A Sociophonetic Study of the Metropolitan French [R]: Linguistic Factors Determining Rhotic Variation

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ABSTRACT

Rhotic consonants are subject to much variation in their production cross-linguistically. The Romance languages provide an excellent example of rhotic variation not only across but also within languages. This study explores rhotic production in French based on acoustic analysis and considerations of different conditioning factors for such variation. Focusing on trills, previous cross-linguistic studies have shown that these rhotic sounds are oftentimes weakened to fricative or approximant realizations. Furthermore, their voicing can also be subject to variation from voiced to voiceless. In line with these observations, descriptions of French show that its uvular rhotic, traditionally a uvular trill, can display all of these realizations across the different dialects. Focusing on Metropolitan French, i.e., the dialect spoken in Paris, Webb (2009) states that approximant realizations are preferred in coda, intervocalic and word-initial positions after resyllabification; fricatives are more common word-initially and in complex onsets; and voiceless realizations are favored before and after voiceless consonants, with voiced productions preferred elsewhere. However, Webb acknowledges that the precise realizations are subject to much variation and the previous observations are not always followed.

Taking Webb's description as a starting point, this study explores the idea that French rhotic production is subject to much variation but that such variation is conditioned by several factors, including internal and external variables. Focusing on Metropolitan French, a variety that has not received as much attention as other French dialects in terms of its rhotic, I present acoustic data to support my claim and show that rhotic production is conditioned by internal factors such as syllable and word position, stress and neighboring segments. Metropolitan French also allows us to investigate the impact of external factors such as knowledge and contact with French-based Creole languages.

In order to investigate rhotic production, an experiment was designed to obtain acoustic data from seven native speakers of Metropolitan French. I included three tasks: a reading task, a picture description task and an interview, in order to obtain different types of speech styles. Within each task, target words were selected that included differences with respect to the environments where the rhotic occurred. The factors considered were syllable position (coda, onset, complex onset), word position (initial, medial or final), stress, preceding sound for complex onsets and following sound for codas. Each token was analyzed based on the presence or absence of several acoustic features, including frication, voicing, formants and trill-like phases. These allowed me to derive five different categories: approximant, devoiced approximant, voiced fricative, devoiced fricative and voiceless fricative.

Results confirm previous reports that trill realizations are almost non-existent in Metropolitan French. It is worth noting, though, that the few trills that we observe come from the reading task, suggesting that style plays a role in rhotic production. Overall, the most common realization is approximant, although the other categories are also frequent and their distribution proves to be conditioned by the factors I considered. Syllable position has a strong effect on rhotic production. Codas and simple onsets are most frequently realized as approximants, but codas display a higher percentage of devoiced and voiceless productions than onsets, suggesting that codas are subject to a higher degree of devoicing than onsets. Complex onsets, on the other hand, favor voiceless fricatives. However, when taking the effect of the preceding consonant into account for complex onsets, I find that a preceding voiceless consonant (/t/ or /f/) favors voiceless fricative rhotic production but a preceding voiced stop (/d/) correlates with approximant production. Similarly, the following consonant has an effect on coda rhotics: a following voiced consonant favors a fully voiced approximant realization, while a following voiceless prefers

devoiced and voiceless realizations, including approximants and fricatives. Word position and stress prove to play a more limited role in rhotic production. Finally, the data show some speaker variation in that two speakers present a higher percentage of fricatives. I relate this difference to the linguistic background of the participants, more precisely to their place of origin: northern France outside of Paris. To conclude, this study finds that the French rhotic is subject to much variation; however and most importantly, it is shown that this variation is in fact conditioned by several linguistic factors that correlate with different realizations including approximants, fricatives, voiceless, voiced and devoiced productions.

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CHAPTER 1: BACKGROUND INFORMATION

1.1 Introduction

Throughout history, the world's languages, while evolving from different primary tongues into various language families, have shown general similarities. Rhotics, i.e. /r/-like sounds[1], have been shown to vary crosslinguistically, and even within the same language. Rhotics appear in more than 75% of the world's languages, with almost one fourth of these languages containing two rhotic phonemes within their consonant inventory. For most languages containing more than one rhotic, the different rhotic phonemes vary based on manner of articulation rather than place of articulation, as seen in the Spanish contrast between an alveolar trill and an alveolar tap. Rhotics can be categorized by their manner of articulation: trills, taps, fricatives, and approximants. Alveolar trills are the most common rhotic crosslinguistically, while uvular trills are the second most common trill attested (Bradley 2006; Ladefoged & Maddieson 1996; Sessarego 2011; Solé 2002). As stated by Ladefoged and Maddieson (1996), Standard German and Standard French both contain uvular trills within their inventory, which often weaken and are realized as fricatives or approximants. Rhotics continue to exhibit many variations crosslinguistically in pronunciation both in place and manner of articulation (Bradley 2001; Bradley 2006; Ladefoged & Maddieson 1996; Sessarego 2011; Shosted 2008; Solé 2002; Tranel 1987; Walker 1984; Webb 2004). This thesis illustrates the current phenomenon of change in manner of articulation in Metropolitan French rhotics and seeks to identify the potential causes of variation in French rhotic pronunciation.

[1] For the purpose of this paper, when refering to rhotics crosslinguistically, the IPA symbol /r/ (denoting an alveolar trill) will be used, as it is common practice in the field. When discussing the French rhotic in particular, the IPA symbol for the uvular trill /R/ will be used.

1.2 Literature Review

1.2.1 Rhotics in Romance

The Romance languages provide an excellent example of rhotic variation across and within languages. Even though these languages are derived from Latin, one can observe obvious differences between the rhotics found in Spanish and French, for instance. The Spanish inventory contains two rhotics, while French only has one rhotic. While Spanish rhotics differ in manner of articulation, they share the same place of articulation. The tap and the trill are both produced at the alveolar ridge, whereas the French rhotic is typically produced further back in the oral cavity, more precisely in the uvular region. The tap consists of one single quick occlusion that occurs when the articulators touch. In Spanish, an alveolar tap is produced when the tip (the apex) of the tongue rapidly touches, or taps, the alveolar ridge. When the articulators touch multiple times in quick succession, the rhotic is realized as a trill (Bradley 2006; Sessarego 2011; Shosted 2008; Solé 2002). In Spanish, the trill and tap contrast phonemically solely in intervocalic position, which is denoted orthographically. Apart from orthographic indications, Spanish rhotics follow patterns to obtain the proper distribution as a trill or a tap. When following a nasal, a lateral or a sibilant (fricatives and affricates), the rhotic is realized as a trill. Trill realizations also occur in word initial positions. As for taps, they occur in complex onsets and syllable coda positions. For examples of tap and trill distribution in Spanish, see (1) below (Bradley 2006; Morgan 2009; Sessarego 2011; Solé 2002).

(1) Rhotic distribution in Spanish

Intervocalic trill	*perro*	/pe.**r**o/	‘dog’
Intervocalic tap	*pero*	/pe.ɾo/	‘but’
Post-nasal trill	*sonrisa*	/son.**r**i.sa/	‘smile’
Word-initial trill	*rosa*	/**r**o.sa/	‘rose’
Complex-onset tap	*brazo*	/bɾa.so/	‘arm’
Word-final tap	*mar*	/maɾ/	‘sea’

Comparing the trills of Spanish and French – apical and uvular, respectively – shows the difference between the ability to use these rhotics in consonant clusters. While the French uvular can be the second member of a consonant cluster, Spanish does not combine the apical trill with another consonant. When a consonant cluster is formed across syllables, Spanish apical trills can cause pronunciation shift in preceding consonants, such as /s/, in which the sibilant becomes voiced (to match the voicing of the rhotic) or undergoes deletion, e.g. *las rosas* /la#**r**osas/'the roses' and *Israel* /i**r**ael/ 'Israel' (Bradley 2006; Morgan 2009; Sessarego 2011; Solé 2002). Opposed to the asymmetric distribution of trills and taps in Spanish, French has maintained one single rhotic phoneme in the evolution from Latin to Romance. This rhotic can occur in intervocalic positions, in codas and in complex onsets, as outlined in (2). In addition, French has complex codas, in which a liquid appears as the second member of the consonant cluster (Colantoni & Steele 2005; Sessarego 2011; Webb 2004).

(2) Rhotic distribution in French

Intervocalic	*origine*	/ɔ**R**iʒin/	'origin'
Word-final coda	*mère*	/mɛ**R**/	'mother'
Complex onset	*frère*	/f**R**ɛʀ/	'brother'
Complex coda	*sucre*	/syk**R**/	'sugar'

Rhotics are traditionally grouped together with laterals to form the class of consonants called liquids. The term liquid originally signified the second member of a consonant cluster but its use evolved to refer to the class of laterals and rhotics as opposed to other consonants. In contrast to the rhotic, the lateral has been considered by many phoneticians to be the ideal liquid, given its lack of vulnerability to variation. Colantoni and Steele (2005), based on evidence from French and Spanish, argue that the lateral and the rhotic cannot always be consolidated into one class due to the variability of these segments, especially of the rhotics. Based on the evolution from Latin to

Romance resulting in changes in consonant clusters and recent phonetic phenomena producing various rhotic allophones, Colantoni and Steele (2005) state that rhotics and laterals do not share enough similarities to be categorized into the liquid class. Unlike the lateral, the rhotic in these languages is vulnerable to its environment, which can determine shifts in pronunciation and dialectal differences (Bradley 2006; Colantoni & Steele 2005; Sessarego 2011; Solé 2002; Webb 2004; Webb 2009).

Colantoni and Steele (2005) have made generalizations that question the validity of the liquid class, which consolidates rhotics and laterals. While they can function in a phonologically similar way compared to other phonemes, the evolution of obstruent-liquid clusters from Latin to Romance has resulted in cluster differences between the languages. For example, from Latin *arbor* 'tree', Spanish has obtained *árbol* while French retains the rhotic with *arbre*, keeping the original liquid in the final syllable. There also exist coronal asymmetries in French, in which only one liquid can be used to form complex onsets with certain obstruents. For example, /tr/ and /dr/ exist as complex onsets in the inventory of French (e.g. *très* 'very' /tʀɛ/ and *draguer* 'to hit on' /dʀa.ge/), but */tl/ and */dl/ are not possible. See (3) below for examples (Colantoni & Steele 2005; Hallé, Best & Bachrach 2003; Webb 2009).

(3) Stop-Liquid clusters in French

Voiced stop + rhotic	*draguer*	/d**ʀ**a.ge/	'to hit on'
Voiced stop + lateral	**dlore*	/dlɔʀ/	
Voiceless stop + rhotic	*très*	/t**ʀ**ɛ/	'very'
Voiceless stop + lateral	**tlaie*	/tle/	

In addition, Colantoni and Steele (2005) observe variation in the production of the French rhotic compared to the lateral. In one data set, the pronunciation of French liquids was compared in L2 learners of French. Laterals were pronounced consistently by L2 learners, while the rhotic was pronounced as a voiced or voiceless fricative (either uvular or velar) or was aspirated to produce

an [h]. Concerning consonant clusters, their data showed that rhotics, and not laterals assimilate to the preceding sound in voicing and frication. The lateral underwent some assimilation, but it was more infrequent (Colantoni & Steele 2005; Colantoni & Steele 2006; Webb 2009). A further piece of evidence presented by Colantoni and Steele (2005) against grouping rhotics and laterals together comes from the fact that rhotics sometimes behave phonetically like fricatives. For example in some native speakers, French rhotics cause lengthening of a preceding vowel, as seen in (4).

(4) Effects of voiced fricatives and liquids on vowel lengthening[2]

Lengthened vowel	*air*	/ɛ:**R**/	'air'
Lengthened vowel	*vive*	/vi:v/	'lively'
Non-lengthened vowel	*aile*	/ɛl/	'wing'
Non-lengthened vowel	*ville*	/vil/	'city'

Lengthened vowels are commonly found before voiced fricatives. Relatedly, Colantoni and Steele state that the patterns gathered show that the French rhotic is most commonly attested as a fricative (an obstruent) or an approximant. To conclude, the authors hypothesize that the rhotic might be moving away from the liquid class and moving into other phoneme classes such as approximants or obstruents. An interesting question that stems from Colantoni and Steele (2005) is whether the French rhotic is becoming more like a fricative or an approximant rather than pairing with its lateral counterpart, i.e. whether the modern rhotic is becoming part of the obstruent or the approximant class (Colantoni & Steele 2005; Webb 2009). The current study will present data that bears on this issue, which supports the claim that rhotics are functioning more as approximants than as fricatives.

As mentioned earlier, the manner of articulation of rhotics in French oscillates between an approximant and a fricative realization. Recent studies have analyzed the potential causes for these

[2] Noting that laterals do not cause vowel lengthening, they cannot be grouped together with fricatives as rhotics can.

various realizations of the rhotic phoneme in French. Articulatory weakening can give rise to a non-trilled /r/; this nontrilled rhotic variation has also been proven to be common crosslinguistically. When the trill articulation undergoes lenition, this weakening often results in an approximant, a fricative, or an aspirated /h/ (Bradley 2006; Shosted 2008; Solé 2002; Straka 1979; Webb 2004). As has been shown in Standard German and Standard French, the uvular trill rhotic attestation has undergone weakening to become a fricative (Ladefoged & Maddieson 1996). Perhaps the shift from a fricative to an approximant represents a further step in the present-day process of lenition.

1.2.2 French Rhotic: Evolution and Dialectal Variation

While Spanish has often been used as the ideal example for researching rhotic variation within the Romance languages, such as Bradley (2006), Colantoni & Steele (2006) and Sessarego (2011), French proves to be equally relevant. Of all the languages that are derived from Latin, Standard French is the only language not to have retained the alveolar trill. By the mid XVII century, the apico-alveolar /r/ was already in the process of being replaced by the dorso-velar rhotic, as the latter was being adopted by the high society in Paris (Goelzer 2005; Straka 1979; Tranel 1987). At the turn of the century, grammarian Andry de Boisregard stated that Parisians should adopt the uvular rhotic pronunciation of the bourgeoisie: “a soft manner that is not coarse or harsh”, while Antoine Furetière published a hypothetical pronunciation of the French /r/ in the Dictionnaire Universel de Furetière, which included the descriptor “gutteral”. His suggestion leaned towards a pronunciation shift further back in the oral cavity. These influential statements encouraged the changes that would ensue shortly thereafter (Demolin 2001; Straka 1979).

Scholars have commented on this pronunciation shift which was begun by the aristocracy, which served to retain the French rhotic from disappearing entirely. At the time, these academicians spoke out against the apical /r/ due to realizations that proved problematic for the previous couple of centuries. The rhotic had been pronounced as /z/ and /l/, or was deleted completely in various positions (Shosted 2008; Straka 1979). These different attestations were seen as consequences of the weakness of the apical articulation of the /r/. Around the mid-XVII century, French was experiencing an extreme loss of rhotics, where the /l/ was replacing the /r/ in any position. When de Boisregard and Furetière suggested an adjustment in the rhotic pronunciation, the aristocratic society had already commenced a retraction in the place of articulation of this phoneme. The change that occurred marks the pronunciation transformation to the back of the oral cavity. The adoption of the dorso-velar rhotic by the bourgeoisie branded the apical rhotic as the vulgar pronunciation (Demolin 2001; Straka 1979). Within a century, Standard French adopted the uvular fricative /R/ after gaining popularity with speakers from Paris. As proven by Solé (2002), the apico-alveolar rhotic requires more muscular energy for its production than the velar rhotic does, which could explain the process of lenition that occurred with the former French rhotic. As the alveolar trill became problematic, the retraction of the French rhotic to a uvular attestation was initiated (Goelzer 2005; Solé 2002; Straka 1979).

Focusing on contemporary French, there have been several studies on the variation in rhotic pronunciation in different regions of the Francophone world. In a recent article, Webb (2009) analyzed the rhotic found in various Francophone countries, based on previous descriptions, and concluded that the rhotic remains one of the most unstable phonemes in the French language (Demolin 2001; Webb 2009). The following are some of the dialectal differences regarding French rhotic production. In Francophone Africa, the rhotic can be realized as an apical

tap, exhibiting differences in place and manner of articulation from Standard French rhotic (Dumont 1979; Duponchel 1979; Manessy 1984; Renaud 1979; Tranel 1987; Webb 2009). In Montréal, speakers are heading in the direction of frication, whereas in the past they were known for their apical and uvular trills, distinguishing themselves as preserving the Old French rhotic pronunciation (cf. Sankoff and Blondeau 2007; Straka 1979; Tousignant, Sankoff and Santerre 1989; Tranel 1987; Walker 1984; Webb 2009). Quebecois French demonstrates rhotic vocalisation in coda position, so that the rhotic is produced as a vowel-like element, for example *pire* 'worse' [piʲ]. St. Thomas French also displays rhotic vocalisation in complex codas and rhotic elision in simple codas (Webb 2009). French speakers from southwestern France typically pronounce the rhotic as a voiceless fricative (Tranel 1987; Webb 2009). The phoneme's variability across the French-speaking world – both historically and present-day – demonstrates the unstable nature of the French rhotic, marking it as an intriguing linguistic phenomenon that is still in the process of evolving (Colantoni & Steele 2005; Demolin 2001; Shosted 2008; Straka 1979; Tranel 1987; Webb 2004; Webb 2009).

Many studies of the French language involve analyses of regional variation spoken in the French colonies such as Francophone Africa or Quebec. However, Webb's (2009) research compares Francophone dialects to Metropolitan French, i.e. the French spoken in Paris and the northern-central region of France, defining the rhotic allophones in terms of those found in Standard French or *convergent French* (as defined in Webb's paper). According to Webb's data, the French rhotic in Standard French can be realized as a voiced or voiceless fricative or an approximant, being pronounced as both a velar or uvular sound (Shosted 2008; Walker 1984; Webb 2009). Trilled rhotics are infrequent in Standard French and typically only surface with marked speech patterns (such as singing). Webb claims that /R/s are usually fricatives in word-

initial position and when the rhotic functions as the second member of a consonant cluster. He generalizes that rhotics preceding or following a stop exhibit the same voicing patterns as that stop, whether voiced or voiceless. As presented in his data, word-initial rhotics were typically attested as voiced fricatives. Voiced approximants are most commonly found intervocalically, in the coda position (both word-medially and word-finally), or as the first member of a consonant cluster. See (5) for approximant and fricative distribution according to Webb (2009). However, rhotics can be fricativized in the coda position for emphatic or enunciated speech and can be lenited in word-initial positions based on resyllabification. While most rhotics are attested as approximants intervocalically, Webb (2009) generalizes that rhotics seem the most unstable in intervocalic environments (as is found in historical phonetic realizations of Old French as early as the XV century) (Straka 1979; Webb 2009).

(5) Attestations of French rhotic in Metropolitan French (Webb 2009)

Approximants:			
Intervocalic	*arabe*	/a**R**ab/	'arab'
Word-final	*par*	/pa**R**/	'by'
Coda	*porte-clés*	/pɔ**R**təkle/	'key ring'
1st member of CC	*absurde*	/apsy**R**d/	'absurd'
Fricatives:			
Word-initial	*rêver*	/**R**eve/	'to dream'
2nd member of CC	*absoudre*	/apsud**R**/	'to absolve'

1.3 Goals of the Study

By using acoustic analyzing software, this thesis seeks to compare approximant and fricative rhotic realizations based on social factors of the speakers and linguistic factors, such as environment and word stress. The project was designed to expand on Webb's previous analyses of the French rhotic by helping to clarify the classification of rhotics in Metropolitan French. Rather

than making impressionistic observations regarding rhotic pronunciation, this study takes an approach of acoustic analysis to properly categorize the /R/ while accounting for phonetic details that might otherwise go unnoticed in perceptive generalizations. The words chosen contain the rhotic in various environments: intervocalically, word-initially, in complex onsets, and in simple codas. The rhotics appear in the stressed and unstressed syllables of the selected words to account for potential variation based on syllable-stress. French consists of only final stress words. Complex onsets are also commonly found in French. The current study analyzes the production of rhotics when following a voiced alveolar stop /d/, a voiceless alveolar stop /t/, and a voiceless labiodental fricative /f/, to explore the effect of the voicing and manner of articulation of this preceding consonant.

The purpose of this study is to analyze rhotic variation within the city of Paris to support other academic findings in French phonetic research that observe the variability of the rhotic. This thesis seeks to explore whether differences in the realizations of this phoneme can be attributed to various social factors of the speakers, such as gender, place of origin and contact with other languages (specifically African creole languages). This study will acoustically analyze the speech patterns of Paris-native speakers or those who have lived in the city for an extended period of time (more than a decade). This thesis contributes to a plethora of research on non-Metropolitan French phonetics with the hopes of encouraging further studies on the linguistic evolution of speakers living in the region where Standard French originated.

CHAPTER 2: METHODOLOGY

2.1 Speaker Distribution

The project gathered eleven speakers, whose speech patterns were recorded and acoustically analyzed. The participants used for the study were acquaintances of the primary investigator. The requirements for these speakers were threefold: i) they had to be at least 18 years old; ii) they had to be native speakers of French; and iii) they had to have lived in Paris for an extended period of time (for the purposes of this study, this was considered at least a decade). The map provided in Figure 1 shows the surrounding area of Ile-de-France to denote the close proximity to Paris from which speakers F1 and F4 originated. The participants represent a variety

Figure 1: Map of Northern France around Paris

of social backgrounds, including differences in age, gender, and contact with other languages. Of the eleven interviews obtained, only seven were used due to background noise found on the recordings and lack of spontaneous speech elicited. Four female speakers and three male speakers were used for this study. These speakers represent different age groups ranging from 20 to 68 years

old, while two of the participants (M3 and F3) have contact with other languages (specifically, African creole languages). The demographics of the speakers used for this study are shown in Table 1. One must take into account the difficulty of accurately generalizing rhotic production based on the amount of social factors that potentially influenced speaker pronunciation and given the uneven distribution of this study's speakers in the different social categories. Age proved to be the most problematic factor considering there was a wide age gap in the participants. As stated in the results section of the paper, language contact and place of origin proved to be the social factors that attributed to variation in rhotic production.

Table 1: Speaker Demographics

Gender	**Age**	**Place of Origin**	**Primary languages**
M1	21	Paris, France	French, English
M2	20	Le Lamentin, Martinique	French
M3	20	Les Abymes, Guadeloupe	French, Antillean Creole
F1	68	Le Mans, France	French, English
F2	45	Ile de France, France	French, Spanish
F3	25	Paris, France	French, Bassa (Cameroon)
F4	35	Chartres, France	French

For the purpose of the table, "primary languages" denotes the languages they listed as speaking fluently, their native language, and the language they speak with their family. As stated by Ladefoged and Maddieson (1996), contact with other languages can influence the attestation of the rhotic. Ladefoged and Maddieson (1996) describe the effect of exposure to English on Mexican Spanish speakers. Living in the United States had changed the pronunciation of their Spanish

alveolar rhotics. Therefore, exposure to other languages, such as African creole languages, potentially influence the French rhotic pronunciation found in these speakers.

2.2 Stimuli

There were three sections in the recording. The first section, the reading task, consisted of a series of words containing the rhotic in different positions. The speakers were directed to place these target words into different carrier sentences given in Table 2.

Table 2: Carrier Sentences for the Reading Task

Écrivez _____.	V_#	Write _____.
Dites _____ *encore une fois*.	t_V	Say _____ again.
Écrivez _____ *s'il vous plaît*.	V_s	Write _____ please.
Dites _____ *deux fois*.	t_d	Say _____ two times.

All words used in the experiment had final stress, as is common in French. There were a variety of stimuli in order to test the effect of several linguistic factors on the rhotic production, such as syllable position, word position, surrounding sounds and stress. To observe the effect of stress, the target words, which were either two- or three-syllable words, had the rhotic in different positions within the word both in unstressed and stressed syllables. Stressed syllables in French are only found word finally. The target words contained rhotics intervocalically, word-initially, in complex onsets, and in simple codas. In three-syllable target words, the tokens appeared both in the penultimate (second to last) and the antepenultimate (third to last) syllables to account for potential variation in rhotic attestation attributed to the word position. As seen in Table 3, words with a variety of rhotic environments were chosen in order to observe any shift in pronunciation that might be attributed to the surrounding phonemes. The /R/ could occur intervocalically both

Table 3: Rhotic Distribution in Target Words for the Reading Task

	Stressed		Unstressed
Intervocalic	préfé**r**er latér**a**l libe**r**er atte**rr**é	gé**r**er pa**r**ade pa**r**aître peu**r**eux	a**rr**achage pa**r**esser a**r**abique a**rr**êter
Coda Position: Word finally	partenai**r**e secondai**r**e témérai**r**e solidai**r**e	porteu**r** bonheu**r** légè**r**e preneu**r**	n/a
Coda Position: Word medially Before Voiced Consonant	rechar**g**eable rechar**g**er te**r**mine		la**r**gement
Coda Position: Word medially Before Voiceless Consonant	ma**r**quer pa**r**tir conve**r**tir		na**r**cotique pa**r**ticipe
Coda Position: Word medially Before Voiceless Fricative	ma**r**cher reche**r**cher		pe**r**suasion
Complex Onset: after /t/	é**tr**ennes cont**r**aire mont**r**er mont**r**able		t**r**action t**r**aduire t**r**aité t**r**avail
Complex Onset: after /d/	voud**r**ais vend**r**ais prend**r**ais ad**r**esse		d**r**ainage d**r**esseur d**r**apeau d**r**agon
Complex Onset: after /f/	souff**r**age souff**r**ait aff**r**eux off**r**ais		f**r**apper f**r**aisier f**r**agile f**r**équent
Word Initially	n/a		**r**êver **r**ester **r**égner **r**apport

within words and across words. Rhotics were used word initially and word finally, both in the middle of carrier sentences and also after or before pauses, respectively, to eliminate the potential effect of surrounding phonemes. In the coda position within the target words, the rhotic was placed before voiced and voiceless consonants and voiceless fricatives to observe variability in voicing and manner of articulation due to the following sound. To analyze the same features relative to rhotic instability, the /ʀ/ was placed as the second member of a consonant cluster for complex onsets. While the inventory of French contains coda and word-final consonant clusters, for the purpose of this task, only words with complex onsets were used. Three complex clusters were used in the reading task to account for the influence of voicing and manner of articulation: /tʀ/ (voiceless stop), /dʀ/ (voiced stop), and /fʀ/ (voiceless fricative).

In addition to the reading task, the picture description task included words that contain the rhotic in various environments. Participants were asked to name and briefly describe nine famous Parisian monuments: la Tour Eiffel, le Moulin Rouge, l'Arc de Triomphe, le Louvre, la Sorbonne, Notre Dame, l'Opéra Garnier, Montmartre, and le Sacré Cœur. La Tour Eiffel and l'Opéra Garnier were target words with an intervocalic rhotic (both within and across words). L'Arc de Triomphe and Notre Dame were analyzed for examples of the rhotic in complex onsets, both word initially and word medially. Le Louvre[3] provided a complex coda rhotic attestation. Montmartre, la Sorbonne, l'Opéra Garnier, and le Sacré Cœur included the rhotic in coda position, both before the voiced stop /b/, the voiceless stop /t/, a nasal /n/ and at the end of a word before a pause.

The third task consisted of a short, five question interview in which the researcher elicited spontaneous speech from the participants by asking simple, personal questions, such as "What's your favorite type of food?" "What music do you like?" "Do you like living in Paris?". During the

[3] Since complex codas had not been addressed in the reading task, tokens analyzed in this environment were left out of this paper.

final task, the speakers would typically increase the rate of speech rather than enunciating as in the previous tasks. The tokens chosen, almost all /R/s produced in the interview task, represent the rhotic intervocalically, word-initially, in coda position (both word-medially and word-finally), and in various complex onsets following a voiceless fricative /fR/, a voiced bilabial stop /bR/, a voiced alveolar stop /dR/, a voiceless alveolar stop /tR/, and a voiced velar stop /gR/. The analyzed rhotic tokens appeared both in the stressed and unstressed syllables. These three tasks were used to observe if there were pronunciation differences between more formal speech patterns (found in the reading task) or more informal, spontaneous speech (found in the picture description task and the interview task).

2.3 Recording Procedure and Data Analysis

2.3.1 Acoustic Features

The interview was divided into three sections and recorded onto a laptop using the program WaveSurfer 1.8.8p3 and a head-mounted microphone. The recordings took place in Paris, France between October and December 2011 in quiet rooms in order to avoid background noise. WaveSurfer was used to analyze the participants' speech patterns via waveforms and spectrograms. In order to obtain a clearer image to analyze the rhotic tokens, the researcher used an analysis bandwidth of 250 Hz in WaveSurfer, viewing the spectrogram in a window between 0 and 9000 Hz. Each token was viewed individually and analyzed for voicing and frication. Voicing is determined by the presence of a voicing bar, which appears at the bottom of the spectrogram, and periodicity in the waveform. Aperiodic noise in the upper frequencies of the spectrogram and aperiodic waves in the waveform denote frication. Approximants are defined as voiced phonemes in which the articulators approach but do not touch each other. Approximants have voicing,

formants and lack frication on waveforms and spectrograms (as seen in Figure 2). Unlike approximants, fricatives can be either voiced or voiceless. Figure 3, showing aperiodic waves and aperiodic noise in the spectrogram, displays a voiceless fricative in the complex onset /tʀ/, while one can note the presence of a voicing bar in Figure 4 to show a voiced fricative in complex onset /dʀ/. In addition to fricatives and approximants, a few tokens were classified as trills, in which the period of the wave is consistent on the waveform denoting the open and closed phases where the articulators touch to create occlusion.

Figure 2: Speaker M2 pronounces a fully voiced approximant in *pa<u>r</u>ade* 'parade'

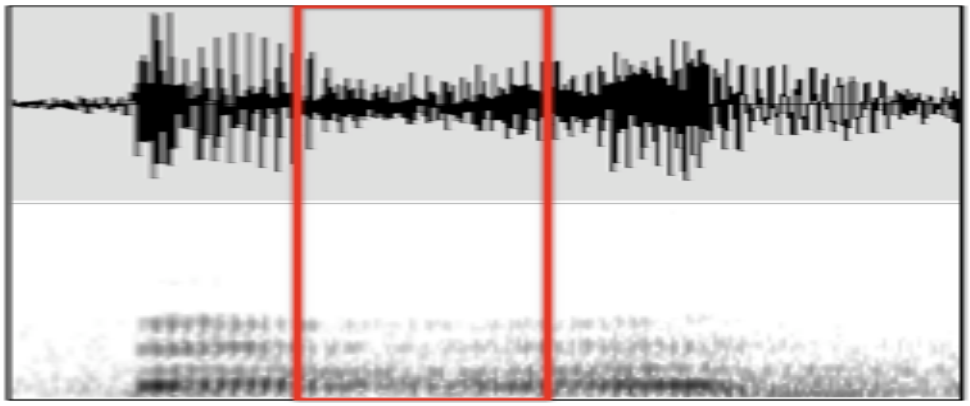


Figure 3: Speaker F1 pronounces a voiceless fricative in the complex onset /tʀ/ *mont<u>r</u>able* 'presentable'

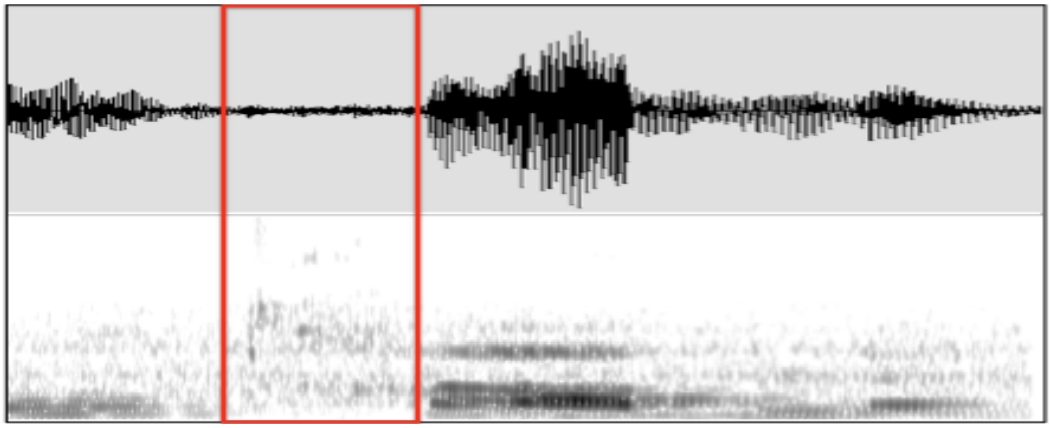
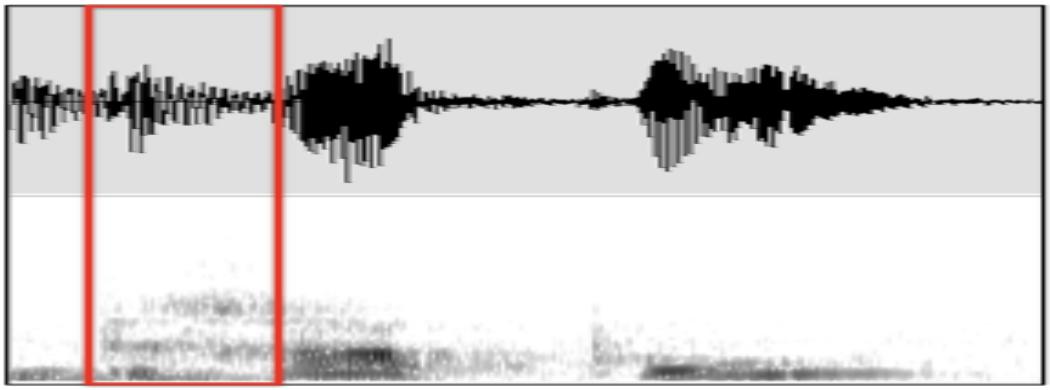


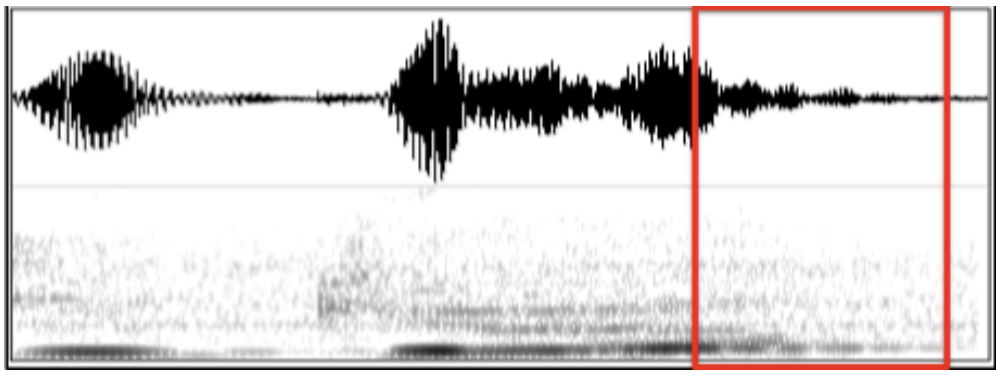
Figure 4: Speaker F2 produces voiced fricative in the complex onset /dʁ/ in *drapeau* 'flag'



2.3.2 Categories

After the acoustic analysis was finished, the tokens were categorized based on manner of articulation and voicing. Unforeseen voicing gradiency (a change in voicing that occurs during the production of the phoneme) caused for further division of the categories to properly name each rhotic attestation. Seven categories were used to classify tokens: approximant, voiced fricative, voiceless fricative, devoiced approximant, devoiced fricative, voiced trill, and voiced fricative with prevoicing. Two classes of devoiced segments arose due to the presence of voicing gradiency in some tokens, where the voicing would change during the utterance of the rhotic. As seen in Figure 5, a clear decline in the voicing bar in addition to the presence of formants denotes a devoiced approximant.

Figure 5: Speaker F4 produces devoiced approximant in a word-final rhotic in *le cœur* 'the heart'



Whereas voiced trills and voiced fricatives with prevoicing did occur in some speakers (seven and four respectively), there was not a sufficient number of tokens in order to attribute it to Standard French rhotic realizations. Therefore, for the purposes of this study, these tokens were not included in the results. These productions are further discussed in section 3.1. The distribution of the different categories was submitted to statistical analysis. Cross tabulations and chi-square tests were performed in order to prove the effect of the linguistic and social factors on the categories distribution.

CHAPTER 3: RESULTS

In this section, I report the results from the statistical analysis. I divide the results according to task: reading task, picture description task and interview task.

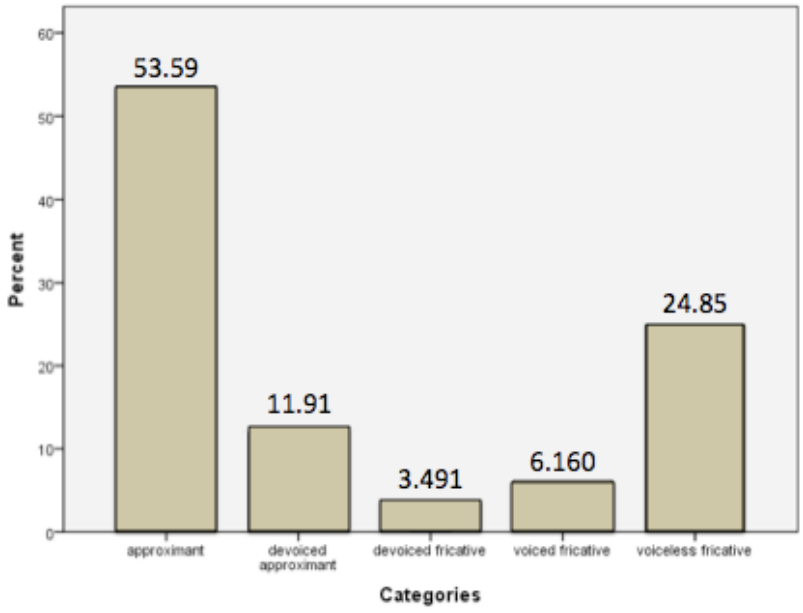
3.1 Reading Task

Rhotic attestation percentages gathered from the reading task support hypotheses and generalizations made in previous research, which argue that, while the rhotic is moving away from Old French trill attestation, the phoneme is behaving more like an approximant or a fricative. This first task yielded 487 tokens divided between five different categories: approximant, devoiced approximant, voiced fricative, voiceless fricative, and devoiced fricative. Eleven tokens – seven voiced trills and four voiced fricatives with prevoicing – were eliminated due to the small number found. Voiced trills were found in onset positions, both word medially and word initially, and in the coda position before a voiceless consonant. The fricatives with prevoicing were only word-initial rhotics (specifically in words *rechercher* 'to research' and *rechargeable* 'refillable') found in speakers F3, F4, and M3. These tokens exhibited acoustic features similar to that of a glide /w/,

i.e. vocalisation. These speakers either had contact with African creole languages (where this type of vocalized rhotic is frequently found) or were not originally from Paris. It should be noted that these two categories of rhotics were only found in the reading task. As for trill productions, Webb (2009) claimed the presence of uvular trills in Standard French only in emphasized speech. For the purpose of this paper, we are labeling this reading task as such. However, since this task is marked as emphatic speech, one might hypothesize that the use of trills in the inventory of Standard French is significantly declining based on the lack of trills produced in the reading task.

In the reading task, the category with the highest amount of attestation of rhotics was approximants with 261 tokens. The second highest category was voiceless fricatives with 121 tokens, followed by devoiced approximants (58 tokens), voiced fricatives (30 tokens) and devoiced fricatives (17 tokens). See Figure 6 for exact percentages.

Figure 6: Bar graph showing the rhotic distribution in percentages found in the reading task.



3.1.1 Onsets

Various factors determined rhotic production in onset position. Out of the 133 onset tokens, the category with the highest percentage was approximants (76.7%) followed by devoiced

approximants (7.5%), voiced fricatives (6.8%), devoiced fricatives (5.3%) and voiceless fricatives (3.8%). Onset rhotics are found in word initial or word medial (intervocalic) positions. Word initial rhotics, as previously stated, are always unstressed in French, unless it is a monosyllabic word. Word medial rhotics can fall in the stressed or unstressed syllable. According to the Pearson Chi-Square, stress only has a marginal effect on pronunciation of word-medial intervocalic rhotics (p-value = .048); unstressed syllable rhotics are mostly pronounced as approximants (92.3% of word medial, unstressed rhotics were attested as approximants compared with 82.3% of word medial, stressed tokens). However, speaker and word position have a strong influence on rhotic distribution (chi-square, p-values < .001). See Table 4 for percentages related to effect of word position on pronunciation. Word initial position proves to have a higher percentage of fricatives than word medial (37.8% compared with 4.5%). Speaker F1 behaves differently from the other

Table 4: Graph denoting the effect of word position on rhotic distribution in reading task in onset position (word initial and word medial)

			Category Abbreviation					Total
			a[4]	dv a	dv f	vd f	vl f	
Word Position	wi	Count	27	1	6	7	4	45
		% within Word Position	60.0%	2.2%	13.3%	15.6%	8.9%	100.0%
		% of Total	20.3%	.8%	4.5%	5.3%	3.0%	33.8%
	wm	Count	75	9	1	2	1	88
		% within Word Position	85.2%	10.2%	1.1%	2.3%	1.1%	100.0%
		% of Total	56.4%	6.8%	.8%	1.5%	.8%	66.2%

speakers, having a much lower percentage of approximants (46.7%) with the remainder of her tokens pronounced as fricatives (53.4%). The results found, showing that onset (both word initial

[4] The abbreviations signify the categories produced: *a* 'approximant', *dv a* 'devoiced approximant', *dv f* 'devoiced fricative', *vd f* 'voiced fricative' and *vl f* 'voiceless fricative'.

and word medial) rhotics are mostly approximants, are not in accordance with previous research reported by Webb (2009), which states that word initial rhotics are most commonly produced as fricatives. Perhaps more fricatives are produced word-initially and in stressed positions when speakers will emphasis the rhotic pronunciation, which could result in fricative realizations as opposed to approximants. Seemingly, rhotics will weaken in unstressed positions, word-medially and word-finally. This could indicate that rhotics lenite in these environments that do not accompany emphatic speech patterns.

3.1.2 Codas

Rhotics in coda position behaved similar to those in onset position. 186 tokens were gathered in this word position for the reading task, of which 60.2% were categorized as approximants, 25.3% as devoiced approximants, 5.9% voiceless fricatives, 4.8% voiced fricatives and 3.8% devoiced fricatives. Based on the Pearson Chi-Square data (p-values < .001), speaker, word position, and surrounding consonants influence rhotic pronunciation in the coda. Speakers F1 and F4 (those who originate from cities outside of Paris in Northern France) exhibited similar patterns, having a much lower percentage of approximants (33.3% and 35%) compared to the other speakers. Word final rhotics were almost all approximants or devoiced approximants (with the exception of 2.9% of voiceless fricatives), whereas word medial rhotics were categorized as 49.4% approximants, 21.7% devoiced approximants and 28.8% fricatives (voiced and voiceless). In contrast to previous research carried out regarding Metropolitan French rhotics, this study analyzes the effects of following consonants for coda rhotics, as seen in Table 5 below. The greatest consistency was found before voiced consonants: voiced bilabial nasal /m/ and voiced palato-alveolar fricative /ʒ/. Before a nasal, rhotics were attested as approximants in 100% of the cases;

however, it should be noted that there were not as many tokens collected from this word environment (only seven tokens were analyzed in the coda position before a nasal). Before a voiced fricative, 81% of rhotics were approximants, 9.5% were voiced fricatives and the remaining 9.5% were both voiceless and devoiced fricatives. On the other hand, presence of fricative rhotics was more prominent before voiceless consonants: velar stop /k/, alveolar fricative /s/ and dental stop /t/. Before velar stop /k/, rhotics were evenly attested as approximants and devoiced approximants (28.6% for each category). Alveolar fricative /s/ produced a higher rate of approximants, 55% and 10% devoiced approximants whereas dental stop /t/ obtained a 57.1% rate of devoiced approximants and a 9.5% rate of approximants. Summarizing, for word medial codas, a following voiced consonant favors an approximant realization and a following voiceless consonant favors a fricative. Overall, word final codas produced a higher rate of approximants (both fully voiced and devoiced) while word medial codas yielded a higher percentage of fricatives.

Table 5: Table showing rhotic distribution based on word position and following consonants in the coda position for the reading task.

Word position				Category Abbreviation					Total
				a	dv a	dv f	vd f	vl f	
wf	Following C		Count	71	29			3	103
			% within Following C	68.9%	28.2%			2.9%	100.0%
	Total		Count	71	29			3	103
			% within Following C	68.9%	28.2%			2.9%	100.0%
wm	Following C	k	Count	4	4	3	2	1	14
			% within Following C	28.6%	28.6%	21.4%	14.3%	7.1%	100.0%
			% within Category Abbreviation	9.8%	22.2%	42.9%	22.2%	12.5%	16.9%
		m	Count	7	0	0	0	0	7
			% within Following C	100.0%	.0%	.0%	.0%	.0%	100.0%

		% within Category Abbreviation	17.1%	.0%	.0%	.0%	.0%	8.4%
	s	Count	11	2	2	2	3	20
		% within Following C	55.0%	10.0%	10.0%	10.0%	15.0%	100.0%
		% within Category Abbreviation	26.8%	11.1%	28.6%	22.2%	37.5%	24.1%
	t	Count	2	12	1	3	3	21
		% within Following C	9.5%	57.1%	4.8%	14.3%	14.3%	100.0%
		% within Category Abbreviation	4.9%	66.7%	14.3%	33.3%	37.5%	25.3%
	z	Count	17	0	1	2	1	21
		% within Following C	81.0%	.0%	4.8%	9.5%	4.8%	100.0%
		% within Category Abbreviation	41.5%	.0%	14.3%	22.2%	12.5%	25.3%
Total		Count	41	18	7	9	8	83
		% within Following C	49.4%	21.7%	8.4%	10.8%	9.6%	100.0%
		% within Category Abbreviation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

As addressed in prior studies, rhotics in coda position are typically attested as approximants (Webb 2009). However, in previous research, neither the placement of the coda within the word (e.g. word medial or word final) nor the effect of the following consonant on the rhotic was taken into account. This project illustrates that variation in rhotic pronunciation in the coda varies with speaker, as well as its position within the word and the manner of articulation of the following consonant.

3.1.3 Complex Onsets

Unlike the previous rhotic positions, tokens followed slightly different patterns in this syllable position. According to the Pearson Chi-Square figures, neither speaker nor position within the word had a significant effect on the pronunciation. Preceding consonant proved to strongly

influence rhotic attestation (chi-square p-value < .001). Similar to the results found in the coda-position rhotics, voiceless consonants favor voiceless rhotic attestation while voiced consonants tend to produce approximants. This task contained 56 tokens per complex onset, totalling 168 rhotics. Complex onsets /fR/ and /tR/ yielded voiceless fricatives at a rate of 91.1% and 94.6% respectively. Unlike what previous research had hypothesized, complex onset /dR/ favored approximants at a higher rate than voiced fricatives (80.4% to 14.3%). /dR/ clusters in word initial position produced a higher amount of fricatives (32.1%) than in word medial position (7.1%); this difference in rhotic attestation depending on word position is also noted in simple onsets, where word initial onsets generate a higher percentage of fricatives and word medial onsets yield a higher amount of approximants. On the other hand, /tR/ and /fR/ clusters showed no approximants in word initial position compared with 7.2% and 3.6% approximant attestation in word medial position. As seen in Table 6, there is a higher percentage of approximant productions when

Table 6: Table denoting rhotic distribution based on the first member of a consonant cluster for the complex onset category in the reading task.

			Category Abbreviation					Total
			a	dv a	dv f	vd f	vl f	
Preceding C	d	Count	45	0	2	8	1	56
		% within Preceding C	80.4%	.0%	3.6%	14.3%	1.8%	100.0%
		% of Total	26.8%	.0%	1.2%	4.8%	.6%	33.3%
	f	Count	1	0	1	3	51	56
		% within Preceding C	1.8%	.0%	1.8%	5.4%	91.1%	100.0%
		% of Total	.6%	.0%	.6%	1.8%	30.4%	33.3%
	t	Count	1	1	0	1	53	56
		% within Preceding C	1.8%	1.8%	.0%	1.8%	94.6%	100.0%
		% of Total	.6%	.6%	.0%	.6%	31.5%	33.3%
Total		Count	47	1	3	12	105	168
		% within Preceding C	28.0%	.6%	1.8%	7.1%	62.5%	100.0%
		% of Total	28.0%	.6%	1.8%	7.1%	62.5%	100.0%

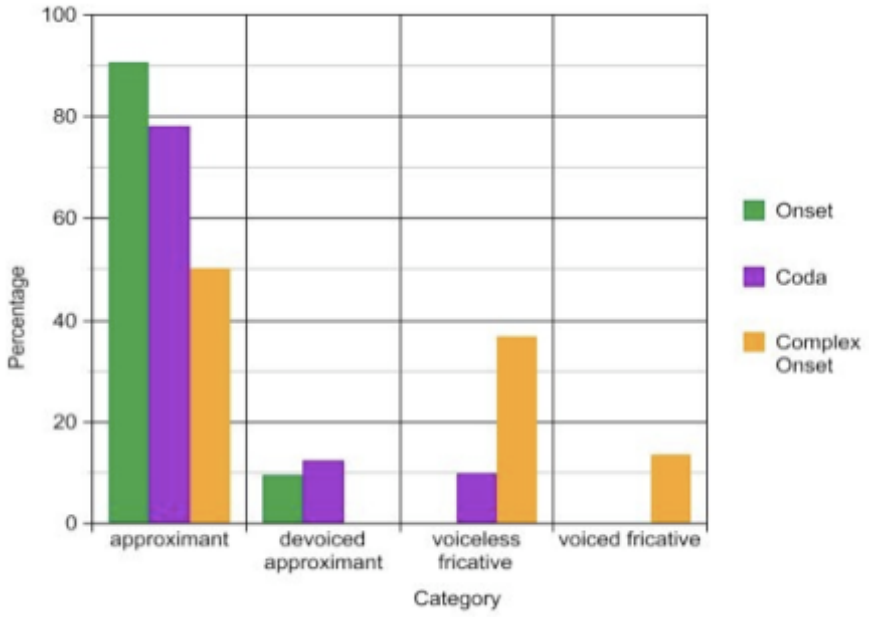
surrounded by a voiced consonant, while voiced fricatives show a smaller percentage than the amount of attestations generalized in previous research.

These findings provide insight into internal, linguistic factors that determine rhotic pronunciation in French. For example, word initial rhotics in complex onsets favor fricatives more strongly than in word medial position. In addition, as seen by the small amount of voiced fricatives produced surrounding voiced consonants, the results suggest that the use of voiced fricatives in Metropolitan French is giving way to the increasing number of approximants that have more recently become integrated into Standard French.

3.2 Picture Description Task

The analysis of the second task of the recording supported the results found in the reading task. There were a total of 92 tokens gathered – 41 tokens in the coda position, 30 complex onsets and 21 onsets (see Figure 7 for graphic representation of rhotic distribution). It is important to note the small number of tokens and lack of even distribution of tokens found in this task, which might influence the accuracy of the statistics and percentages calculated. Syllable position proved to have an effect on pronunciation. Complex onsets had a higher percentage of voiceless fricatives (36.7%), while codas and onsets show higher percentages of approximants (90.2% and 100% respectively). Similar to the findings in the reading task, devoiced and voiceless categories are more commonly found in codas (22%) rather than in onsets (9.5%), as shown in Figure 7. Based on the statistical results, speaker does not significantly influence rhotic pronunciation in any of the three positions analyzed (coda, onset, complex onset). However, as found in the reading task, speaker F1 exhibits a lower rate of approximant pronunciation than the other participants.

Figure 7: Graph of rhotic distribution in the picture description task based on word position.



Coda rhotics exhibit the same characteristics in this task as those analyzed in the reading task. Word final rhotics have a higher percentage of devoiced approximants (22.2%) than word medial (4.3%), which has a greater amount of voiceless fricatives (17.4%). As previously stated in this paper, French is known for its words having final stress. According to the Pearson Chi-Square, stress has a marginal effect on the distribution of the three categories in word medial position (p-value = .056). Unstressed syllables prove to have a higher percentage of approximants (93.3% in comparison to 69.2% in stressed syllables). In addition to stress, the effect of the following consonant was taken into account when analyzing rhotic pronunciation. All word medial stressed rhotics were followed by a voiceless dental stop /t/, which favors fricatives over approximants. All word medial unstressed tokens were followed by a nasal or a voiced bilabial stop /b/, which yield approximants. The tokens gathered are not generalizable based on stress; these rhotics represent a lack of even distribution considering that all stressed rhotics were followed by a voiceless segment and unstressed rhotics preceded voiced segments. As found in the reading task, word final codas

produce a higher percentage of approximants, while word medial codas yield a higher amount of fricatives.

Onset rhotics display different results from those found in the reading task. However, there were not many onset tokens gathered in this task, which could account for variation (only 21 tokens were analyzed). Only two categories were represented in onset rhotics: approximants and devoiced approximants. Out of 21 onset tokens, only two devoiced approximant tokens were found, both of which were in word medial position. Based on Pearson Chi-Square (p-value = .198), word position did not have an effect on rhotic pronunciation. Since there are very few tokens in this environment, it is difficult to make accurate generalizations.

Complex onsets in the picture description task behave similarly as in the reading task. Three categories stemmed from the results for complex onset rhotics: approximant, voiced fricative and voiceless fricative. Speaker has a marginal effect on the distribution (p-value = .006). Speakers F4 and M3 exhibit higher percentages of approximants than the other speakers (77.8% and 80% respectively). Similar to rhotics found in coda position, there were not enough tokens found per speaker to allow for a well-rounded generalization regarding rhotic pronunciation in complex onsets (only 30 tokens were analyzed in this environment). While word position has no significant effect on rhotic distribution, word initial tokens tend to have a higher percentage of fricatives (69.3%). As seen in previous tasks, word medial tokens tend to have a higher number of approximants (64.7%). As in other tasks and word positions, surrounding consonants play a crucial role in determining rhotic pronunciation (p-value < .005). As seen in Table 7, when preceded by a voiced dental stop /d/, rhotics were approximants in 100% of the cases whereas when following a voiceless dental stop /t/, tokens were approximants in only 6.2% of the cases. Only one

approximant was produced following a voiceless consonant in complex onset position. Rhotics most often were voiceless fricatives (68.8%) or voiced fricatives (25%).

Table 7: Table showing the distribution of complex onsets in picture description task

			Category abbreviation			Total
			a	vd f	vl f	
Preceding C	d	Count	14	0	0	14
		% within Preceding C	100.0%	.0%	.0%	100.0%
		% within Category Abbreviation	93.3%	.0%	.0%	46.7%
	t	Count	1	4	11	16
		% within Preceding C	6.3%	25.0%	68.8%	100.0%
		% within Category Abbreviation	6.7%	100.0%	100.0%	53.3%
Total		count	15	4	11	30
		% within Preceding C	50.0%	13.3%	36.7%	100.0%

The results elicited in the picture description task closely mirror those found in the reading task. Rhotics in onset and coda positions heavily favor approximant pronunciation. Word position has an effect on coda rhotics, yielding a higher percentage of approximants word-finally and more fricatives word-medially and word-initially. Pronunciation of rhotics in complex onsets is determined by the preceding consonant, the first member of the consonant cluster. When following a voiced stop, the rhotic is most often attested as an approximant. When following a voiceless stop, rhotics yield a higher percentage of fricatives than approximants.

3.3 Interview Task

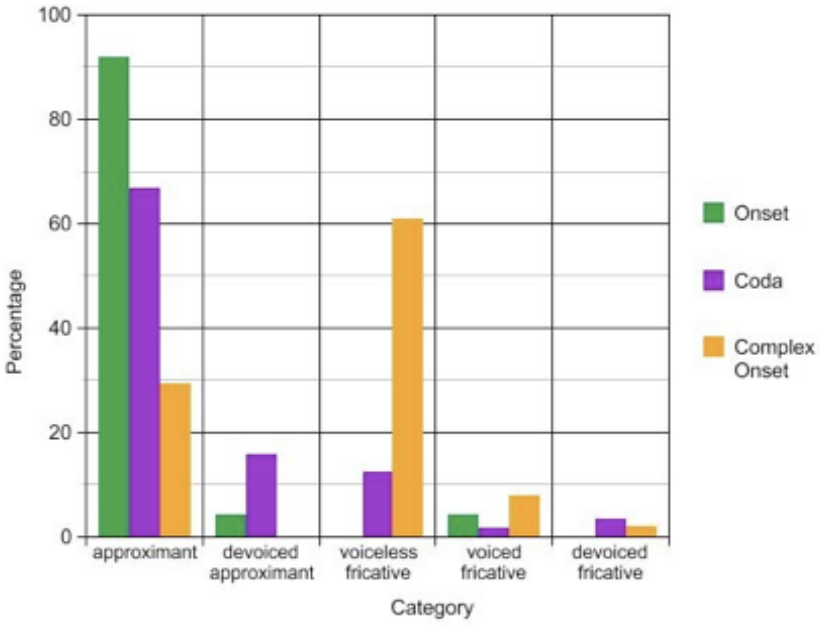
The aim of the interview task was to elicit spontaneous speech to observe potential differences between these patterns and those of a more emphasized speech, such as that found in the reading task. This task yielded 132 tokens in various environments. Following the pattern of

the previous two tasks, even though rhotics in this task were more evenly distributed cross-categorically, approximants remain the category with the highest overall rhotic attestation (56.8%), followed by voiceless fricatives (28.8%), devoiced approximants (7.6%), voiced fricatives (4.5%) and devoiced fricatives (2.3%), as seen in Table 8. For a visual representation of the total percentages, see Figure 8 below.

Table 8: Table of rhotics in the interview task based on syllable position (coda, complex onset and onset)

			Abbreviation					Total
			a	dv a	dv f	vd f	vl f	
Syllable Position	c	Count	38	9	2	1	7	57
		% within Syllable Position	66.7%	15.8%	3.5%	1.8%	12.3%	100.0%
		% within Abbreviation	50.7%	90.0%	66.7%	16.7%	18.4%	43.2%
	co	Count	15	0	1	4	31	51
		% within Syllable Position	29.4%	.0%	2.0%	7.8%	60.8%	100.0%
		% within Abbreviation	20.0%	.0%	33.3%	66.7%	81.6%	38.6%
	o	Count	22	1	0	1	0	24
		% within Syllable Position	91.7%	4.2%	.0%	4.2%	.0%	100.0%
		% within Abbreviation	29.3%	10.0%	.0%	16.7%	.0%	18.2%
Total		Count	75	10	3	6	38	132
		% within Syllable Position	56.8%	7.6%	2.3%	4.5%	28.8%	100.0%

Figure 8: Bar graph representing rhotic distribution in interview task across categories.



While speaker does not influence rhotic attestation, speaker M1 showed the highest amount of approximants. Overall, as seen in the previous tasks, syllable position plays a crucial role in pronunciation. In this task, complex onsets have a higher percentage of voiceless fricatives, whereas onsets and codas have a higher percentage of approximants (see Table 8). Similar to data elicited in the reading and picture description tasks, codas demonstrate a greater amount of devoiced and voiceless categories than onsets in addition to having a higher percentage of fricatives, as shown in Figure 8. These findings might suggest that rhotic devoicing occurs more frequently in coda position than in onset position.

Onset rhotics in the interview task follow the same patterns previously exhibited in this paper. Having the highest percentage of the 24 total onset tokens, the category of approximants characterizes 91.6% of rhotic tokens in onset position while the remaining 8.4% is split evenly between devoiced approximants and voiced fricatives. Neither speaker, word position, nor stress have any effect on pronunciation in this task. It is noted that the non-approximant tokens stem

from word-medial stressed positions. However, since there were only two tokens that were categorized as such, it is difficult to make generalizations when taking into account the lack of a large number of tokens following this pattern.

With 57 tokens representing rhotics in coda position, the results also pattern similarly with previous results gathered. Approximants remain as the category with the greatest amount of tokens (66.7%). Devoiced approximants (15.8%) and voiceless fricatives (12.3%) seem quite prominent in coda pronunciation as well, with devoiced fricatives (3.5%) and voiced fricatives (1.8%) representing the remaining tokens. While speaker does not have an effect on pronunciation, the speech patterns of speaker F3 separate her as having the lowest amount of approximants (37.5%) compared with the other speakers. Word position has a marginal effect on the category distribution. As seen in previous tasks, while word medial and word final coda positions have the same amount of approximants (66.7%), word medial rhotics have a higher percentage of fricatives (27.3%) than word final rhotics (4.2%). Word final tokens had a higher percentage of devoiced approximants (29.2%), as was demonstrated in previous tasks. In addition to word position and speaker, following consonants have a marginal effect on rhotic distribution in word medial position (p-value = .024). As already found in prior tasks, rhotics typically mimic the voicing of their surrounding consonants. In the interview task, voiceless phonemes /s, t/ have the lowest percentage of approximants and the highest percentage of fricatives (50% and 54.6% respectively). Voiced phonemes /d, n, ʒ/ yielded only approximants, supporting the findings in the reading task which suggests a potential change of the voiced fricative (to be replaced by the approximant).

The rhotics in complex onsets followed the patterns of those in previous tasks in this study. With 51 tokens collected, voiceless fricatives were the most prominent (60.8%), followed by approximants (29.4%), voiced fricatives (7.8%) and devoiced fricatives (2%). As in the other

tasks, speaker does not have an effect on rhotic production in complex onsets. While the Pearson Chi-Square figures prove that word position influences rhotic pronunciation (p-value = .003), it is important to take into account the distribution of first member voiced and voiceless consonants in the complex onsets in this task. With a lack of evenly distributed data compared to the reading task, more complex onsets of /dR/ were collected word medially, while there were more voiceless clusters such as /tR/ and /fR/ found word initially. In addition, there were many more tokens gathered in word initial position (38) than word medial position (13) due to lack of sufficient spontaneous speech elicited containing rhotics in complex onsets. This distribution most likely influenced the data set that claimed word position as a determining factor for rhotic pronunciation. Word initial position contains more fricatives (84.2%), while word medial position has more approximants (69.2%). Word initial complex onsets with voiceless consonants /t, f/ yielded only fricatives, while complex onset /dR/ yielded 60% approximants, 30% voiced fricatives and 10% voiceless fricatives. While there were fewer tokens for word medial complex onsets, the results showed 100% approximants for onsets starting with a voiced stop (all of which were in the stressed syllable) and 100% voiceless fricatives when the rhotic followed a voiceless consonant (in both stressed and unstressed syllables). While lacking a sufficient number of tokens to properly generalize, the results collected support previous findings in this research project. Complex onsets with voiced stops as first member of the consonant cluster favor approximants while voiceless consonants (stops or fricatives) favor fricatives.

CHAPTER 4: DISCUSSION AND CONCLUSION

This project addresses the question of the variation in rhotic pronunciation and potential evolutionary trends towards other manners of articulation of the rhotic in Metropolitan French. While many studies have focused on dialectal variation around the Francophone world (especially French-speaking Africa and Quebec), analyzing rhotic production in Paris brings to light the idea that variation occurs not only in the French spoken outside of France, but also within the hub of what is considered the origin of Standard French.

Using observations from rhotic variability in Romance languages, Colantoni and Steele (2005) questioned the validity of the liquid class by stating that, since laterals behave as the ideal liquid, they greatly differ from rhotics. Based on the results gathered in this research project, one can generalize that all speakers seem to follow a pattern of rhotic pronunciation based on the linguistic factors manipulated (stress, word position, syllable position, surrounding consonants). Every speaker produced rhotics as both approximants and fricatives depending on the environment in the word. Opposed to having two attestations within one speaker's inventory, typically laterals do not have more than one attestation per speaker. As Colantoni and Steele (2005) have hypothesized, based on the trends in rhotic variation in Romance languages, one can presume that the rhotic will either leave the liquid class altogether and become categorized with obstruents (since fricative realizations are common) or that they will become more similar to liquids (based on the trend towards high percentages of approximant use). While they claim that the rhotic is in a transitional state, based on the evidence gathered in this project, one should not generalize that the French rhotic favors one attestation while fully neglecting another. Approximants have proven to be the most common pronunciation for rhotics in Metropolitan French for most environments: coda, onset and complex onset (preceded by a voiced stop). However, one cannot negate the data

that proves voiceless fricatives as the most common attestation for rhotics in complex onsets following a voiceless segment. Previous research concludes that the French rhotic is typically attested as a voiced fricative. The lack of voiced fricatives found in this analysis contradicts this generalization. While some tokens in this project have been classified as such, the percentage of voiced fricatives remains quite low (6.2% of total tokens analyzed in the reading task). In addition, unlike previous work, this study observed and accounted for a change in voicing in the rhotics. Devoiced tokens, both approximants and fricatives, made up a larger percentage of the total tokens gathered in the reading task than voiced fricatives (15% and 6% respectively). It seems that voiced fricatives have started to be replaced by approximants, which represent a majority of the tokens in the positions where rhotics were formerly attested as voiced fricatives (complex onsets following voiced segments and word-initial onset positions).

In a more recent study, Webb (2009) gives a brief overview of dialectal differences in rhotic pronunciation in the Francophone world. Using the term *convergent French* to classify Metropolitan French, he provides a short summary of the phonetics found in this dialect. Webb (2009) generalizes that rhotics are pronounced as approximants or fricatives (voiced and voiceless). In his analysis, he states that approximants are most commonly found in the coda position whereas fricatives are typically in the onset position. Webb (2009) generalizes that rhotics in intervocalic position yield more variation than in other environments. Although approximants have the highest percentage of rhotic production intervocalically, fricatives are also found.

The results analyzed in this paper only partially support Webb's findings (2009). Approximants were found to have the highest percentage of realizations intervocalically and in coda position. Unlike Webb's research, this project illustrates the effects of word position and both preceding and following consonants on rhotic pronunciation. In addition, voicing changes found in

tokens were taken into account and categorized as devoiced rhotics. In the coda position, word-final rhotics proved to have a higher percentage of approximants than word-medial codas. Word-final rhotics had a higher amount of devoiced approximants than word medially (28.2% and 21.7% respectively). Pronunciation of word-medial coda rhotics was influenced by following consonants. When followed by a voiced consonant (voiced stop, nasal or voiced fricatives), the majority of tokens were realized as approximants (71.1%) with the remainder attested as voiced, voiceless and devoiced fricatives (10.8%, 9.7% and 8.4% respectively). Following voiceless consonants (voiceless stops or voiceless fricatives) still have a higher number of approximants than fricatives (approximants averaging 63% of rhotic production preceding voiceless consonants), but do not produce as many approximants as voiced consonants (averaging 90.5% of rhotics produced preceding voiced consonants).

Regarding complex onsets, the results found in this paper support a majority of the generalizations made by Webb (2009). Voiceless consonants as the first member of a complex onset produce the highest percentage of voiceless fricatives than in any other environment. Voiced consonants yield a high number of approximants. Voiced fricatives prove to be more infrequent than alluded to by previous research. This data suggests that voiced fricatives, while once present in Metropolitan French, are being replaced by approximants in environments that used to produce many voiced fricatives. Such environments, in a complex onset following a voiced stop or word initial position, prove to have a higher percentage of approximants than noted in other research. Similar to the data reported by Webb (2009), rhotics mimic the voicing of surrounding consonants. Whether a consonant precedes or follows the rhotic, as proven in the tokens analyzed, the highest percentage of devoiced or voiceless segments preceded a voiceless consonant. The highest

percentage of voiceless tokens followed voiceless consonants. Approximant was the favored rhotic pronunciation when following or preceding a voiced consonant.

According to Webb (2009), onsets are most commonly produced as fricatives. The results gathered in this acoustic analysis show that onsets favor approximants over any other rhotic production. Word-initial rhotics have a higher percentage of fricatives than in word-medial onset position (37.8% compared to 4.5%). Regardless of placement within the word, approximants have the highest number of attestations for onset rhotics. Webb's description of convergent French also claims that intervocalic rhotics (word-medial onset position) prove to have a higher percentage of variability than most other positions. However, the results found in this project prove word-medial onset rhotics to be one of the most stable environments, yielding some of the most consistent data throughout the entire project. In the reading task, only 4.5% of the 88 word-medial onset tokens gathered were fricatives. The majority of the remaining tokens were approximants. In the picture task, 83.3% of word medial onset tokens were attested as approximants. The remainder were devoiced approximants; no fricatives were realized in this environment. In the interview task, only voiced approximants were attested in word-medial onset position. Based on the slight differences between the reading task and the picture description and interview tasks, one could hypothesize that intervocalic (word-medial onset) rhotics are attested as approximants in spontaneous speech, which might shift to a slight amount of fricative use in emphasized speech (such as the reading task).

This project examined rhotic production in Metropolitan French from two sides, looking at the effects of both external, social factors such as age, gender, place of origin, contact with other languages (specifically African creole languages) and internal, linguistic factors such as word position, syllabic stress and surrounding sounds. The only social factors that might have

contributed to slight differences in rhotic attestation amongst the speakers in the reading task were place of origin and contact with other languages. Apart from place of origin and contact with other languages, age and gender did not seem to play a role in rhotic variation. The results provided a generalization that linguistic factors greatly influence the pronunciation of the rhotic and these attestations follow similar patterns. Most of the speakers exhibited these patterns, but some had slightly different results compared to the other speakers (specifically speakers F1 and F4 in the reading task). These speakers, both originally from Northern France outside of Paris, perhaps provide insight into slight phonetic differences in Metropolitan French between Paris and cities residing just outside the capital. However, based on the lack of enough tokens with this variation, one cannot generalize that these differences can be attributed solely to social factors.

The findings presented in this paper support and elaborate on previous research regarding Metropolitan French rhotics. However, given the reduced number of tokens from the picture description task and the interview task, another more elaborate research project that focuses more on spontaneous speech patterns is proposed, which would provide more accurate, generalizable conclusions. A project that provides tasks with an equal amount of emphasized speech and spontaneous speech would create a proper generalization on the pronunciation of Metropolitan French rhotics. With this proposed project, rhotics should also be analyzed in complex codas to create a well-rounded overview of this phoneme in all environments. More accurate generalizations of Metropolitan French rhotic production could be obtained with a project involving more participants. In addition, research that examines the dialect in cities of Northern France residing outside Paris might provide insight into the higher percentages of fricatives found in speakers F1 and F4 in the emphatic speech of the reading task.

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APPENDIX

Verbal Script for Obtaining Informed Consent

In French:

Bonjour, je m'appelle Sarah Little. Je suis étudiante à l'Ohio State University dans le département de Lettres, et je suis en France pour essayer d'obtenir des données de recherche pour mon mémoire d'honneur. J'étudie la phonétique sociale du français selon les lieux de Paris. Je voudrais vous demander si vous pouviez lire les mots donnés sur chaque phrase et décrire la série d'images. L'enseignement que vous allez partager avec moi sera très important pour me donner un moyen d'analyser les différences entre les tendances de langage. Le résultat peut augmenter notre compréhension des changements de langage en parties différentes de la Francophonie par examiner les secteurs de Paris. Cet entretien vous prendra à peu près 30 minutes de votre temps. Il n'y a aucun risque d'infraction de confidentialité. Je ne vais pas prendre votre nom avec quelque chose que vous dites ni sur la transcription de cet entretien ni dans le texte de ma thèse ni sur une autre publication. Il n'y a aucun autre risque anticipé par votre participation. Votre participation est seulement volontaire. Si vous décidez de ne pas participer, il n'y a aucune peine ou perte des avantages dont vous avez le droit. Bien sûr, si vous choisissez, vous pouvez refuser de lire certains mots ou décrire une image. Vous avez la liberté d'arrêter votre participation n'importe quand sans aucune peine ou perte des avantages dont vous avez le droit. Si vous avez quelques questions sur cette recherche ou votre participation, n'hésitez pas à me contacter. Vous pouvez contacter ma directrice de thèse ou notre bureau universitaire de recherche n'importe quand si vous le souhaitez. *(The participant will be given an information card, when applicable, containing name, institutional affiliation, and contact information.)* Je voudrais enregistrer notre entretien de manière à ce que j'aie un enregistrement des renseignements que vous me donnez. Je vais transcrire l'enregistrement à la main et garder votre confidentialité pour le garder en ma possession. Je vais a l'effacer une fois transcrit. Avez-vous des questions sur cette recherche? Vous êtes d'accord pour participer et est-ce que je peux enregistrer notre entretien? Si c'est le cas, commençons.

In English:

Hello, my name is Sarah Little. I am an undergraduate student at The Ohio State University in the College of Humanities, and I am in France undertaking research that will be used in my Honors Thesis. I am studying the sociophonetics of French in different districts of Paris. I would like to ask you to read the words given to you in the sentences provided and to briefly describe the series of pictures. The information you share with me will be of great value in giving me a way to analyze speech pattern differences, the result of which could enhance our understanding of language change in different parts of the Francophone world by looking at the districts of Paris. This interview will take about 30 minutes of your time. There is no risk of breach of confidentiality. I will not link your name to anything you say, either in the transcript of this interview or in the text of my thesis or any other publications. There are no other expected risks of participation. Participation is voluntary. If you decide not to participate, there will be no penalty or loss of benefits to which you are otherwise entitled. You can, of course, decline to read certain words or describe an image, as well as stop participating at any time,

without any penalty or loss of benefits to which you are otherwise entitled. If you have any additional questions concerning this research or your participation in it, please feel free to contact me, my thesis supervisor or our university research office at any time. *(The participant will be given an information card, when applicable, containing name, institutional affiliation, and contact information.)* I would like to make a tape recording of our discussion, so that I can have an accurate record of the information that you provide me. I will transcribe that recording by hand, and will keep the transcripts confidential and securely in my possession. I will erase the tape after I transcribe it. Do you have any questions about this research? Do you agree to participate and may I record our discussion? If so, let's begin.

Interview Questions

In French:

1. Quel type de musique aimez-vous écouter?

2. Comment passez-vous votre temps libre?

3. Typiquement, qu'est-ce que vous mangez la journée? Quelle est votre nourriture préférée?

4. Aimez-vous habiter à Paris? Pourquoi ou pourquoi pas?

5. Quel est votre endroit préféré à Paris?

In English:

1. What type of music do you like to listen to?

2. How do you spend your free time?

3. What do you typically eat during the day? What is your favorite food?

4. Do you like living in Paris? Why or why not?

5. What's your favorite place in Paris?

Questions in Picture Description Task

In French:

1. Qu'est-ce que c'est?

2. Qu'est-ce qu'on peut faire là?

3. Quel arrondissement est-ce qu'on trouve _____ (nom du monument)?

4. Avez-vous visité ce monument?

    a. Si non, voudriez-vous le visiter?

    b. Si oui, quand l'avez-vous vu pour la dernière fois?

In English:

1. What is that?

2. What can someone do there?

3. What district of Paris can you find _____ (name of monument) ?

4. Have you visited this monument?

    a. If not, would you like to visit it?

    b. If yes, when was the last time you were there?