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| RESEARCH ARTICLE

Acoustic Correlates of Stress Patterns in Phrases and Compounds in the Sub-varieties of Educated Nigerian English

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| ABSTRACT
Although scholarly attention has been drawn to the stress correlates of the sub-varieties of Educated Nigerian English (ENigE) without a conclusion on modes of determining stress patterns in the varieties, therefore, the current study provides insights into the stress correlates in the sub-variety. Two regional sub-varieties of ENigE, namely: Educated Yoruba English (EYE) and Educated Igbo English (EIE), are compared to describe the correlates of the stress of ENigE. Data were collected from twenty (20) university degree graduates (ten men and ten women). The participants have Igbo and Yoruba as their first languages (L1), satisfying Udofot's 2004 classification for an educated variety of NigE. The participants read the prepared phrases and compounds to acoustic cues for stress placement in educated NigE. Acoustic signals such as pitch, intensity and duration are employed. The thresholds of significant difference are set at $p<.05$. This allows me to explore the interactions between YE, IE, and the control (British English). Findings show that pitch (F0) serves as the main cue for stress correlates in the sub-varieties. The results further reveal that 80% of the participants operated British English stress pattern in isolated words. It suggests that the cues for stress placement vary in the varieties by region and gender where English functions as a second language. However, duration and intensity as acoustic parameters are insufficient to predict stress correlates in the sub-varieties of the ENigE understudy. The study as well discovers fundamental frequencies as stress correlates in the sub-varieties.

| KEYWORDS

Stress correlate, Educated Nigerian English, compounds, phrases

| ARTICLE INFORMATION

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1. Introduction

In an attempt to describe the English situation in Nigeria, studies have shown that the English accents in Nigeria, as in other parts of the world, are more diverse than homogeneous, particularly given Nigeria's multi-ethnic makeup (Jolayemi, 2006; Oyebola, 2020). Due to this, opinions on the English accent in Nigeria vary based on speech communities and ethnic groups. Some of this research has thoroughly examined the wide range of dialects that define Nigerian English and has come to the conclusion that the accent of NigE is more regional and ethnic (see Jolayemi, 2008a; Awonusi & Babalola, 2004; Jowitt, 2000; Jowitt, 1991; Jibril, 1982; Ubahakwe, 1979). Furthermore, it shows that speakers of English in Nigeria have different, varied, and unique speech accents that differentiate one region of speakers from another (Gut, 2005). However, since this has not been sufficiently explored in any of these experiments between Igbo and Yoruba English speakers, it is necessary to examine the accents that uniquely distinguish each site to provide scientific evidence rather than just auditory experience. The current situation, education levels, and some research (Udofot 2007, 2004, 2003) all impact Nigerian English accents. Other scholars have, however, developed this notion and asserted that the status quo and language exposure as variables substantially impact the accent of the typical Nigerian (Awonusi, 1986). According to some studies (Brosnahan, 1958; Banjo, 1971; Jibril, 1982; Jolayemi, 2006; and Udofot 2007, 2004, 2003), the status quo and education levels are related to Nigerian English accents. However, other researchers have expanded on this idea by claiming that the status quo and language exposure as variables significantly impact the accent of the typical Nigerian (Awonusi, 1986).

In a quest to describe accents of NigE, studies like Kujore 1985; Atoye, 1991; Sunday, 2011; Bobda, 2013, 2007, 1997; Anyagwa, 2014; Gut, 2008; Sunday & Oyatokun, 2016; Atoye 2005; Melefa & Amoniyan, 2019) have described several patterns that characterize NigE in either isolated or connected speeches. Sunday and Oyatokun (2016), in particular, submit that NigE is not absolute. Melefa and Amoniyan further describe that Igbo speakers assign stress that satisfies left and right rules without paying attention to words with prefixes and suffixes. Conversely, Akinjobi's study (2006) establishes that vowels that surface in unaccented syllables in English remain strong and full by educated Yoruba English without vowel reduction. The study is close to the current investigation, though her research does not compare Yoruba speakers with other NigE. Studies examining whether phonetic properties determine stress patterns in words, phrases and compounds among Igbo and Yoruba speakers need more scholarly enquiry to supplement the existing investigations. The acoustic cues such as pitch heights, vowel lengths, and intensity have not been adequately investigated as stress correlates in earlier research. Therefore, the present study investigates and identifies stress correlates of phrases and compounds in ENigE and shows gender and regional differences as attempts to describe stress correlates of phrases and compounds that characterize the sub-varieties.

1.1 Research Objectives

The present study aims to provide insight into the acoustic features that determine stress patterns among educated Igbo and Yoruba speakers of English. By this, the study explores the relationship between the dependent (Igbo and Yoruba) and independent (native) variables for stress patterns of compounds and phrases.

1.2 Research Questions

The study shall provide answers to the following questions. The primary question: what are the stress correlates of sub-varieties of Nigerian English in phrases and compounds? The question will be further considered as follows:

i. To test the significant difference between IE and YE,
ii. To test the significant difference between ENigE (represented by IE and YE) and BrE; and
iii. To test the significant difference between female and male ENigE (Gender variable).

2. Literature Review

According to studies, Nigerians' distinct accents explain why the stress patterns that distinguish NigE from British English (BrE) differ (cf. Atechi, 2015; Kujore, 1985; Atoye, 1991; Jowitt, 1991; Schmied, 1991; Udofot, 2007, 2004, 2003; Bobda, 2013, 2007, 1997; Bobda, Saxena & Omoniyi, 2010; Anyagwa, 2014; Gut, 2008; Sunday & Oyatokun, 2016; Melefa & Amoniyan, 2019; Oyebola 2020). The investigations have explained the significant roles indigenous languages play in NigE, making NigE vary from BrE in stress placement. The features that differentiate NigE from RP include a lack of frequent stress alternations and the peculiarity of stress alignment as L-H-R or R-H-R in NigE. The features result in the distinctiveness of stress patterns in NigE. For instance, Amoniyan (2019) finds that Igbo speakers of English fluctuate between Left-Head-Rule and Right-Head-Rule, while educated Yoruba speakers of English frequently have stress patterns that satisfy the Left-Head-Rule. Jolayemi (2006) also found a similar heterogeneity of stress patterns among the Hausa Speakers of English (HSE), Igbo Speakers of English (ISE), and Yoruba Speakers of English (YSE).

In addition, Akinjobi (2004) inspects vowel weakening and unstressed syllable obscuration in educated Yoruba English (EYE). Akinjobi finds that the schwa vowel of SBE was rendered as a strong vowel in 97.1% and 82.2% of cases in polysyllabic and disyllabic items for the study. Similarly, 86% and 82.2% of occurrences rendered the weak sound as a strong vowel. For the content words, 83% of the respondents appropriately uttered strong vowels in the stressed syllables, while 72.8% inappropriately used strong vowels in the syllables that should have /ə/ as their peaks. She, therefore, asserts that a major deviation from Received Pronunciation usage by educated Yoruba speakers of English is in the realization of vowels and syllables that occur in unstressed positions, that is, the use of the strong forms rather than the weak of the tested grammatical items. The study reveals that educated Yoruba speakers of English rarely articulate the schwa sound, though such a study has not received attention in EIE. This gap makes the present research relevant to examining vowel duration and other correlates of stress patterns in educated Igbo and Yoruba English Accents (EI&YEA).

As a follow-up to the discussion of vowels in educated Yoruba English, Akinjobi (2006) examines how EYE speakers produce vowels. The study intends to find out if or not vowels in unstressed syllables of English words whose suffixes require a shift of stress and a consequent reduction of vowels. She employed twenty (20) suffixed English word-pairs that were read by a hundred educated Yoruba participants, while their productions were compared to those of a Briton, who served as control. The findings reveal that EYE speakers do not reduce vowels. They either pronounce the supposedly reduced vowels almost equal in duration to the strong vowels, showing no weak vowel in Yoruba English. For instance, the study reports that most participants produced strong full vowels in the syllables, unlike in British English which has weak and strong vowels. However, reducing a vowel leads to a stress shift, as reported in her study. The result attests that Yoruba English varies from British English in vowel duration and variability, especially in weakening sounds.

Similarly, a study by Ko (2021) further demonstrates that vowel duration before voiced and voiceless consonants vary among undergraduate students of Brown University. The results show that the duration that precedes voiceless double the original vowel duration pattern. The study fails to explore vowel duration with the speech rate of the participants. The study submits that vowels before voiced consonants are elastic and are determined by other segments. The study and others have, however, lent their voices to describe the variability of duration in segments (see Eon-Suk Ko, 2021; Pépiot & Arnold, 2021; Seidl, Cristia, Soderstrom, Ko, Abel, Kellerman, Schwichtenberg, 2018; Ko, Seidl, Cristia, Reinchen & Soderstrom, 2016; Pépiot, 2017, 2015).

The study by Akinjobi (2006) explains the difference between vowel duration in the root and suffixed English words in YE. The study identifies how vowel reduction determines stress in BrE but was limited in approach to stress (shift) in Yoruba English. The current study aims to identify a correlation between stress patterns and acoustic correlates: vowel duration, pitch and intensity in phrases and compounds of ENigE. It explores the stress correlation of compounds and phrases. The review of Akinjobi (2004 & 2006) has shown that though studies have discussed vowel and durational variability in EYE, the current study explores whether duration, pitch, intensity and vowel heights are determinants of stress correlates in the sub-varieties. If otherwise, what is the primary cue for stress correlate in the sub-varieties? However, though these studies have tried to describe the stress patterns that characterize NigE, none of the studies has tried to explain the duration, pitch, and loudness, which the present study intends to find out. The study will contribute to the ongoing description of the sub-varieties of NigE.

3. Methodology

The information for this investigation was recorded using a tape recorder. After securing their consent, a total of twenty (20) participants read a specifically created text that had ten lexical elements, including open and closed compounds. The participants were educated Igbo and Yoruba English speakers selected from the southeastern and southwestern parts of Nigeria. The material was read aloud by a total of ten male and ten female participants, ages 18 to 45, who are from the south-eastern states of Abia, Anambra, Enugu, Ebonyi, and Imo and the south-western states of Ogun, Oyo, Ondo, Lagos, and Osun, respectively. These participants were undergraduate and graduate students chosen randomly from two universities in Nigeria: the University of Nigeria in Nsukka for Igbos and the University of Ibadan for Yorubas that speak English. The selection of these participants from these two representative institutions is deemed acceptable since these two universities are well-known in the two areas of the nation and serve as centres where these essential participants are conveniently accessible. Participants had easy access to the universities if they had no long-term travel plans outside their home regions. The selected respondents met the criteria for an educated version of Nigerian English as defined by Banjo (1971) and Udofot (2003, 2004, and 2007). That said, the University of Nigeria, Nsukka's Faculty of Arts Research Ethics Committee approved these respondents. The acoustics and statistics of the voice recordings were processed and analyzed to calculate the frequency of tokens and descriptive statistics of simple and inferential statistics in SPSS. Chi-square was then used to determine whether there was a significant difference between the phrasal/compound stress patterns of educated Igbo English speakers and educated Yoruba speakers of English at 0.05 ($p \leq .05$). The researcher annotated and aligned audio files on Praat. Vowels of high and low syllables for phrases and compounds were marked for differentiation in the output. The sampling frequency for the recording was 44,100Hz to capture high and low acoustic features. Praat (Boersma & Weenink, 2017) was used for sound file processing and acoustic analysis. For the acoustic analysis, acoustic correlates of stress, pitch (F0), intensity (dB) and duration (ms) were manually set on Praat to determine which syllables of the tested compounds were assigned stress by the participants. Tokens for the study include compounds and phrases such as *meal time, back fire, proof read, foul play, bush meat, half way, has taken, pass book, put up, and very fast*. These tokens have twenty-one (21) syllables (that is, 20 respondents rendered 21 syllables to make up 420 syllables), which range from CVC, VC, and CCV structures (respectively). Using Praat 6.1, four acoustic correlates of stress, namely: intensity (70-100dB), pitch (100-280Hz), duration, and formants to investigate vowel quality as a correlate for stress assignment were explored to examine stress correlate of phrases and compounds in sub-varieties of ENigE.

4.0 Data Analysis and Interpretation

4.1 Data Presentation

Table 4.1.1 shows the distribution of the stress patterns in Igbo English (IE), Yoruba English (YE), and their closeness to British English (BrE).

Tokens	Igbo English (%)	Yoruba English (%)	Closeness to BrE (%)
ˈMeal time	**90**	**93.3**	**91.65**
meal ˈTime	6.7	3.3	0
ˈMeal ˈTime	3.3	3.3	0
ˈBack fire	26.7	40	0
back ˈFire	**66.7**	**60**	**63.35**
ˈBack ˈFire	6.7	0	0
proof ˈRead	**53.3**	**70**	**61.65**

'Proof read	40	26.7	0
'Proof 'Read	6.7	3.3	0
'Foul play	**73.3**	**93.3**	**83.3**
foul 'play	13.3	6.7	0
'Foul 'Play	13.3	0	0
'Bush meat	**83.3**	**96.7**	**90**
bush 'Meat	16.3	0	0
'Bush 'Meat	0	3.3	0
'Half way	100	83.3	91.65
half 'way	0	10	0
'Half 'Way	0	6.7	0
'Has taken	23.3	23.3	0
has 'taken	**70**	**70**	**70**
'Has 'Taken	6.7	6.7	0
'Very fast	**93.3**	**86.7**	**90**
very 'Fast	6.7	10	0
'Very 'Fast	0	3.3	0

Table 4.1.1 Stress pattern representation of speakers in varieties of ENigE

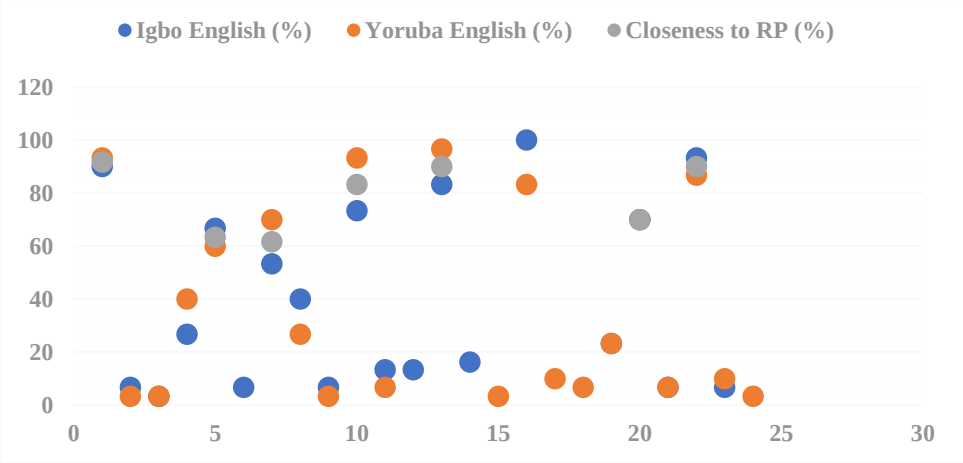

Figure 4.1.2: Scatter plot for Table 4.1.1

The results showcase the similarity between Nigerian English and British. Furthermore, the overlapping identifies the degree of closeness of a variety to another while otherwise describing differences between BrE and the ENigE (see Fig. 4.1.2). The regression analysis between IE and YE shows a significant relationship of the p-value (6.69e-14***) with less variance in data points with 10.27 (Residual Standard error). However, there is no significant difference, as the p-value shows 0.924 (p-value > 0.05) at the level of the intercept (see Figure 4.1.3).

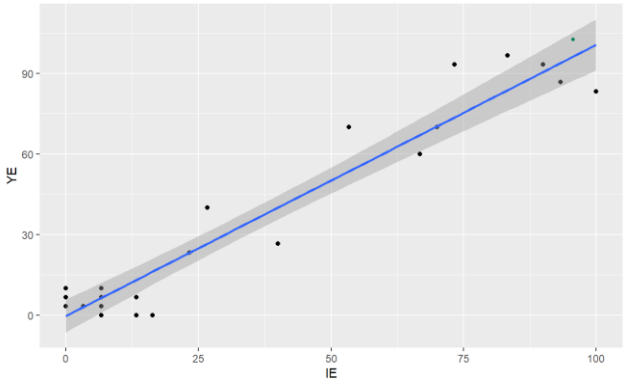

Figure 4.1.3: regression line for IE and YE

Analysis of variance among the three variables (IE, YE and BrE) show a significant difference with the p-value of 0.0372 on the significant level of 0.05 (p-value <.05). It suggests a significant difference between IE and YE and between the dependent (IE and YE) and independent (native) variables.

4.2 Discussions

The difference in the vocal tract between men and women is characterised by a difference in amplitude and pitch. Table 4.2 supports the assertion by revealing the intensity variance between men and women participants. The results establish that the amplitude values for men and women only differ between the groups but are similar within each gender construct. Table 4.2 shows evidence that men and women have an intensity variance between 75dB and 80dB (for men) and 70dB to 80dB (for women) for stressed/accented phrases and compounds. It suggests that men and women respondents have a minimum intensity range that categorises the gender. The difference in amplitude by gender seems consistent with previous research on bioacoustics (Davidson, 2020, Pépiot, 2017, 2015a, 2015b).

Table 4.2: Intensity values for respondents of ENigE

Men			**Women**		
Intensity values	**Igbo**	**Yoruba**	**Intensity values**	**Igbo**	**Yoruba**
70-74dB	30%	25%	65-69dB	5%	20%
75-80dB	70%	75%	70-74dB	45%	70%
Total	100	100	75-80dB	50%	10%
			Total	100	100

The anatomy-acoustic implication of this 5% and 20% (for 65-69dB) observation is that the female participants have the natural tendency to hasten the abduction and adduction rates of their vocal folds (Table 4.2). However, few of them (5% Igbo and 20% Yoruba) have the nature as discovered in the study. In addition to that, results attest that the Nigerians who are Yoruba women (a sub-variety of ENigE) respondents demonstrate a characteristic feature of speech modulation as 20% and 10% have an intensity range between 65dB and 69dB with a 75-80dB, but 70% of the Yoruba female respondents have speech modulation that ranges between 70dB and 74dB. That is, unlike the Nigerians who are Igbo females (a sub-variety of ENig,E), respondents have a 5% low-intensity range of 65dB and 69dB; 45% and 50% have 70-74dB and 75-80dB ranges, respectively. The results affirm that Igbo female respondents have higher speech modulation than Yoruba female respondents, whereas, for male respondents, there is a similarity in speech intensity values between Igbo and Yoruba respondents. Towards the description of the varieties of NigE, it is discovered that the respondents have similar amplitude cues that are gender biased than the regional difference for phrases and compounds.

Also, pitch distinguishes between stressed and unstressed syllables and shows that Yoruba men have similar pitch values to their Igbo counterparts, though not without a difference. For example, Table 4.3 (below) reveals that Igbo male respondents have pitch heights from 121Hz to 180Hz for stressed or accented syllables in phrases and compounds, differentiating the stressed syllables from unstressed syllables in phrases and compounds. The outcomes show that 75% of Igbo male respondents have pitch heights of 121–180Hz, respectively. It is implied that the minimum average pitch height for stressed syllables in the ENigE range is between 121Hz and 180Hz, whereas, for unstressed phrases and compounds, F0 drops to below 121Hz (I often consider F0 of high and low for the analysis rather the generalization because of physiological features). For example, 91.65% of the respondents that assign prominence to *meal* in *meal time* have pitch values that range between 100Hz and 180Hz, compared to 13.3% of the respondents whose pitch features are lower than 100Hz. Similar results feature in *foul play, bush meat, half way, has taken* and *very fast* (see Table 4.1).

Table 4.3: Pitch range for Igbo and Yoruba respondents

Male (IE & YE)			**Female (IE & YE)**		
Pitch values	**IE**	**YE**	**Pitch values**	**IE**	**YE**
100-120Hz	25	15	141-200Hz	45	10
121-140Hz	30	50	181-200Hz	25	50
141-180Hz	45	35	201-260Hz	30	40
Total	100	100	Total	100	100

It is revealed that Yoruba men respondents do not have an average F0 height of 161Hz and above, whereas Igbo male respondents do. Results explain that 85% of every Yoruba men respondent has a pitch range between 121Hz and 160Hz for stressed/accented syllables in phrases and compounds. Moreover, Table 4.3 shows that female pitch heights vary compared to male respondents. For instance, when the male respondents have a minimum and maximum of 100 Hz and 180 Hz, the female respondents have 141 Hz and 260 Hz, respectively. Table 4.3 describes that the Igbo female respondents have higher pitch accents than the Yoruba female respondents by 20Hz. Specifically, when the highest pitch for Yoruba speakers was 160Hz, Igbo speakers had between 161Hz and 180Hz as their highest pitch range, with a difference of at least 20Hz from Yoruba male speakers. Ten per cent of Yoruba female respondents can relax their vocal tract between 141Hz and 200Hz, but on average, Yoruba female respondents have a pitch range of 181Hz and 240Hz for stressed syllables. From the findings, the Igbo female respondents have a range of 190Hz and 260Hz for accented or stressed syllables or lexical items that comprise prosodic features of phrases and compounds. The study shows that the pitch difference is more noticeable by gender than by region despite the regional varieties. The level of the difference is identified in Table 4.4 (below).

Table 4.4: Correlations between Igbo and Yoruba respondents (resp.) in pitch heights

			Tokens	F0 for Yor. M/Resp.	F0 for Yor. F/ Resp.	F0 for Igbo M/ Resp.	F0 for Igbo F/ Resp.
Spearman Rho	F0 for Yoruba Male Respondents	Correlation Coefficient	-.191	1.000	.636**	.443	.755**
		Sig. (2-tailed)	.421	.	**.003**	**.050**	**.000**
		N	20	20	20	20	20
	F0 for Yoruba Female Respondents	Correlation Coefficient	-.245	.636**	1.000	.583**	.905**
		Sig. (2-tailed)	.298	**.003**	.	**.007**	**.000**
		N	20	20	20	20	20
	F0 for Igbo Male Respondents	Correlation Coefficient	.028	.443	.583**	1.000	.670**
		Sig. (2-tailed)	.906	**.050**	**.007**	.	**.001**
		N	20	20	20	20	20
	F0 for Igbo Female Respondents	Correlation Coefficient	-.154	.755**	.905**	.670**	1.000
		Sig. (2-tailed)	.516	**.000**	**.000**	**.001**	.
		N	20	20	20	20	20

For instance, the pitch range between Yoruba men and female respondents indicates a significant difference ($p \leq .05$). This shows that men and women Yoruba respondents have a varied pitch range for expressions that serve as data for the study. Similarly, the result authenticates that there is a significant difference between the pitch values of Yoruba and Igbo male respondents as the significant level at $p \leq .05$. The correlation asserts that there is a significant variance between Yoruba men and women respondents at $p \leq .05$. The result is similar between the male respondents for Igbo and Yoruba.

The correlation also reveals a significant difference between Igbo and Yoruba women respondents. It implies that the pitch values of Yoruba and Igbo respondents significantly varied, as either Yoruba women respondents pitched higher than their Igbo counterparts or vice versa. The same significant variance is repeated for Igbo and Yoruba women. This reveals that though Igbo and Yoruba respondents were speakers of English as a second language, the pitch values of these speakers varied. In contrast, there was no significant difference in the pitch range among Yoruba male respondents. Likewise, there is no significant difference in the pitch values of the Igbo men. From the foregoing, it is evident that gender serves as a factor that determines pitch heights in Igbo and Yoruba male and female respondents.

Table 4.5: Correlations between Igbo and Yoruba with a native speaker for pitch heights

		Pitch (F0) for control
F0 for Yoruba men respondents	Pearson Correlation	-.289**
	Sig. (2-tailed)	.216
	Sum of Squares and Cross-products	-11.200
	Covariance	-.589
	N	20
F0 for Yoruba women respondents	Pearson Correlation	-.363
	Sig. (2-tailed)	.116
	Sum of Squares and Cross-products	-21.200
	Covariance	-1.116
	N	20
F0 for Igbo men respondents	Pearson Correlation	-.269**
	Sig. (2-tailed)	.251
	Sum of Squares and Cross-products	-15.600
	Covariance	-.821
	N	20
Pitch for Educated Igbo Women respondents	Pearson Correlation	-.467**
	Sig. (2-tailed)	.038
	Sum of Squares and Cross-products	-37.200
	Covariance	-1.958
	N	20

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.5 reveals no significant difference in pitch heights among the respondents for phrases and compounds in isolations. This shows no significant disparity in the pitch values of the control and dependent variable in this context. The result shows a significant variance between the Igbo women's pitch and native speakers. The results describe that 75% of the Igbo and Yoruba respondents have similar pitch heights for stressed and unstressed syllables for lexical items.

Another concern of this study is an investigation of what role the vowel duration plays as a correlate of stress in phrases and compounds among the participants. From the analysis, I notice that duration differentiates long from short vowels. Table 4.6 shows that Igbo and Yoruba male and female respondents have the varied duration for stressed and unstressed vowels in phrases and compounds. For instance, 50% of Igbo and Yoruba female respondents, on average, spend 6–10ms on vowels that have CVC structure for phrases and compounds, while Igbo and Yoruba male respondents have 45% and 60% of respondents.

Table 4.6: Vowel duration for Igbo and Yoruba respondents

Duration	Female		Male	
	Igbo	Yoruba	Igbo	Yoruba
6 – 10ms	50%	50%	45%	60%
11 - 15ms	35%	30%	25%	30%
16 – 20ms	10%	10%	15%	
21 – 30ms	5%	10%	15%	10%
Total	100	100	100	100

From the data, it is evident that average Igbo and Yoruba male and female respondents spend between 6ms and 10ms on vowels like /i:/, /i/, /a/, /ai/, in *meal time, back fire, foul play, put up* which make up phrases and compounds for the data. Specifically, /ai/ in *time* for *meal time* averagely has more duration than /i:/ in *meal* but *meal has a* higher pitch accent than *time*. The results are similar to those of the control variable. It attests that duration is insufficient to determine stress patterns in stress-timed languages (like English). The data reveals that vowels with fricatives (as before) are likely to be prolonged because of the fricative sounds (Ko, 2021). Also, open syllables tend to stretch vowels that surface at the boundary.

Vowel duration for phrases and compounds among the Yoruba women reveals no significant difference between the duration assigned to the first and second lexical items in two-base compounds and phrases (Table 4.7 below). This shows that Yoruba female respondents are unaware of vowel duration for the stressed and unstressed syllables. This explains that vowel duration (alone) does not determine lexical items that bear prominence in sub-varieties (Igbo and Yoruba) of ENigE. It means that a lexical item with a shorter vowel duration may still bear prominence depending on the pitch heights and another acoustic correlate of stress that lexical items bear.

Table 4.7: Correlation of Vowel duration for Yoruba women respondents

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	60.000[a]	57	.368
Likelihood Ratio	46.731	57	.832
Linear-by-Linear Association	6.482	1	.011
N of Valid Cases	20		

Table 4.7 reveals that the correlation coefficient for vowel duration among Yoruba female respondents reveals no significant difference between stressed and unstressed lexical items ($p>0.05$). Similarly, results for vowel duration among Yoruba men respondents show no significant difference (Table 4.8 below).

Table 4.8: Correlation of vowel duration for Yoruba men respondents

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.000[a]	38	.381
Likelihood Ratio	35.918	38	.566
Linear-by-Linear Association	1.333	1	.248
N of Valid Cases	20		

Table 4.8 shows no significant difference in vowel duration between Yoruba female respondents and Yoruba male respondents, as well as with Igbo male respondents, as a significant level for Yoruba male and female respondents reveal 0.024 and 0.009, which are less than the critical value of 0.05. It suggests that Yoruba (women) respondents have varied vowel duration patterns from the Igbo and Yoruba (men) respondents.

Table 4.9: Correlation in vowel duration for Igbo and Yoruba respondents

			Vowel duration for Yoruba Male respondents	Vowel duration Igbo Male respondents
Spearman's rho	**Tokens**	Correlation Coefficient	-.314	-.126**
		Sig. (2-tailed)	.177	.597
		N	20	20
	Vowel duration Yoruba Female respondents	Correlation Coefficient	.503**	.568
		Sig. (2-tailed)	.024	.009
		N	20	20
	Vowel duration Yoruba Male respondents	Correlation Coefficient	1.000	.418*
		Sig. (2-tailed)	.	.067
		N	20	20
	Vowel duration Igbo Male respondents	Correlation Coefficient	.418	1.000**
		Sig. (2-tailed)	.067	.
		N	20	20
	Vowel duration Yoruba Female respondents	Correlation Coefficient	.545	.441*
		Sig. (2-tailed)	.013	.051
		N	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Similarly, the study results describe no significant difference in the vowel duration for phrases and compounds between Igbo and Yoruba men respondents. However, a significant difference is evident in the vowel duration among the Yoruba and Igbo respondents ($p<.05$). In addition to that, vowel duration among the respondents concerning the native speaker reveals significant levels of difference between respondents and the native speaker (Table 4.9 & 4.10).

Table 4.10: Vowel duration patterns for dependent and independent variables

		Vowel duration for Control
Vowel duration for Educated Yoruba Female respondents	Pearson Correlation	-.100*
	Sig. (2-tailed)	.676
	Sum of Squares and Cross-products	-1.800
	Covariance	-.095
	N	20
Vowel duration for Educated Yoruba Male respondents	Pearson Correlation	.261
	Sig. (2-tailed)	.267
	Sum of Squares and Cross-products	4.400
	Covariance	.232
	N	20
Vowel duration for Educated Igbo Male respondents	Pearson Correlation	-.050
	Sig. (2-tailed)	.836
	Sum of Squares and Cross-products	-1.000
	Covariance	-.053
	N	20
Vowel duration for Educated Igbo Female respondents	Pearson Correlation	.408
	Sig. (2-tailed)	.078
	Sum of Squares and Cross-products	6.300
	Covariance	.332
	N	20

*. Correlation is significant at the 0.05 level (2-tailed).

In Table 4.10, duration patterns among dependent and independent variables reveal significant differences between control (British English) and NigE respondents. For instance, results reveal no significant difference between Yoruba female respondents, Igbo male respondents, Igbo female respondents, and the control. On the other hand, there was a significant difference between Yoruba male respondents and the control variable because the critical read was 0.007. This shows that among the categories of the respondents, it is only Yoruba male respondents that have a significant difference in duration patterns of CVC, CV and CCV structures that make up phrases and compounds in isolated expressions.

However, the study assumes that duration determines stress placement in BrE as an interaction of pitch and vowel quality; this shows that vowel duration does not determine stress placement among the sub-varieties of NigE respondents. It suggests that the effect of the L1 might have contributed to the features because studies by Peng and Ann (2001), Ko (2013), and Kozasa (2004) identified vowel duration as a cue for stress placement. The present study suggests that the vowel duration patterns vary from one language situation to another.

Table 4.11: Segment Duration for Igbo and Yoruba Respondents

Duration	Female		Male		
	Igbo	**Yoruba**	**Igbo**	**Yoruba**	**Briton**
16 – 20ms		5%		10%	
21 - 30ms	20%	20%	35%	50%	30%
31 – 40ms	45%	40%	35%	30%	60%
41 - 50ms	10%	30%	25%	10%	10%
51 – 60ms	25%	5%	5%		
Total	100	100	100	100	100

Notwithstanding, it is important to identify that individuals' speech rate and speed may vary depending on the individual's psychological reading, the complexity of lexical items to be read, and the management of distraction (internal) when reading. Table 4.11 provides insights into speech duration among Igbo and Yoruba respondents for phrases and compounds in isolated words. This helps to compare the average speech rate of Igbo and Yoruba speakers of English near native speakers who served as controls for the study to identify different duration patterns for CVC, CV, and CCV in phrases and compounds among the native and second-language users.

The description of energy in harmonics (F1 – F3) shapes the component of vowels in syllables. F1 usually describes the position of vowels, either high, mid, or low. 50% of the Igbo speakers of English have F1 between 350Hz and 600Hz, while 75% of the Yoruba speakers of English have F1 between 350Hz and 600Hz. It implies that 50–75% of Igbo and Yoruba respondents often have F1 for the front, back, and complex vowels between 350Hz and 600Hz.

The study reveals the maximum harmonic levels that educated Yoruba men can articulate, which range between 350Hz and 800Hz, while educated Igbo male respondents can have between 350Hz and 950Hz for F1. It shows that IMR tends to have higher harmonics than YMR. 10% of the Igbo and Yoruba respondents have 350Hz and 450Hz for /i:/ in *meal time*. It shows that Igbo and Yoruba respondents have F1 values that range between 350Hz and 450Hz, unlike the control variable, which has F1 for /i:/ in *meal time* as 350Hz-400Hz. It implies that Igbo, Yoruba, and native speakers do not have uniform F1 values.

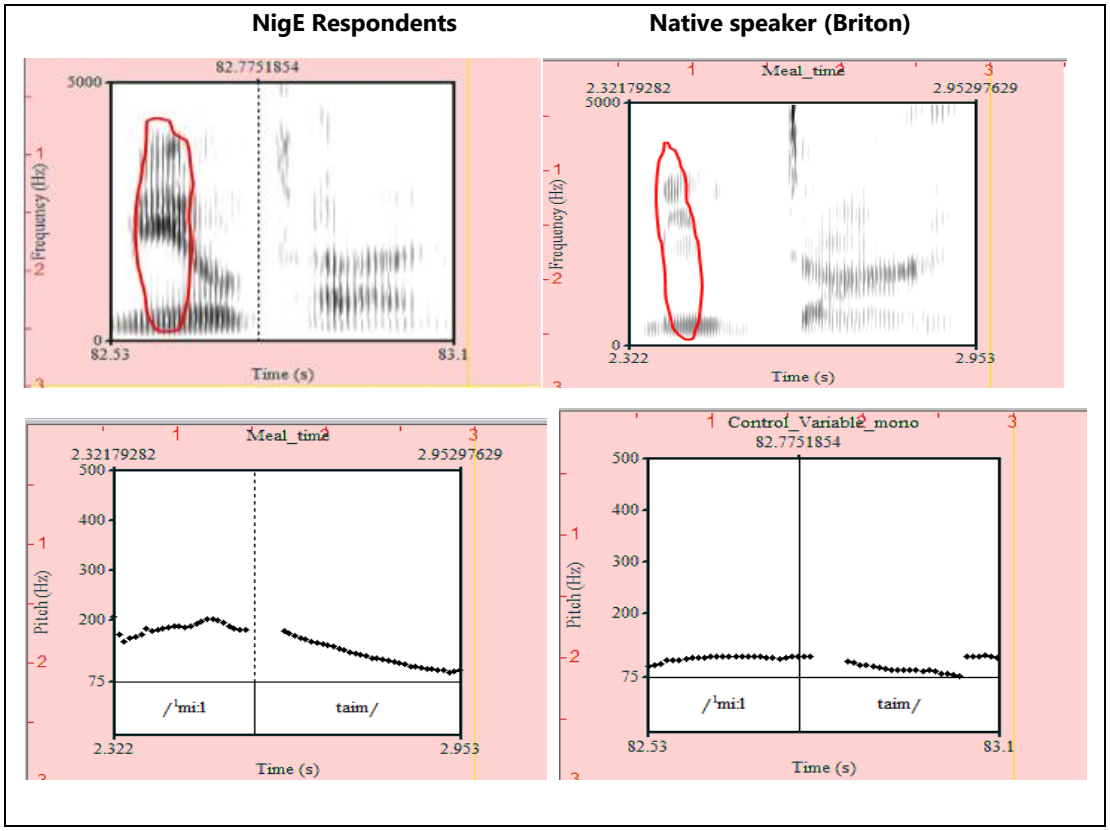

Figure 4.3: Representative picture for production of *meal time* by NigE respondents and native speaker

Figure 4.3 identifies similarities that exist between fundamental frequencies and stress correlates. For instance, the encircled portion of the vowel (for native and NigE respondents) shows higher formants in *meal* than in *time*. It implies that distance in harmonics through F1 features correlates with stress placements in phrases and compounds among native and second-language users, as evident in Igbo and Yoruba respondents.

5. Summary/conclusion

The study has investigated that NigE, as well, has stress correlates that determine how tokens received prominence in phrases and compounds in the sub-varieties of ENigE. From the findings, the study shows similarity and variability in stress placement between ENigE and BrE (80.2%). The study discovers that vowel duration (alone) is not sufficient to differentiate stressed from unstressed syllables in phrases and compounds of the sub-varieties. It may suggest the inelastic nature of the varieties. The discoveries are similar to the vowel duration in crosslinguistics (BrE) for stress patterns. For example, the duration of the syllable does not always determine stress placement in BrE, though it may provide insight into syllables with higher prominence and longer duration. The results contradict Peng and Ann (2001), Ko (2013) and Kozasa (2004), who emphasize duration as a cue for stress placement among second language users of English. The contrast buttresses the variability of the L1 and the target language. The findings show that ENigE and BrE share a relationship between vowel duration and stress assignment when duration does not determine stress placement. However, British is stress-timed and allows elasticity, but educated NigE is closer to syllable-timed; therefore, duration may not be sufficiently appropriate for stress correlation in ENigE, unlike other varieties (Rietveld, Kerkhoff, & Gussenhoven, 2004). The study emphasizes that other acoustic cues like F0, intensity, and fundamental frequencies must be examined closely as determinants of stress placement in ENigE, but F0 supersedes them. The clue from this paper suggests that F0 is more reliable in identifying stress correlates than other stress correlates, especially in second language situations; this assertion is similar to Jolayemi 2006 and 2008a. Though the study is not comprehensive towards the description of the accent that over 150 million people speak, the motivation encourages this study to contribute to the ongoing description and codification of ENigE. Future studies may harness different speech contexts, and for reliability, with `mixed effects, logistic model to test each of the predictors, including L1 and L2 proficiency for stress correlates of the varieties. They may also wish to be more distinctive by isolating, for individual studies, each of the stress correlates engaged in this investigation.

The study is limited to 20 participants to discuss stress determinants of compounds and phrases in clear speech as a preliminary study open for further engagement towards a comprehensive discussion of acoustic correlates of stress in ENigE. Clear and spontaneous speeches should be compared in future studies rather than clear speeches alone for correlational interpretation. Likewise, different speech contexts may be explored if context affects the acoustic correlate of stress in the sub-varieties of ENigE.

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References

[1] Akinjobi, A. (2004). A phonological investigation of vowel weakening and unstressed syllable obscuration in Educated Yoruba English. *An Unpublished Ph. D. Thesis, University of Ibadan*, 1-20.
[2] Akinjobi, A. (2006). Vowel reduction and suffixation in Nigeria. *English Today*, *22*(1), 10 17.
[3] Anyagwa, C. N. (2014). *Word stress in Nigerian (Igbo) English* (Doctoral dissertation, University of Lagos (Nigeria)).
[4] Atechi, S. N. (2015). The emergence of Cameroon francophone English and the future of English in Cameroon. *British Journal of English Linguistics*, *3*(3), 23-33.
[5] Atoye, R. O. (2005). Non-native perception and interpretation of English intonation. *Nordic Journal of African Studies*, *14*(1), 17-17.
[6] Atoye, R. O. (1991). Word stress in Nigerian English. *World Englishes*, *10*(1), 1-6.
[7] Awonusi, V. O. (1986). Regional accents and internal variability in Nigerian English: A historical analysis.
[8] Awonusi, V. O., & Babalola, E. A. (2004). The domestication of English in Nigeria.
[9] Banjo, A. (1971). "Towards a Definition of Standard Nigerian Spoken English" *Actes du 8 Congress de Societe Linguistique de L'Afrique Occidentale Abidjan* 165-175.
[10] Bobda, A. S. (1997). Further demystifying word stress. *English Today*, *13*(4), 48-55.
[11] Bobda, A. S. (2007). Some segmental rules of Nigerian English phonology. *English WorldWide*, *28*(3), 279-310.
[12] Bobda, A. S., & Mbouya, I. F. (2005). Revisiting some linguistic concepts and beliefs in the light of the sociolinguistic situation of Cameroon. In *Proceedings of the 4th International Symposium on Bilingualism* (pp. 2122-2132).
[13] Bobda, A. S., Saxena, M., & Omoniyi, T. (2010). Local networks in the formation and development of West African English. *Contending with Globalization in WorldEnglishes*, 177.
[14] Bobda, S. (2013). The Emergence of a Standardizing Cameroon Francophone English Pronunciation in Cameroon. *2013), Of Butterflies and birds, of dialects and genres. Stockholm: US-AB*, 289-301.
[15] Brosnahan, Leonard F. 1958. English in Southern Nigeria. *English Studies* 39(1–6): 97–110.
[16] Davidson, J. (2020a). Spanish phonology in contact with Catalan. *Spanish Phonetics and Phonology in Contact: Studies from Africa, the Americas, and Spain*, *28*, 384.
[17] Davidson, J. (2020b). Spanish phonology in contact with Catalan: On implementations of gradience and discreteness in the study of sociolinguistic variation of laterals. *Spanish Phonetics and Phonology in Contact: Studies from Africa, the Americas, and Spain. Philadelphia, PA: John Benjamins Publishing*.
[18] Gut, U. (2005). Nigerian English prosody. *English Worldwide*, *26*(2), 153-177.
[19] Gut, U. B. (2008). Nigerian English: Phonology. *Varieties of English*, *4*, 35-54.
[20] Jibril, M. M. (1982). *Phonological Variation in Nigerian English* (Doctoral dissertation, University of Lancaster).
[21] Jolayemi, D. (2006). The stress pattern of Nigerian English: An experimental phonology approach. Gottingen, Germany: Cuvillier Verlag.
[22] Jolayemi, D. (2008a). Acoustic analysis of tone and stress: An illustration with varieties of English spoken in Nigeria. In Wolf, Hans-Georg; Lothar Peter & Frank Polzenhagen (Eds.), *Focus on English: Linguistic structure, language variation and discursive use. Studies in honour of Peter Lucko*, (pp. 105-119). Leipzig: Universitaetsverlag.
[23] Jowitt, D. (1991). *Nigerian English usage: an introduction*. Longman Nigeria.
[24] Jowitt, D. (2000). Patterns of Nigerian English intonation. *English Worldwide*, *21*(1), 63-80.
[25] Ko, E. S. (2021). Effects of vowel duration on the perceived naturalness of English monosyllabic words ending in a stop: Some preliminary findings. *Phonetics and Speech Sciences*, *13*(2), 37-44.
[26] Ko, E. S., Seidl, A., Cristia, A., Reimchen, M., & Soderstrom, M. (2016). Entrainment of prosody in the interaction of mothers with their young children–ERRATUM. *Journal of child language*, *43*(4), 964-965.
[27] Ko, E. S. (2013). A metrical theory of Korean word prosody. *The Linguistic Review*, *30*(1), 79-115.
[28] Kozasa, T. (2004, June). The interaction of duration and pitch in Japanese long vowels. In *Annual Meeting of the Berkeley Linguistics Society* (Vol. 30, No. 1, pp. 211-222).
[29] Kujore, O. (1985). English usage: Some notable Nigerian variations. *Ibadan: Evans*.
[30] Melefa, O. M., & Amoniyan, O. M. (2019). Word Stress Patterns in Educated Igbo English. *Journal of the English Scholars' Association of Nigeria*, *21*(2), 9.
[31] Ortega-Llebaria, M., Faulkner, A., & Hazan, V. (2001). Auditory-visual L2 speech perception: Effects of visual cues and acoustic-phonetic context for Spanish learners of English. In *AVSP 2001-International Conference on Auditory-Visual Speech Processing*.
[32] Oyebola, F. (2020). *Attitudes of Nigerians towards accents of English* (Doctoral dissertation, PhD dissertation, University of Münster).
[33] Pépiot, E. (2015). Voice, speech and gender: male-female acoustic differences and cross-language variation in English and French speakers. *Corela. Cognition, représentation, langage*, (HS-16).
[34] Pépiot, E. (2017). Gender identification from a speech in Parisian French and American English speakers. *PAISII HILENDARSKI UNIVERSITY OF PLOVDIV–BULGARIA RESEARCH PAPERS*.
[35] Pépiot, E., & Arnold, A. (2021). Cross-Gender Differences in English/French Bilingual Speakers: A Multiparametric Study. *Perceptual and Motor Skills*, *128*(1), 153-177.

[36] Peng, L., & Ann, J. (2001). Stress and duration in three varieties of English. *World Englishes*, *20*(1), 1-27.
[37] Rietveld, T., Kerkhoff, J., & Gussenhoven, C. (2004). Word prosodic structure and vowel duration in Dutch. *Journal of Phonetics*, *32*(3), 349-371.
[38] Schmied, J. J. (1991). *English in Africa. An Introduction*. Longman, Inc., 95 Church Street, White Plains, NY 10601-1505 (hardbound: ISBN-0-582-07456-8; paperback: ISBN 0-582-07455-x).
[39] Seidl, A., Cristia, A., Soderstrom, M., Ko, E. S., Abel, E. A., Kellerman, A., & Schwichtenberg, A. J. (2018). Infant–mother acoustic–prosodic alignment and developmental risk. *Journal of Speech, Language, and Hearing Research*, *61*(6), 1369-1380.
[40] Sunday, A. B. (2011). Compound stress in Nigerian English: An empirical study of stress placement in compounds in educated Nigerian English. *English Today*, *27*(3), 43-51.
[41] Sunday, A. B., & Oyatokun, O. O. (2016). Optimality theoretical analysis of word stress in educated Nigerian English. *SKASE Journal of Theoretical Linguistics*, *13*(1).
[42] Ubahakwe, E. (Ed.). (1979). *Varieties and functions of English in Nigeria: selections from the proceedings of the 9th Annual Conference of the Nigerian English Studies Association*. African University Press.
[43] Udofot, I. (2003). Stress and rhythm in the Nigerian accent of English: A preliminary investigation. *English World-Wide*, *24*(2), 201-220.
[44] Udofot, I. (2004). Varieties of spoken Nigerian English. *The domestication of English in Nigeria. A festschrift in honour of Abiodun Adetugbo*, 93-113.
[45] Udofot, I. (2007). A tonal analysis of standard Nigerian English. *Journal of the Nigerian English Studies Association*, *3*(1), 58-68.