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Hiatus Resolution Strategies in a Southern Nigerian English Accent

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ABSTRACT

*Studies on the Nigerian accents of English are yet to provide any empirical account of the handling of hiatus, and little is known about the strategies that Ika speakers of English adopted to resolve it. Therefore, this paper discusses how Educated Ika speakers of English (EISE) handle hiatus and the strategies adopted. A specially prepared text was administered to and read into a tape recorder by 60 EISE from Delta State University, Nigeria, who were selected through a simple random sampling technique to achieve this aim. The recordings were analysed perceptually, acoustically, theoretically, and statistically. The acoustic analysis was done using Praat, version 6.0., while Prince and Smolensky's Optimality theory (OT) served as the theoretical framework for data analysis. The findings reveal that EISE prohibits hiatus, and the repair strategies adopted by the speakers are consonant epenthesis and vowel elision, respectively. Constraints for the identified strategies are ranked by the participants thus: $ONSET^{WM}$>> *VV>> INS(C) >>HET-SYLL >> $PARSE^{PF}$ >> DEP-IO>> MAXIO>>IDENT-IO. The study concludes that the handling of hiatus by these participants further provides evidence that Nigerian English accents vary from inner circle accents.*

Keywords: Ika English; hiatus; vowel-cluster; resolution strategies; constraints

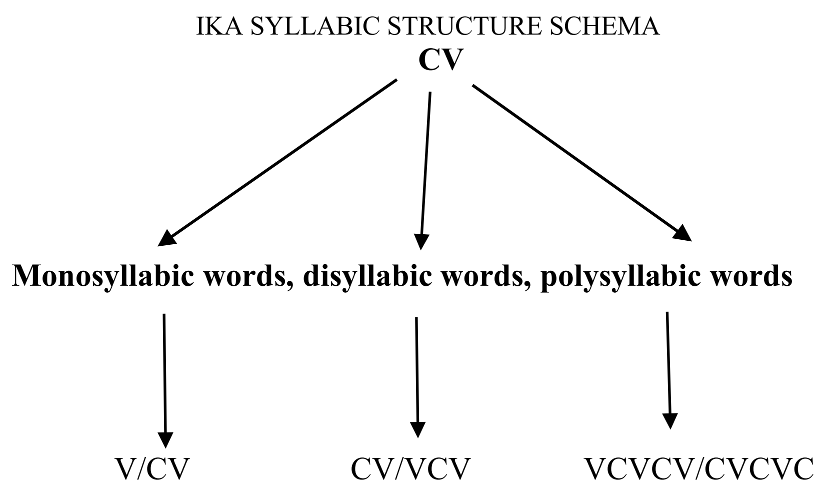
INTRODUCTION

Some languages frequently employ a syllabic structure of consonant-vowel-consonant-vowel-consonant-vowel (CVCVCV), whereas vowel-vowel (VV) configurations can occur in languages like English. However, some non-native English speakers may restore the utterance to a canonical consonant-vowel (CV) syllable structure, which can be helpful in speech production andthe absence of a consonant between two adjacent vowels in a syllable or at the boundary between syllables can, therefore, cause difficulties for non-native speakers. Though English allows vowel-vowel sequences within and between syllables called hiatus, some languages and English varieties with mother tongue interference prohibit this sequence. Hiatus occurs when two vowel sounds are adjacent in a syllable without an intervening consonant. Some languages do not allow or restrict hiatus because it creates unnaturalness and articulation difficulties (Mompean & Gomez, 2011) and the phonotactics of different languages require them to use various phonological processes to handle articulatory difficulties (Senturia, 1998). Although prior research has suggested that English allows vowel-vowel sequences within and between syllables, it is unclear if this applies to non-native varieties such as (southern) Nigerian English. Therefore, this study aims to investigate the nuances of hiatus and the strategies used by Educated Ika speakers of English (EISE). Ika

English is a variety of Nigerian English that has not received much scholarly attention, unlike other mainstream varieties like Igbo, Hausa and Yoruba English, which have received considerable attention (e.g., Akinjobi, 2006; Amoniyan, 2023a, 2023b; Amoniyan et al., 2022; Anyagwa, 2014; Jibril, 1982; Melefa & Amoniyan, 2019, 2023; Sunday, 2008).

The Ika language is part of the Kwa language subgroup and the larger Niger-Congo language family. According to Onyeche (2002), the Ika people live in an area of 117.45 square kilometres, located at the boundary between Edo and Delta States. The Ika North-East and Ika South local government areas are located northwest of Delta State, Nigeria. The language has approximately 240,000 speakers in Delta State, as recorded in the 1991 census. In the Ika speech community, the Ika language, English, and Nigerian Pidgin are frequently used in formal and informal contexts. The working class typically communicates in Ika North-East and South local government councils' offices using Ika and English, while the official matters are discussed in English and Ika(Blench, 2002; Danladi, 2013; Igboanusi, 2008). Therefore, the use of the Ika language in these offices is mainly because many of the employees are Ika speakers.

Ika has a strict CV syllabic configuration. The following are vowel and consonant interactions in monosyllabic, disyllabic, and polysyllabic words in Ika: For monosyllabic words, it is possible to have V/CV structure, CV/VCV for disyllabic words and VCVCV/CVCVCV for polysyllabic words. However, there can be some rare cases of CVC structure as NOCODA is higher ranked in the Ika language. Below is the Ika syllabic structure schema.



Monosyllabic words	Disyllabic words	Polysyllabic words
yu (CV) - you	U.kpe (V.CV) - Light	E.zi.za(V.CV.CV) - Broom
kwa(CV) - sew	A.zu (V.CV) - Fish/back	E.kpe.re(V.CV.V) - Prayer
O (V) - he/she	Ku.ru (CV.CV) - Scoop	Chu.kwu.ka(CV.CV.CV) - A name

TABLE 1. Ika Syllabic Structure with Examples

Ika language has a phonotactics pattern of alternating consonant-vowel (CV) syllabic structure, as shown in Table 1, particularly in disyllabic and polysyllabic words. The language does not allow vowel clusters at syllable boundaries or within a syllable, as per Senturia's (1998) observation.

EARLIER STUDIES

A cross-linguistic study investigated hiatus resolution strategies in English and non-English contexts. The strategies used depend on the language's preference for syllables and phonotactics. Davidson and Erker (2014) examined hiatus resolution in American English (AmE) and found that glottal stop insertion is the primary strategy at word boundaries, while no resolution occurs within words. The study showed that glottal stops are present in less than 5% of vowel-vowel sequences within words and in less than 5% of vowel-glide-vowel sequences across word boundaries. American English speakers tend to resolve hiatus at word boundaries with glottal stop insertion, while no hiatus resolution is within words (Mosionek & Zembrzuski, 2019). The study suggests that hiatus is tolerated word-medially without any resolution strategy in American English. Glottal stop insertion is the preferred strategy for hiatus resolution at word boundaries, but it occurs only before stressed syllables. Hiatus is mostly allowed before unstressed vowels in syllables (Garellek, 2012; Lee, 2018).

The phenomenon in non-rhotic English (Mompeán & Gómez, 2011) revealed /r/-liaison as a common strategy, but glottal stops and creaky voices are often used. The study discussed the reasons for the increase in glottal strategies over /r/-liaison. Another strategy involved r-sandhi, wherein /r/prevents hiatus across word boundaries (Blevins, 2008; Cox et al., 2014). This is evident when the initial vowel is [-high]. There are two types of /r/-liaison: "linking r," where etymological evidence of /r/ exists, and "intrusive r," where no etymological evidence of /r/ exists; additionally, in potential hiatus contexts where the first vowel is [high] and unrounded, a palatal glide is often inserted, while a labial-velar glide is inserted when the first vowel is [+high] and rounded. The study sampled a corpus of BBC newscasts, and the findings showed that /r/-liaison is a common strategy for resolving hiatus in nonrhotic English with a 60.5% accuracy rate. The study discovered that linking /r/ was used in 66.5% of cases, while intrusive /r/ was used in 38.1%. Also, glottal stops and creaky voices are frequently used to break vowel sequences (Cox et al., 2014; Lee, 2018; Slocum, 2010; Yun & Lee, 2022).

Baltazani's (2003) study in Greek found that the context and focus marking of prosody and vowel quality affect the resolution of hiatuses. Vowel pairs such as [ia] and [ua] resist assimilation the most, with [ia] having less assimilation than [ua]. Prosody and vowel quality serve as strategies for resolving hiatuses. Kabak's (2007) study in Turkish showed that vowel assimilation is discretionary, with elongated vowel sounds used to prevent consecutive vowels. Glide epenthesis can avoid vowel hiatus when vowel assimilation cannot be applied. The glide epenthesis used depends on the vowel type, with lateral glide epenthesis used for round vowels and velar glide epenthesis used for dorsal vowels that are not labial. Other strategies for resolving hiatuses include glide formation, glide epenthesis, vowel elision, and vowel coalescence (Razinejad, 2019; Uzun, 2021). These strategies were also found in the analysis of the Zezuru language, spoken in Zimbabwe, where glide epenthesis is used word-initially, word-medially, and word-finally, with palatal glide [j] being inserted between vowel sequences. Hiatus is never tolerated in Zezuru, and different strategies are employed to satisfy the language's preference (Etakwa & Mukhwana, 2018; Kwambehar, 2014; Mabugu et al., 2019; Mudzingwa, 2013; Perwitasari et al., 2016; Saygın & Wilson, 2002, 1989, 2010; Vratsanos & Kadenga, 2017; Zsiga, 1997).

The earlier investigation has primarily focused on two varieties of English, i.e., American English with glottal stop insertion and non-rhotic British accent with /r/ liaison and creaky voice. Other studies have examined European, Asian, and African languages. The languages resolve vowel clusters through various methods, including vowel elision, assimilation, consonant epenthesis, diphthong formation, and hetero syllabification. However, there is a lack of research on hiatus in second-language contexts, particularly multilingual settings. Therefore, it is unclear whether hiatus is tolerated or prohibited by Educated Ika speakers of English and what repair strategies they use if it is prohibited. This phenomenon may be part of the defining characteristics of English as a second language. In addition, earlier works on hiatus (Etakwa & Mukhwana, 2018; Lin, 2008; Mutonga, 2017) have based their investigations on perceptual clues without providing acoustic evidence. In addition to supplying acoustic evidence, this study discusses the handling of hiatus in educated Ika English (Nigerian English variety) and the strategies adopted by the participants. This will help to explain further evidence on the defining features of outer circle Englishes.

METHODOLOGY AND THEORETICAL FRAMEWORK

The population of this study comprises 60 EISE selected from Delta State University, Abraka campus in Ethiope East Local Government, and Agbor campus in Ika South Local Government Area of Delta State, Nigeria. These two schools were selected because they are the apex and largest higher learning institutions in Delta State, where most EISE from different socio-cultural backgrounds are domiciled. The selection of the category of participants was based on Udofot's (2004) classification of spoken Nigerian English into nonstandard, standard, and sophisticated varieties. The exponents of her two standard varieties include third and final-year undergraduates, university graduates, college lecturers, etc. Okoro (2004) recommends Udofot's variety two (2) as the standard spoken Nigerian English variety because it is already being taught in schools. Secondly, it is the variety spoken by most educated Nigerians, including teachers at all levels. The use of these human participants has been approved by the Faculty of Arts Research Ethics Committee, University of Nigeria, Nsukka. A simple random sampling technique was adopted for this study to ensure that every member of the population had equal chances of being selected and that no choice was premeditated. The instrument used to collect the data for this study was a Sony Digital Tape Recorder with a sampling frequency of 44100Kz. A text containing a specially prepared word list of twenty (20) lexical items was administered to the participants, who read them aloud into the audio recorder for analysis. The participants were also engaged in free conversations to elicit naturally occurring data to complement the citation. The data collected were subjected to perceptual and acoustic analysis using Praat version 6.0. The Praat window showed the spectral information for given tokens, calculated their mean values, and then extracted them into tables for discussion. The Praat window presented pictorial evidence to support the phonological processes. Samples from the data were further subjected to Optimality Theory (OT) analysis to account for the re-ranking of universal constraints of English and the cognitive processes followed by the participants. According to Uzoagba (2016), OT is a contemporary and leading approach to phonological analysis, which was put forward by Prince and Smolensky (1991, 1993) and McCarthy and Prince (1993). Candidates were generated using the CONSTRAINT component for competition and assessed by EVAL, while constraints interacted and were ranked in order of strict domination to present winning candidates. The values obtained were calculated for their respective percentages and presented using bar and pie charts for easy comprehension.

DATA ANALYSIS AND DISCUSSION

Data analysis revealed that EISE does not tolerate vowel clusters within syllables and at the boundary between syllables. Hence, speakers of this variety of NE resolved vowel-vowel sequences by adopting two main strategies. Firstly, when the vowel 1 (V1, henceforth) has the features [-rounded] and [+back], the voiced palatal approximant (VPA, henceforth) is inserted between the V1 and the vowel 2 (V2, henceforth), while the voiced bilabial approximant (VBA) is inserted when the V1 has the features [+rounded] and [-back]. These two main phonological processes adopted by the participants in resolving hiatus are discussed in the sections below.

CONSONANT EPENTHESIS

The first strategy adopted by the participants in resolving hiatus is consonant epenthesis, *also* known as glide insertion. The phonological process of consonant epenthesis occurs in many of the world's languages and often involves the insertion of a glide adjacent to a vowel. Phonological descriptions of consonant epenthesis tend to focus on the recurrence of pre-vocalic consonant insertion, such as the bilabial approximant and the palatal approximant (Blevins, 2008; Kadenge, 2010). For articulating the word *diagram,* for instance, 22(36.7%) of the respondents resolved vowel clusters in the word by inserting the VPA between V1 and V2. Below is spectral information for the V1, inserted VPA, and V2. Figure 1 shows that EISE repair hiatus through consonant insertion. The spectral information in the picture revealed three circled regions. The first circled region where the spectrogram is relatively dark is the V1; the darkening reveals that the sound represented there did not undergo any form of obstruction during its production. The second circled part labelled VPA indicates the region of the spectrogram where the consonant was inserted. It is whitish and faded. The fading (lighter spectrum) results from the partial occlusion at the oral cavity during its production, interrupting the airflow from the lungs and reducing the quality of the VPA, hence the fading. The region of the spectrogram labelled V2 is also dark, which has the same spectral qualities as V1.

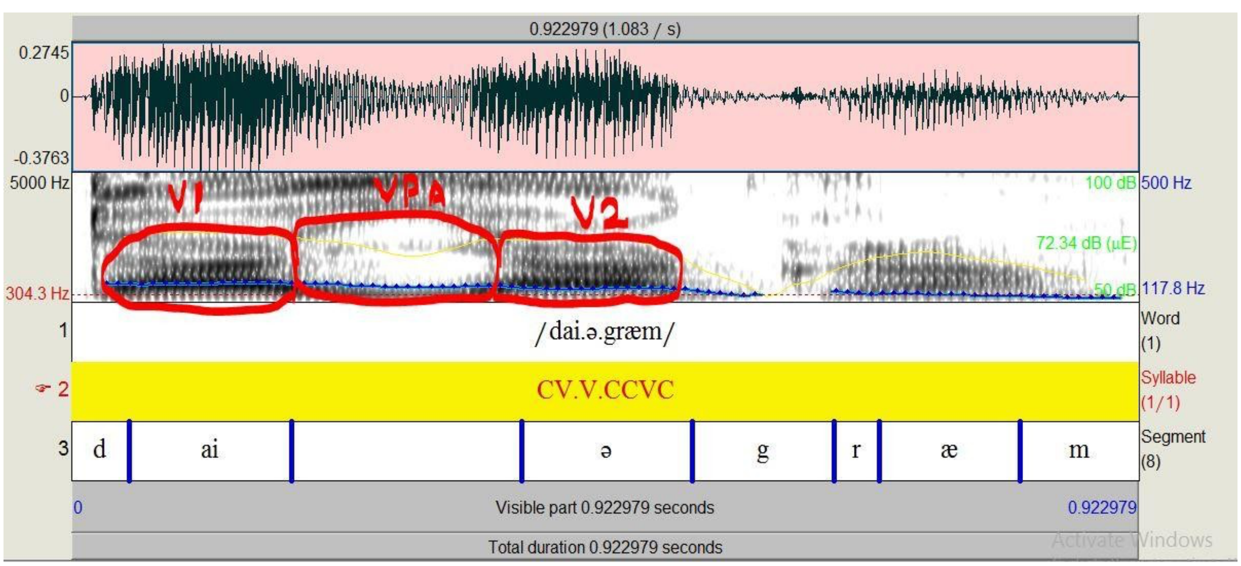


FIGURE 1. Representative Praat Picture Showing V1 and the VPA for the Word *Diagram*

Figure 1 shows the highest intensity in the first circle (V1), as shown by the solid yellow line (the intensity contour) running across the spectrogram. The contour drops in the second circle (VPA) due to the pre-vocalic consonant, which has encountered some obstruction. The blue line (pitch frequency) on the spectrogram displays the vibration during the articulation of V1 and VPA, making them [+voiced]. Table 2 contains the acoustic values obtained from the spectrogram.

TABLE 2. Mean Acoustic Values for V1 and the Inserted VPA for the Word *Diagram.*

Acoustic properties	**V1**	**VPA**	**Differences in Value**
Intensity	77.1dB	75.2 dB	1.9dB
Pitch	162.2Hz	133.3Hz	28.9Hz
Duration	6ms	6ms	Nil

Table 2 showed that the V1 in the sequence was articulated with a mean intensity of 77.1 decibels (dB), while the VPA was inserted after it and recorded an average intensity of 75.2 dB. The intensity dropped between the V1 and the VPA, with a difference of 2 dB, due to partial occlusion of the approximant at the oral cavity, which led to the articulation of V1 with more force than the VPA. The pitch value for the V1 was 162.2 Hz, while the inserted approximant sound recorded 133.3 Hz, with a difference of 28.9 Hz. This suggests that the respondents articulated the V1 with a higher pitch due to resonance in the vocal tract during articulation. The V1 and VPA had the same timing, with an average of 6 milliseconds (ms). The similarity in duration indicates that the V1 was monophthongised, as the duration of a diphthong is typically longer than a monophthong. Overall, the statistical details suggest that educated Ika speakers of English articulated the V1 with higher force and intensity. Below is the OT account, which shows how the participants re-rank the constraints of the English language to produce the optimal candidate:

Subject 1: /dai.ə.græm/.

INPUT /dai.ə.græm/ ⟶ OUTPUT /da.ja.gram/

	Candidates	ONSET^{wm}	INS(C)	DEP-IO	IDENT-IO
a	/dai.ə.gram/	*!	!*		
b ☞	/da.ja.gram/			*	*

Key

ONSET$^{wm:}$ Onset at word medial position

INS(C): Insert a consonant between syllables.

DEP-IO: Output segments depend on the Input segment.

DENT-IO: Output feature must equal input features

Constraint Ranking: ONSET^{WM}>> INS(C)>>DEP-IO>> IDENT-IO

Optimal Candidate: (b): /da.ja.gram/

The re-ranking of the universal constraints of English by these participants indicates the peculiarities of the structural features of this Nigerian English accent. The interaction of constraints for Subject 1 showed that the markedness constraints ONSET^{WM}, which prohibits open syllables occurring word medially, and INS(C), which requires the insertion of a consonant between adjacent vowels ranked higher than DEP-IO, a constraint that prohibits insertion. For

DEP-IO to be ranked lower by the participants indicates that vowel-vowel sequence is prohibited. This re-ranking is in tandem with Smolensky's (1993) principle of *richness of the base*, which postulates that in OT, all cross-linguistic variations depend on the ranking of constraints rather than differences in the inputs of languages. It is expedient for DEPIO to be violated for ONSET^{WM} and INS(C) to be satisfied. The participants, therefore, inserted the VPA between the V1 and the V2 because the V1 and VPA fall into the same natural class of [+voiced], [-rounded], and [+back]. This epenthesis satisfies INS(C). The satisfaction of INS(C) leads to candidate (b) violating DEP-IO and IDENT-IO; the violation is not fatal because DEP-IO and IDENT-IO are ranked lower than ONSET^{WM} and INS(C). Candidate (b) with the pointed finger emerges as the optimal candidate as it satisfies the higher ranked constraints, ONSET and INS(C), but violates the lower ranked constraint DEP-IO. Although candidate (a) satisfies DEP-IO, it still loses the contest as it violates the high-ranked ONSET and INS(C), leading to a fatal violation as indicated by the asterisk.

The interaction of Constraints ONSET^{wm} and INS(C) for Subject 1 revealed the abstract phonological structure that is embedded in the cognitive domain of the speakers; that is, the speakers who are exposed to the SBE model for the articulation of the *diagram* violate ONSET^{wm} and INS(C) and also have the SBE form in their mind, but articulate forms that satisfy the constraints as mentioned earlier at the surface level (output). This shows that the participants' brain contextual realisation (as output) is modelled after a syllabic structure where every syllable within words or at the word boundary position must have a CV structure.

The hiatus repair strategy of glide insertion identified in Subject 1 differs from Davidson and Erker's (2014) findings on American English, where they claim that hiatus is tolerated at word medial positions. Their acoustic analyses provided no support for glide insertion, which was further explicated in their OT account where DEP-IO was ranked higher than ONSET; hence, candidates that violated DEP-IO incurred fatal violations, which is the opposite of what is obtainable in this study. The variance in AmE's structural requirements and the participants' articulation indicates the differences between these two varieties of English.

Furthermore, the participants' handling of hiatus in the word *biomass* showed the insertion of the palatal approximant, /j/, for some participants. Figure 2 presents spectral information for the V1 and the VPA in the token. Here, 20 respondents inserted the palatal approximant between the V1 and the VPA.

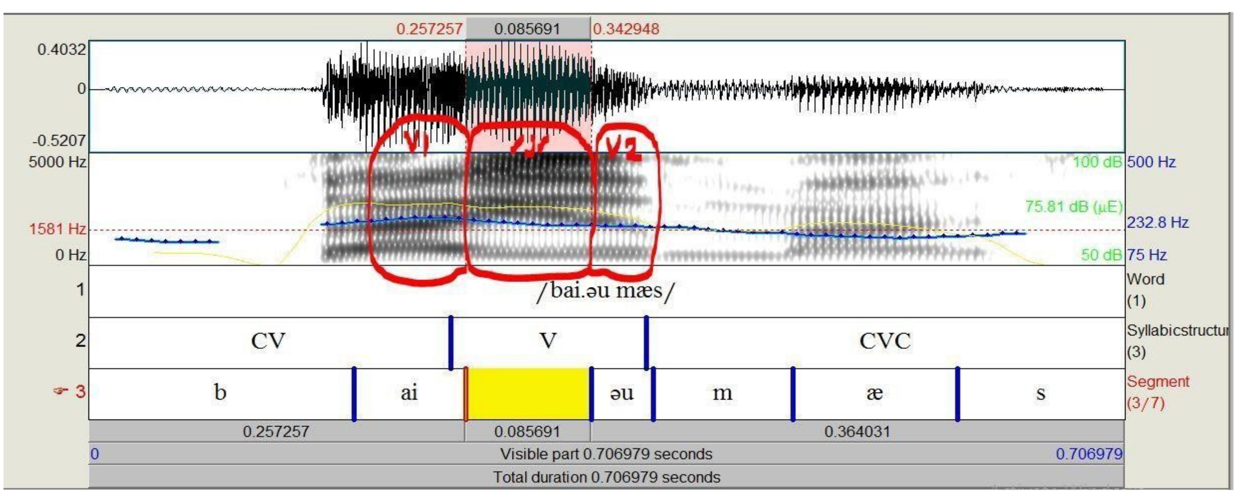


FIGURE 2. Representative Praat Picture Showing the V1 and the VPA for the word *biomass*

Variations in spectral shade and a drop in the intensity indicated by the yellow solid line running across the spectrogram are seen. The estimated average intensity for the inserted approximant in the *diagram* and *biomass* is the same. The similarity in values can be associated with the epenthetic consonant, and the VPA shares the same articulatory features of [-rounded] and [+back]. The acoustic values are presented in Table 4.

TABLE 4. Mean Acoustic Values for V1 and the VPA for the word biomass

Acoustic properties	V1	Inserted VPA	Difference in values
Intensity	73.8 dB	75.7dB	1.9dB
Pitch	153.6Hz	133.3Hz	20.3Hz
Duration	6ms	6ms	Nil

Table 4 shows that the participants inserted the palatal approximant with a mean intensity of 75.7dB, which is 1.9dB higher than the V1, as the V1 recorded a mean intensity of 73.8dB. The pitch level for the VPA recorded a mean value of 133.3Hz, which is 20.3Hz lower than the V1, as the V1 recorded an average of 153.6Hz. This means that the V1 was articulated with a higher pitch level than the VPA, which confirms the earlier assertion that vowels are naturally marked with higher pitch ranges than consonants. For the timing, the V1 and the VPA were articulated within the same duration of 6ms. This similarity in duration is also an indication that the V1 was monophthongised. Below is the OT account:

Subject 2: /bai.əu.mas/
INPUT / bai.əu.mas / → OUTPUT /ba.jo.mas/

	Candidate	$ONSET^{WM}$	DEP-IO	IDENT-IO
a	/ bai.əu.mas /	*!		
b ☞	/ba.jo.mas/		*	*

Constraint Ranking: $ONSET^{WM}$ >> DEP>> IDENT-IO
Optimal Candidate: /ba.jo.mas/

The interaction of constraints in the above adhered to the principle of richness of the base as ONSET is ranked higher than DEP-IO by the participants, leading to the realisation of /bai.əu.mas / as /ba.jo.mas/. This revealed that the cognitive process that gave rise to the epenthesis is what is contained in the input, which is realised differently at the output. It can be seen from the tableau above that candidate (b) emerged as the winning candidate because it satisfied a higher-ranked constraint by the insertion of the palatal approximant in front of the V2 at the syllable medial position. It is also evident that candidate (b) violates DEP-IO and IDENT-IO, which are pardonable as they are lower-ranked constraints. Violating DEP-IO is expedient for candidate (b) because it is the only way to satisfy the markedness constraint $ONSET^{WM}$. Candidate (a) loses out because it fatally violates the higher-ranked constraint $ONSET^{WM}$ by allowing a vowel-vowel sequence. Candidate (a) satisfies DEP-IO, but that does not guarantee its stay, as DEP-IO is a lower-ranked constraint in the participants' grammar.

For the word "buyer" (see the representative Praat picture for the word "buyer" in Figure 3), 41 respondents inserted the palatal approximant /j/. The number of respondents involved in the epenthesis for the word "buyer" is the same as those inserted in "wire." The high number of insertions recorded for "buyer" might relate to the presence of the letter "y" realised phonemically as /j/.

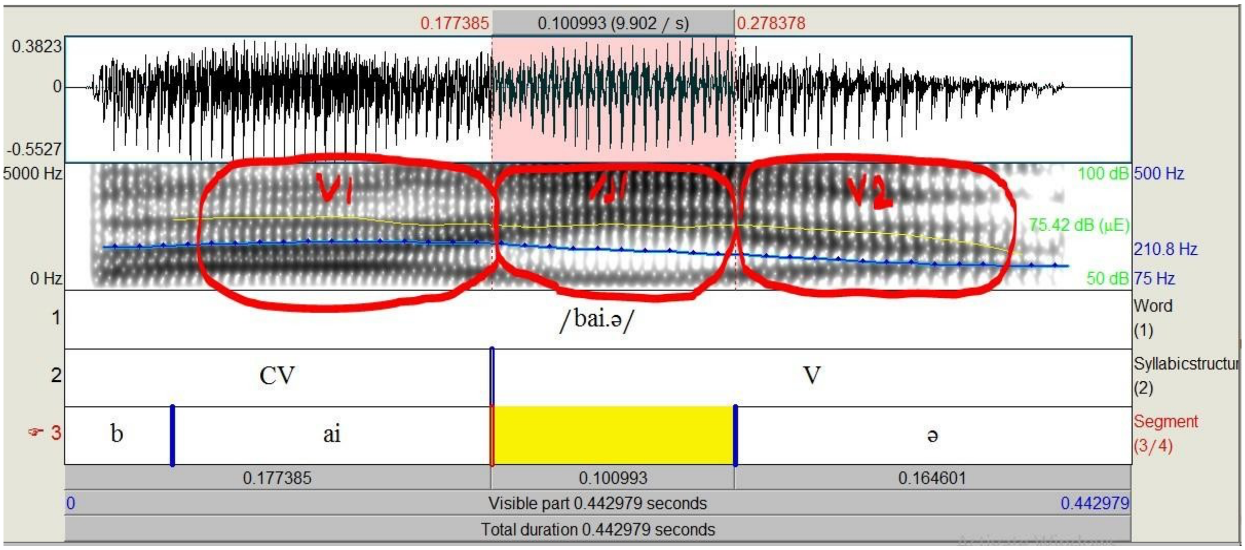


FIGURE 3. Representative Praat Picture Showing V1 and the VPA for the Word *Buyer*

Figure 3 revealed that the /j/ region in the spectrogram is faded due to relative occlusion at the vocal tract compared to the V1 portion, which has no blockage at the point of articulation. The yellow line in the spectral slide indicates a drop in intensity at the /j/ medial circle. The acoustic values for V1 and the inserted VPA are provided below.

TABLE 5. Mean Acoustic Values for V1 and The VPA for the Word *Buyer*

Acoustic properties	**V1**	**VPA**	**Difference in Value**
Intensity	78.8dB	76.0dB	2.8dB
Pitch	141.1Hz	158. 5Hz	17.4Hz
Duration	10ms	7ms	3ms

For articulating the word *buyer,* as seen in Table 5, the palatal approximant was inserted with a mean intensity of 76.0dB, while the V1 recorded a mean intensity of 78.8dB. The average force exacted in articulating the V1 is 2.8dB higher than the VPA. This may not be unconnected with the feature of the V1, which is [+vocalic], while the VPA is [-vocalic] as the latter is produced with some degree of constriction at the oral cavity. The same variance in intensity was observed with the *diagram*, and *biomass was* treated earlier.

For the pitch level, the VPA recorded a mean value of 158.5Hz, 17.4Hz higher than V1, as the V1 recorded 141.1Hz. The statistical evidence for the pitch shows that the VPA was articulated with a pitch higher than the V1, which is different from the pitch frequency level recorded for the *diagram* and *biomass*. The high pitch level recorded for the VPA in the current token may be connected to its being [+voice] and the irregularities in articulation by the respondents. For the duration, educated speakers of Ika English articulated the V1 longer than the VPA as the V1 recorded an average duration of 10ms while the VPA recorded 7ms with a difference of 3ms. Below is the OT account.

Subject 3: / bai.ə/
INPUT / bai.ə/ ⟶ OUTPUT /ba.ja/

Candidates	ONSET	INS(C)	DEP-IO
a /bai.ə/	!*	*	
b ☞ /ba.ja/			*

Constraint Ranking: ONSET>>INS(C) >>DEP-IO
Optimal Candidate: /ba.ja/

From the interaction of constraints, as seen above, inserting a segment for an onset-less syllable to be repaired is expedient, as evident in subject 1. For this to happen, DEPIO needs to be violated; hence, candidate (b), which emerged as the optimal candidate, violated the faithfulness constraint DEP-IO, which stipulates that every element in the output must have a corresponding input, meaning that no account should there be an insertion. If this principle is adhered to, hiatus repair would not be possible. Violating DEP-IO does not pose a severe problem for the candidate (b) because DEP-IO is a lower-ranked constraint for the participants. Candidate (b) emerged as the optimal candidate, satisfying the structural requirement, ONSET, a higher-ranked constraint. Although candidate (a) satisfies DEP-IO, it is still disqualified because it does not satisfy a higher-ranked constraint. Candidate (b) is structurally in consonance with Kavalan, an indigenous language of Taiwan, where onset-less syllables are prohibited, as reported in Lin's (2008) study. In AmE, as revealed by Davidson and Erker's (2014) study, vowels occurring in succession are allowed, implying that DEP-IO outranks ONSET in AmE. Forty-one respondents inserted the palatal approximant /j/to articulate another word sample *wire*. The number of respondents involved in the epenthesis for the word is the same as those inserted in the *buyer. Below* is the spectral slide.

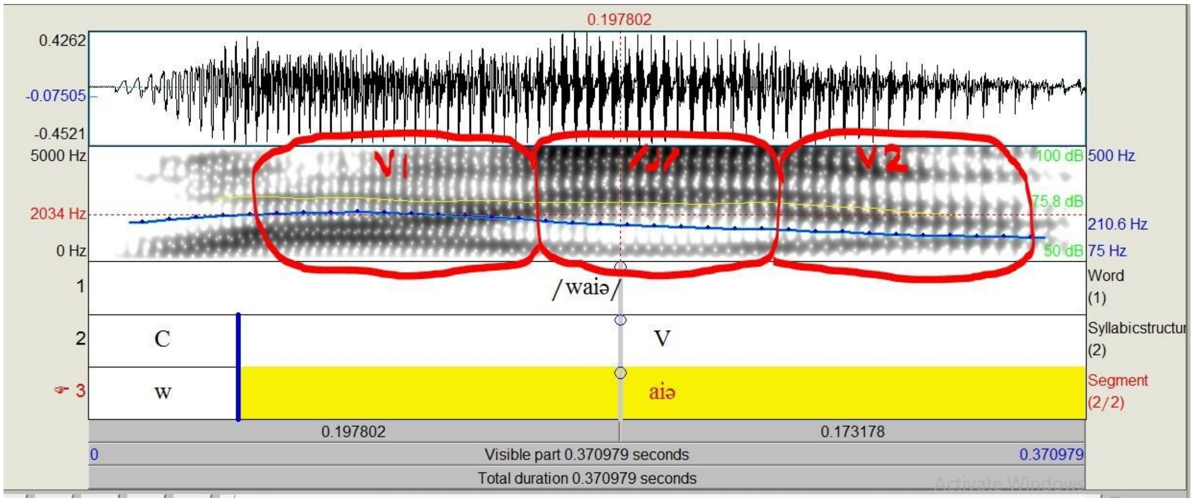


FIGURE 4. Representative praat picture showing V1 and the VPA for *wire*

Figure 4 also revealed three circled regions. The medial circled portion of the amplitude labelled /j/ indicates where the bilabial approximant was inserted. A close observation revealed that the portion is faded. The reason for the fading had been discussed previously. The yellowish horizontal line indicating the intensity can be seen running through the V1 and the VPA, which shows that the VPA did not lose its voice. However, the intensity level dropped slightly to a mean value of 1.8 dB. The acoustic values for the V1 and the VPA are contained in Table 6.

TABLE 6. Mean Acoustic Values for V1 and the VPA for the word Wire

Acoustic Properties	V1	Inserted VPA	Differences in Value
Intensity	78.2dB	76.8dB	1.4dB
Pitch	157.1Hz	151.3Hz	5.8Hz
Duration	7ms	10ms	3ms

Table 6 shows the insertion of palatal approximant between the V1 and the V2 with a mean intensity of 76.8dB, which is 1.4dB less than the V1 calculated at a mean value of 78.2dB. The intensity for the V1 is slightly higher than the VPA, firstly because vowels are naturally heavier in quality; secondly, the V1 is preceded by a bilabial approximant, which shares the same features with the initial consonant /w/. The pitch frequency extracted for the inserted VPA is at a mean value of 151.3Hz, which is 5.8Hz less than the V1; the pitch level for the V1 recorded a mean value of 157.1Hz. Therefore, the V1 was produced with a higher pitch than the VPA, while for the duration, the VPA recorded the highest value so far, 10ms, which is 3ms higher than the V1. The timing for the VPA in the *wire* has also been the highest.

The acoustic analysis carried out in this study further confirms the claim that educated Ika speakers of English break up strings of vowels into segments to aid articulation, as 33% of the sampled population hetero-syllabified the word *wire* before inserting the palatal approximant, which served as the onset for the second syllable. The percentage distribution for respondents that resolved vowel hiatus by inserting the VPA in four (4) words treated so far is presented in Figure 5.

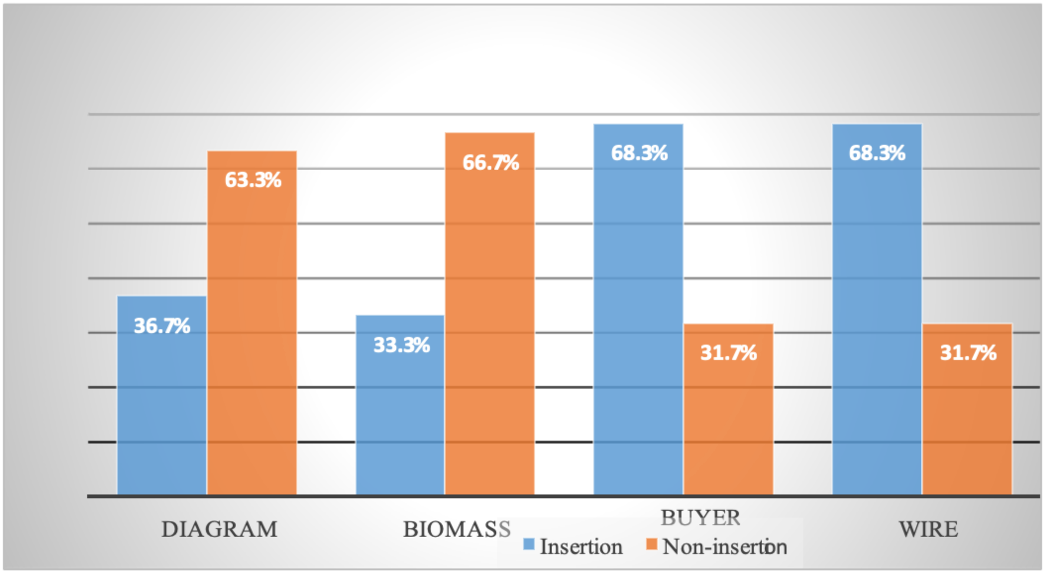


FIGURE 5. Bar Chart Showing the Percentage Distribution of VPA Insertion and Non-insertion

Figure 5 consists of four (4) words distributed into four (4) categories; each category comprises two bars, representing the handling of the words by 60 participants. The blue-colored bar represents the percentage of the sampled population that inserted the VPA, while the red-coloured bar represents the percentage of those that did not insert.

With the results in Figure 5, it can be argued that the participants inserted the palatal approximant between vowels that occur adjacently. This insertion is recorded more in disyllabic words than in polysyllabic words, as revealed by the high percentage recorded for the disyllabic words *buyer* and *wire* compared to the insertions in the polysyllabic words *diagram* and *biomass*. See Figure 6 for a summary of the results for the four words.

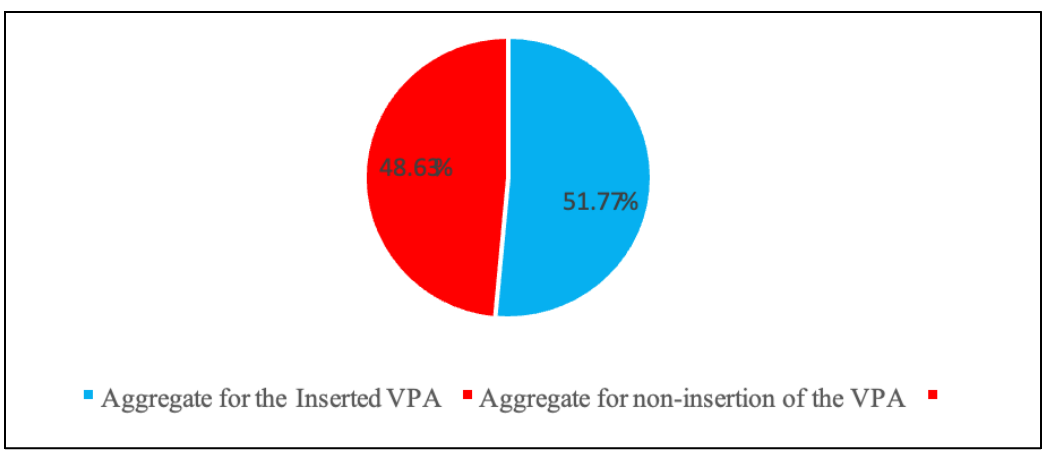


FIGURE 6. Pie Chart Showing the Percentage Distribution of VPA Insertion and Non-insertion in words by the participants

Figure 6 reveals that 51.77% of 240 words had the palatal approximant inserted to resolve hiatuses, while 48.63% did not show any insertion. This indicates that many participants use the palatal approximant as a hiatus resolution strategy. The bilabial approximant is another consonant inserted between V1+V2 sequences as a hiatus-breaking strategy. The spectral slice for the repair strategy of the word *Jewish* involves epenthesis by 24 participants.

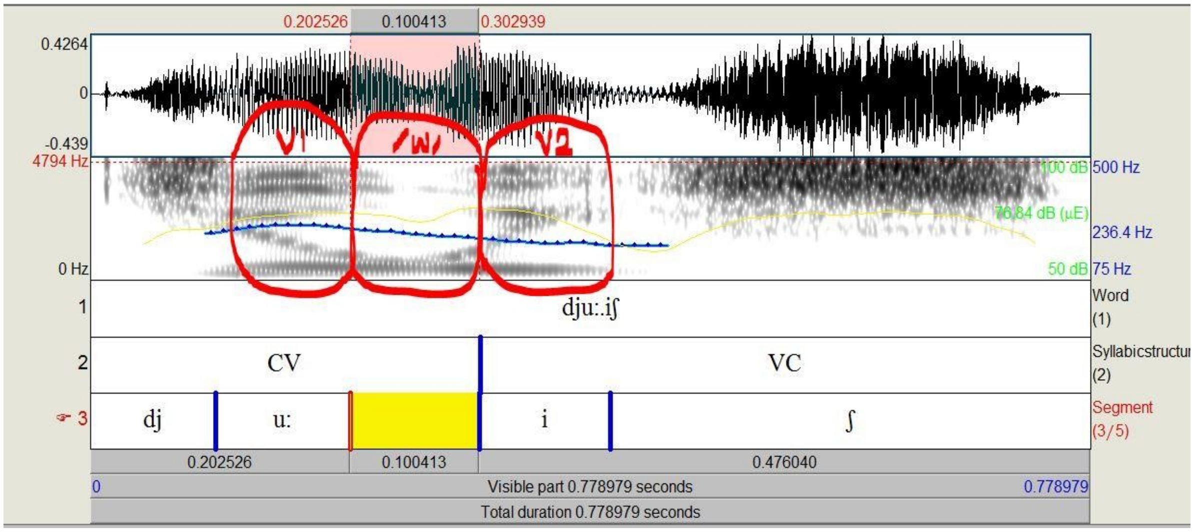


FIGURE 7. Representative Praat Picture showing V1 and the VBA for *Jewish*

From the spectral slide above, the circle at the middle region with the label /w/, which indicates the inserted consonant, is broadly faded. In contrast, the first circled region, V1, is darker than the middle region. See the acoustic values in Table 8.

TABLE 8. Acoustic Values for the V1 and the VBA for the Word *Jewish*

Acoustic properties	V1	Inserted VBA	Difference in Value
Intensity	76.9dB	75.9dB	1dB
Pitch	117.4Hz	167.0Hz.	50Hz
Duration	6ms	7ms	1ms

Table 8 showed that the respondents inserted the bilabial approximant within the word with a mean intensity of 75.9dB, 1dB less than the V1, as the V1 recorded a mean intensity of 76.9 dB. This implied that the V1 was articulated with higher force than the VBA. The pitch frequency for the VBA is calculated at a mean value of 167.0Hz, which is 50Hz less than the V1, as the V1 recorded 117.4Hz. This means the VBA was articulated with a higher tone than the V1. For the timing, the VBA was articulated at 1 ms longer than the V1 as the VBA recorded a mean value of 7 ms against the V1, which recorded 6 ms. Below is the OT account.

Subject 5: /dju:ɪʃ/
Keyword
*VV: Prohibits two vowels occurring in the adjacency

Candidate	*VV	DEP-IO	IDENT-LENGTH
(a) / dju: ɪʃ/	!*		
(b) ☞ /dju.wi ʃ/		*	*

Constraint Ranking: *VV >> DEP-IO>> IDENT-LENGHT
Optimal Candidate: (a) /dju:wiʃ/

The constraint ranking for Subject 5 above goes thus: *VV ranks higher than DEP-IO and IDENT-LENGTH. This means that violating *VV incurs a fatal violation. Candidate (a) satisfies. DEP-IO and IDENT-LENGHT, yet it loses out because it violates the higher ranked *VV constraint. Candidate (b) violates DEP-IO and IDENT-LENGHT, yet it emerges as the optimal candidate because it satisfies the higher-ranked *VV. It is expedient for candidate (b) to violate DEP-IO and IDENT-LENGHT to repair the clustered vowels. The interaction of constraints, as shown above, brings to bear the phonological structure internalised in the participants' minds where vowel-vowel sequence is prohibited. Candidate (b) describes the pattern that defines the handling of vowel clusters in EIE. The optimal candidate above is the actual realisation attained by the participants. Another instance of the adoption of the insertion of bilabial approximant, /w/, as a repair strategy to break a vowel-vowel sequence is seen in the articulation of the word *hour* extracted from the data. Find the acoustic evidence in Figure 8:

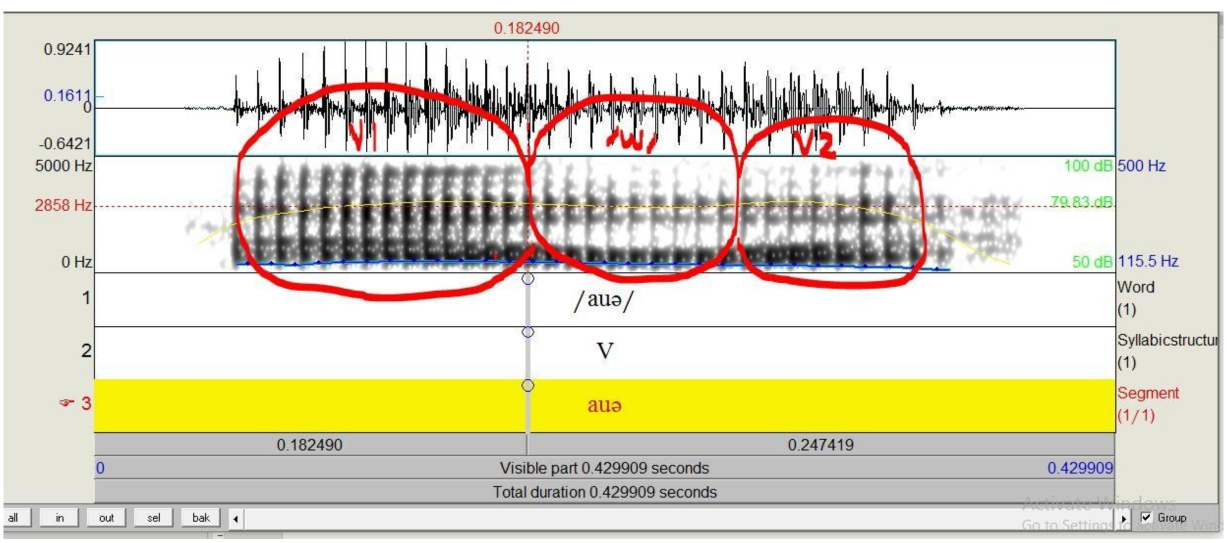


FIGURE 8. Representative Praat Picture Showing V1 and the VBA for *Hour*

From Figure 8, it is evident that the segment of the spectrogram designated by /w/ is less dense than the V1, which suggests the presence of a consonant to interrupt a vowel-vowel sequence. The acoustic values are provided in Table 10.

TABLE 10. Acoustic Values for the V1 and the VBA for *the hour*

Acoustic properties	V1	Inserted VBA	Differences in Value
Intensity	79.8dB	77.2dB	2.6dB
Pitch	114.6Hz	142.5Hz.	27.9Hz
Duration	9ms	8ms	1ms

Table 10 presents the mean values for the acoustic properties of the V1 and the VBA in the word *hour*. Eighteen 18 (30%) of the respondents inserted the bilabial approximant with a mean value of 77.2dB, 2.6dB less than the V1 that recorded an average of 79.8dB. It is evident, therefore, that the respondents articulated the V1 with more force than the VBA, while for the pitch frequency, the VBA recorded a mean value of 142.5Hz, which is 27.9Hz higher than the V1, which recorded an average of 114.6Hz. The V1 was articulated for timing with a mean value of 9ms, while the inserted VBA recorded an average of 8ms. This showed that the V1 was articulated longer than the inserted VBA with a difference of 1 ms. Comparable results were obtained for articulating the word *power*, where 18 respondents inserted the VBA with a mean intensity of 78.0dB, which is 1.9dB higher than the VBA, which was articulated with a mean intensity of 76.1dB. At the same time, the pitch for the V1 was recorded higher than the VBA with a difference of 8. 9Hz.There is no significant difference in pitch for the V1 and the VBA. The two segments were articulated at the same time, 7ms, as both monophthongs. Figure 9 shows the percentage distribution of VBA insertion and non-insertions for the words Jewish, hour, and *power* by 60 participants.

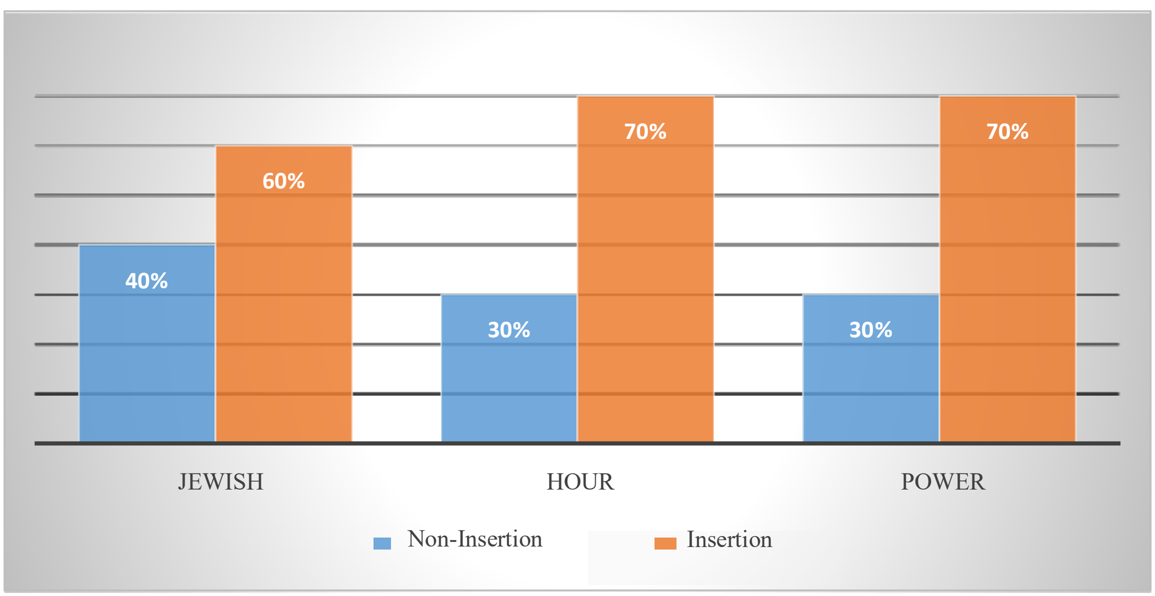


FIGURE 9. Distribution of VBA insertion and non-insertion

For *Jewish*, 40% of the respondents did not insert the VBA as indicated by the blue bar, while 60% inserted it. The word *hour* has 30% of the respondents as those who did not insert the VBA, while (42)70% did. *Power* has 30% of the respondents as those who did not insert the VBA, while 70% did. Figure 9 shows the percentage of insertions for 180 words tested for the VPA. Out of the 240 words read, the VBA was inserted in 120, while the remaining 60 words did not record insertion. This result showed that EISE resolves vowel clusters through the epenthesis of a palatal approximant.

VOWEL ELISION

The second primary strategy adopted by the participants to resolve hiatus is vowel elision. The OT analysis revealed that EISE prohibits hiatus, as the markedness constraints ONSET[WM], *VV, and INS(C) ranked higher than DEP-IO, while PARSE[PF] ranked higher than MAX-IO. As such, the respondents responded to vowel elision as a coping strategy. This second strategy, which is the elision of the V2 when the V1 is [+wide] and the V2 [-wide], is consonance with Casali's (1996) claim that prominent vowels are preserved. Consonant epenthesis and vowel elision were not used arbitrarily, as the choices of the consonant to insert and the vowel to delete depended on the features of the initial vowels in the sequence. According to Casali (1996), it is common for a single language to manifest V1 elision in some contexts and V2 elision in others. The choice of the vowel to be elided is not random but is subject to certain phonological restrictions. In some contexts, the choice is universally determined. In other environments, this type of elision is possible. He argues further that in these environments, the type of elision manifested in each language is determined by the ranking of certain constraints obtained in that language. The acoustic analysis reveals that the V2 is targeted for elision for the participants studied as it occurs in a less prominent position. Below is spectral evidence for the word *hiatus*:

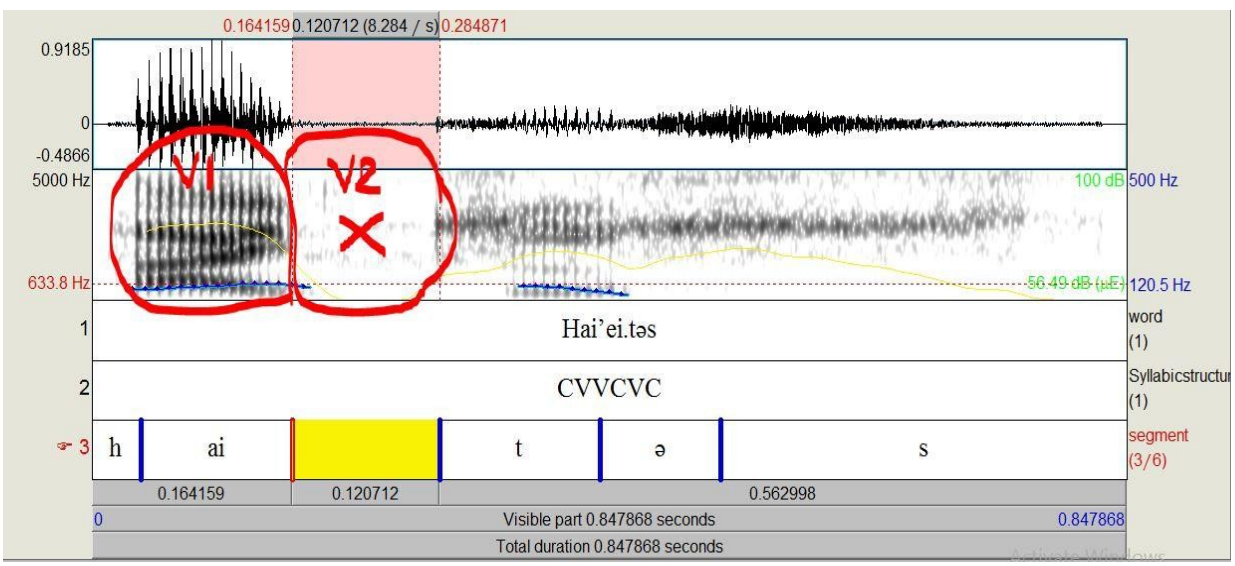


FIGURE 10. Representative Praat Picture Showing Elision of V2 in *Hiatus*

For the articulation of the word *hiatus*, 12 (20%) of the respondents elided the V2 and retained the V1. The retained V1 was realised with an average intensity of 75.1. The portion labelled V2 and marked with an X indicates the region the V2 was supposed to occupy, which is replaced with a short pause. Figure 10 shows that for the respondents, the rightmost vowel two is elided, which negates Slocum's (2010) finding that vowel deletion in the context of hiatus in the Georgian language targets low vowels regardless of their position. The choice of the vowel to be elided at a time is not random; instead, it is conditioned by certain phonological restrictions. Consider the OT account:

Subject 6:/hai'ei.təs/
INPUT:/hai'ei.təs/ ⟶ OUTPUT:/hai.tus/

Candidate	PARSE^{PF}	MAX-IO
(a) /hai'ei.təs/	! *	
☞ (b) /'hai.tus/		*

Constraint Ranking: PARSE^{PF} >> MAX-IO
Optimal Candidate: (b) /hai.tus/

To enable elision, it is necessary to violate MAX-IO, as this ensures that the input segments are not over-represented in the output. The tableau for Subject 6 illustrates this principle, where the best candidate, (b), elides V2, which violates MAX-IO but satisfies PARSEPF by preserving the most prominent feature. Vowel elision is not exclusive to V2 and depends on the language's phonological configuration, as Casali (1996) noted that elision is position-sensitive. Although previous studies (e.g., Lin, 2008) indicate that deletion only occurs when adjacent vowels are identical, in this case, deletion of V2 occurs when V1 is [+wide] and V2 is [-wide]. In 15 cases, respondents elided V1 while preserving V2, as V1 satisfied a higher-ranked constraint PARSEPF. Figure 11 provides acoustic evidence.

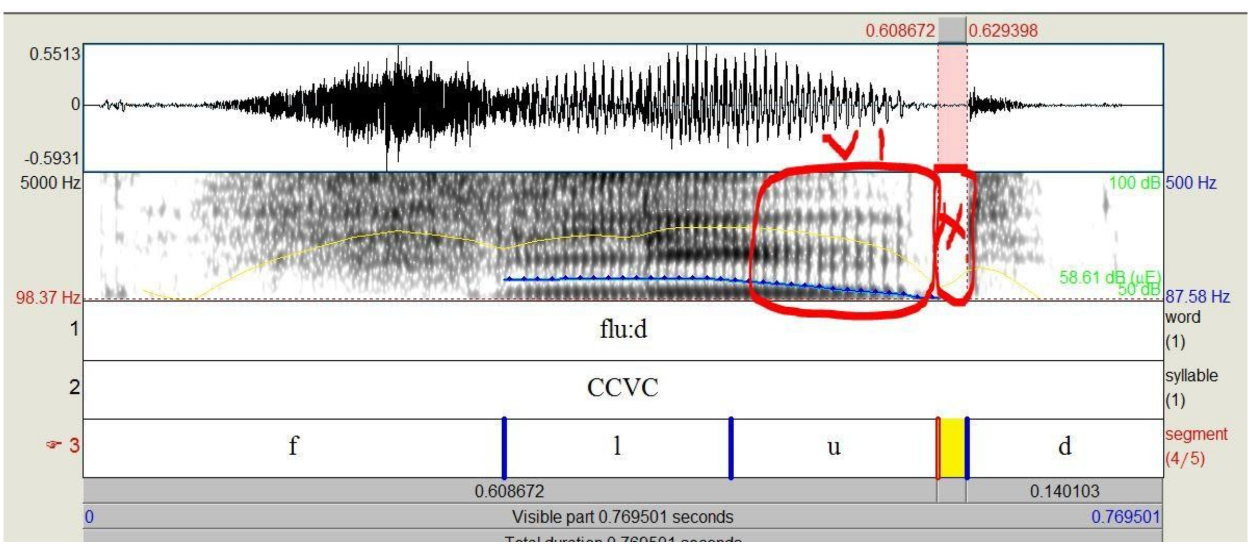


FIGURE 11. Representative praat picture showing Elision of (V2) for *fluid*

The spectrogram in Figure 11 indicates the V1 segment with a wider circle, which suggests that it was retained and had an average duration of 12ms, which is longer than usual. The short pause before the final phoneme /d/ is also visible on the spectrogram. This short silence acts as a place filler, occupying the position where V2 was supposed to be. The choice of the two adjacent vowels to be elided is determined by the constraint form that carries out the elision. See the OT account below:

Subject 7: flu:.id
INPUT:/flu:.id/ ⟶ OUTPUT:/flu: d/

Candidate	PARSE^{PF}	*MAX-IO	ALIGN-LEFT
(a) /flu:id/	*!		*
☞ (b) / flu:d/		*	

Constraint Ranking: PARSE^{PF} >> *MAX>>ALIGN-LEFT
Optimal Candidate: flu:d

The ranking above revealed that elision at the boundary between syllables targets V2 for the participants, as illustrated by the tableau above. The symbol indicates the output form for the participants ☞. From the interaction above, candidate (b) satisfies the higher-ranked constraint PARSE^{PF,} which prefers prominent features, which is why the V1 is retained since it occurred at the initial position and carries the primary stress. The V2 is knocked out as it occurs in a less prominent position and an unstressed syllable. This means that elision by the respondents may be stress sensitive. The alignment constraint, ALIGN-LEFT, prefers elements in leftmost positions no matter their quality or quantity; hence, the element occurring rightmost had to be knocked out even though it has the features [+front] and [+high]. Candidate (b) satisfies the constraint ALIGN-LEFT, which guarantees its stay even though it violates MAX-IO; violating MAX-IO is expedient for elision to occur. Candidate (a) satisfies MAX-IO but is still disqualified as MAX-IO is a lower-ranked constraint for the participants.

The interaction of Constraints PARSE^{PF}, MAX-IO, and ALIGN-LEFT for Subject 7 reveals the surface realisation of the word *hiatus* by speakers previously exposed to the SBE. This means speakers exposed to the SBE have its form in their cognitive domain but articulated forms that satisfy PARSE^{PF} and ALIGN-LEFT constraints at the surface level. The statistical report shows that out of the 240 words tested for the presence of the VPA, 51.7% had the voiced palatal approximant inserted. At the same time, 48.6% of the words did not record insertion. Again, 80% of 180 words that were tested for the VBA had the bilabial approximant inserted, while 20% of the words did not record insertion. Vowel elision pertained to only 12 (20%) of the respondents. It can, therefore, be concluded that consonant insertion is the primary hiatus resolution strategy adopted by the speakers of this variety of English, while vowel elision is a secondary strategy.

CONCLUSION

This research aimed to discuss hiatus and the various strategies adopted by educated Ika speakers of English in resolving hiatus in word lists and connected speech. The results from the perceptual and acoustic analysis carried out revealed that hiatus is prohibited in this accent of Nigerian English, and the strategies adopted by the speakers share certain similarities with the strategies identified in previous studies (Etakwa & Mukhwana, 2018; Lin, 2008), albeit there were contextual and operational differences. The OT analysis revealed that hiatus is prohibited in educated Ika English as the markedness constraints ONSET^{WM}, *VV, and INS(C) ranked higher than DEP-IO, while PARSE^{PF} ranked higher than MAX-IO (Kwambehar, 2014; Mabugu et al., 2019).

The study revealed that this accent of Nigerian English does not tolerate vowel clusters within syllables and at the boundary between syllables, word medially. Hence, speakers of this variety of Nigerian English resolved vowel-vowel sequence by adopting two strategies: Firstly, when the V1 has the features [-rounded] and [+back], the voiced palatal approximant (VPA) is inserted between the V1 and the V2, while the voiced bilabial approximant (VBA) is inserted when the V1 has the features [+rounded] and [-back]. It was also observed that long initial vowels were shortened in a word like *Jewish* to aid the phonological insertion process. The second strategy is the elision of the V2 when the V1 is [+wide] and the V2 [-wide]. This aligns with Casali's (1996) claim that prominent vowels are preserved. Consonant epenthesis and vowel elision were not arbitrarily handled, as the choices of the consonant to insert and the vowel to delete depended on the features of the initial vowels in the sequence (Razinejad, 2019; Uzun, 2021). It was also discovered from the acoustic analysis that the portions of the spectrogram between the V1 and the V2 were faded. The fading indicates the presence of an approximant, as approximants have shared features with vowels, except that approximants are [vocalic]. Furthermore, the fading on the spectrogram results from the partial constriction the approximants undergo in the oral cavity during production, which reduces their quality but still retains their voicing.

Similarly, we also observed that for onset-less syllables at word medial positions that have just the V structure, the speakers generated an onset (a glide) for such open syllables that function as C for the V to satisfy the INS(C) requirement, as a result of which a word like /bai.əu.mas/ in SBE becomes /ba.jo.mas/ in EISE. This discovery is a radical departure from Davidson and Erker's (2014) finding, as their acoustic analyses provided no evidence of glide insertion. According to them, AmE tolerates hiatus in a word medial position, meaning DEP-IO outranks ONSET^{WM} in AmE. Secondly, AmE resolves hiatus by glottal stop insertion and creaky voice, not glide insertion. Glide insertion formed 90% of the strategies identified in this current study. Therefore, glide insertion is the primary strategy adopted, while elision, which formed 10 per cent, is the secondary strategy. The study concludes, therefore, that the handling of hiatus by these participants is a further pointer to the variation that characterises this accent of Nigerian English.

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