An Acoustic Analysis of Palatalization and Palatality: A Case of Nigerian Speakers of English.

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Abstract
This study examined acoustic analysis of palatalization and palatality among Nigerian speakers of English. The assumption that Nigerian speakers of English vary in their articulation of palatal glide /j/ especially with palatalized consonants such as [k], [t], [d] and [v] becomes the background knowledge of this study. As a quantitative and qualitative research work, the study adopted a well- structured words list as an instrument for data collection. In the study, twenty (20) students were randomly sampled from different languages in Nigeria such as Ibibio, Yoruba and Igbo from the University of Uyo and University of Port Harcourt. The study considers Prince and Smolensky's Optimality Theory was used to account for constraints affecting the nature and environment in which a sound is positioned. Analyzing the data, both perceptual and acoustic approaches were adopted. The perceptual analysis showed that generally place-changing palatalization processes like coronal palatalization, velar softening and off-glide are established features in English though some Nigerian speakers of English seem not to observe the palatalized consonant at medial position. It was confirmed that majority of Ibibio and Igbo speakers of English could not articulate /k^{j}/, /d^{j}/ and /n^{j}/ like the Yoruba when they appear at the medial position. Thus, palatalization is influenced by position of the consonant. Also, the velar stops /k/ and /g/, alveolar /l/, /s/ are hardly palatalized by some Yorubas. This seems controversial when it is obvious that the Yoruba sound inventory includes the palatal /j/. In the acoustic analysis, both the control and experimental groups showed that differences exist between Nigerian spoken English and Standard English with regards to palatalization. The major findings drawn were that Nigerians hardly observe palatalization at medial positions.

Keywords: *Acoustic, Palatalization, Palatality, Sound Change*

Introduction

Background to the Study

There is no doubt that Nigeria is a multilingual nation with a great number of indigenous languages. Speakers of these languages belong to different ethnic groups. By virtue of this reality, it is viewed that people would have problems learning or understanding other languages other than theirs since they have been used to their own way of speaking. It therefore implies that English language adopted in a multilingual nation like Nigeria would pose problems to its speakers as they are likely to make conscious efforts in order to speak and write a language that is not theirs.

English language gained official status in Nigeria as a second and official language. This, according to Bamgbose (1982) cited in Essien (2017: 25), was when English language was introduced in Nigeria by the missionaries. The contact between English and Nigerian languages in 18th century led to its eventual acceptance and adoption as Lingua Franca

following the development of the language in the country. What this means, according to Essien (2017:23), is that as the language arrived Nigeria, it assumed different qualities as a result of cultural and environmental influences. These qualities are found in phonology, morphology, syntax and semantics. Today, one finds out that in all the language areas mentioned, non-native speakers tend to nativize the structures by using them based on how they understand or what influences their understanding.

Nigerian speakers of English have peculiar ways of pronouncing words which, no matter how he/she tries to sound English, the accent is glaringly outstanding (Udofot, 2007:32). For instance, an Annang speakers of English are likely to say "Plofost" instead of "Provost", "leduce" instead of 'reduce' with the /r/ taken as /l/. Also, a Warri or an Urohbo speaker of English would say 'share' instead of 'chair', assuming the voiceless palate-alveolar affricate /tʃ/ as voiceless palato-alveolar fricative /ʃ/. In the same vein, an Ibibio speaker of English could pronounce 'Junction' as 'yunction' and 'jam' and 'yam'. The above explanations could only mean one thing: there are distinctions or phonetic differences between English language and Nigerian languages. Such differences, according to Igboanusi (2001), may be perceived in the areas of sound quality, especially consonant sounds.

English language has twenty-four (24) consonants and can be studied from the point of view of articulatory phonetics or acoustic phonetics. According to Effiong, Isok and Ekah (2019: 21) while articulatory phonetics studies the use of different speech organs by the speaker to produce sounds, acoustic phonetics focuses on the transmission of sounds from the speaker to the listener through sound waves. More often than not, researchers are interested in the way speakers produce sounds and not necessarily their voice, effects and frequency which are core elements of acoustic phonetics.

Since sound is a wave, it has acoustic properties attributed to any wave. These properties include: frequency, amplitude, wave form and duration (Ashby, 2011:142). Frequency is the pitch of a sound which could be low or high depending on the distance it travels when measured in hertz. Also, according to Bamgbose (1982:4), frequency as acoustic property of sounds relates to the individual pulsations produced by vocal cord vibrations for a unit of time. The duration it takes determines what sound is produced.

Acoustically speaking, frequency formant transitions have been widely used as cues to determine places of articulation such as the palatals. Palatalization is often more apparent at the consonantal release than at the formation of the primary construction (Ladefoged and Maddieson, 1996: 28). Palatalization entails shifting the primary place of articulation towards the palatal region. Otherwise, Kochetor (2011: 56) views it as super imposition of a raising of the front of the tongue toward a position similar to that. On that note, two types of palatalizations are identified: secondary palatilization and full palatalization. The former refers to addition of a secondary, palatal articulation without changing the initial place of articulation such as [t, tj]. This type according to Adeoye (2019:97), is extremely common in Nigerian languages. The latter includes palatalization to a posterior coronal and to an interior coronal. It is a shift resulting in a non-sibilant sound [p, k, t] or a sibilant, which sound [p, k, t, s] which is equally common in Nigerian languages.

Palatalization is a way of pronouncing a consonant in which part of the tongue is moved close to the hard palate. Consonants produced this way are therefore said to be palatalized and are transcribed in the International Phonetic Alphabet by affixing the letter /j/ as superscript to the base consonant. In view of the above explanation, when a speaker palatalizes, he or she pronounces another sound as though it were palatal. Palatal /j/ is a sound produced when the back of the tongue is raised towards the palate. The sound appears in letters: 'y', 'u', 'ew', eu', as in the words 'yam, union. stew, euphemism'.

Despite its typological variability, palatalization is often regarded as a natural process motivated by the interplay of acoustic, articulatory and perceptual factors. In a number of studies, it has been claimed that palatalization is primarily motivated by the acoustic similarity between its target and outcome in the context of front vocoids (Ohala, 1978:10). Thus, it is true that acoustic phonetics can be used to determine the duration, time and frequency in palatalization.

Objectives of the study

The primary aim of this study is to examine acoustic analysis of palatilization and palatality /j/ of Nigerian speakers of English. More specifically, the study seeks to:

examine phonetic frequencies in the production of palatal sound /j/.
determine the duration taken by speakers to realize palatal sounds.
identify and discuss phonetic environment of palatality.
explain conditions that bring about palatalization among many Nigerian speakers of English.
examine whether Nigerian speakers of English do observe palatalization in their speech production

Methodology

This study adopts quantitative and qualitative research design as it shall not only account for discussion of sound productions but also present frequencies in the tables showing the different speakers of English from 3 ethnic groups: Ibibio, Igbo and Yourba. A native speaker of English will serve as a control to achieve this, speakers will be recorded orally from two tertiary institutions. A twenty-word test items containing the palatal /j/ at different positions will be administered to twenty (20) respondents. From there, an audio tape will be used to record their readings and will later be uploaded into the computer for acoustic analysis using a speech analysis software known as PRAAT.

Theoretical framework

Optimality Theory

Optimality Theory is a language theory developed by Alan Prince and Paul Smolensky. It is a theory of constraints and constraint ranking used within the field of linguistics and more specifically within phonology. Since its introduction, Optimality Theory has been constantly and continuously further developed. O.T., as is often called, is now considered a prominent approach within phonological processes as observed by Essien (2017).

Prince and Smolensky's introductory manuscript entitled: *Optimality Theory: Constraint Interaction in Generative Grammar*, outlines a system of interactive constraints. The system of constraints helps to explain how a speaker's phonological processes generate or regulate output. Optimality Theory (O.T.) is based on the idea that there is a set of constraints that are universal to all languages, and these constraints are ranked and are violable. According to the proponents, there are two types of constraints: faithfulness and markedness. Faithfulness constraints control variation occurring between what was there originally and what is brought in. That is, difference in what place of production of a sound

and what is realized differently in terms of minimal possibility. What this type means is that a particular production should remain faithful as possible to the input into the phonological system. On the other hand, markedness constraints are constraints on phonological output and usually affect anything vowel or syllable length, vowel insertion. It is germane to note that there are variations between dialects and even individual speakers in markedness constraints. It is the interaction among constraints of these two categories that creates the ideal outline for a continuum guiding phonology.

In O. T. we have two principles. The first is that the constraints are universal. Second, all constraints are present in the grammar of every language. Using these two rules, it is possible to explain that the only difference among the world's languages is constraint ranking. Since its introduction, there has been considerable debate as to whether the supposed universality of constraints is feasible. When evaluating a transformation or phonological process using O.T., a unique chart is used to identify the option that is optimal or most harmonious. Constraints are ranked in a hierarchy specific to a language, dialect, or speaker. Output is then evaluated using a simple measure or property known as minimal violation. The output that violates the least constraints is the winner or the optimal output.

We also have the process of pointing finger which marks the optimal candidate, and each cell displays an asterisk for each violation for a given candidate and constraint. Once a candidate does worse than another candidate on the highest ranking constraint distinguishing them, it incurs a fatal violation (marked in the tableau by an exclamation mark (!) and by shaded cells for the lower-ranked constraints). Once a candidate incurs a fatal violation, it cannot be optimal, even if it outperforms the other candidates on the rest of constrain. Below is an example of a tableaux that shows the constraints and candidates.

Tableaux 1: Constraints and candidates

Input	Constraint 1	Constraint 2	Constraint 3
☞ Candidate A	*	*	***
Candidate B	*	**!	

In O.T. there are three basic components of the theory: Generator (GEN), Constraints (CON) and Evaluation (EVAL).

i. Generator (GEN) takes an input, and generates the list of possible candidates,

ii. Constraints (CON) provides the criteria, in the form of strictly ranked violable constraints, used to decide between candidates, and

iii. Evaluator (EVAL) chooses the optimal candidate based on the constraints, and this candidate is the output.

Concept of Sound Change and Palatalization

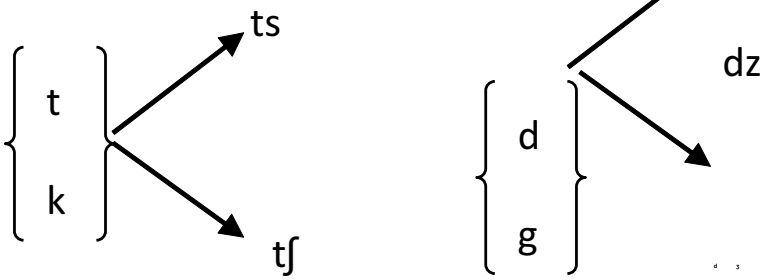
Sound change often comes as a result of phonetic environment or alteration in the flow of air from the lungs. According to O'Grady, Debrovolsy and Aronoff (2008:30), most sound changes begin as subtle alterations in the sound pattern of a language in particular phonetic environments. The linguistics processes underlying such phonetically conditioned change are identical to the ones found in the phonology of currently spoken languages. The application of such processes, according to the authors, usually brings about

an articulatory simplification and over time, resulting in significant changes in the phonology of a language.

Although all aspects of a language's phonology: tone, stress, and syllable structure are subject to change over time, attention is usually restricted to change involving segments. Since most sound changes involve sequences of segments, the main focus of the author is on sequential change. However, we then also discuss one common type of segmental change, involving the simplification of an affricate. In addition, in order to indicate that more than just articulatory factors play a role in sound change, then authors discuss a case of sound change based on acoustic factors.

With regards to sequential change, O'Grady et al (2008:30) recognize assimilation, dissimilation, epenthesis, and deletion as its aspects. According to them the most common type of sequential change is assimilation, which has the effect of increasing the efficiency of articulation through a simplification of articulatory movements. The authors recognize four main types of sequential change: partial assimilation, total assimilation, palatalization and nasalization. Partial assimilation involving place or manner of articulation is a very common change which, over time, can result in total assimilation.

Another type of assimilation is palatalization. According to Allen (2015: 54), patalization is the effect that front vowels and the palatal glide [j] typically have on velar, alveolar, and dental stops, making their place of articulation more palatal. If one compares one's pronunciation of *keep* as opposed to *cot*, one will notice that the pronunciation of [k] in keep is much more palatal than in *cot* due to the influence of [j]. Palatalization is often then first step in affrication change in which palatalized stops become afffricates, either (ts) or [tj] if the original stop was voiceless or [dz] or [dʒ] if the original stop was voiced, as demonstrated thus:



The foregoing establishes the fact that certain sounds can be palatalized. From the diagram, it is obvious that front vowels can influence velar dentals and dental stops. Another form of assimilation is nasalization. Udoh (2020) defines it as the effect that a nasal consonant can have on an adjacent vowel, such as in the word: *botton.* This change can occur in both French and Portuguese, with the subsequent loss of the nasal consonant. Although assimilation is probably most common in the case of adjacent segments, it can also apply at a distance. A case in point is umlaut, the effect a vowel or sometimes a glide in one syllable can have on the vowel of another syllable, usually a preceding one. Umlaut (resulting in front rounded vowels (y) and (ø) played an important role in Old English and is the source of irregular plurals such as *goose/geese* and *mouse/mice* in Modern English. For example, the plural of the pre-Old English words *gs 'goose'* and *ms 'mouse'* was formed by adding a suffix [i]. As a result, umlaut of the vowel in the preceding syllable occurred in the plural forms see pre-old English stages 1 and 2) but not in the singular forms.

Data Presentation/Analysis

The data presented is a twenty wordlist which were recorded as earlier stated in our methodology. The data are presented below.

S/N	Items tested	Transcription
1.	Due	/dju:/
2.	View	/vju:/
3.	News	/nju:z/
4.	Stew	/stju:/
5.	Queue	/kju:/
6.	Yield	/ji:ld/
7.	Universe	/ju:niv3:s/
8.	Beautiful	**/bju:tif ə l/**
9.	Graduate	/grædju ə t/
10.	Tune	/tju:n/
11.	Music	/mju:zik/
12.	Student	/stju:d ə nt/
13.	Huge	**/hju:dʒ/**
14.	Accurate	/ækjuri ə t/
15.	Pure	**/pj ʊ ə /**
16.	Value	/vælju:/
17.	Few	/fju:/
18.	Muse	/mju:z/
19.	You	/ju:/
20	Opinion	/ ə pinj ə n/

Data Analysis on the Respondents' Performance on the Realization of Palatal Sound /j/ The words that were used as the test items typically had front vowels [u:,I,e,æ], palatal glide [j], velar [k, g] alveolar [s, z, t, d, n, l, r] and dental stops (‡Ẅẏ It was observed that the front vowels and palatal glide exert influence on velar, alveolar and dental stops making them more palatal than usual. In the analysis, the Voice Note (VN) that recorded the performance of 20 respondents were played and listened to; they were analyzed perceptually. Also, selected words from respondents representing Ibibio, Yoruba and Igbo were acoustically analyzed using the PRAAT Analysis Software. It was a further proof, justifying the intensity, duration and pitch in the observ ance of palatalization during production of sounds. A summary of the performance of the respondents during recording is presented in table 1 below.

Table 3: Respondents' Performance on Palatalization

			Ethnic group	**Ibibio**	**Yoruba**	**Igbo**
S/N	**Items tested**	**Transcription**	**Palatalized stops**	**Resp.**	**Resp.**	**Resp.**
	Due	/dju:/	/d/		/du:/	
	View	/vju:/	/v/	/fju/	/vjʊ/	/vjʊ/
	News	/nju:z/	/n/	/nus/	/nu:z/	/nu:s/
	Stew	/stju:/	/s/	/stju/	/stu:/	/stu:/
	Queue	/kju:/	/k/	/kju/	/ku:/	/kjʊ/
	Yield	/ji:ld/	/j/	/jild/	/ji:ld/	/jild/
	Universe	/ju:niv3:s/	/j/	/dʒunifes/	/jʊniv3:s/	/jʊniva:s/
	Beautiful		/b/	/bitiful/	/bjʊtifəl/	/butiful/
	Graduate	/grædjuət/	/g/	/græduet/	/grædʒuet/	/græduet/
	Tune	/tju:n/	/t/	/tʊn/	/tu:n/	/tu:n/
	Music	/mju:zik/	/m/	/mjusik/	/mjuzik/	/muzik/
	Student	/stju:dənt/	/s/	/stʊdent/	/stjʊdənt/	/student/
	Huge	/hju:dʒ/	/h/	/ʊdʒ/	/hjudʒ:/	/hu:dʒ/
	Accurate	/ækjuriət/	/k/	/akuret/	/ækjuret/	/ækuret/
	Pure	/pjʊə/	/p/		/pjuɔ/	/pjuɔ/
	Value	/vælju:/	/v/	/fælju:/	/vælu:/	/vælu:/
	Few	/fju:/	/f/	/fjʊ/	/fjʊ/	/fjʊ/
	Muse	/mju:z/	/m/	/mju:s/	/mu:s/	/mu:s/
	You	/ju:/	/j/	/dʒʊ/	/jʊ/	/jʊ/
	Opinion	/əpinjən/	/n/		/ɒpiniɔ:n/	/ɒpinjən/

From the data in Table 3 above, it can be seen that certain common core features emerge in the production of the items from Ibibio, Yoruba and Igbo respondents and the standard (IPA) transcription shows the difference in the duration. The common performance features include:

loss of palatalization with alveolar stops as in /d / for /dju:/; /stʊdent/ for //stju:dənt/.

reduction of duration in long vowels as in /jild/ for /ji:ld/ /væliʊ/ for /vælju:/

replacing of palatal /j/ with other related palatal /dʒ/, as in /græduet/ for /grædjuət/; /dʒu:/ for /ju:/. Although there are other observations in the performance of the respondents, the few are noted to be outstanding and noticeable among Nigerian speakers of English.

Perceptual Analysis of Palatalization

Table 4: Perceptual analysis of respondents' pronunciation of /j/

Test Items	Control's Pronunciation (SBE)	NSE		Percentage		Expected Score
		No. Able	No. Not Able	% Able	% Not Able	20
Due	/dju:/	15	5	75%	15%	20
View	/vju:/	16	4	80%	20%	20
News	/nju:z/	18	2	90%	10%	20
Stew	/stju:/	15	5	75%	15%	20
Queue	/kju:/	18	2	90%	10%	20
Yield	/ji:ld/	15	5	75%	25%	20
Universe	/ju:niv3:s/	9	11	45%	55%	20
Beautiful	/bju:tifəl/	12	12	60%	40%	20
Graduate	/grædjuət/	9	11	45%	55%	20
Tune	/tju:n/	17	3	85%	15%	20
Music	/mju:zik/	17	3	85%	15%	20
Student	/stju:dənt/	8	12	40%	60%	20
Huge	/hju:dʒ/	11	9	55%	45%	20
Accurate	/ækjuriət/	10	10	50%	50%	20
Pure	/pjʊə/	17	3	85%	15%	20
Value	/vælju:/	18	2	90%	10%	20
Few	/fju:/	19	1	95%	5%	20
Muse	/mju:z/	18	2	90%	10%	20
You	/ju:/	14	6	70%	30%	20
Opinion	/əpinjən/	10	10	50%	50%	20
TOTAL		**286**	**124**			**400**

Key: SBE - Standard British English

NSE - Nigerian Speakers of English

Table 5: Cumulative Analysis of Test Items

Overall Analysis of Test Items		Percentage Score
Total percentage score	400	100%
Students' overall score of palatal sound /j/ pronunciation	286	71.5%
Number not able	124	31%

Respondents' actual score in the realization of the palatal sound /j/ is presented in Table 4 and 5. The overall score of pronunciation by the respondents is 286 token while that of control's token is 400 anticipated. Therefore, their percentage score is 71.5% and 31% respectively. This shows that most respondents realized the palatal /j/ during pronunciation especially in words like, you, few, queue while few deleted the palatal /j/ which is as a result of mother tongue interference. To further explicate perceptual analysis of palatalization three kinds of palatalization are used, namely: coronal palatalization, velar softening, and palatal glide.

Coronal Palatalization

Due /dju:/, News /nju:z/, stew /stju:/

Some of the words on the corpus which indicated the occurrence of coronal palatalization are 'due', 'news' and 'stew' with the alternation between alveolar [d,n,t] and the palatal /j/. Coronal palatalization changes alveolar into a palatal or palato alveolar. Seven variants of this form were noticed in the respondents' pronunciation. It was noticed that the Ibibio respondents carefully, though probably unconsciously observed the glide in pronouncing /d/ for instance with /j/ in the word /dju:/. However, in other cases, some other Ibibio respondents pronounced without the palatalized stop as /diu:/.

About 80% of Ibibio and Igbo respondents rendered the voiced alveolar stop /d/ completely without a glide or alternation with palatal sounds, and the duration used in the production of the variants seemed quite shorter than the ones articulated by the control. Thus, most of the Igbo respondents realized due, stew, news, graduate, students and opinion as /dʊ/, /stʊ/, /nʊs/ /græduet/, /stʊdent/ and /ɒpiniɔn/ respectively. Generally, the variant articulated by the highest number of respondents is alveolar stop without palatal. Only about 65% of Yoruba respondents articulated the variants correctly. Even so, two Yoruba respondents were heard realizing the form /stʊdent/ which was considered as being idiosyncratic or occurring in error. From these statistics, it can be concluded that the palatalization of alveolar plosive [d_j, s_j, n_j] at initial or medial word position or syllable juncture among Nigerian speakers of English occurred, although the proportion of those realizing it is within the range of 45%. This may lead to the conclusion that although palatalization (coronal palatalization) of [d^j, s^j, n^j] at initial and medial world positions is possible with Nigerian English speakers, majority of Nigerians do not realize [d, s, n] as palatalized segment at medial position.

The pattern of coronal palatalization and palatality [j] appeared to be a random occurrence in Nigerian English since some of the respondents almost did not articulate the palatalized variant in medial position, such as 'student', 'graduate' 'opinion'. Some of them realized the words as /student/, /græduet/ and /opinion/. It therefore seems the positions of

the palatalized alveolar [t, d, n] in the words above, as well as the immediate environment determine the occurrence of coronal palatalization, though lacking consistency.

Data Analysis of Velar Softening Palatalization

Velar softening looks at alternation between velar stops /k/, /g/ and /ŋ/ and coronal fricatives or affricates. It is a change of velar to coronals triggered by front vowels. For palatilization to occur, there have to be a target and a trigger. In the item test, palatalization seemed to have occurred more frequently with velar among respondents than the other sounds. For instance in the words 'Queue' and 'accurate' transcribed as /kju:/ and /ækjʊriət/ respectively, it was observed that "Queue' was articulated with the velar /k/ being palatalized by all the respondents just as the one rendered by the control. No respondent pronounced the word without the palatal /j/ coming after the velar. Perhaps it was because the velar softening appeared at the initial position. It was not the same for 'accurate' as majority of Igbo and Ibibio respondents articulated it as /ækuret/ without softening the /k/ with palatal glide /j/.

In all, about eighteen (18) respondents out of twenty (20) realized the word 'queue' as palatalized [k^j] while about fifteen (15: mostly Yoruba respondents) could realize 'accurate' as palatalized [k^j]. The reason is not far from the positioning. However, Nigerian languages have palatalization at initial and medial positions. Thus, it is quite difficult to generalize the findings that some respondents could not pronounce accurately with /k^j] just because it did not come at initial position.

Data Analysis of Off-Glide /j/ Palatalization

The insertion of a transitional /j/ off-glide between the consonant and the vowel is very common in English language. This kind of assimilation is also considered as palatalization since there is an attraction towards the hard palate or the production of the palatal /j/ although the resulting sound may not necessarily be an affricated consonant. Examples of such words as used in the test items are: beautiful, tune, music, huge, pure, value, few, muse, view, yield, universe and you. It was observed that about 85% of the respondents inserted the palatal glide [j] of the voiced and voiceless stops /b, t, p/, 90% of them articulated labiodentals /v, f/ with palatal /j/ while only about 30% were able to articulate the bilabial /m/.

It was observed that in the course of pronouncing the words, the length of the vowel that occur after the palatal glide had to be long. These are presented as follows:

Word	**Realisation**
Beautiful	/bju:tifəl/
Tune	/tju:n/
Music	/mju:zik/
Huge	/hju:dʒ/
Pure	/pjʊə/
Value	/vælju:/
Few	/fju:/
Muse	/mju:z/
View	/vju:/
Yield	/ji:ld/
Universe	/juniv3:s/
You	/ju:/

This feature can be regarded as a necessary condition as lengthening in vowel as an aspect of palatalization. About 80% of the respondents could show palatalization in the words 'beautiful', 'tune', universe and 'few'. However, the [mʲ] palatalized variants: 'music' 'muse' were found more with Yoruba and Ibibio respondents than Igbo speakers. In the Igbo rendition, for instance, it appeared as if the /j/ element was absent, making the words sound /muzik/ for music and /mus/ for muse respectively. Again, no respondent mispronounced beautiful, few, view, and universe. There is no clear-cut explanation to this other than the fact that there is a necessary tendency for speakers to palatalize /b/, /f/ /v/ and /u/, especially at initial position.

Analysis of Optimality Theory Data

Optimality Theory is essentially an alternative way you view phonology. Instead of rules to figure out what is and is not allowed in a language, O.T. uses constraints and structures as systems that map out differences in pronunciation. Certain constraint may affect sound changes in English. Constraints according to O.T. are violable. When a candidate (respondent) violated a constraint, we put in an asterisk (*), as multiple asterisk if it violates it several times. The violation that results in a candidate being kicked out is a fatal violation. This is where he/she gets marked with an exclamation mark (!). The candidate that was not kicked out is optimal. To further analyse our data using the Optimality Theory, the following words will be used for illustration, 'student', 'stew', 'view' and 'music'.

Tableaux 2: Showing 'faithfulness' of optimal candidate 1 and 2 (Control)

Input: Student	Constraint 1: +coda	Constraint 2: +/j/	Constraint 3:
☞ /stju:dənt/			!
/stu:dənts/			!

In tableaux 2, the input is 'student' /stjudənts/ as analysed above, two candidates are generated and evaluated. As indicated in the tableaux, both candidates have successfully satisfied the lower ranked constraint 1 (C1) '+coda' which states that all words must end with a consonant sound. Candidate 1 and 2 highly ranks C2 which states that all words must have the palatal sound /j/. From the tableaux, both candidates do not satisfy the higher ranked constraint 3(C3) which states that all words must have the sound /ʊ̈/. Therefore, candidate 1 and 2 emerges faithfully as optimal candidate.

Tableaux 3: Showing candidate 2 as optimal candidate (Igbo Speaker of English)

Input: Stew	Constraint 1: +coda	Constraint 2: +/j/	Constraint 3: +/ʊ̈/
/stju:/	!		!*
☞/stʊ̈/	!	!	

Tableaux 3 presents an activity of markedness between the constraints presented. The input 'stew' generates two candidates, /stju:/ and /stʊ̈/ respectively. C1 is violated by both candidates. This is because '+coda' states that all words must end with a consonant sound. It is

seen that C2 has been violated by the second candidate because it failed to obey the requirement which states 'insert /j/'. Furthermore, C2 is responsible for the correct pronunciation of the word has been ranked lower than C3, which favours candidate 2. Candidate 1 is kicked out due to its fatal violation while the second candidate is the optimal candidate. Interestingly, the sound /ʊ/ is present in the Igbo phonology which results in its use in place of the long vowel /u:/

Tableaux 4: Showing candidate 2 as the optimal candidate (Ibibio Speaker of English)

Input: View	**Constraint 1: +coda**	**Constraint 2: +/v/**	**Constraint 3: +/f/**
/viu:/	!		!*
☞ /vju:/	!	!	

Tableaux 4 presents a markedness tableaux with the input 'views'. The input generates two candidates, /viu:/ and /vju:/. Constraints from both the English and Ibibio are evaluated by these candidates. The candidates have violated the lower ranked C1, '+coda' which states that all words must end with a consonant sound. However, C2 was violated by the second candidate which states 'insert /v/'. From tableaux 2, candidate 1 is kicked out due to its fatal violation. This is because C2 is responsible for the correct pronunciation of the word was ranked lower than C3 and this favours candidate 2. Hence, the second candidate is the winner. Furthermore, since the sound /v/ is not present in the Ibibio language but has the sound /f/ instead, it uses the voiceless labio-dental fricative in place of the voices labio-dental fricative /v/.

Tableaux 5: Showing candidate 2 as the optimal candidate (Yoruba Speaker of English)

Input: Music	Constraint 1: +coda	Constraint 2: +/z/	Constraint 3: +/s/
/miu:sik/			!*
☞ /mju:zik/		!	

Tableaux 5 presents the input 'music which generates two candidates, /mju:zik/ and /mu:sik/. These candidates are evaluated by constraints from both the English and Yoruba sound system. Both candidates do not violate the lower ranked C1, '+coda' which states that all words must end with a consonant sound. In the tableaux, it appears that C3 which states that words must have the sound /s/ has been ranked higher than C2 which states words must have the sound /z/ and this is violated by the second candidate. This shows that the Yoruba language ranks the constraint /s/ higher than the constraint /z/ because it is not present in their sound system but finds a close equivalent. Since the second candidate does not fatally violated C3, it still remains in the tableaux, while candidate 1 is kicked out of the tableaux for fatally violating C3. Therefore, candidate 2 emerges as the winner.

Acoustic Analysis of Data on Palatalization in Nigerian English

This study made use of PRAAT. For the acoustic analysis the words 'stew', 'news' and 'yield' were physically displayed in PRAAT object window as it was time consuming to

present all the words. The word had their labels written against each output and were coded. The following data shows the acoustic interpretations:

Acoustic Interpretation of the Control's Pronunciation of the word 'yield' /ji:ld/

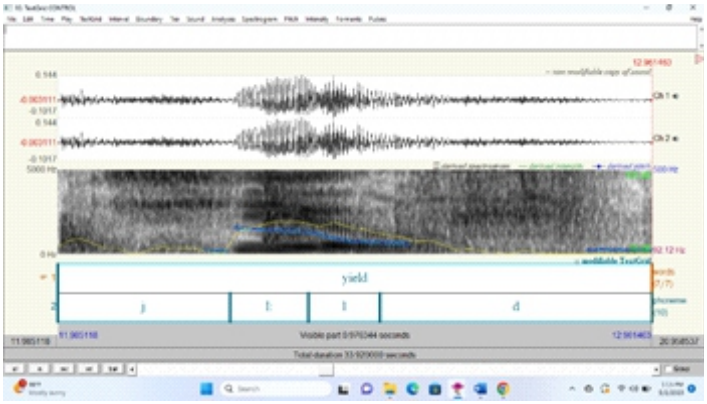


Figure 1: Yield /ji:ld/

From the spectrogram in figure 1, the frequency of the palatal glide /j/ was very low and clear. Moving on the frequency rises in the sound /i:/ but in this case becomes darker. Furthermore, there was a fall in the frequency from the sound /l/ to /d/ which at this point becomes shaded. From the spectrogram, the total duration of the word /ji:ld/ is 33.920000 seconds, while the visible part is 0.976344 seconds.

An Acoustic analysis of Igbo Respondent's Realization of the Word 'Yield' /ji:ld/

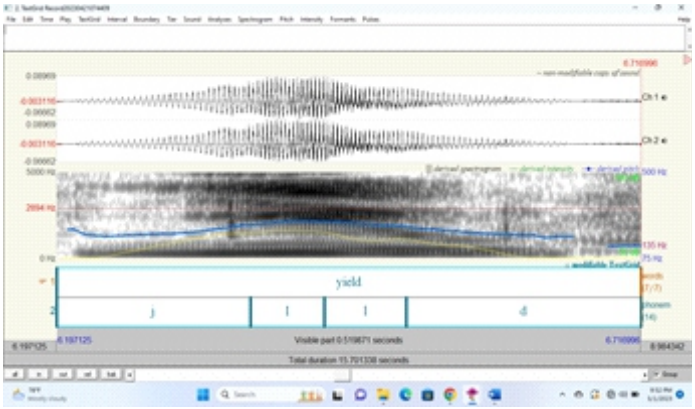


Figure 2: Yield /jild/

In spectrogram 2 the word 'yield' was realized as /jild/ by Igbo respondents. The frequency for the sound /j/ is clear and low while the palatal glide /j/ has a high frequency. It is the darkest part in the spectrogram. The visible part is 0.519871 seconds while the total duration is 15.701338 seconds.

An Acoustic analysis of Yoruba Respondent's Realization of the Word 'Yield' /ji:ld/

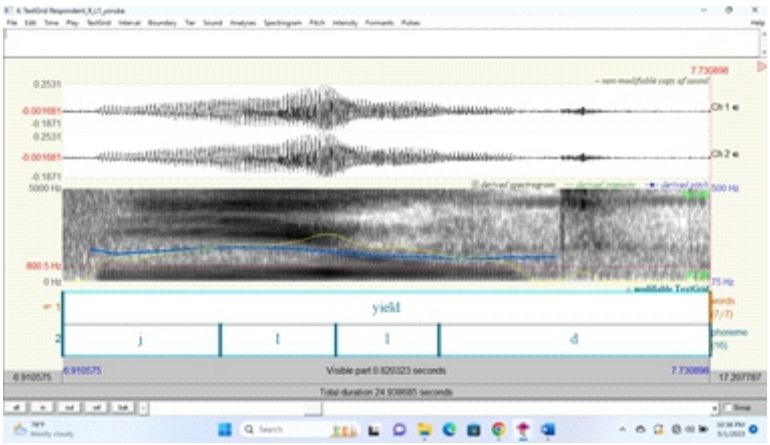


Figure 3: Yield /jild/

The above spectrogram in figure 3 shows the acoustic cues of the word 'yield' by Yoruba respondents. It is seen that the frequency is slightly high in realizing the palatal glide /j/ and progresses to a very high frequency in /i/. Furthermore, /l/ has a slightly low frequency while /d/ has the shaded part and its frequency is the lowest. The visible part has 0.820323 seconds while the total duration during realization is 24.938685 seconds.

An Acoustic analysis of Ibibio Respondent's Realization of the Word 'Yield' /ji:ld/

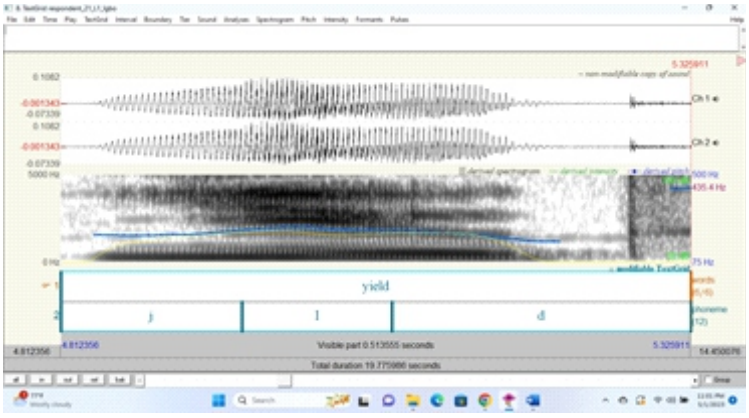


Figure 4: Yield /jid/

The above spectrogram as presented in figure 4 the acoustic cues for the word 'yield' of Ibibio respondents. The word was pronounced as /jid/. On the spectrogram, the cues for /j/ and /i/, has the frication of lower and higher frequency which are clearly visible. The voiced alveolar plosive /d/ has a clear area. Note that the frequency for the sound /d/ is very low. The visible part is 0.5135555 seconds and 19.775966 as total duration.

Acoustic Analysis of Control's Realization of the word 'News' /nju:z/

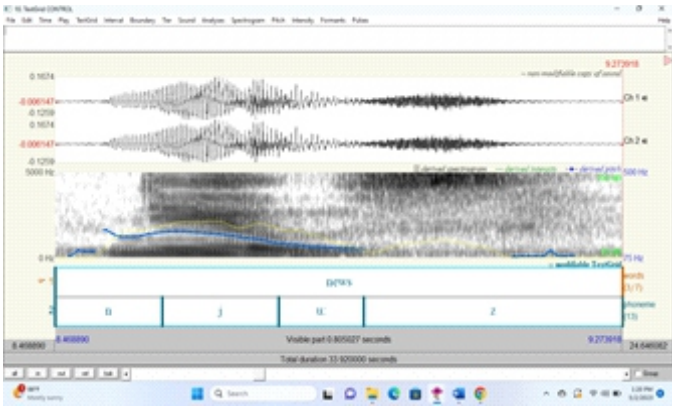


Figure 5: News /nju:z/

The spectrogram in figure 5 shows that /nju:z/ was pronounced as /nju:z/ by the native speaker of English in the word 'News'. The acoustic cues of /nju:z/, that is, the frequency were clearly visible from the sound /n/. From the spectrogram, there was an increase in intensity. Thereafter, a drop in frequency from the long vowel /u:/ which slightly rises in the realization of the voiced alveolar fricative /z/. Hence, the sound /z/ which is voiced was depicted in the spectrogram as a dark frequency. The total duration of realizing the word /nju:z/ is 33.920000 while the visible part is 0.805027 seconds.

Acoustic Analysis of Igbo Respondent's Realization of the word 'News' /nju:z/

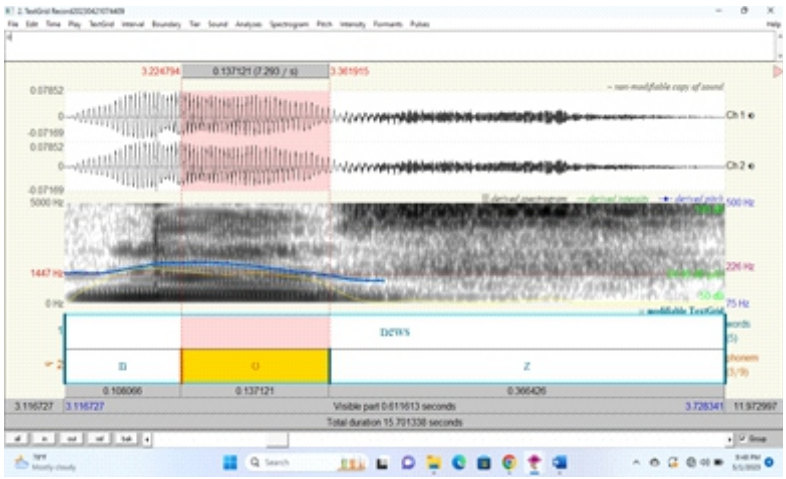


Figure 6: News /nʊ̈z/

Spectrogram 6 reveals the acoustic cues of the word 'News' which was realized as /nʊ̈z/ by Igbo respondents. From the realization, it is traced to the Igbo speakers of English because they tend to omit the palatal glide /j/. The frequency for /n/ is low and /ʊ̈/ high as seen on the spectrogram. The frequency drops when realizing the sound /z/. In this case the frequency for /z/ is low and dark. The seconds for the visible part is 0.611613 while the total duration is 15.701338

Acoustic Analysis of Yoruba Respondent's Realization of the word 'News' /nju:z/

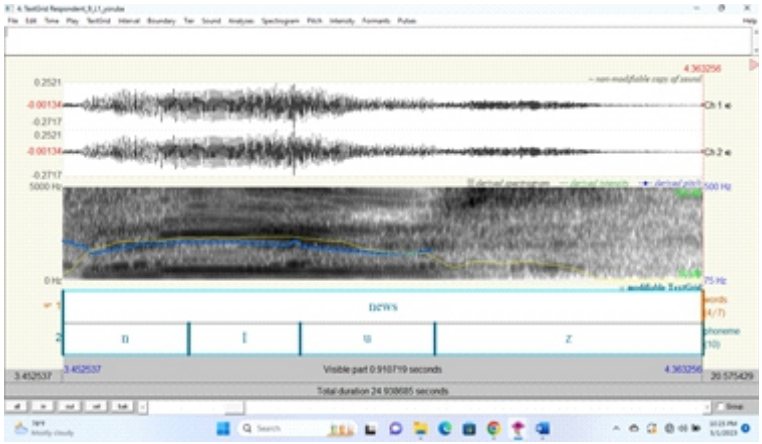


Figure 7: News /niuz/

In spectrogram 7 there is a duration of friction where the vowel transactions are smooth in Yoruba's respondents. We can also see that the frequency is high in /n/, /i/ and /u/ respectively but shaded in /z/. Hence we see that there is a high energy density in the realization of the word. The seconds of the visible part is 0.910719 seconds while the total duration is 24.938685 seconds.

Acoustic Analysis of Ibibio Respondent's Realization of the word 'News' /nju:z/

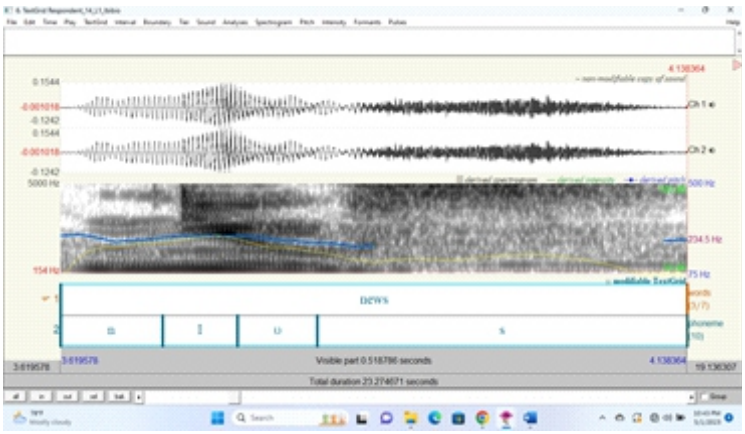


Figure 8: News /niʊ̈s/

The spectrogram in figure 8 shows that the word 'news' was realized as /niʊ̈s/ by Ibibio respondent. It shows that there is a free flow of air as the banded lines are clear when realizing the sounds /i/, and /ʊ̈/ respectively. Moving on, the darkest part on the spectrogram shows the realization of the front vowel /i/. From the spectrogram, the visible part is 0.518786 seconds while the total duration is 23.27467 seconds.

An Acoustic Analysis of the Control's Realization of the Word 'Stew' /stju

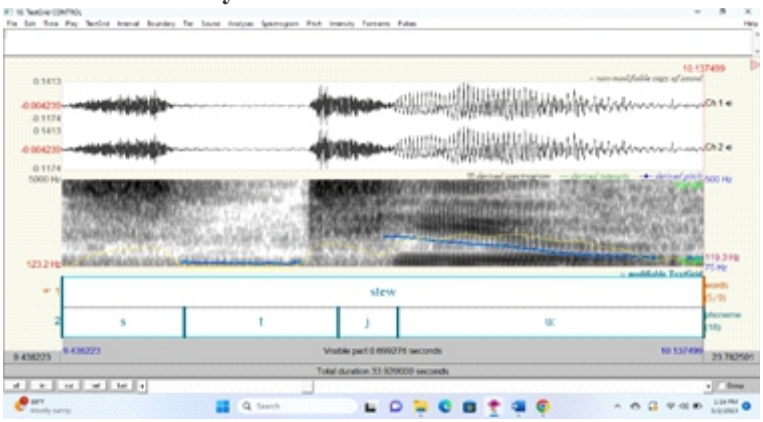


Figure 9: Stew /stju:/

From the spectrogram in figure 9 it can be deduced that the voiceless alveolar fricative /s/ is slightly high and dark. This is because fricatives have a turbulent airstream which creates a mix of random frequencies as seen on the spectrogram. There is a gap between the fricative /s/ and plosive /t/. At this point, the frequency rises in the palatal glide /j/, and then flows into the long back vowel /u:/ which has a high and shaded frequency. The visible part has 0.699276 seconds while the total duration of realizing the word /stju:/ is 33.920000 seconds.

An Acoustic Analysis of the Igbo Respondent's Realization of the Word 'Stew' /stju;/

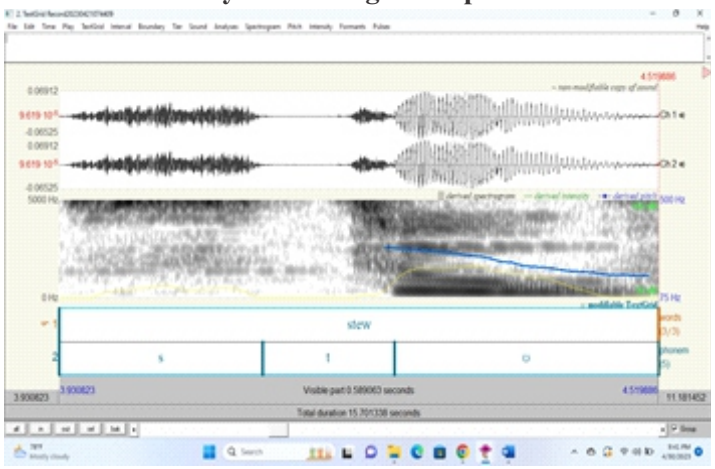


Figure 10: Stew /stʊ/

Spectrogram 10 shows the pronunciation of 'stew' /stju:/ as /stʊ/ by Igbo respondent. The frequency for /s/ is slightly low and dark. There is a big gap between the sound /s/ and /t/ as seen on the spectrogram. Furthermore, from the sound /t/ which has a no frequency, there is a rise in frequency in the realization of the back vowel /ʊ/. This is because the Igbo phonology do not have the sound /ʊ/. The visible part is 0.589063 seconds while the total duration is 15.701338 seconds.

An Acoustic Analysis of the Yoruba Respondent's Realization of the Word 'Stew' /stju;/

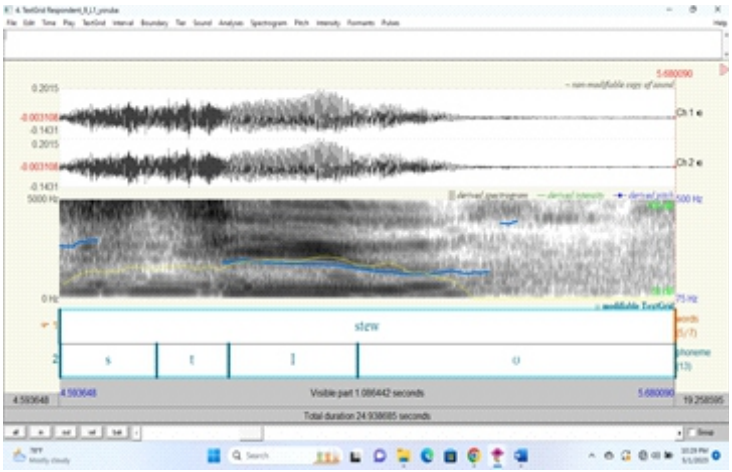


Figure 11: Stew /stiʊ/

In figure 11, the spectrogram shows the realization of the word 'stew' as /stiʊ/ by Yoruba respondent. Here, the palatal glide was replaced with short front vowel /i/. The sound /s/ has a high average frequency. The sound /s/ and /t/ is seen on the spectrogram as the darkest areas while /i/ has a slightly dark banded lines. The sound /ʊ/ has a free flow of air in its release and its frequency is very low. The visible part has 1.086442 seconds while the total duration is 24. 938685 seconds.

An Acoustic Analysis of the Ibibio Respondent's Realization of the Word 'Stew' /stju;

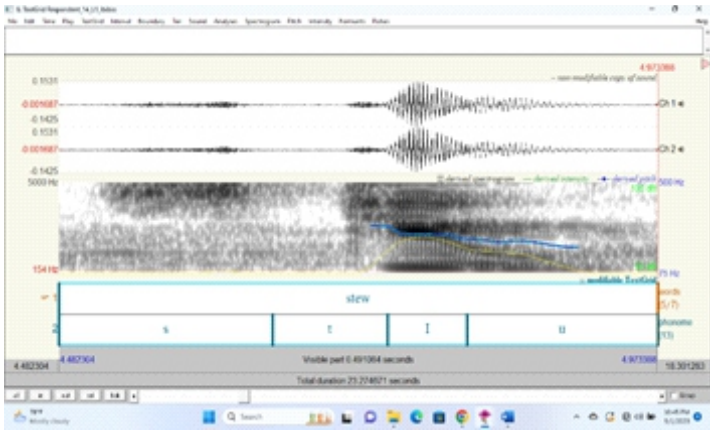


Figure 12: Stew /stiu/

.

The frequency for the sound /s/ is very low and clear. Between the sound /s/ and /t/ there is a gap. We also notice that the frequency for the sound /i/ is very high and dark and becomes slightly low in realizing the sound /u/. The realization of the word /stiu/ has 0.491084 seconds and 23.274671 seconds as the visible part and total duration respectively

In the above displays, it is observed that there are thread-like wavy lines displayed just above the words: the lines are identified as blue and yellow. They are intensity lines which indicate the loudness of palatalized consonant as well as voicing ripples on the spectrogram: For instance, the Yoruba respondent pronounces 'news' as /niuz/ instead of /nju:z/ without observing palatalization or rather pronouncing with greater loudness, so that

even the vowel /u/ seemed palatalized. The same goes for Ibibio respondent. However, the Igbo respondent does not seem to recognize an influence of front vowel after the alveolar /n/. Spectrogram in figure 12 shows that the palatal glide /j/ was replaced with the front vowel /i/.

Discussion of Findings

From the analysis, carried out, it has become obvious that palatalization in English Language among Nigerian speakers of English is controversial so that it is possible for some speakers to unpalatalize or depalatalize consonants. Based on the explanations provided in the study, it is apparently revealing that fewer Nigerians palatatize /n, t, h, m/ and more pronounce /d, f, v, k, j, b/ at word-initial positions as palatalized. However, only very few Nigerians (mostly the Yorubas) have palatalization of /k, d, t/ at medial positions. This last remark is corroborated by Akmajian (2008:31) who opined that most Nigerian speakers of English do not patalalize /k/ and /d/ in words such as 'accurate' and 'student' when the consonant appear in the middle. Using the O. T. as the framework, it can be said that the major difference encountered by the respondents in producing palatalized segments lie with the phonetic environment and position because where /k/ and /t/ appear at the beginning and followed by an obvious front vowel such as /i:/, it would have been possible for them to articulate the palatal glide.

From the above analysis of the spectrogram, the control has a total duration of 33.920000 seconds, Igbo respondent has a total duration of 15.701338 and 19.775966 seconds respectively, Ibibio respondents has a total duration of 23.27467 seconds while the Yoruba respondent has a total duration of 24.938685 seconds. Hence, the control has the highest total duration as the realization of the words were based on the Standard British English (SBE). In addition, the influence of the mother tongue of the respondents is reflected in the realization of the English words. This influence made it difficult for the respondents to realize the palatal glide /j/ accurately.

In the perceptual analysis, it was observed that if /k/ and /t/ at the initial position, there are tendencies for their places of articulations to shift to the palate region than if they occur in the middle of a word. Thus, it is possible to hear Nigerians pronounce 'queue' /kju:/ but accurate /ækuret/; tune /tju:n/ but student /stu:dent/. This contrasts with the postulation of Fola and Dan (2017) who opined that palatalization for Nigerian speakers is possible more in medial position than initial. Thus, while /k^{j}/ appear marginally in medial position it appears more frequent in medial position.

Conclusion

The aim of this study was to analyze the palatalization/palatality phenomena in Nigerian English. Here, the study revealed some patterns of palatalization as well as acoustic analysis. It was also found that the presence of palatalization in English has a specific rule. Palatalization is marked with superscript [^{j}] symbol. The requirement of palatalization in English is the existence of target sounds followed by trigger sounds. The trigger sounds are front vowel sounds [i] and [e]. The target sounds are [b], [v], [d], [g], [f], [l], [r], [m], [n], [ŋ], and [w]. These consonants have [+voice] features as the characteristic of the target sounds. Moreover, these target sounds are also classified into two categories. This classification is based on the appearance of palatalization. The first group of the target sounds are [b], [t], [d], [g], and [k] included as plosive sounds. The second of the target sounds are [l], [r], [m], [n], [ŋ], and [w] included as sonorant sounds. The rules pattern of palatalization is that when the target sound is followed by the trigger sounds, the target sounds are palatalized in the initial (first syllable) or middle position (second syllable or

more). The inconsistencies in palatalization also happens with some Nigerian speakers of English not being able to articulate the palatal glide properly.

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