The Perception of Vowel and Glide Errors in French and its Possible Relation to Language Variation

BA Linguistics Thesis

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0. Abstract

In this author's anecdotal experience, his Eastern French language variation, "oui" into "ui," went unnoticed by other French speakers. Little ink has been spilled about this language variation, so this paper thus tests whether this may be because approximant (glide) substitutions are less likely to be perceived as errors than normal vowel substitutions. An experiment designed as an alternative to an MMN (mismatch negativity) test gave rates of error perception for different substitutions of vowels and glides. Each category of substitution showed a different rate of change between vowels and glides, so there is no generalizable effect. The experiment also showed no particular evidence to back up a theory that the "oui" > "ui" language change was influenced by language contact with Germanic dialects in Alsace and Lorraine.

1. Introduction

It occurred to this author one afternoon, after a Zoom meeting where he was tutoring a high school student for her French courses, that he pronounces the French word “oui” (yes) as “ui” [ɥi], rather than [wi], that is, using the approximant/semi-consonantal forms (or henceforth, glides, as they are often called in French linguistics literature) for “u” [y] instead of “ou” [u]. Upon casual questioning he found that his mother and brothers also pronounced “oui” this way, but not his father or any other members of the family. As a relatively isolated set of French speakers living abroad, it was clear that the author’s mother had passed down this language change to her sons, and yet no one had noticed that they said “ui” until this author pointed it out. How could the transformation of [w] into [ɥ] go unnoticed for decades? Would a change involving vowels rather than glides be more noticeable? What about vice-versa, or involving [i] and [j]? This paper studies whether the error perception of French speakers is influenced by whether high sounds are vowels or glides, using a perception test designed to be a simpler alternative to a mismatch negativity test for a Bachelor’s Thesis. This thesis also attempts to explain how this [wi] > [ɥi] substitution may have come about, from the perspective of language contact and ease of articulation.

2. Literature Review

2.1 Glides and Vowels

The substituted sounds in the language variation in focus are glides, otherwise known as approximants, semi-vowels, or semi-consonants. These sounds begin as a sound identical to their respective vowel ([j] as [i], [ɥ] as [y], [w] as [u]), but then ‘glide’ into the next vowel (or from a previous vowel, less common in French), rather than an abrupt change. This typically modifies the prosody of the word, allowing a vowel-like sound to act as a consonant. For example, in French the name “Julien” is divided into two syllables rather than three: [ʒy.ljɛ̃] rather than [ʒy.li.ɛ̃]. Glides are also pronounced shorter than vowels, approximately lesser than 80

milliseconds, since their purpose is to transition to the next vowel (Coren and Warren, 2003). The difference between glides and vowels can be lexically important in French; without the glide, [ʒy.li.ɛ̃] would be understood as “Julie un” (Julie one) rather than a male name, making a minimal pair that shows that glides are their own phonemes in French rather than just allophones of vowels.

As for the perception of vowels and glides, production-perception experiments showed that the perception on vowels (Paliwal, Lindsay, and Ainsworth,1983) and glides (Ainsworth and Paliwal, 1984) were equally unaffected by the production of the listener. Experiments involving visual perception showed that only half of French speakers were capable of perceiving the visual difference between [y] and [ɥ] (Cathiard, Abry, and Schwartz, 1998). Error perception of glide and vowel substitutions in French, especially when it comes to regional variation, is a gap in the literature.

2.2 “ui”

Research on accents within French speakers is largely limited to a North-South divide, with little research on the French accents of individual regions. According to Hall (2013), this is because linguists are generally more interested in regional languages, as well as accents being influenced by class as well as region, creating a confounding variable that makes study more difficult than in other countries. French linguists also use the term “patois” to refer to both accents of French and regional languages, only confusing the matter and de-incentivizing research in the field of regional varieties of French. This paper shall avoid this term because of this confusing double-meaning. Though recently the popular website francaisdenosregions.com has begun collecting lots of language data from across France via surveys, a majority of the regional varieties studied by the researchers are lexical rather than phonological (since participants cannot be relied upon to accurately report on all but the most obvious of

phonological changes), so the “oui > ui” substitution has not been tested (or if it has, the results have not been published).

In French, certain speakers may pronounce the word “oui” (yes) as [ɥi], rather than the standard [wi]. That is, rather than the tongue sliding from the back to the front, the tongue is already at the front. Despite lack of academic analyses of this substitution, saying [ɥi] is commonly known in the Lorraine region of France. The local news site Le Lorrain lists it as one of the particularities of Lorrainian French (Kremer 2019), and its Facebook account sometimes spells “oui” as “ui” to humorously reflect this. The trait also appears in the Ardennes department and the Alsace region. An anonymous but thoroughly researched website about the Ardennes accent notes that saying [ɥi] is a particularly difficult habit to break (cited: Anonymous). The newspaper Le Parisien mentions [ɥi] in an article about Alsatian accents (Mongaillard 2020). The newspaper Libération (2013) makes the more general claim that Eastern French speakers say [ɥi], noting the (loan) words [tɥite] “tweeter” and [ɥiskɛ] “whiskey” as similar uses of w to ɥ substitution.

Interestingly, in Belgium and some Northern French accents, the opposite substitution can be found: ɥ to w. However, unlike Eastern French speakers who limit this substitution to “oui” and possibly some more recent words, this applies universally; all instances of ɥ become w. For example, “pluie” is pronounced [plwi] rather than [plɥi] (Ooijevaar 2009, Hambye et al. 2003).

2.3 Phonology and Change Frameworks

Obviously, it would be ridiculous to imagine that Alsacians and Lorrainians have literally always said “ui.” The Eastern French variation must have evolved over time, likely (relatively) recently, since Alsace and Lorraine are the most modern major additions to mainland France (acquired by France between 1648 (Treaty of Westphalia) and 1766 (death of Duke Stanislas

Leszczynski). There are a few different ways language variation can occur; relevant here are articulatory ease and language contact.

Naturally, speakers prefer pronunciations that would be easier to pronounce, requiring less mouth or larynx movement. For example, English has many common contractions like “it’s,” “they’re,” or “can’t,” which decrease the amount of syllables to decrease articulatory effort. Or you may observe that English words never use /mg/ or /nb/ as consonant clusters, because the two consonants are pronounced in different parts of the mouth, thus requiring more tongue movement. However, if pronunciations change too often, then different speakers would change pronunciations in different ways at different times, making it hard for speakers to understand each other as they have to process pronunciation that is highly unlike their own. Changes in pronunciation are also limited by ease of perception. If English speakers were to decide that [ʃ] is simpler to pronounce than [s], and that all /s/s should be realized as [ʃ], it would become more difficult for listeners to distinguish the word “its” from “itch.”

For these reasons, despite the constant desire of speakers of all languages to make their own speech as effortless as possible, speakers must be very conservative with their speech so as to effectively use it with others. How a language change can spread if speakers try to stay conservative is called the actuation problem (Weinrich et al., 1968), as a sort of paradox is posed if language tends to not change because clearly language must and does change.

One theory, or part of the answer, is that language change occurs when an accidental mistake is repeated by other speakers. These speakers then spread the language variation to others, like a virus (though less harmful). This is why insular language communities are more likely to develop language change, if contact with speakers who have not adopted a change is limited, a change is more likely to spread (Schreir, 2009). An example of this is this author’s own acquisition of the Eastern French [ɥi] substitution. Growing up in the United States, with limited

access to French speakers, this author and his brothers were very likely to acquire the language change from their mother, whereas they may have been less likely to acquire it had they been raised in France.

Language change can also stem from, rather than a mistake that gets popularized, language contact. Bilinguals, or even just those with a cursory knowledge of another language, may use borrow lexical items from another language. For example, a large portion of the English lexicon for instance comes from French, despite being a Germanic language. A speaker may use the pronunciation of another language. Most often this comes in the form of imperfect acquisition of an L2 and reliance on L1-like pronunciation, however in rarer cases it is possible for even native speakers of a language to change their own pronunciation to match that of another language (Thomason, 2001). Even when it comes to variation within a language, Brunelliere et al. (2009) found that French speakers with more exposure to different accents were less strict in their perceived vowel categories, which typically leads to change in production.

When speakers of a language hear another language, they are most often limited by the phonological categories of their own languages. For example, a native English speaker may not be able to perceive [y] as a separate sound when listening to French or Dutch, interpreting it as an [i] or an [u] sound, as the formants of the sound [y] (in particular the F3) are in between the formants of the other two vowels (Ladefoged and Disner, 2012). The reverse can happen as well; an English speaker, since he does not have to avoid the pronunciation of [y], may accidentally front his [u]s or round his [i]s, a difference another English speaker would not perceive, while a French or Dutch speaker may interpret this sound as a separate phoneme. Some British English speakers for instance, may pronounce “beautiful” as [bjy:.tɪ.fʊl] rather than [bju:.tɪ.fʊl]. Since /u/ follows a /j/, fronting the /u/ into [y] to match /j/ simplifies pronunciation, without impeding on a English listener’s ability to process the word, while a French or Dutch

speaker might infer that this is the standard pronunciation and both imitate it themselves, and believe that [y] is a valid phoneme in English.

In French, besides the oui > ui substitution, research has been done on a few other phonemic/phonetic language variations. For example, in 1941, a French military officer captured by the Nazis conducted a survey of 409 other prisoners-of-war to gather data on the pronunciation of “-in” and “-un” (Martinet, 1945). The aforementioned Français de nos Régions language polling website has produced results on variation within the words “vingt,” “moins,” “persil,” and “encens” (Avanzi 2016, 2017), as well as more modern data on “-in” and “-un” to provide a synchronic analysis. These studies are purely analyses of synchronic production data, however, unable to explain how the variation began in the first place. Analysis of perception of individual errors in French such as oui > ui also appears to be unstudied in French, though it has been done in other languages.

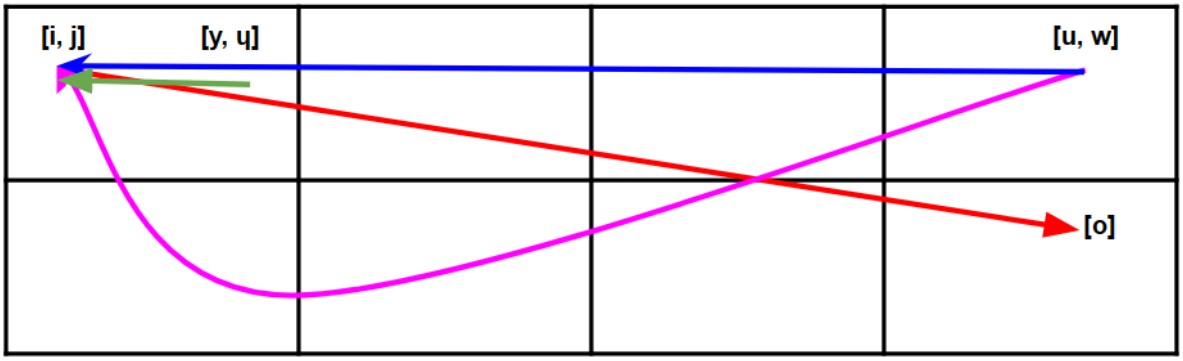
3. “ui” Hypothesis

Given that language contact is a common result of language contact (see previous section), one may imagine that the [ɥi] substitution must be influenced by the regional languages, since it is found in a specific area of France (In fact, the words for “yes” are already commonly used to divide French regional languages into north-south categories, “hoc ille” from Vulgar Latin becoming the “langues d’oïl” while just “hoc” becoming the ”langues d’oc.” This dichotomy bears little direct relevance to this study, but it could not go unmentioned.). However, a glance at the words for “yes” in the different regional languages in Alsace and Lorraine do not suggest a clear origin point for this language change. In the regions described we find three languages besides French: Lorrainian, Alsatian, and Platt (this latter term denoting the combination of Luxembourgish, Mosellan, and Rhenish). While Lorrainian is a Romance language related to French, the latter two are Germanic languages, spoken in the Alsace region

and the Moselle department (It should be noted that the linguistic boundaries of these languages approximately coincide with the French/German border from 1871 to 1918, as the Germanic speaking areas (plus the city of Metz) were conquered with the intention of creating a unified Germanic-speaking state in the Franco-Prussian War.). In none of these languages do we find [ɥi] for “yes.” In the Germanic dialects the word is [jo:] (Atamaniuk et al. 2012) (situationally in Alsatian, often “ja” instead according to this author’s Alsatian-speaking grandparents), while in Lorrainian the word is [waj] or [wɛj] (Zéliqzon 1924).

Figure 1 roughly shows the mouth movements in each of the relevant words for “yes.” The top layer indicates a low F1 (caused by a higher tongue position), while sounds at the left have higher F2 (caused by the tongue meeting the roof of the mouth further out. Within a box, sounds have no change in tongue movements, but the rounding of vowels on the right like [y] and [o] are rounded, which decreases the F2 (and F3). By drawing an arrow from the word-initial glide to the final vowel, we see that the Germanic (red) and Romance (blue and pink) languages move in about opposite directions. Meanwhile the Eastern French variation shows no tongue movement, only lip rounding. None of the surrounding languages thus use [ɥ], so the origin is not clear.

Figure 1: Mouth movement in “yes” words in Eastern France languages



Legend:

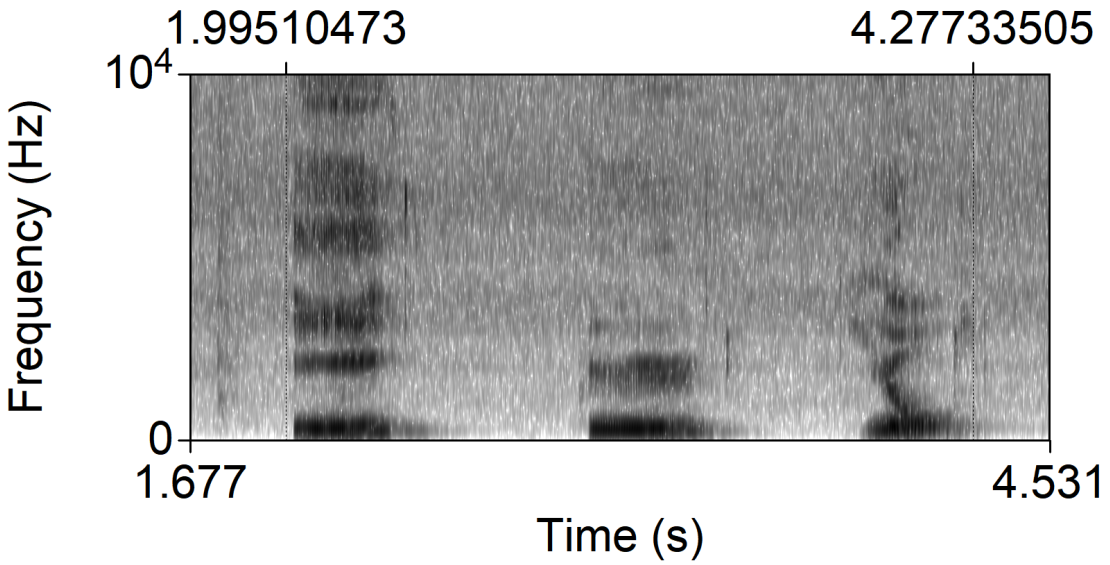
- **[jo:] Luxembourgish, Frankish, and Alsatian**
- **[wej, waj] Lorrainian**
- **[wi] Standard French**
- **[ɥi] Eastern French**

Since [ɥi] involves no tongue movement, it is thus simpler to pronounce than the standard French [wi] (such that, having acquired this variation, it becomes hard for this author to pronounce it the standard way). Thus, it would be logical for a language to develop this sound change as long as it does not interfere with perception. However, rather than having spread across France from any random area, the [ɥi] substitution is isolated to Eastern France, in particular areas where Germanic/Romance language contact would have been common in the last few centuries. It thus seems more likely to this author, that rather than [ɥi] originating in Alsace-Lorraine by pure chance, it was caused by Germanic influence, despite the apparent lack of a [ɥ] sound in the relevant Germanic languages. There may be a reasonable theory for how [ɥi] developed.

As shown in Figure 1, the Germanic languages (in red) feature an unrounded glide followed by a rounded vowel /jo:/. Platt and Alsatian do not have [ɥ] in their vowel system (Platt doesn’t have [y] at all, and it is a less common vowel in Alsatian), so they would be more free to slightly co-articulate [j] with [o] by rounding it (thus, [ɥo:]), to make pronunciation simpler, as less

lip movement would be required. A recording was made of this author's Alsatian-speaking (early L2 acquisition; around age 7, Strasburg variant) grandfather, pronouncing [i] and [y], then [jo:]. Figure 2 shows the spectrogram of this recording. The spectrogram shows the difference between [i] and [y], a slightly lower F2, but more importantly almost no distinguishable formants at lower frequencies than the faint F3, the lips controlling the air flow and sound vibrations to a stricter degree than the open [i] sound. In [jo:] we see the F2 lowering, showing the tongue movement from the front glide to the back [o]. During this transition we see some activity at higher formants, but less than that of [i]. In the perception of this author, it was difficult to decide whether the glide produced was closer to [j] or [ɥ], describable best as "[ɥ] with noise." This suggests that Alsatians, and likely other Germanic language speakers in modern Eastern France, may indeed have coarticulated [jo:] into something approaching [ɥo:].

Figure 2: [i], [y], [jo:]



When French speakers would hear this word, since their language did have [ɥ], they might have perceived /jo:/ as [ɥo:]. This, combined with the fact that that [ɥi] is simpler to pronounce than [wi], may have somehow precipitated the adoption of the [ɥ] glide into the French word. It may be possible to test whether this theory is likely by testing French speaker's

perceptions of high vowels and glides and their interchangeability. If French speakers are perceptive to /j/ being realized as [ɥ], then this would back up the theory that they reinterpreted [jo:] in the past, assuming the perceptive 'habits' of French speakers have not changed in modern times.

4. Methodology

4.1 Participants

To study error perception, a higher-level study would use a mismatch negativity test (MMN) (such as Cornell et al. 2013), which uses electrodes placed on the skull to detect activity in the brain approximately 200 milliseconds after hearing a sound that doesn't match what the listener was expecting. However, this paper being only a Bachelor's Thesis, and one conducted at Amsterdam at that (meaning, a more limited supply of native French speaking participants), the resources to do this sort of experiment were not available. A simpler study had to be designed, sacrificing precise data for ease of data collection.

To answer the research question, whether errors in glides were perceived less reliably than vowel errors, 23 native adult French speakers were recruited for a perception experiment, in the form of a survey in Qualtrics (2020). In the anonymous survey, the only personal information collected was verification that they were native French speakers and had no language impairments. It should be noted that this experiment was restructured several weeks into the data collection period. The experiment originally included production data collection to observe the link between production and perception, however this forced the experiment to include a pre-test where participants met with the researcher in a video call so he could observe their production and assign them a group based on it. This commitment to scheduling a meeting made willing participants hard to find and harder to stay in touch with over time. It was decided that the production data would not help answer whether glides or vowels were more noticeable,

so the pre-test was cut from the experiment, simplifying it to a simple anonymous survey, which participants were much happier to take.

4.2 Stimuli items

The experiment concerns the pronunciation and perception of a short text (Appendix 1). The text was intentionally written to include words with high vowels and glides. Table 1 shows the amount of target tokens of each sound in the experiment text. [i] has the most, a result of being a common vowel, as well as being the only vowel that naturally follows [ɥ]. Tokens of [i] following [ɥ] will thus not be considered for error allocation. The word “oui” also has its own category, to investigate the specific [wi] → [ɥi] substitution found in Eastern France, so is not counted towards [w] or [i]. In total, there are 105 potential error positions (see breakdown in Table 1).

The Experiment Text

Aujourd'hui, Julien conduit sa voiture au Luxembourg depuis Lyon. Le vent souffle fort, poussant sa voiture vers la droite. Épuisé, il doit s'arrêter dans une aire. Il se trouve du jus de fruits dans un frigo dans le magasin.

« Puis-je vous donner autre chose? demande le caissier.

– Oui, répond Julien, trois croissants, s'il vous plaît. »

Le caissier lui met trois croissants dans un sac en papier. « C'est tout?

– Oui, merci. Vous prenez bien du liquide? J'ai des pièces à vider de mon portefeuille.

– Mais bien sûr. Ça sera trois-soixante-huit. »

Le bruit du vent s’entend depuis dehors.

« Ça souffle fort dehors, hein? dit le caissier.

– Oui, ça pousse ma voiture comme un voilier.

– Moi, j'attendrai pour repartir. La météo dit que dans une heure, il y'aura beaucoup moins de vent. »

Julien le remercie pour l'avis, utilise ses pièces pour payer sa nourriture, puis retourne à sa voiture. Il mange, puis attend que le vent finisse de souffler.

Repartant, il suit un camion, venant de la Suisse. Il porte des voitures de luxe.

« J'aimerai bien une voiture comme ça, pense Julien. Si seulement mon compte en banque disait 'oui!' »

Julien se résout donc à faire du bon boulot au Luxembourg, pour un jour pouvoir s'acheter une belle voiture.

Table 1: Distribution of vowels and glides in the short text

	i	y	u	“oui”
vowel	39 (-11)	18	17	4
glide	13	14	11	x

Five versions of the text were made. Each one had 13 intentional errors, two for each vowel (switching to each of the high vowel alternatives), and one for “oui” (one recording had to have to use the same “oui” token as another, as the text could only include so many tokens of the word). This allowed each type of error to be heard five total times, as Table 2 shows. Blank spaces are irrelevant; it is impossible for i > i to be an error. Note that the use of the term “error” is not intended to delegitimize any substitutions that happen to be used by some French speakers (evidently, for this author uses the [wi] > [ɥi] substitution), rather referring to substitutions compared to Standard French, which are likely to be perceived as errors.

Table 2: Allocation of total errors in the five recordings of the text

	i	y	u	j	ɥ	w	[wi]
i/j		5	5		5	5	
y/ɥ	5		5	5		5	5
u/w	5	5		5	5		

The recordings were made by the researcher, using a Qware Dacapo 620 microphone, and edited using Shotcut (Meltytech, 2023). The distribution of these errors in the different versions of the experiment text is marked in different colors in Appendix 1: red (version 1), orange (version 2), green (version 3), blue (version 4), and magenta (version 5) . For each version of the experiment text, the darkest colors indicate u/w pronunciation, the lightest indicate i/j, and the brightest indicate y/ɥ. For example, maroon (dark red) indicates a substitution to u/w in version 1, while pink (light red) denotes a substitution to i/j, and bright red denotes a substitution to y/ɥ. There is also a yellow mark which denotes versions 2 and 3 both having the same “oui > ui” errors.

4.3 Procedure

The Qualtrics survey began with the text of the information brochure and consent form for the experiment. Then the experiment text appeared on the screen, which they were asked to read aloud. Next Qualtrics showed the text, and upon clicking on the audio bar, one of the five stimuli recordings played, and the participants read along. As they listened, they clicked on the appropriate word when they heard a pronunciation error. Using the heat map tool, Qualtrics recorded each click and on which category of error it was placed, thanks to invisible boxes placed manually on the token words. Note that Qualtrics limits the number of clicks on a heat

map to 10, so to allow participants to get all thirteen target errors (or more), the text had to be divided into two halves. Participants were not allowed to rewind the audio, and once one repetition had finished, they continued to the next page. After five repetitions (a total of approximately seven minutes), the experiment concluded, and a short end message debriefed the participants on the precise focus of the study.

The prediction was that participants would recognize errors in glides less reliably than vowels. Errors between i/j and u/w were expected to be more easily recognized than errors involving y/ų. “oui” was also predicted to be less noticeable than other w > ų errors based on the personal experience described in the introduction.

5. Results

Of the 27 participants, 4 did not select any mistakes, presumably only skipping through the survey without listening to the audio. These results were thrown out, giving data from 23 participants for analysis. For each of the ten heat maps, Qualtrics outputs a bar graph with the total results, in correct results out of 115 (1 error per test * 23 participants). Note that three tokens were either accidentally omitted in the recordings, or lost their heat map boxes when the test was reorganized in panic after realizing the limitations of Qualtrics heat maps, so those tokens were thrown out, giving the token groups only 92 tokens, and one audio mistakenly had two i-u tokens, giving that group 138 tokens, a result of the convoluted token assignment seen in Appendix 1.

Table 3 shows the participants’ overall responses for each of the error types; the top row is base sounds, the first column is what the sounds were changed into. For example, 39 of 115 y > i errors were perceived as errors (33.9%), the lowest perception rate. The highest perception rates were 105 of 115 j > w errors were perceived as errors (91.3%) and the respective vowels: 116 of 138 i > u errors were perceived as errors (84.1%). Other results to take note of are that

90 of 115 w > ɥ errors were perceived as errors (78.3%) while 61 of 115 “oui-ui” substitutions were perceived as errors (53%). Also, 52 of 92 j > ɥ errors were perceived as errors (56.5%).

Table 3: Successful error perceptions

	i	y	u	j	ɥ	w	[wi]
i/j		39/115 33.9%	76/92 82.6%		70/115 60.9%	76/115 66.1%	
y/ɥ	53/115 46.1%		60/115 52.2%	52/92 56.5%		90/115 78.3%	61/115 53%
u/w	116/138 84.1%	58/115 50.4%		105/115 91.3%	45/92 48.9%		

The total rate of error perception was 61.2% (901 responses out of 1449 tokens; the sum of the above table). This calculation is flawed however because certain data sets are over- and under-represented because of lost data. To control for these differences in proportion, we average together the percentages of Table 3, to get 61.9%. This overall perception rate was much lower than anticipated. In addition, there were also 113 mistakes that were not explicitly designed, and thus unclassified by Qualtrics. Section 7.2 discusses these qualitatively.

An F-test was performed in R to find the variance between glides and vowels. Since there was no statistically significant difference ($p = 0.4751$), a independent-samples T-tests could be done (as opposed to a Welch t-test to control for different variances). Glides overall were perceived 11 percentage points more than vowels, or an 18% increase ($p = 0.5061$; insignificant).

Table 4 shows the difference between the results of vowels and glide (first in raw percentage points between vowels and glides, then percentage differences between these two scores) and the statistical significance of these differences, calculated using SurveyMonkey's AB test calculator (cited as SurveyMonkey). The table is read the same way as Table 3; columns being the base phoneme and rows being the realizations. Boxes highlighted in red are statistically insignificant results, while green are significant results. y > i errors were perceived 27 percentage points more than ɥ > j errors, a 79.49% increase ($p < 0.0001$; very significant). u > i errors were perceived 21.7 percentage points less than w > j errors, a 20% decrease ($p = 0.0053$; significant). u > y errors were perceived 26.1 percentage points more than w > ɥ errors, a 50% increase ($p < 0.0001$; very significant). "Oui" > "ui" errors (not on Table 4) were perceived 25.3 percentage points less than other w > ɥ errors, or a 32.22% decrease ($p < 0.0001$; very significant).

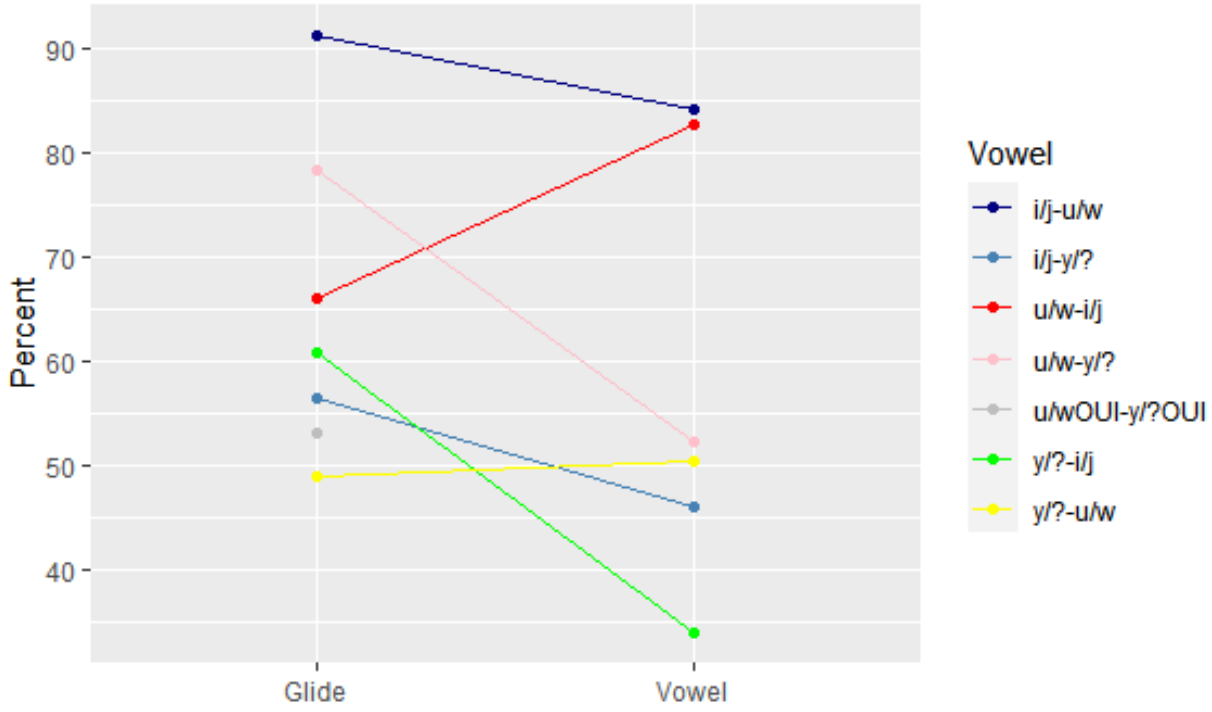
Table 4: Difference of perception of vowels against glides.

	i = j	y = ɥ	u = w
i/j		+27% +79.49%: p < 0.0001	-21.7% -20%: p = 0.0053
y/ɥ	+10.4% +22.64: p = 0.0667		+26.1% +50%: p < 0.0001
u/w	+7.2% +8.62%: p = 0.0754	-1.5% -3.02%: p = 0.8277	

Figure 3 visualizes these differences on a graph using R (R Core Team, 2022) and the ggplot2 package (Wickham, 2016). Note that R cannot naturally handle IPA symbols, so "?" stands for [ɥ] in the figure. Note that the statistically significant lines are pink, lime, and red. This graph shows more clearly that there is a wide range of effects between different sets of vowels and glides. Remember that the gray dot, the data for the specific [wi] > [ɥi] substitution, is

comparable to the pink dot above it, as pink represents w > ɥ which the word would otherwise be in.

Figure 3: Difference of perception of glides against vowels, plotted.



6. Discussion

6.1 Targeted Errors

The four error categories between u/w and i/j made up four of the five most reliably perceived errors, while errors involving y/ɥ sounds went unnoticed more often. This is natural, since the F2 of [ɥ] is partway between that of [i] and [u], and thus the acoustic differences between [y - i] and [y - u] would be much lesser than the difference between [i - u]. The least perceived error was y > i, only 33.9% of tokens were perceived as errors, though the glides were perceived significantly more, near double.

The lowest noticed glide substitution was ɥ > w, noticed only 48.9% of the time, slightly less (though not significantly) than y > w. This may be because, as described in Section 2.1,

Belgian French speakers substitute all instances of [ɥ] with [w]. This data suggests that because there is a relatively large subset of French speakers who make this substitution, other French speakers are less likely to notice the error, or perhaps, notice it but not consider it an error.

6.2 Untargeted Errors

The participants made a total of 113 clicks that were not inside a box, in other words, words they perceived as errors that were not intended to be. Though over half of the participants made at least one unclassified error, a vast majority of this total came from only a few participants. Generally, a vast majority of words these few participants considered mispronounced included the sound [ʁ] (letter “r”), for example in the word “arrêter.” In addition, audio 1 had most of these presumed [ʁ] errors, while audio 5 had the least, which may be attributable to the researcher’s pronunciation of [ʁ] getting clearer as he recorded each of the texts. Upon review of the audio recordings, the pronunciations of Alpha did sound a bit more fronted, like an [ɹ], while later recordings sounded more uvular, possibly an effect of the speaker being a native English speaker as well. While the realization of /ʁ/ can be varied in French (Billières, 2015), [ɹ] is not one of those typical realizations, and thus these few participants consistently considered those words as errors, though most participants appeared to have not noticed or chosen to allow the error.

6.3 Vowels Against Glides

The difference of error perception between glides against vowels was varied. Three statistically significant effects were found between vowels and glides. [ɥ] mispronounced as [j] was noticed nearly 80% more often than [y] mispronounced as [i]. [w] mispronounced as [ɥ] was noticed nearly 50% more often than [u] mispronounced as [y]. On the other hand, [w] mispronounced as [j] was noticed nearly 20% less often than [u] mispronounced as [i]. Other categories showed lesser, insignificant effects. These varied results suggest that there is no

generalized error perception effect between glides and vowels, but rather effects on specific vowel interactions.

6.4 “ui”

The “ui” errors were noticed 25.3 percentage points less, or a 32.22% negative effect ($p < 0.0001$) than the general w/ɥ tokens, the errors only being noticed just over half of the time, and about the same as vowel substitutions. This suggests that, similarly to the effect of the Belgian [ɥ] > [w] substitution discussed in Section 6.1, French listeners are less likely to perceive the Alsacian/Lorrainian substitution of [w] into [ɥ] in the word “oui” specifically, compared to other words. However it would take a diachronic study to find if this language feature is in decline, stable, or spreading.

When it comes to the theory that “ui” comes from [jo:], j > ɥ errors (lighter blue on Figure 2) were not noticed particularly reliably, nor was there a statistically significant difference between glides and vowels. [jo:] would thus not be particularly likely to be interpreted as [ɥo:] by Eastern French speakers. The results of this experiment thus do nothing to back up this language change theory, although they also do not disprove it.

7. Conclusion

In running the experiment, many aspects were changed in panic. The pre-test, designed to collect information regarding regions and the participants’ own speech production, made it exponentially harder to find participants, for people were less incentivized to participate when they had to commit to doing it later by scheduling the pre-test. Once the pre-test was removed, it took only two days to find enough participants, after a month of almost no-one, at the cost of the region and production data, which might have shown any regional differences. However (or luckily), as described in Section 2.1, previous research suggests that production and perception

are not linked anyway. In the unlikely event that another researcher would like to replicate this study, these are aspects to attempt to include for a richer data set and a fuller analysis, as well as potentially examining other specific glide substitutions rather than just “ui.”

The experiment’s final results were varied. There is not an overall difference between the perception of glides and vowels. Instead, the results show that the difference in the error perception of vowels and glides depends heavily on which sound is being substituted into which, which was not expected. The “oui > ui” substitution, while significantly less noticeable than other w > ɥ substitutions, was not less noticeable than an u > y substitution as was hypothesized. It was only w > j that was noticed significantly less than the vowels. These results ask interesting questions about the seemingly random effects of different substitution pairs, in particular why a substitution can be more noticeable as a glide in one direction but not in the other.

The results also do not give strong evidence to back up the theory that [ɥ] developed in “oui” by way of contact with the Germanic languages in and around Alsace and Lorraine, although the theory is not disproven either. Though the interpretation of [jo:] as [ɥo:] is still possible, (current) French speakers are not especially likely to reinterpret this sound. So while the “oui > ui” is a logical language change phonologically, since [ɥi] requires less mouth movement to pronounce than [wi], this study does not prove that it is not a coincidence that the substitution comes from ex-German territory.

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10. Appendix

1. Short Text

Here the 13 errors in each of the 5 different versions of the experiment text are marked in different colors: red (version 1), orange (version 2), green (version 3), blue (version 4), and magenta (version 5) . For each version of the experiment text, the darkest colors indicate u/w pronunciation, the lightest indicate i/j, and the brightest indicate y/ų. For example, the first error is light orange, so the /ų/ was realized as a [w] in the version three.

		< u/w >		
		< y/ų >		
		< i/j >		

Aujourd'hui, Julien conduit sa voiture au Luxembourg depuis Lyon. Le vent souffle fort, poussant sa voiture vers la droite. Épuisé, il doit s'arrêter dans une aire. Il se trouve du jus de fruits dans un frigo dans le magasin.

« Puis-je vous donner autre chose? demande le caissier.

– Oui, répond Julien, trois croissants, s'il vous plaît. »

Le caissier lui met trois croissants dans un sac en papier. « C'est tout?

– Oui, merci. Vous prenez bien du liquide? J'ai des pièces à vider de mon portefeuille.

– Mais bien sûr. Ça sera trois-soixante-huit. »

Le bruit du vent s'entend depuis dehors.

« Ça souffle fort dehors, hein? dit le caissier.

– Oui, ça pousse ma voiture comme un voilier.

– Moi, j'attendrai pour repartir. La météo dit que dans une heure, il y'aura beaucoup moins de vent. »

Julien le remercie pour l'avis, utilise ses pièces pour payer sa nourriture, puis retourne à sa voiture. Il mange, puis attend que le vent finisse de souffler.

Repartant, il suit un camion, venant de la Suisse. Il porte des voitures de luxe.

« J'aimerai bien une voiture comme ça, pense Julien. Si seulement mon compte en banque disait 'oui!' »

Julien se résout donc à faire du bon boulot au Luxembourg, pour un jour pouvoir s'acheter une belle voiture.