Impact of Technology-based Non-enculturation Sources of Native English on Yoruba (Nigerian) Teenage English Nuclear and Contrastive Stress Assignment

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Abstract

This study examined the impact of technology-based non-enculturation sources on Yoruba (Nigerian) teenagers' nuclear and contrastive stress assignment to determine the suitability of the facilities as ancillary models of spoken English in Nigeria. Labov's variability theory and Liberman and Prince's metrical phonology served as theoretical framework. Participants were purposively selected from 300 University of Ibadan teenage undergraduates (UIYTUs) and a Briton, who served as the native baseline (NB). The teenagers' technology (TC) levels were ascertained through a questionnaire. Participants were stratified into High(H), Mid(M) and Low(L) TCs. Their production of a prepared text into Speech Filing System (version 1.54) constituted the data which were analysed statistically, metrically and acoustically. The teenagers' nuclear stress assignment to regular [$F_{(2, 297)}$=63.78; p<.05] and contrastive [$F_{(2, 297)}$=50.93; p<.05] Designated Terminal Elements was reflective of their level of technology exposure. HTC exhibited metrical pattern similar to the NB. MTC either imposed stress on metrically weak syllables or assigned stress following the NB pattern. LTC productions were predominantly characterised by stress clash. Sample HTC spectrograms showed the highest amplitude and longest duration for the nuclearly stressed syllable. Although the spectrograms of the MTC displayed some alternation, the nuclearly stressed syllable did not receive its due prominence. Sample LTC spectrograms displayed flatness. Technology-based non-enculturation sources of native English available to teenage Nigerians have the capability of enhancing their spoken English. These technological devices should be explored as alternative model of English pronunciation.

1 Introduction

Variationist sociolinguistics introduced by Labov (1966) has established relationship between linguistic choices at the disposal of individuals and social variables such as age, gender, education, income, social status, among others, in various sociolinguistic settings (cf. Trudgill 1974, 1983; Milroy 1987; Milroy/Milroy 1991; Hudson 1996; Kerswill/Williams 2000; Barker 2003). These studies are based on the assumption that language varies with social structure

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represented by social groups, institutions, etc. In the Nigerian sociolinguistic context, variationist studies have largely rested on social variables of educational attainments and occupation (cf. Soneye 2007; Aina 2014; Aiyeola 2021). Some have adopted other variables as age (giving focus to the speeches of young Nigerians) and gender (cf. Oladipupo 2014; Oladipupo/Akinjobi 2015); socio-economic status (cf. Johnson 2017) and (virtual) exposure to native speakers (cf. Aiyeola 2020a, 2020b). However, none of these studies has established a relationship between native English to which teenagers are constantly exposed through technology and their ability to assign nuclear stress to English sentences or reassign stress to contrast meanings.

Stress, like other suprasegmental features of English, has been proved to be a major point of variation of Nigerian English from Standard British English (SBE). Studies attest to a tendency to delay primary stress in Nigerian English such that it is shifted as far to the right as possible (cf. Jowitt 1991). Further studies establish the predominance of stressed syllables in Nigerian English contrary to SBE where there is a preponderance of weak syllables (cf. Eka 1993; Udofot 2003; Akinjobi 2006, 2009, 2012; Akindele 2018, 2020; Adesanya 2020a; Emmanuel-Ogbe/ Akinjobi 2020). Sunday (2008) in his study of two-base compound nouns, verbs, adjectives and adverbs in Educated Yoruba English (EYE) observes that EYE apply the Compound Prominence Rule (CPR) to compounds of all categories unlike what obtains in native English where some compounds behave like phrases, thereby observing Phrasal Prominence Rule (PPR). Simo-Bobda (2010), attesting to a similarity in stress assignment in Cameroonian and Nigerian Englishes and their variance from the RP, asserts that speakers of both varieties try to cope with English stress complexity, using their knowledge of some general rules of English stress and those generated based on their indigenous languages. Sunday/Oyatokun (2016) and Sunday/ Oyemade (2021) observe that, in Nigerian English, high pitch (likened to the high tone of the indigenous languages of the speakers) is usually sufficient to determine the position of stress without recourse to the other correlates- intensity and duration.

The differences in Standard British English and Nigerian English have been attributed to, among other factors, the non-native situation in which Nigerians learn the language; the complexity of English stress and the non-availability of native-speaker teachers (cf. Jowitt 1991; Udofot 2003). Also, studies have established that some supposed models of English language in Nigeria, especially teachers of English language, do not approximate to some SBE suprasegmentals, thereby lacking the capability to serve as models of English pronunciation for their learners and the general users of English in Nigeria (cf. Akinjobi/Aina 2014; Adesanya 2020a; Aiyeola 2021).

However, Akinjobi (2015) opines that, even in a non-native context like Nigeria, approximation to native English is achievable. According to her, technological innovations, particularly Information and Communication Technology (ICT), which she terms *non-enculturation sources,* have the capability to enhance approximation of the spoken English of L_2 speakers to Standard English, in spite of physical distance between them and native speakers. Such sources include electronic media sources (radio and television stations), internet sites and links with speech drills; telephony hardware and software for live conversation with native speaker and

web-based video conferencing. Others are social network sites, dictionaries with audio aids, computerised speech laboratory as well as British and American films.

This present study is, therefore, premised on Akinjobi's recommendations. Its focus aims to empirically examine the influence of technology-based non-enculturation sources, to which Yoruba (Nigerian) teenagers are exposed, on their (re)assignment of nuclear stress to normal and contrastive Designated Terminal Elements (DTEs) of English simple sentences. This is with a view to determining if access to and utilisation of such facilities can serve as an ancillary model of spoken English in Nigeria

2 Literature Review

2.1 Sentence stress in Standard British English and Nigerian English

Studied from the perspectives of structure, production and perception, the notion of stress generally relates to the degree of prominence with which a syllable is produced relative to other syllable(s) in a lexical or phrasal unit (cf. Cruttenden 1986; Giegerich 1992; Hayes 1995; Roach 2000, 2013; Gussenhoven 2004; Collies 2007; Carr 2008). English is a language which makes a clear distinction between stressed and unstressed syllables owing to the inequality of prominence which obtains among syllables. Stressed syllables are noticeably longer; more prominent and more resistant to reduction processes than unstressed syllables (cf. Gussenhoven 2011).

Just as some syllables are more prominent than others within a word, there are more prominent and less prominent words within an utterance (cf. Roach 2000; McMahon 2002; Skandera/ Burleigh 2005; Gimson 2008). The stress carried by a word within an utterance is referred to as sentence stress (cf. Skandera/Burleigh 2005). When English words occur as part of a sentence, the stress assigned to the words becomes gradable. Hence, the notion of sentence stress is shaped by the stress of some words in relation to others in a fashion similar to what obtains within a word. Lexical words – nouns, adjectives, verbs and adverbs – are predisposed to receive and retain their stress as in the isolated form, while grammatical/ function words – determiners, pronouns, preposition, conjunctions and auxiliary verbs – are often prone to reduction (cf. Roach 2000; Skandera/Burleigh 2005; Gimson 2008).

Stress in connected speech is determined largely by the meaning which the utterance is intended to convey in the particular circumstance in which it is uttered, thereby making it freer than those of the word and useful in contrasting meaning (cf. Gimson 2008; Ladefoged/Johnson 2011; Levis/Silpachai 2018). Consequently, some words which are stressed in isolation may become unstressed while others which have primary stress may have their stress shifted or converted to secondary or tertiary stress. Grammatical words which are predominantly weakened in normal speech may also be emphasised to contrast meaning (cf. Roach 2000; Skandera/Burleigh 2005).

In Nigerian English, however, studies have shown that Nigerian speakers of English do not assign nuclear stress to appropriate elements in sentences (cf. Jowitt 1991). Studies have also attested to the predominance of stressed syllables in Nigerian English contrary to what obtains in RP (cf. Eka 1993; Udofot 2000; Akinjobi 2006, 2009, 2012; Akindele 2020). Scholars such as Jibril (1986) and Jowitt (1991) also observe that Nigerian speakers of English do not deploy stress for meaning contrast. However, Ayinde (2021), against the aforementioned studies

reveals that educated Yoruba Christian leaders use sentence stress for emphasis, thereby approximating native forms and demonstrating ability to serve as models for their followers and other Nigerian users of English.

2.2 Technology-based non-enculturation sources of native English

The term "non-enculturation sources of standard spoken English", coined by Akinjobi (2015), is used to refer to technological facilities that could assist non-native speakers to access and approximate native English outside the native setting of the language through virtual means. This intervention became necessary as a result of the influence wielded on Nigerians' pronunciation of English by Nigerian indigenous languages, non-availability of native-speaker teachers, complexity of English suprasegmentals etc. She opined that, through technological facilities such as electronic media sources (BBC, CNN, Cartoon Network etc.) and internet sites and links which provide speech drills, Nigerians can access standard spoken English. Others include telephony hardware and software, social network sites, dictionaries with audio aids, computerised speech laboratory as well as British and American films.

Roach (2000) had earlier asserted that young children possess the ability to acquire the rapid casual pronunciation of a language similar to that of native speakers without effort if they are provided with the necessary social contact with native speakers. He added that adults can "pick up" spoken English with such communication provisions. However, if Roach's "communication situations" were supposed to be strictly physical, the distance between native and non-native speakers would be a great hindrance and such provision would have remained an illusion for most non-native speakers of English. To Akinjobi (2015), the 21st century advancement in information and communication technology has "shrunk" the world and collapsed all the physical boundaries separating native and non-native speakers. Native English is, therefore, brought closer to non-native speakers through technological means. The positive impact they wield on spoken English proficiency of some young Nigerian, particularly regarding lexical stress and vowel reduction, have been empirically established (cf. Adesanya 2020b; Aiyeola 2020a, 2020b).

2.3 Theoretical Framework

This study adopts Labov's (1966) variability theory and Liberman/Prince's (1977) metrical phonology as theoretical framework. Variability theory, as propounded by Labov (1966) and further expounded in the works of Trudgill (1974, 1983), Milroy (1987), Milroy/Milroy (1991), Hudson (1996), Kerswill/Williams (2000) and Barker (2003) provides a vivid platform for language variation resulting from (in addition to geographical origin) factors such as age, sex, gender, social class, occupation and personality. Through this work, Labov (1966:5) established that 2the language of an individual cannot be understood without knowledge of the speech community of which he is a member using social factors as education, occupation and income which determine his social class membership". The adoption of this theory for the current study hinges on its objective distribution of linguistic features and the outline of social groups on the basis of such features.

Metrical phonology, originally introduced as a hierarchical theory of stress (cf. Crystal 2008) starting with Liberman (1975) and Liberman/Prince (1977) and further elaborated on by Halle/ Vergnaud (1987) and Hayes (1981), is one of the theories which paved the way for the non-linear model of phonological description as a result of the inadequacy of the linear model of SPE in accounting for features beyond the segments. This approach to stress dismisses the vowel inherent feature [± stress] of the linear model for a more flexible and principled description of stress in different languages. Stress, therefore, is no longer represented by means of a feature but is essentially considered to be a strength relation between syllables such that strong syllables (S) are stronger than weak syllables (W) and weak syllables are weaker than strong syllables. (cf. McMahon 2002; Carr 2008; Gussenhoven/Haike 2011).

This theory of phonology hinges on the hierarchical notion of segment, syllable, foot and word, with a focus on the contrast between stressed and unstressed syllables. In metrical phonology, suprasegmental phenomena such as stress and rhythm are represented on a metrical tree or a metrical grid. The metrical tree is a binary-branching structure whose nodes reflect the relative strength between sister constituents. The metrical grid is a formalism used to display hierarchic patterns of syllable prominence presented graphically in columns (for relative prominence) and rows (for rhythmical structure) as determined by the Relative Prominence Projection Rule (RPPR). Two rules determine the assignment of strong and weak nodes- the Lexical Category Prominence Rule (LCPR) which operates on simple and compound words and the Nuclear Stress Rule (NSR) which operates on phrases and sentences. The justification for this theory to the present study rests on its relational descriptive approach to stress and its location within the word or phrase rather than the predictability feature of the Chomsky/Halle's (1965) model.

2.4 Methodology

The sampling technique is criterion sampling. The target population is Educated Yoruba teenagers from seven Yoruba-speaking states- Oyo, Ogun, Kwara, Lagos, Osun, Ondo, and Ekiti. Three hundred Yoruba teenagers selected for the study were all undergraduates of the University of Ibadan (henceforth, UIYTUs) and L_1 speakers of "Nigerian English" who have not lived in countries where English is a native language but have had English as their "first language." Hence, with regard to such variables as ethnicity, education, first language and age, they constitute a homogenous sociolinguistic group. The choice of this homogenous group is in a bid to avoid any potential difficulty that may be posed by extraneous factors. A native British speaker of the English language born, nurtured and currently living in London served as the native baseline. A questionnaire was administered to the participants to ascertain their eligibility for the study and determine their level of technology contact (TC). The TC levels were generated using the mean score and the standard deviation of participants' response to the use of technology-based non-enculturation sources. The mean rating and the standard deviation (SD) were 58.15 and 24.89 respectively. The SD was divided by 2, added to or subtracted from the mean and rounded off to the nearest whole number to obtain the mid TC level (MTC = 58.15 ± 12.45). Hence, participants whose exposure to the technology-based non-enculturation sources were rated between 47 and 71 were categorised as the Mid Technology Contact (MTC). Those with 0–46 and 72–100 were categorised as Low Technology Contact (LTC) and High Technology Contact (HTC) respectively. A text containing ten English sentences designed to

elicit semi-spontaneous speeches was read by participants into Speech Filing System (SFS/ WASP version 1.54). Data were analysed using one-way analysis of variance (at 0.05 significance level), metrical grid and acoustics.

3 Analysis

3.1 Statistical analysis of UIYTUs' nuclear and contrastive stress assignment

The The UIYTU's (re)assignment of stress to the regular and contrastive DTEs of ten English simple sentences were analysed to establish any significant differences among the three TC levels. The frequencies and percentages of the participants' (re)assignment of nuclear stress to the sentences are first presented in tables and figures below before analyses of variance are conducted for significant differences.

3.1.1 Statistical analysis of UIYTUs' nuclear stress assignment

The analysis of UIYTUs' assignment of nuclear stress to the regular Designated Terminal Elements of English simple sentences are presented in this section.

	Low		**Mid**		**High**	
Utterance	**ANS**	**NNS**	**ANS**	**NNS**	**ANS**	**NNS**
There could be a bit of rain at the end of the morning.	49 (29.9%)	115 (70.1%)	36 (50.7%)	35 (49.3%)	48 (73.8%)	17 (26.2%)
You must come over for dinner.	66 (40.2%)	98 (59.8%)	52 (73.2%)	19 (26.8%)	59 (90.7%)	6 (9.3%)
We could talk about it at lunch.	46 (28%)	118 (72%)	40 (56.3%)	31 (43.7%)	53 (81.5%)	12 (18.5%)
Ask them to come to the party.	54 (32.9%)	110 (67.1%)	44 (61.9%)	27 (38.1%)	58 (89.2%)	7 (10.8%)
There should be some more in the box	29 (17.7%)	135 (82.3%)	30 (42.3%)	41 (57.7%)	52 (80%)	13 (20%)

Table 1: Frequency and percentage of UIYTUs' assignment of nuclear stress to English sentences (ANS: Assignment of nuclear stress; NNS: Non-assignment of nuclear stress)

Table 1 shows the frequencies and percentages of assignment and non-assignment of nuclear stress on the DTE of English sentences produced by UIYTUs. Of the 164 respondents with LTC, only 29.9% assigned the nuclear stress to *mor-* in *There could be a bit of rain at the end of the ˈmorning.* Among the MTC, 50.7% stressed the DTE while 73.8% stress assignment was realised in the rendition of the HTC. For *You must come over for ˈdinner*, 40.2% of the LTC assigned stress the nuclear stress. Of the MTC, 73.2% stressed the DTE while 90.7% stress assignment was realised in the speeches of the HTC. *We could talk about it at lunch* had 28% stress assignment in the speeches of the LTC, 69% assignment in the speech of MTC and 81.5% stress assignment in the production of the HTC. For the production of *Ask them to come to the ˈparty,* 32.9% of the LTC, 61.9% of the MTC and 89.2% of the HTC assigned nuclear stress.

The respective percentages of standard assignment of nuclear stress on the DTE of *There should be some more in the ˈbox* among the LTC, the MTC and the HTC are 17.7%, 42.3% and 80%. Percentage of nuclear stress assigned to English sentences by UIYTUs is graphically represented in Figure 1 below:

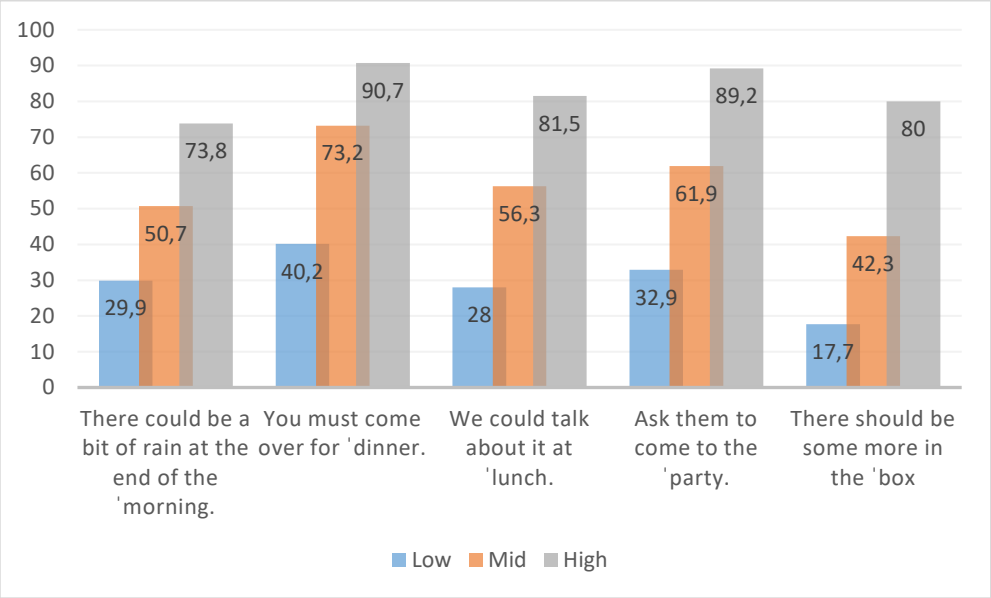


Figure 1: Percentages of nuclear stress appropriately assigned to English sentences by UIYTUs

The percentages of nuclear stress assigned to five English simple sentences by UIYTUs is graphically presented in Figure 1. As shown in the graph, the higher the level of technology contact, the higher the approximation to native English assignment of nuclear stress to appropriate syllables of the sentences.

Level of technology contact	**N**	**Mean**	**Std. deviation**
Low	164	2.94	3.30
Mid	71	5.63	3.61
High	65	8.34	3.17
Total	300	4.75	3.99

	Sum of squares	**Df**	**Mean square**	**F**	**Sig.**
Between Groups	1430.324	2	715.162	63.78	.000
Within Groups	3330.423	297	11.214		
Total	4760.747	299			

Table 2: Analysis of variance for UIYTUs' nuclear stress assignment (significant at 0.05 level; df = 2, 297; critical F. =3.00)

The result of ANOVA for nuclear stress assignment to the appropriate syllables of five sentences by UIYTUs as presented in Table 2 shows that the LTC had 2.94 mean nuclear stress assignment while the MTC had 5.36 mean assignment of nuclear stress. The mean performance

realised for the HTC was 8.34. Mean performance for the 300 UIYTUs was 4.75. The result shows that the difference in UIYTUs' ability to assign nuclear stress to the appropriate syllables of the sentences, based on their level of technology exposure, is statistically significant [$F_{(2, 297)} = 63.78$; $p < .05$].

(I) Level of technology contact	(J) Level of technology contact	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Low	Mid	-2.70*	.48	.000	-3.87	-1.52
	High	-5.40*	.49	.000	-6.61	-4.19
Mid	Low	2.70*	.48	.000	1.53	3.87
	High	-2.71*	.58	.000	-4.12	-1.29
High	Low	5.40*	.49	.000	4.19	6.61
	Mid	2.71*	.58	.000	1.29	4.12

Table 3: Multiple (between-group) comparison for UIYTUs' nuclear stress assignment (*The mean difference is significant at the 0.05 level.)

The result of the between-group comparison test reveals that the UIYTUs with HTC assigned nuclear stress to the appropriate syllables of the sentences significantly better than the UIYTUs with MTC (MD = 2.70; p <.05) and the UIYTUs with LTC (MD = 5.39; p <.05). Also, the performance of UIYTUs with MTC was significantly better than that of UIYTUs with LTC (MD = 2.69; p <.05). Therefore, established significant differences exist among the three levels of technology contact for assignment of nuclear stress to the appropriate syllables of the English sentences. Table 4 below presents the homogeneous subsets for nuclear stress assignment.

Level of technology contact	N	Subset for alpha = 0.05		
		1	2	3
Low	164	2.94		
Mid	71		5.63	
High	65			8.34
Sig.		1.000	1.000	1.000

Table 4: Homogenous subset-categorisation of UIYTU for nuclear stress assignment

The results displayed in Table 4 show that UIYTUs with LTC are dissimilar to UIYTUs with MTC who are, in turn, different from UIYTUs with HTC. The three groups can therefore belong

to distinctive categories based on their performance in the assignment of nuclear stress to English sentences. The participants' performance is illustrated in Figure 2 below:

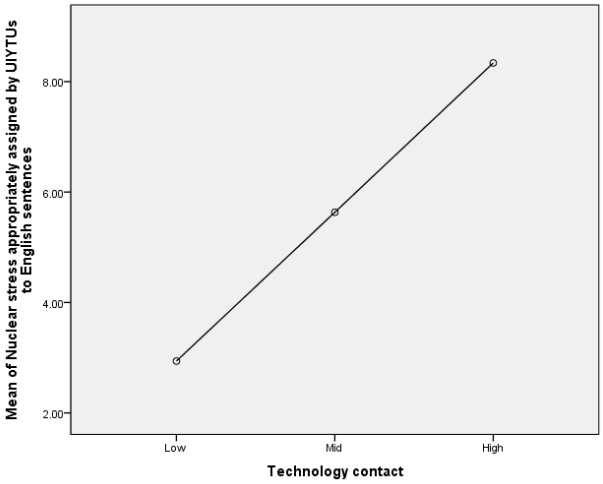


Figure 2: Mean of Nuclear stress appropriately assigned by UIYTUs to English sentences

The graph in Figure 2 ascends to show that exposure to technological facilities which make native English accessible to UIYTUs positively influences their assignment of nuclear stress to English phrasal structures.

3.1.2 Statistical analysis of UIYTUs' contrastive stress assignment

The analysis of UIYTUs' reassignment of nuclear stress from the regular Designated Terminal Elements of English simple sentences to the contrastive Designated Terminal Elements are presented in this section.

	Low		**Mid**		**High**	
Utterance	**SR**	**NR**	**SR**	**NR**	**SR**	**NR**
That was a <u>great</u> idea.	76 (46.3%)	88 (53.7%)	55 (77.5%)	16 (22.5%)	56 (86.1%)	9 (13.9%)
He <u>bought</u> a black car.	54 (32.9%)	110 (67.9%)	44 (61.9%)	27 (38.1%)	54 (83.1%)	11 (16.9%)
She <u>was</u> my friend.	55 (33.5%)	109 (66.5%)	47 (66.2%)	24 (33.8%)	60 (92.3%)	5 (17.7%)
<u>John</u> has a nice suit.	63 (38.4%)	109 (61.9%)	48 (67.6%)	23 (32.4%)	58 (89.2%)	7 (10.8%)
Mary <u>saw</u> the officer	52 (31.7%)	112 (68.3%)	33 (46.4%)	38 (53.6%)	57 (87.7%)	8 (12.3%)

Table 5: Frequency and percentage of UIYTUs' nuclear stress reassignment (SR- stress reassignment, NR- Non-reassignment)

Table 5 presents the frequencies and percentages of reassignment and non-reassignment of stress in the speeches of UIYTUs. Of the 164 participants in the LTC category, 46.3% reassigned stress in *That was a great idea* while the MTC and the HTC reassigned stress from *dea,* the usual DTE, to *great*, the contrastive DTE, in 77.5% and 86.1% instances respectively. For *He bought a black car*, the expected stress reassignment was realised in the speeches of 32.9% of the LTC, 61.9% of the MTC and 83.1% of the HTC. Stress reassignment in *She was my friend* was realised in the rendition of 33.5% of LTC, 66.2% in those of the MTC and 92.3% in the production of HTC. For *John has a nice suit*, expected stress reassignment was realised in 38.4% of the LTC, 67.6% of the MTC and 89.2% of the HTC. Only 31.7% of the LTC contrasted meaning by stressing *saw* in *Mary saw the officer*. The meaning was expectedly contrasted by 46.4% of the MTC and 87.7% of the HTC. Percentages of stress reassignment in the utterances as produced by UIYTUs is presented graphically in Figure 3 below:

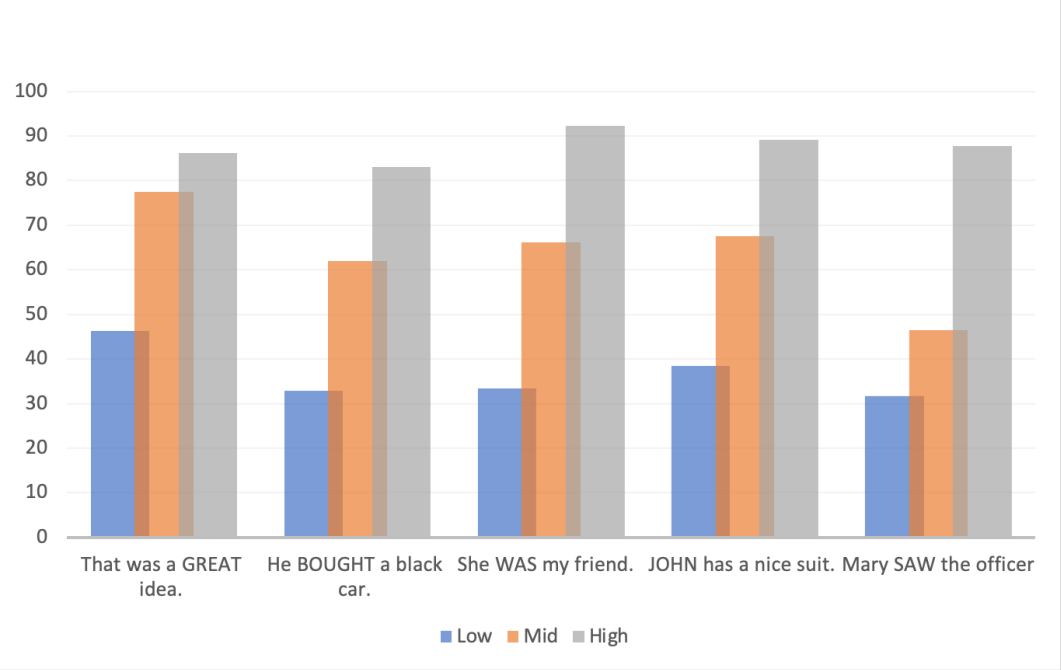


Figure 3: Percentages of nuclear stress reassigned by UIYTUs to focused words

Figure 3 displays the percentages of nuclear stress reassigned to the contrastive Designated Terminal Elements (DTE) of English sentences by UIYTUs. The bars show the approximation strength of each of the groups- high, mid and low- to the native baseline's stressing of focused words for the purpose of contrast. Clearly, the participants with high technology contact had higher percentages for each of the utterances than those with mid technology contact who, in turn, had higher percentages than those with low technology contact.

Level of technology contact	N	Mean	Std. deviation		
Low	164	3.63	3.85		
Mid	71	6.41	3.76		
High	65	8.74	2.54		
Total	300	5.39	4.14		
	Sum of squares	**Df**	**Mean square**	**F**	**Sig.**
Between Groups	1311.567	2	655.783	50.93	.000
Within Groups	3824.020	297	12.875		
Total	5135.587	299			

Table 6: Analysis of variance for UIYTUs' contrastive stress assignment (significant at 0.05 level; df = 2, 297; critical F. =3.00)

The result for UIYTUs' reassignment of nuclear stress to focused words for contrastive purposes shows a mean performance of 3.63 for the LTC, 6.41 in the productions of the MTC and a mean stress reassignment of 8.74 for the HTC. The total mean stress reassignment for the 300 participants was 5.39. The difference in the ability of UIYTUs to reassign stress to focused words in order to contrast meanings, based on their technology exposure, is statistically significant [$F_{(2, 297)} = 50.93$; $p < .05$].

(I) Level of technology contact	(J) Level of technology contact	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Low	Mid	-2.78*	.51	.000	-4.04	-1.53
	High	-5.11*	.53	.000	-6.40	-3.82
Mid	Low	2.78*	.51	.000	1.53	4.04
	High	-2.33*	.62	.001	-3.85	-.82
High	Low	5.11*	.53	.000	3.82	6.40
	Mid	2.33*	.62	.001	.815	3.85

Table 7: Multiple (between-group) comparison for UIYTUs' contrastive stress (The mean difference is significant at the 0.05 level).

Having proved a significant difference in UIYTUs' ability to reassign stress for contrastive purposes, multiple comparison test was performed to establish significant difference(s) between each pair of the groups. The result as displayed in Table 7 above confirms that UIYTUs with high technology contact (HTC) significantly reassigned stress to focused words better than UIYTUs with mid technology contact (MD = 2.33; $p < .05$) and UIYTUs with low technology contact (MD = 5.11; $p < .05$). In the same vein, the performance of UIYTUs with mid technology contact was significantly better than that of UIYTUs with low technology contact (MD = 2.78; $p < .05$). Therefore, the established significant differences exist among the three levels of

technology contact for nuclear stress reassignment to appropriate syllables of focused words in each of the sentences. Table 8 below presents the homogeneous subsets for contrastive stress.

Level of technology contact	**N**	**Subset for alpha = 0.05**		
		1	**2**	**3**
Low	164	3.63		
Mid	71		6.41	
High	65			8.74
Sig.		1.000	1.000	1.000

Table 8: Homogenous subset- categorisation of UIYTUs for contrastive stress assignment

Results, as displayed in Table 8, show the dissimilarity among UIYTUs with low technology contact (LTC), UIYTUs with mid technology contact (MTC) and UIYTUs with high technology contact (HTC) since there are statistically significant differences among the groups. Participants of the various levels of technology contact, therefore, belong to different subsets. Figure 4 illustrates their performance.

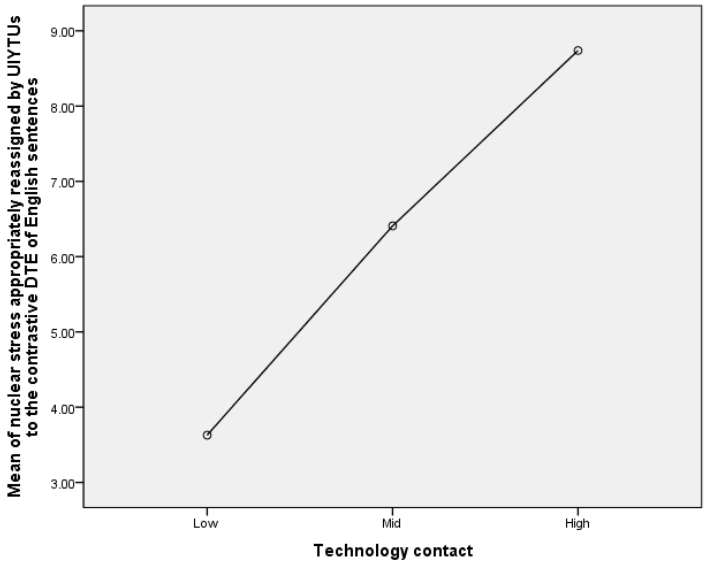


Figure 4: Mean of UIYTUs' nuclear stress reassignment to the contrastive DTE of English sentences

The graph above shows the relationship between the technology contact levels- low, mid and high- and the mean of nuclear stress reassigned by UIYTUs to the contrastive DTE of English sentences. The points on the graph illustrates the correspondence of the mean value of contrastive stress realised in the speeches of UIYTUs to their technology contact level, implying that the higher the technology exposure, the better UIYTUs were able to contrast meaning in simple sentences using stress.

3.2 Metrical analysis

3.2.1 Metrical analysis of UIYTUs' nuclear stress assignment

Predominant metrical grid representations of *Ask them to come to the party* and *There could be a bit of rain at the end of the morning* as produced by UIYTUs are presented in this section.

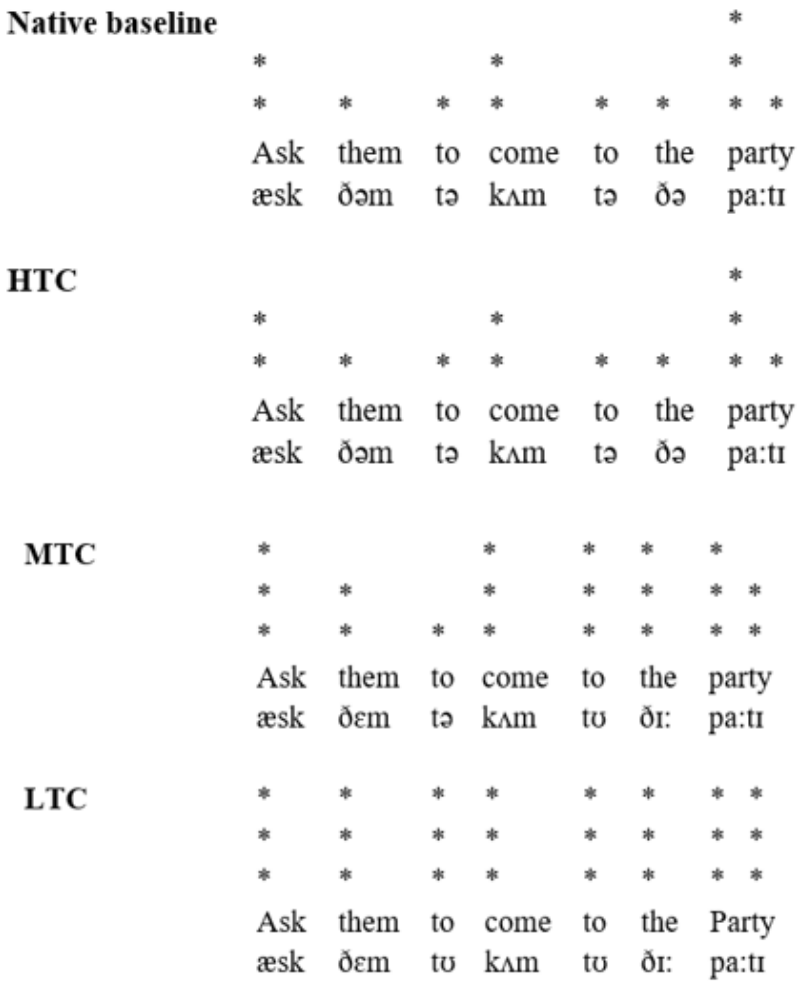


Figure 5: Native baseline metrical grid and predominant UIYTUs' pattern for *Ask them to come to the party*

As noted from the metrical grids in Figure 5, the native baseline stressed only three syllables and assigned the nuclear stress to the Designated Terminal Element (DTE), *par-*. The participant representing the HTC category had a similar pattern as the native baseline by stressing the appropriate syllable of content words- *ask, come* and *par-*; unstressing the function words- *them, to* and *the* and assigning the nuclear stress to *par-*. The speech of the MTC was characterised by a strengthening of some of the grammatical words and syllables in unstressed positions, thereby resulting in a sequence of stressed syllables. The rendition of the participant representing the LTC exhibits a preponderance of stressed syllables as all the syllables were stressed, contrary to the native baseline production.

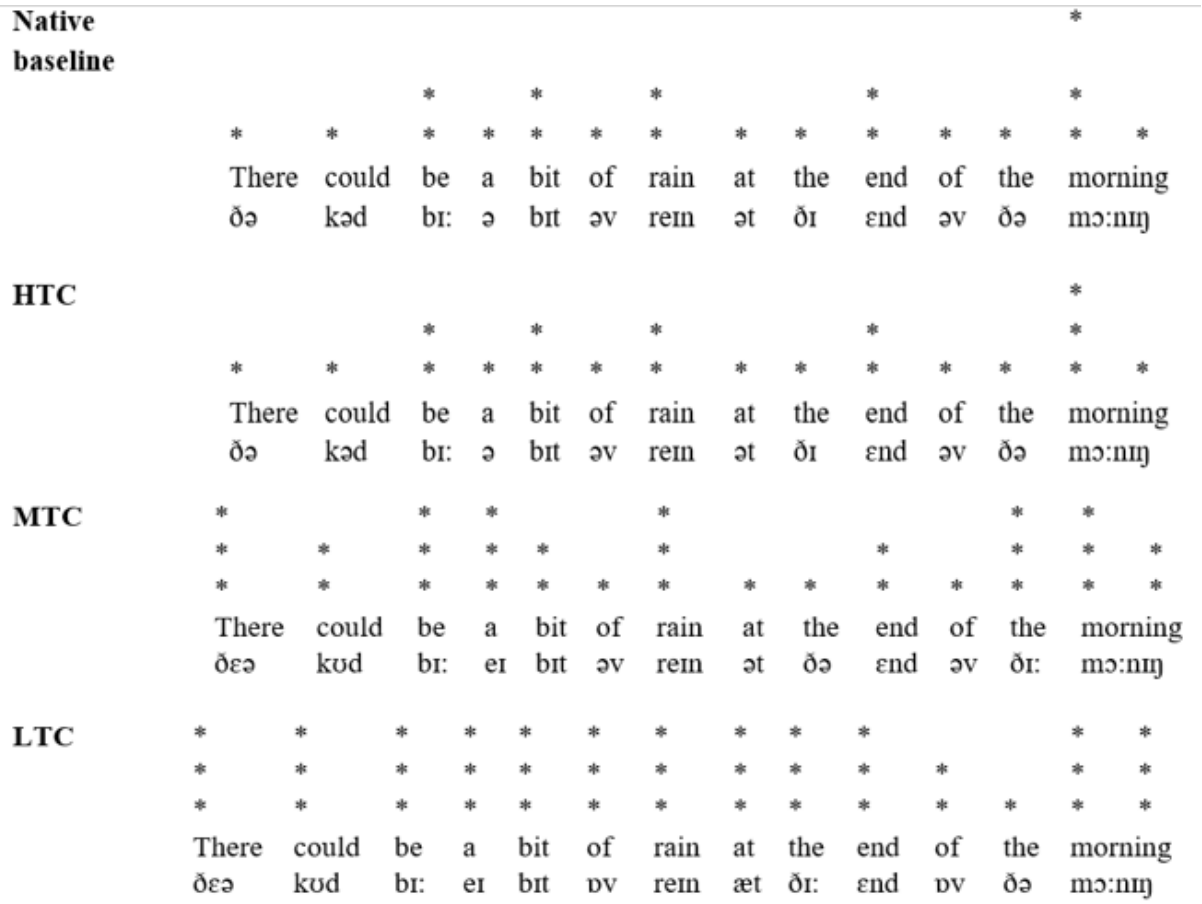


Figure 6: Native baseline metrical grid and UIYTUs' representative pattern for *There could be a bit of rain at the end of the morning*

The native baseline produced *There could be a bit of rain at the end of the morning* with five stressed and eight unstressed syllables. The Designated Terminal Element of the strong node, *mor-* received the nuclear stress of the utterance. The HTC predominantly had a stress pattern identical with that of the native baseline. The representative participant for the MTC stressed some syllables more than those stressed by the native baseline. The stresses were mainly imposed on function words metrically weakened in the production of the native baseline. The productions of participants representing the LTC was characterised by a preponderance of stressed syllables where more syllables, than in the native baseline production, had more grid placeholders. This denote metrical strength on such syllables. Appropriate assignment of the nuclear stress reduced as technology contact level decreased.

3.2.2 Metrical analysis of UIYTUs' contrastive stress assignment

The nuclear stress of an utterance which, by default, falls on the rightmost stressed syllable in a phrasal structure is sometimes assigned to another syllable within the phrase or clause for contrastive or emphatic purpose. This stress function is tested in the speeches of UIYTUs. Their respective representative stress patterns are presented below.

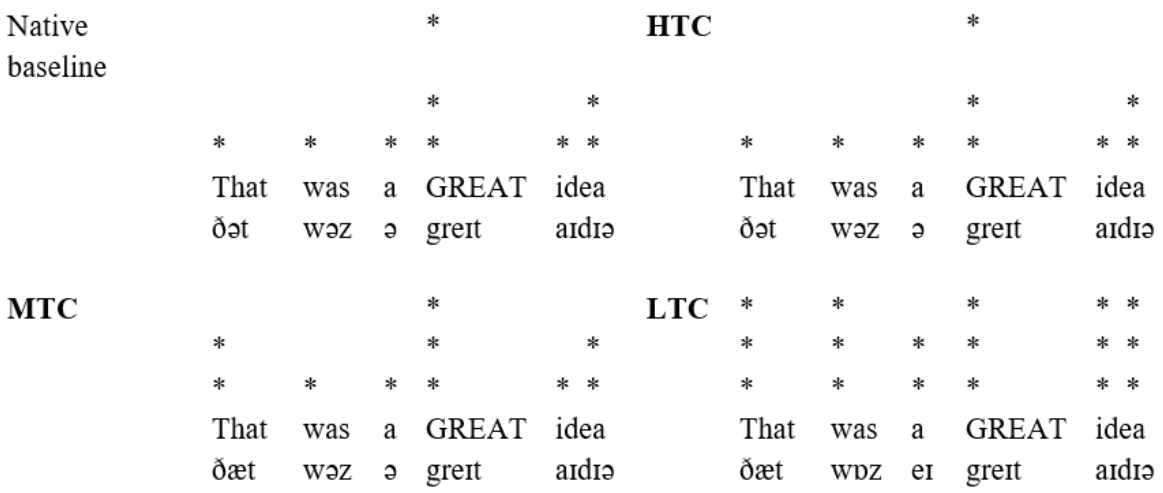


Figure 7: Native baseline and UIYTUs' metrical grid for *That was a GREAT idea*

Figure 7 presents the native baseline and the representative UIYTUs' metrical patterns for *That was a GREAT idea* where *great-* contrasted with words like *stupid, insignificant* or *ineffective-* receives the nuclear stress of the expression. As expected, the native baseline stressed *great* more than any other syllable for contrast. The representative participant of the HTC had stress pattern similar to that of the native baseline and reassigned the nuclear stress to *great,* the contrastive DTE. The stress pattern of the MTC is also identical with the native baseline's (except for a few extra stressed syllables) and expectedly reassigned stress to contrast the focused word. Participants in the LTC category predominantly stressed more syllables than the native baseline. The expected emphasis on *great* also did not feature in their speech.

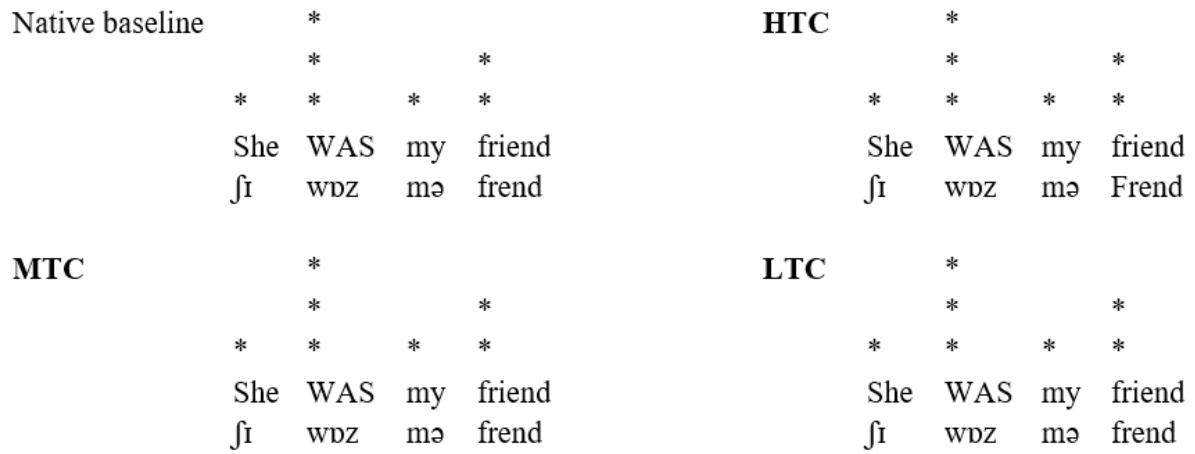


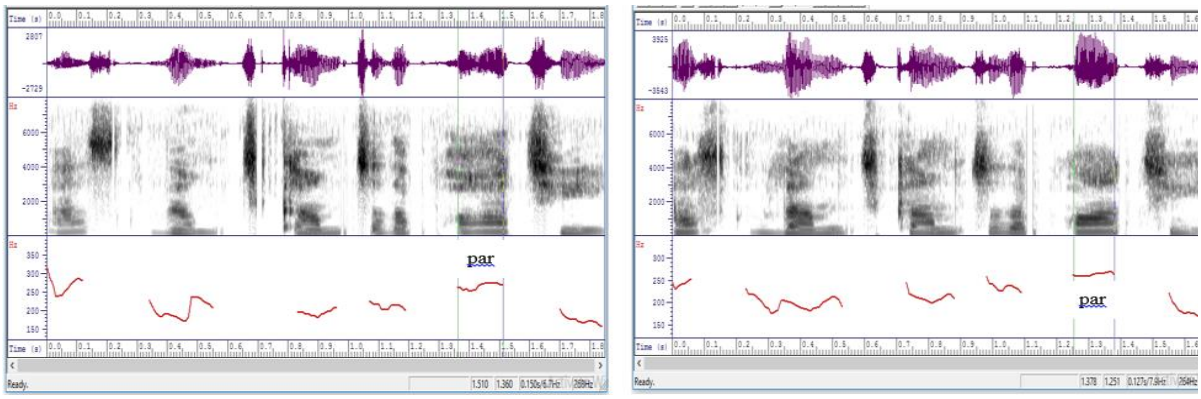
Figure 8: Native baseline metrical grid and representative UIYTUs' pattern for *She WAS my friend*

For *She WAS my friend*, the native baseline and the representative participant of the HTC produced WSWS metrical structure and assigned the nuclear stress of the utterance to *was*, a grammatical word which ordinarily would have been metrically weak, in order to focus attention on it. Contrary to usual nuclear stress assignment, the MTC mainly assigned the nuclear stress to *was* in order to contrast it with *is.* The LTC category produced more stressed syllable than weak ones for the expression. Also, nuclear stress was neither assigned to *friend*, the regular nuclear stress position, nor to *was*, the focused word.

3.3 Acoustic analysis

3.3.1 Dominant spectrographic patterns of *Ask them to come to the party* as produced by the native baseline and the UIYTUs

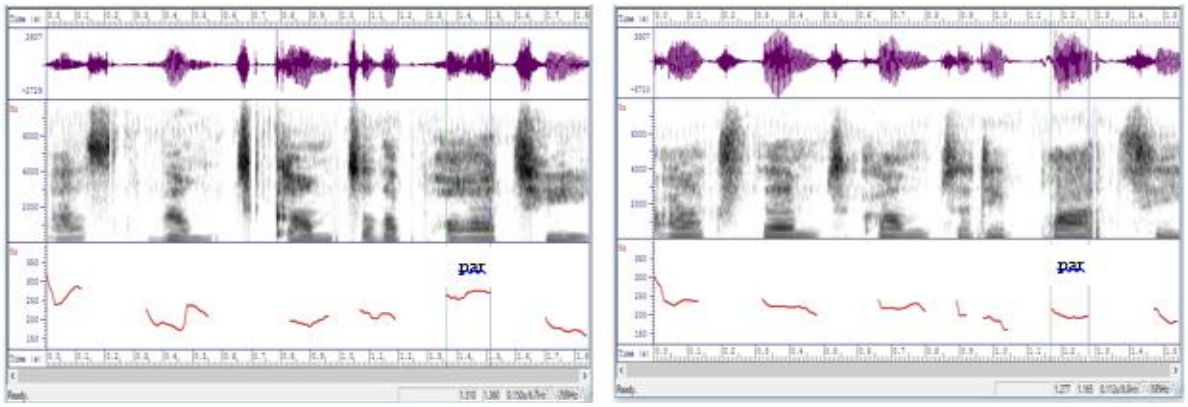
The analysis of the spectrographic patterns realised in UIYTUs' assignment of nuclear stress to the regular Designated Terminal Elements of an English simple sentence are presented in this section.



Native baseline HTC

Figure 9: Native baseline spectrogram of *Ask them to come to the party* compared with sample HTC spectrogram of *Ask them to come to the party* as produced by UIYTU 221

Figure 9 displays the NB spectrogram of *Ask them to come to the party* in comparison with sample HTC spectrogram of *Ask them to come to the party*. The NB waveform and pitch contour shows *par-* was produced with the highest amplitude, at 268Hz and in 150ms, thereby assigning it the highest prominence in the sentence. In similar vein, The HTC spectrogram displays a pitch track which not only shows alternation between strong and weak syllables but also shows that the nuclearly stressed syllables, *par-*, was produce with the highest amplitude and longest duration in the sentence.

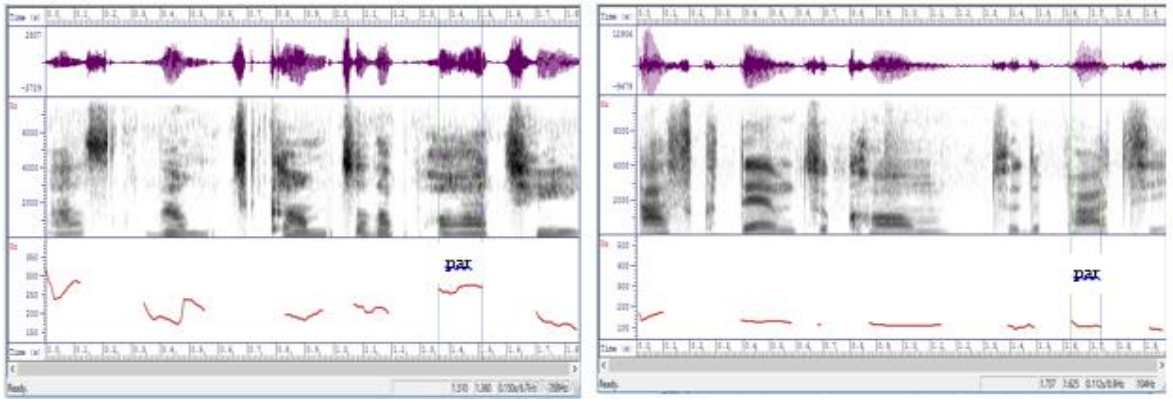


Native baseline MTC

Figure 10: Native baseline spectrogram of *Ask them to come to the party* compared with sample MTC spectrogram of *Ask them to come to the party* as produced by UIYTU 231

The NB waveform and pitch contour show the alternation of strong and weak syllables in the sentence. It also shows that *par-* was produced with the highest amplitude, at 268Hz and in

150ms, thereby assigning it the highest prominence in the sentence. Although the spectrogram of the MTC display some alternation, *par-* which is supposed to be produced with the highest prominence did not receive its due prominence.



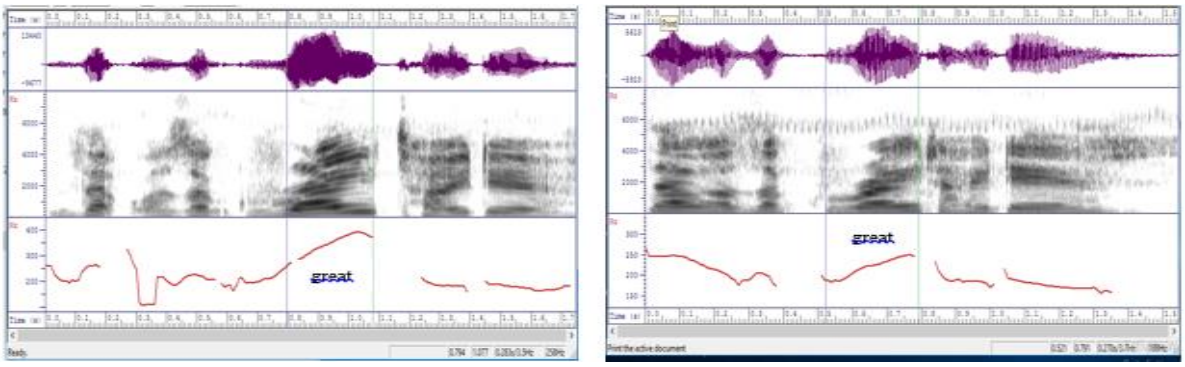
Native baseline LTC

Figure 11: Native baseline spectrogram of *Ask them to come to the party* compared with sample LTC spectrogram of *Ask them to come to the party* as produced by UIYTU 97

While the spectrographic image of the native baseline show alternation of the strong and weak syllables, and the highest prominence on *par-*, the stronger DTE of the sentence, the LTC spectrogram display flatness.

3.3.2 Dominant spectrographic patterns of *That was a GREAT idea* as produced by the native baseline and the UIYTUs

The analysis the spectrographic patterns realised in UIYTUs' assignment of nuclear stress to the contrastive Designated Terminal Elements of an English simple sentence are presented in this section.

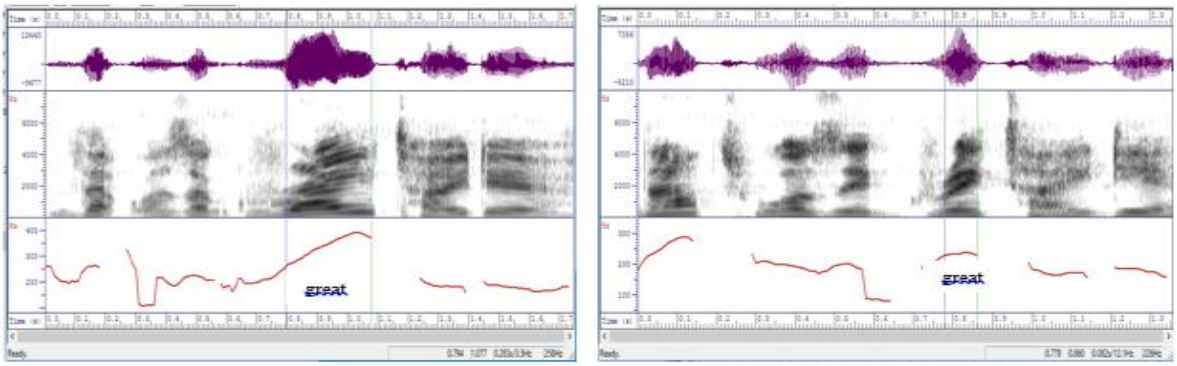


Native baseline HTC

Figure 12: Native baseline spectrogram of *That was a GREAT idea* compared with sample HTC spectrogram of *That was a GREAT idea* as produced by UIYTU 201

As observed in the spectrogram of *That was a GREAT idea* produced by the native baseline the prominence of *great* in relation to the other component syllables of the expression marks it for the nuclear stress. A pitch value of 258Hz and duration value of 1077ms are recorded for the syllable/word against the 192Hz pitch and 1056ms duration value of the normal nuclearly stressed syllable. This makes the nuclear stress reassigned to *great* for contrastive purpose. The sample HTC spectrogram of the same expression shows that the HTC approximated to the NB

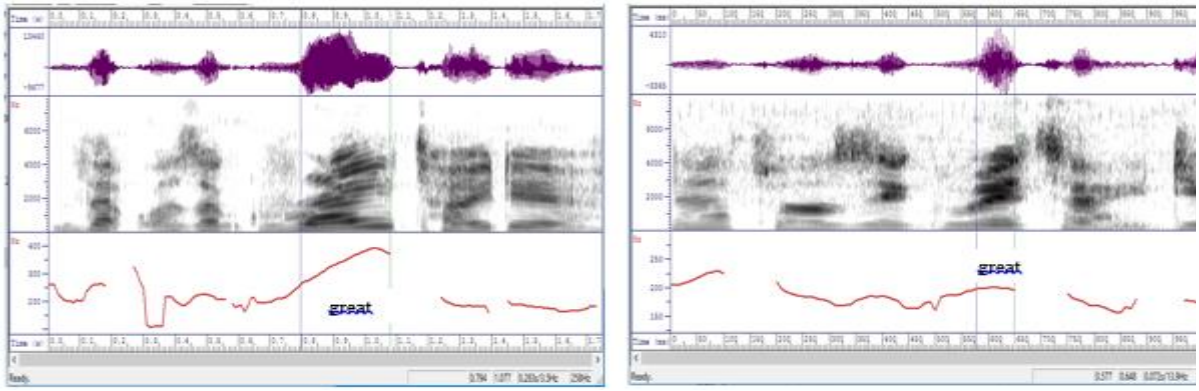
in the meaning contrast by producing *great* at 249Hz and 791ms, a pitch and duration value higher than the pitch and duration value of the other syllables, the default nuclear syllable.



Native baseline MTC

Figure 13: Native baseline spectrogram of *That was a GREAT idea* compared with sample MTC spectrogram of *That was a GREAT idea* as produced by UIYTU 285

The sample MTC spectrogram of *That was a GREAT idea* as produced by UIYTU 285 in comparison with the native baseline spectrogram is presented in Figure 9. Although the MTC spectrogram display some alternation in the pitch contour and the waveform, the expected rise in pitch of the contrastively stressed syllable observed in the NB spectrogram is not clearly evident in the MTC's. The MTC duration of the syllable is much shorter than the value realised for the NB.



Native baseline LTC

Figure 14: Native baseline spectrogram of *That was a GREAT idea* compared with sample LTC spectrogram of *That was a GREAT idea* as produced by UIYTU 193

The sample LTC spectrogram of *That was a GREAT idea* as produced by UIYTU 193 in comparison with the native baseline spectrogram is presented in Figure 10. Unlike what obtains in the NB spectrogram where the pitch and duration values of *great* are not just higher than the values of other syllables but are also higher than those of the regular nuclearly stressed syllable, the LTC pitch track shows no such rise in pitch. In fact, the pitch of *great* is lower than the pitch of *that*, a grammatical word. Its duration is also much shorter than the native baseline's. This shows the LTC's little knowledge of using stress to contrast meaning.

4 Summary of Findings

The spoken English of three groups of participants, as social groups, were investigated in this study. The participants are Yoruba (Nigerian) teenagers with high (HTC), mid (MTC) and low (LTC) technology contact levels. The HTC participants assigned nuclear stress to the appropriate syllables of simple sentences significantly better than the MTC. In the same vein, the MTC performed significantly better than the LTC. Thus, UIYTUs' ability to assign nuclear stress to the regular and contrastive DTEs of simple sentences positively correlates with their level of exposure to the technology-based non-enculturation sources. The metrical grids reveal that appropriate assignment of nuclear stress to regular and contrastive DTEs of simple sentences was commensurate with participants' level of technology contact. The metrical grids of the HTC predominantly displayed alternation of strong and weak syllables and assignment of nuclear stress to the regular and emphatic stronger DTEs of the sentences in which they occurred, while the LTC, more than the MTC, produced adjacent stressed syllables which resulted in stress clashes and non-conformity to SBE rhythm. The acoustic analysis of the pitch and the duration readings of selected utterances produced by UIYTUs reveal that the HTC had the longest duration and the highest pitch frequency and amplitude on the nuclearly and emphatically stressed syllables. The stress cues of the MTC were sometimes appropriate, while LTC deviated from the standard norm.

5 Conclusion

This study examined nuclear and contrastive stress in the English speeches of Yoruba (Nigerian) teenagers based on their levels of exposure to technological facilities through which they have contact with native English. The study, through the differences established in the productions of the three groups, has holistically established that Nigerian teenagers' exposure to and use of technology-based non-enculturation sources of native English influence their proficiency in the assignment of nuclear and the deployment of stress for meaning contrast. Their performance attests to Roach's (2000) assertion that approximation to native form of spoken English is attainable if foreign learners are provided with necessary social contact with native speakers. It also validates Akinjobi's (2015) recommendation of non-enculturation sources of contact with native English as a means through which non-native speakers of English language such as Nigerians can improve their spoken English. It also further confirms earlier empirical studies on the viability of technology-enhanced access to native speakers for English proficiency in Nigeria (cf. Adesanya 2020b; Aiyeola 2020a, 2020b) and the prospects of ICT for (spoken) English language teaching and learning as suggested by Aremu 2014; Akintunde/Angulu 2015.

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