 values. This section details results for the acceptability tasks (Section 4.1) and the production task (Section 4.2).

4.1 *Acceptability.* Linear mixed-effects regression was performed on the acceptability ratings of *Verlan* forms (e.g. [tes] and [tɛs]) for the two subsets of the data (existing and nonce bases). The main predictor used was consistency with productive *Loi de Position* application. A form such as [tɛs] would be consistent with productive *Loi de Position* application, whereas [tes] would not. This variable offers a simple binary look at the *Loi de Position* application, which has some advantages for this study: While the *Loi de Position* is composed of several processes, using this variable allows it to be treated as a one predictor. However, this variable alone does not allow for a more detailed analysis of these processes, and the model also included an interaction between surface syllable structure and underlying mid vowel to better understand it. The regression model used is shown in Table 3, with its results for the two subsets

[14] Although some of the mid vowel pairs are rounded vowels, only F1 values (and not F2 or F3 values) are used in this study as the comparison is made within mid-vowel pairs (comparing corresponding mid-low to mid-high vowels) rather than across pairs. As such, even though F2 and F3 values are useful to assess the positioning of rounded vowels in the vowel space, and specifically the overlap between mid-vowel pairs, these values will not be of use to compare mid-vowel heights for the same pair.

[15] For *Verlan* words, the underlying form is the form in the base word. This corresponds to the vowel of the French word before verlanization.

of the data shown in Table 4 and Table 5. Acceptability ratings for all *Verlan* forms, separated by consistency with productive *Loi de Position* application and by phoneme is shown in Figure 1.

Table 3. Model 1: Linear mixed-effects regression model for acceptability data.

Dependent variable	Main effects	Interactions	Random effects
Acceptability ratings	Consistency with productive *Loi de Position* application (yes or no)	Phoneme and Surface syllable structure	Participant, Test Item

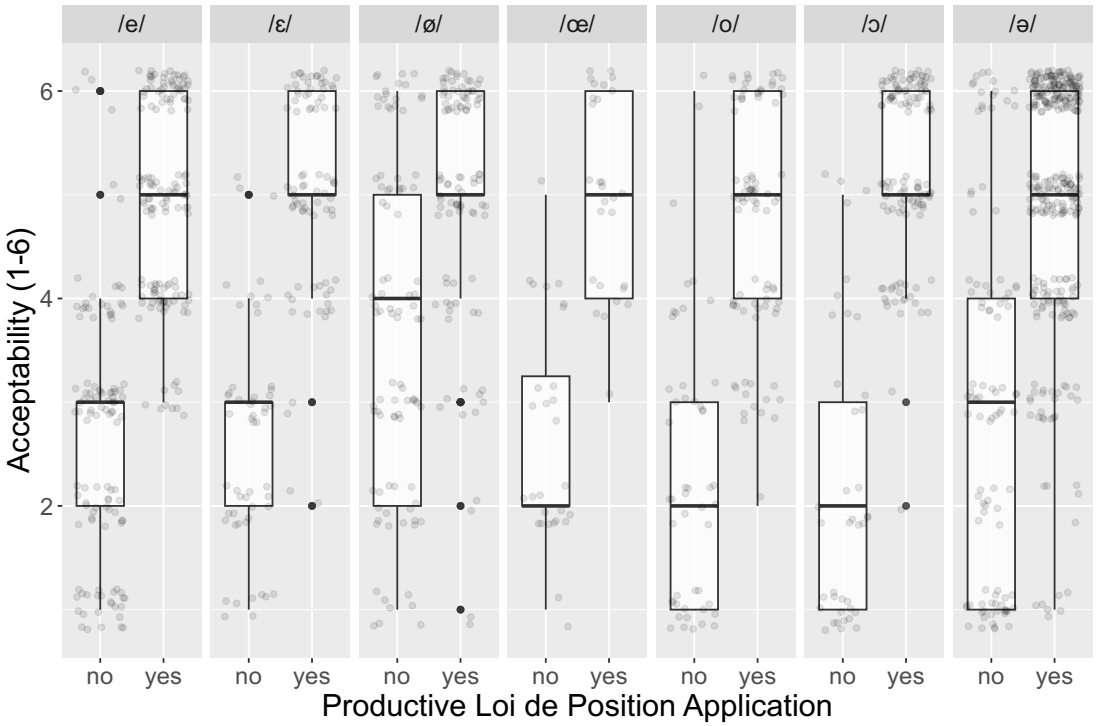
Table 4. Results of Model 1 for French bases

	β	Std Error	Df	t-value	p-value
Intercept	3.270	0.268	59.543	12.182	< 0.001
Consistent with *Loi de Position* application	1 .716	0.164	233.788	10.421	< 0.001
/e/ in closed syllables	0.106	0.301	43.109	0.354	0.724
/ø/ in closed syllables	1.310	0.465	43.124	2.817	0.007
/ə/ in closed syllables	0.446	0.342	41.943	1.310	0.197
/ɛ/ in open syllables	-0.073	0.402	43.057	-0.182	0.856
/ɔ/ in open syllables	0.353	0.110	607.403	3.210	0.001

Table 5. Results of Model 1 for Nonce bases

	β	Std Error	Df	t-value	p-value
Intercept	2.343	0.294	56.776	7.968	< 0.001
Consistent with *Loi de Position* application	2.074	0.126	118.620	16.389	< 0.001
/e/ in closed syllables	-0.070	0.328	53.415	-0.215	0.830
/ø/ in closed syllables	0.681	0.324	50.446	2.102	0.040
/o/ in closed syllables	0.350	0.331	54.668	1.059	0.294
/ə/ in closed syllables	-0.221	0.348	53.069	-0.637	0.527
/ɛ/ in open syllables	0.436	0.380	42.786	1.147	0.257
/œ/ in open syllables	0.473	0.389	47.067	1.214	0.230
/ɔ/ in open syllables	-0.241	0.467	43.272	-0.516	0.608

Figure 1. Acceptability ratings of *Verlan* forms, divided by consistency with productive *Loi de Position* application and underlying phoneme.



In Figure 1, we see overall better acceptability for tokens that are consistent with productive *Loi de Position* application ($p < 0.001$). We note that tokens with underlying /ø/ do not seem to pattern like other underlying mid vowels, as forms that are not consistent with *Loi de Position* application (underlying /ø/ in closed syllables realized as [ø]) are better accepted than for other mid vowels, both for existing bases ($p = 0.007$) and nonce bases ($p = 0.04$)[16]. For example, a *Verlan* form such as [jøv] (from base word *vieux* /vjø/ 'old'), which does not conform to productive *Loi de Position* application, is well-accepted in the results. We also note similar results for underlying schwa, for which *Verlan* forms not consistent with *Loi de Position* application show better acceptability than other underlying mid vowels. Further analysis shows that these are in vast majority cases of [ø] in closed syllables, which matches the tendency described above for /ø/. In both cases, [ø] is better accepted than other mid-high realizations in closed syllables, which appears as an exception to the productive *Loi de Position* as described here.

4.2 *Production.* Linear mixed-effects regression was also performed on the F1 values of the *Verlan* words produced by the participants, using the model shown in Table 7. F1 values here are used as a production indicator of height, to test *Loi de Position* application. The model also includes phonemes to test whether one phoneme behaves differently from the rest. Finally, the interaction of structure and phoneme is used to account for specific combinations that would be favored or disfavored. The statistical results of Model 2 are provided in Table 8, and Figure 2 shows reverse F1 values of *Verlan* productions, separated by underlying mid vowel and syllable structure.

Table 7. Model 2: Linear mixed-effects regression model for production data

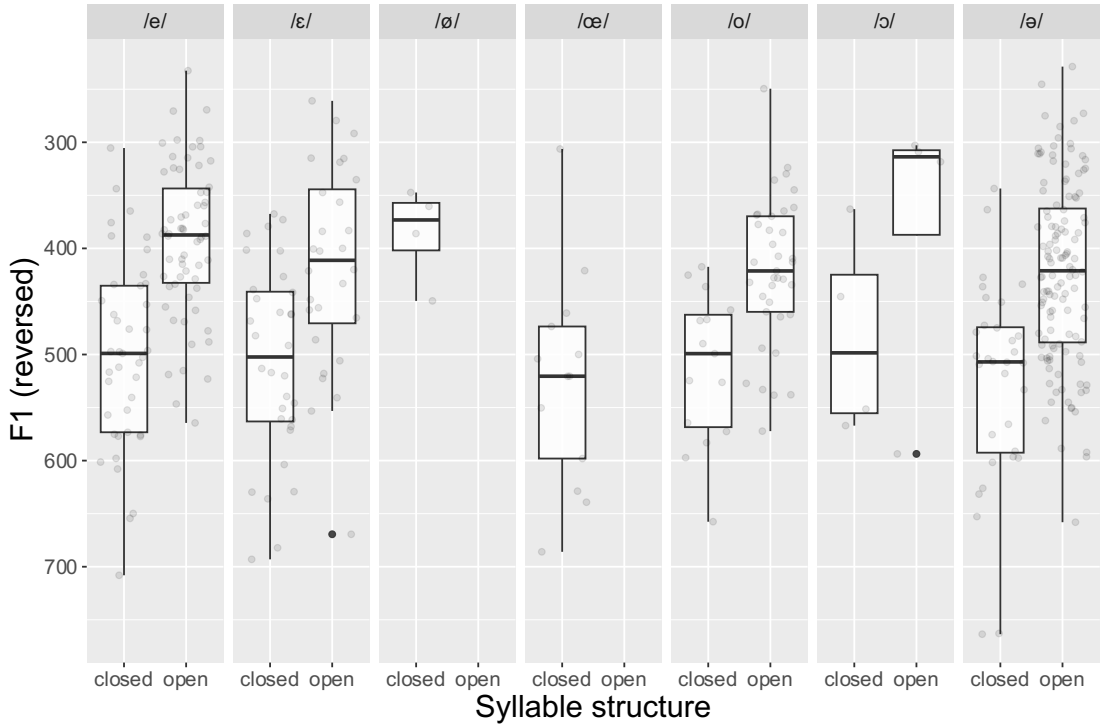
Dependent variable	Main effects	Interactions	Random effects
F1 values	Syllable structure, Underlying phoneme	Syllable structure and Phoneme	Participant, *Verlan* form

Table 8. Results of Model 2

	β	Standard Error	Df	t-value	p-value
Intercept	498.512	19.227	17.798	25.927	< 0.001
Open syllables	-101.075	20.044	16.084	-5.043	< 0.001
/ɛ/	30.411	24.662	14.229	1.233	0.237
/ø/	-42.826	40.340	48.637	-1.062	0.293
/œ/	22.228	33.727	8.332	0.659	0.527
/o/	12.550	28.821	16.035	0.435	0.669
/ɔ/	-10.581	39.731	89.163	-0.266	0.790
/ɛ/ in open syllables	-10.635	31.993	19.185	-0.332	0.743
/o/ in open syllables	21.807	32.437	23.405	0.672	0.507
/ɔ/ in open syllables	29.023	54.398	119.797	0.534	0.594

[16] The stimuli did not include forms going in the opposite direction to productive *Loi de Position* application. As such, even though underlying /ø/ not consistent with *Loi de Position* application could both mean /ø/ realized as [ø] in closed syllables and /ø/ realized as [œ] in open syllables, only the former was included in the stimuli. Consequently, /ø/ not consistent with *Loi de Position* application is in essence /ø/ realized as [ø] in closed syllables.

Figure 2. Reverse F1 values of *Verlan* productions, separated by underlying mid vowel and syllable structure



The results of analysis of the production data show an overall effect of syllable structure on F1 values ($p < 0.001$). This is particularly visible for the pairs /e/-/ɛ/ and /o/-/ɔ/, as they provide the complete comparison of phoneme and syllable structure. We note that for the same phoneme, F1 values are correlated to syllable structures: F1 values are lower (and as such higher in the vowel space) in open syllables and higher (and as such lower in the vowel space) in closed syllables. This is the case for all four phonemes of those two pairs. In addition, we see a similar pattern within pairs: The underlyingly mid-high vowel (/e/ and /o/) in closed syllables has higher F1 values than its underlyingly mid-low counterpart (/ɛ/ and /ɔ/) in an open syllable, and vice versa. While other pairs include two phonemes, schwa does not, but patterns accordingly. The expected effect is visible for underlying schwa: underlying schwa in closed syllables is significantly lower in the vowel space than in open syllables.

The /ø/-/œ/ pair does not include all contrasts; however, we do see that /ø/ in closed syllables does not pattern like the other mid-high phonemes. Although this is constituted of only four occurrences, we see much lower F1 values for /ø/ in closed syllables than for other mid-high phonemes in the same syllable structure. As mentioned in Section 4.1, we find many *Verlan* words with [ø] in closed syllables, and the occurrences of /ø/ in closed syllable seem to be correlated with it.

5. Discussion & conclusions

In H1a and H1b, I hypothesized that *Verlan* forms consistent with *Loi de Position* application would be better accepted than the ones not consistent with it. The results detailed in 4.1 generally support both hypotheses, with overall statistically significant consistency with productive *Loi de Position* application for both base types. Most underlying mid vowels pattern this way: in a syllable structure that would predict a change[17], forms that do show this change are better accepted than ones that do not. While some *Verlan* forms from existing bases are lexicalized, forms from nonce bases support productivity, as participants have never heard the base form or the *Verlan* form they created. The effect of consistency with *Loi de Position* application is visible across underlying mid vowels and is strongly statistically significant; however, we also note a few more interesting aspects. First, schwa, seems to pattern similarly to the three mid-vowel pairs, with results consistent with height assignment based on syllable structure. We see in the results of this study that, aside from [ø] in closed syllables, acceptability of schwa realizations in *Verlan* forms does pattern accordingly with productive *Loi de Position* application. We also do find two cases that do not pattern with the rest of mid vowels. Both underlying /ø/ and underlying schwa realized as [ø] are better accepted when not consistent with *Loi de Position* application than

[17] Underlyingly mid-high vowels in closed syllables and underlyingly mid-low vowels in open syllables.

expected. We note that both are cases of surface [ø] in closed syllables being well accepted, relatively to other comparable token types. As noted above, we find attested *Verlan* words (e.g. [jøv] 'old' and [jøz] 'eyes') as well as attested non-Verlan words (e.g. *chose* [ʃøz] 'thing') with this pattern, and [ø] in closed syllables seems to be the one exception to this productive *Loi de Position* effect in the results of the present study.

The production results detailed in Section 4.2 generally support H2. F1 values measured for *Verlan* words produced by the participants are consistent with assignment or reassignment of height for the pairs /e/-/ɛ/ and /o/-/ɔ/, as well as /ə/, with lower F1 values in open syllables and higher F1 values in closed ones. Due to the distribution of the phonemes in the language and in *Verlan* words, the data does not include all combinations for the /ø/-/œ/ pair; however, we see low F1 values for /ø/ in closed syllables, which matches attested forms such as [jøv] or [jøz] described above. The strong productive syllable structure effect on mid vowel height is particularly visible when opposing underlyingly mid high and mid low vowels. F1 values of underlying mid-high vowels in closed syllables increases to match those of underlying mid-low vowels in closed syllables, and F1 values for underlying mid-low vowels in open syllables decreases to match those of underlying mid-high vowels in open syllables. While these segments have opposite underlying height, their height values are reversed in production due to syllable structure. This F1 indicator seems to show that, in closed syllables, the target of underlyingly mid-high vowels becomes the mid-low variant, and vice versa in open syllables.

Support for the hypotheses formulated in this study is consistent with productive *Loi de Position* application in *Verlan* words and suggest assignment or reassignment of height values determined by syllable structures. The results for the pairs /e/-/ɛ/ and /o/-/ɔ/ are consistent throughout the task types tested in this study, with very few exceptions. The /ø/-/œ/ pair and /ə/ offer more complicated results, particularly with surface [ø] not patterning with other similar tokens, and they also suffer from individual obstacles in their analysis[18]. Yet, aside for [ø] in closed syllables, their results are also consistent with *Loi de Position* application. These results, especially regarding *Verlan* form from nonce bases and with schwa, suggest a phenomenon that is not restricted to a historical process only, but rather the existence of a synchronic productive process. The results of this study go further than the asymmetrical distribution of mid-vowels attested in French- any analysis based solely on the input value (e.g. etymological length) is unable to explain the changes between the input (underlying form) and output (realization) found in this study. These findings support the existence of a phonological process of mid-vowel height assignment or re-assignment, which is in opposition to most studies on mid-vowels in this variety in the past century.

References

Azra, Jean-Louis, & Cheneau, V. (1994). Jeux de langage et théorie phonologique. Verlan et structure syllabique du français. *Journal of French Language Studies*, *4*(2), 147–170.https://doi.org/10.1017/S0959269500002209

Bachmann, Christian, & Basier, Luc. (1984). Le verlan: Argot d'école ou langue des Keums ?. *Mots*, *8*, 169–187.

Bates Douglas, Mächler Marting, Bolker Ben, & Walker Steve. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software, 67*(1), 1–48. doi:10.18637/jss.v067.i01.

Black, Catherine, & Sloutsky, Larissa. (2010). Évolution du verlan, marqueur social et identitaire, dans les films: *La Haine* (1995) et *L'Esquive* (2004). *Synergies Canada*, *2*. https://doi.org/10.21083/synergies.v0i2.1037

Boersma, Peter, & Weenink, David. (2015). *'PRAAT: Doing phonetics by computer'.* http://www.praat.org/

Bordal, Guri. (2012). A phonological study of French spoken by multilingual speakers from Bangui, the capital of the Central African Republic. In Gess, Randall, Lyche, Chantal, & Meisenburg, Trudel. (Eds.). *Phonological variation in French: Illustrations from three continents*. John Benjamins, 23–44.

Coquillon, Annelise, & Turcsan, Gabor. (2012). An overview of the phonological and phonetic properties of Southern French: Data from two Marseille surveys. In Gess, Randall, Lyche, Chantal, & Meisenburg, Trudel. (Eds.). *Phonological variation in French: Illustrations from three continents*. John Benjamins, 105–128.

Crystal, David. (2001). *Language play*. University of Chicago Press.

Davis, Stuart. (1993). Language games. In *The encyclopedia of language and linguistics*. Pergamon Press, 1980–1985.

Dell, François. (1985). *Les règles et les sons*. Hermann.

Durand, Jacques. (1995). Alternances vocaliques en français du Midi et phonologie du gouvernement. *Lingua*, 95, 27–50.

Durand, Jacques, & Lyche, Chantal. (2002). Structure et variation dans quelques systèmes vocaliques du français: L'enquête Phonologie du français contemporain (PFC). In Coveney, Aiden, Hintze, Marie-Anne, & Sanders, Carol (Eds.), *Variation et francophonie.* L'Harmattan, 217–240.

Eychenne, Julien. (2014). Schwa and the *loi de position* in Southern French. *Journal of French Language Studies*, *24*(2), 223–253. https://doi.org/10.1017/S0959269513000173

[18] For example, the pair /ø/-/œ/ pair suffers from limited numbers and frequency, especially within attested and possible *Verlan* words.

Eychenne, Julien. (2016). *Aspects de la phonologie du schwa dans le français contemporain*. Université de Toulouse-Le Mirail.
Fouché, Pierre. (1935). La prononciation actuelle du français. In A. Dauzat (Ed.), *Où en sont les études de français?* Bibliothèque du français moderne, 13–34.
Fougeron, Cécile, Gendrot, Cédric, & Bürki, Audrey. (2007). On the acoustic characteristics of French schwa. In Jürgen Trouvain (Ed.), *Proceedings of the 16th International Congress of Phonetic Sciences*. Universität des Saarlandes. 941–944
Gess, Randall., Lyche, Chantal, & Meisenburg, Trudel. (2012). *Phonological variation in French: Illustrations from three continents*. John Benjamins.
Hansen, Anita Berit. (2012). A study of young Parisian speech: Some trends in pronunciation. In Gess, Randall, Lyche, Chantal, & Meisenburg, Trudel. (Eds.). *Phonological variation in French: Illustrations from three continents*. John Benjamins, 151–172.
Hansen, Anita Berit, & Juillard, Caroline. (2011). La phonologie parisienne à trente ans d'intervalle – Les voyelles à double timbre. *Journal of French Language Studies 21*(3), 313–359. doi:10.1017/S0959269510000347.
Itô, Junko, Kitagawa, Yoshihisa, & Mester, Armin. (1996). Prosodic faithfulness and correspondence: Evidence from a Japanese argot. *Journal of East Asian Linguistics*, *5*(3), 217–294. https://doi.org/10.1007/BF00132604
Kitaoka, Daiho, & Mackenzie, Sara. (2021). Moraic reversal and realisation: Analysis of a Japanese language game. *Phonology*, *38*(1), 41–79. https://doi.org/10.1017/S095267572100004X
Landick, Marie. (1995). *The mid-vowels in figures: hard facts.* French Review 69 (1): 88–103.
Lefebvre, Anne. (1988). Les voyelles moyennes dans le français de la radio et de la télévision. *La Linguistique 24*(2): 75–91.
Lefkowitz, Nathalie J. (1989). Verlan: Talking backwards in French. *The French Review*, *63*(2), 312–322.
Lenzen, Roxanne. (2008). *La loi de position dans la phonologie du français contemporain [Mémoire]*. Université Radboud de Nimègue.
Lyche, Chantal. (2010). Le français de référence: Éléments de synthèse. In Detey, Sylvain, Durand, Jacques, Laks, Bertrand, & Lyche, Chantal (Eds.), *Les variétés du français parlé dans l'espace francophone*, 143–165. Ophrys.
Martinet, André. (1969). *Le français sans fard*. Paris: PUF.
McAuliffe, Micheal, Socolof, Michaela, Mihuc, Sarah, Wagner, Michael, & Sonderegger, Morgan. (2017). Montreal Forced Aligner: trainable text-speech alignment using Kaldi. In *Proceedings of the 18th Conference of the International Speech Communication Association*.
Méla, Vivienne. (1988). Parler verlan: Règles et usages. *Langage et société*, *45*(1), 47–72. https://doi.org/10.3406/lsoc.1988.2405
Méla, Vivienne. (1991). Le verlan ou le langage du miroir. *Languages*, *25*(101), 73–94. https://doi.org/10.3406/lgge.1991.1802
Méla, Vivienne. (1997). Verlan 2000. *Langue Française*, *114*, 16–34.
Montreuil, Jean-Pierre. (1995). Weight and length in Conservative Regional French. *Lingua*, *95*, 77–96.
Morin, Yves-Charles. (1986). La loi de position ou de l'explication en phonologie historique. *Revue Québécoise de Linguistique*, *15*(2), 199–231. https://doi.org/10.7202/602567ar
Morin, Yves-Charles. (1988). Loi de position? *Revue Québécoise de Linguistique*, *17*(1), 237–242. https://doi.org/10.7202/602622ar
Plénat, Marc. (1995). Une approche prosodique de la morphologie du verlan. *Lingua*, *95*(1–3), 97–129. https://doi.org/10.1016/0024-3841(95)90103-5
Rizzolo, Olivier. (2002). *Du leurre phonétique des voyelles moyennes en français et du divorce entre licenciement et licenciement pour gouverner*. PhD thesis, Université de Nice-Sophia Antipolis.
RStudio Team (2020). *RStudio: Integrated Development for R*. RStudio, PBC, Boston, MA URL: http://www.rstudio.com/
Sloutsky, Larissa, & Black, Catherine. (2008). Le Verlan, phénomène langagier et social: Récapitulatif. *The French Review*, *82*, 308–324.
Spence, N. C. W. (1988). Loi de position ou durée vocalique? *Revue Québécoise de Linguistique*, *17*(1), 223–234. https://doi.org/10.7202/602621ar
Straka, Georges. (1981). Sur la formation de la prononciation française d'aujourd'hui. *Travaux de Linguistique et de Littérature*, *19*, 161–248.
Tranel, Bernard. (1987). *The sounds of French: An introduction* (1st ed.). Cambridge University Press. https://doi.org/10.1017/CBO9780511620645
Wickham, Hadley. (2016). *ggplot2 : Elegant Graphics for Data Analysis*. Springer-Verlag New York.