The Phonological Sensibility of Nigerian Pre-Varsity English Speakers' Activation of Heterophones and Pseudohomophones in Reading Comprehension

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Abstract: A very vital aspect of word learning includes phonological discrimination of lexical items. This study investigated the degree by which accurate pronunciation of heterophones and pseudo-homophones could be excitatory to comprehension of English sentences by young Nigerian learners of English. Five sentences, each containing a target word, were presented to 40 pupils to read and interpret. Perceptual, referential and statistical analysis of the data revealed the negative effect of deficit of phonological knowledge on word identification and decoding. It was discovered that phonological sensibility was a vital predictor of correct contextual selection of heterophones and pseudo-homophones. The findings support a model of comprehension in which phonological knowledge is vital.

Key Words: heterophone, homophone, logogen, reading, comprehension.

1. Introduction

Homophones (i.e. a set of words sharing similar pronunciation, but different meanings and spellings) and homographs (i.e. a group of words with varied meanings, but spelt in the same way) are two lexical sense relations that phonetically and orthographically influence the interpretations of words received while reading. Traditionally, the word is assumed to be the basis of meaning, although some linguists such as Spencer (1992) and Matthew, (1991) have argued that the morpheme is the minimal meaning-carrying linguistic unit. However, when reading, it appears that the knowledge of the word plays a vital role in comprehension such that an encounter with an unfamiliar word retards reading progress on the one hand, and wrong decoding of the sound of a word, as is possible with homophones, heterophones and homographs, affects comprehension on the other.

Some linguists, such as Daneman & Carpenter (1983), Morris and Folk (2000) and Harrison & Folk (2003), observe that words like heterophones (i.e. words with two or more possible

pronunciations and two or more meanings) are capable of raising comprehension threshold among unwary readers. Furthermore, Harrison & Folk's (2003) study finds that contextually inappropriate selection of meaning of an ambiguous word (such as heterophones and homophones) in a sentence renders the sentence meaningless. Also, Daneman & Carpenter (1983) discover that the sounds of words are important in the working-memory code in reading. In other words, the different pronunciations of heterophones or homographs in which each patterned pronunciation indexes different meaning of the word, cause differences in the nature of the interpretation a sentence receives (Morris & Folk, 2000 and Folk & Morris, 1995) and this wrong interpretation invariably deviates from the intended meaning of the writer.

Again, a body of related research supports the role of phonology in recoding, decoding and identifying lexical items. For instance, de Jong and van der Leij (2002) find in their study a strong correlation between phonology and comprehension, especially in word-decoding. Similarly, Fitneva *et al*. (2009), Kelly (1992) and Cutler & Carter (1987) discover that the phonological properties of lexical items (especially verbs in English) affect their categorization – i.e. the sound of the verbs determines their prediction in a text. Verbs, for example, tend to have less coronal consonants, less number of syllables, and are more iambic stress pattern than nouns. They therefore conclude that the postulation of readers on new words in a text is determined by phonological ideas. Extending the research to Dutch students, ter Schure (2010) reports that Dutch students learning to read associated category information, especially those of nominal items, with phonological typicality. Also, Crielaard (2011), classifying subjects into consistent group, inconsistent group and independent group corroborates ter Schure's findings.

The controlling repetitive theme in the studies mentioned above is the importance of phonological knowledge to native language learners in the decoding of words in a text. However, the question that remains unanswered is to what extent phonological properties of a lexical item determine the meaning attributable to a sentence by the second language learner- reader. Since phonological processing skills are not limited to skills that enable readers relate sounds to spelling only, but also involve those that make readers sound out correctly the different forms/shades of pronunciation of words, this study aims at investigating how

phonological priming of heterophones and pseudo-homophones contributes to sentence comprehension by English second-language readers. The term 'pseudo-homophone' is used in this study to mean real words that *nearly* sound alike – such as *mere* and *mare* or *where* and *were*. A learner-reader is likely to mistake the pairs for homophones. Therefore, the sole question this investigation seeks to answer is, does phonological cue/priming have excitatory effect on comprehension? Providing an answer to this question is the main focus of this research, based upon which it is hypothesized that the knowledge of the phonological variations inherent in heterophones and some homophones (including pseudo-homophones) reduces the threshold in reading comprehension.

2. Reading is no longer a 'psycholinguistic guessing game'

A fundamental idea to keep in focus is that reading is one of the most complex things that a human being does. No wonder it took about 30,000 years after speech to device a system of writing and reading (Hall and Moats, 1999). Yet one amazing feature of reading is the oscillatory nature of the research results conducted on it. For instance, in 1970s was the assumption that reading was a 'psycholinguistic guessing game' (Goodman 1967 & 1976) with the following corollaries: skilful readers recognize whole words without examining the individual letters; they go directly from print to meaning without studying each word; and they use context to anticipate words, thereby reducing the time needed to studying them (Hall & Moats, 1999). Twenty years later, Dr Marilyn Adams found in her studies that skilful readers read virtually every letter in every word, read almost every word (skipping a few grammatical words) and rely little on contextual information because word recognition skill are so rapid, automatic and efficient. She also found to her chagrin that reading is not a psycholinguistic guessing game: it does depend on some specific linguistic abilities many of which can be learned in school (Adams, 1990). In other words, 'comprehension depends on processing specific, clear, complete information about the words on the page' (Hall & Moats, 1999: 128), and pronunciation is an integral part of the information accessory of the word.

Although, it is argued by many scholars in both psycholinguistics and applied linguistics that words are easier understood than sentences (Featherston et al, 2000 & McElree 2000), other scholars working on the latter, further argue that sentences are better understood than complex or transformed ones (see Chomsky, 1957 & 1965). Further, Chomsky

(1972) explicitly posits that transformations inhibit comprehension. While this assertion appears unexceptionable, especially as regards the ability of the brain to handle stimuli in bits, it is somewhat ill-starred, particularly if the factors that either raise or lower comprehension are taken into consideration. For example, to a reader who has for the first time come across the word *gobbledygook*, the following sentence may pose a challenge:

1. This is a piece of gobbledygook!

On the contrary, however, the reader or listener may conveniently interpret the meaning of sentence 2 below inasmuch as he/she knows the meaning of *jargon*:

2. Phonology, like other disciplines in linguistics that lay claim to jargons, is full of gobbledygook.

Stretching this argument further, an ambiguous kernel sentence can raise comprehension threshold much as any transformed sentence can be inhibitory (Crocker and Brant, 2004). For example, sentence 3 may first pose a challenge to an unwary reader in spite of his/her familiarity with the word *bank*:

3. There is no bank in this headline.

And the presence of the word *headline* (that seemingly contextualizes *bank*) in the sentence does little to help the reader decode the meaning. Compare sentence 3 with sentence 4:

4. There is no bank – a secondary part of news heading, usually in smaller types – in this headline.

It is comfortable to argue that the transformation in sentence 4 is rather excitatory to comprehension. Little wonder that some psycholinguistics scholars, such as Williams (2002b: 432), falsify the *Derivational Theory of Complexity*.

Reading is done in order to extract meaning from a text; therefore, a reader has not really read if he/she does not make sense of what he/she has read. Comprehension is optimal only when a reader successfully engages with ideas in a text. Failure to do so will cause a breach in comprehension. Thus, if a reader must negotiate meaning with a written text, he/she has to understand the different forms – oral and reading – of words. Reading vocabulary constitutes the words recognised or used in print (*Put Reading First*, 2001). Language learners learn most of the words they use by listening to how they are used by others (who are more competent), reading about them and also acquiring them indirectly from personal experiences

and interactions with one another, on the one hand, and appropriate exposure to texts such as dictionaries, on the other. Their ability to read accurately and quickly depends on the adeptness in automatically recognising words in an effortless and impressive manner, so that they do not concentrate on decoding them (the words), instead focus on what the next might be. To aid automaticity, therefore, the phonological cues of words should be automatically understood and mastered by readers.

There seems to be a kind of salient extraneous cue that is often exhibited in the pronunciation of a word. The sound of a word and its meaning are thus not arbitrary. Instead, the meaning is systematically connected to the pronunciation of the word. Put in another way, comprehension of written symbols, to a great extent, depends on the phonological knowledge of the reader, such that when the reader knows the correct sound of a word, he/she recognizes it as he/she hears it.

3. From fovea to cortex

As seen in the preceding section, it is obvious that it is not only the graphic representations in the form of print which readers' eyes access for their brain to interpret that is responsible for comprehension. The sound associated with the words readers read also contributes to their understanding of what they read (especially where homophones and heterophones are concerned). Thus, the two most crucial processes in reading are decoding the print and understanding the meaning of the print (Gough & Hillinger, 1980; Gough & Tunmer 1986). These two processes constitute what Gough & Tunmer (1986) and Hoover & Gough, (1990) term *the simple view of reading*. According to this view, reading equals decoding and comprehension: R = D x C (Gough, 1996). An interesting aspect of this view of reading is the vivid acknowledgement of the division between decoding and comprehension. This therefore implies that the pronunciation a word receives may bias a reader towards a particular interpretation of the word, and this in turn determines the readers' semantic postulation of the sentence or text read.

It is vital here to briefly examine what happens in the brain when reading before comprehension sets in. This shall be done through the provisions of the logogen model. This is by no means the only model in applied-linguistics and psycholinguistics that analyses how information is apparently processed by the brain (there are the parallel distributed model, the cohort model and many more). Worth noting is the fact that it is chosen to be reviewed here because of its perspicuous view

on the visual-grapheme relationship with the brain while reading, on the one side, and grapheme-semantic relationship, on the other side. The brain seems to interpret words based on the logogens fired by the sound signals associated with the word.

Although there seems to be no general agreement as to the originator of this model, it is often traced to the British scientist John Morton, who used the logogens in explaining the effect of context in word recognition. A logogen, according to online Psychology dictionary, 'is a standalone memory unit which corresponds to letters and digits.' Logogens, thus, are small specialized recognition units; with each unit capable of recognizing a word. The above dictionary goes further to describe logogen model as a 'purely theoretical model of memory which has three main stages – recall, recognition, and then recognition. For example, the image of a table is activated by hearing or observing the word table or associated terms.' The beauty of this model lies in its ability to involve semantic and phonemic properties of a lexical item in recognizing and retrieving information – words – from the memory. This therefore means that each word is composed of several minute, abstract elements called logogens. It is important to note that logogens, in themselves, are not word-storage facility, rather, what they do is to store basic information – such as meaning, appearance and sound – of words, (Paradis, 1997, cited in Gürel 2004) which when stimulated above its threshold level, gives rise to output system in the form of pronunciation. It is possible that two or more words are fired through the output system by some stimuli, but it is the one whose activation first reaches the threshold level that is pronounced (Marslen-Wilson & Welch, 1978; Green, 1986 & Paradis, 1993).

Comprehension of written symbols, to a great extent, depends on the phonological knowledge of the reader. The brain seems to interpret words based on the logogens fired by the sound signals associated with the word. When the reader is familiar with the sound components of the words they visually come across, such recognition activates 'a memory representation' (Borowsky, Owen and Masson, 2002: 969) of the words. Therefore, no matter the amount of contextual information surrounding a word, a reader that does not discriminate the sound of a word tends to lose the comprehension of such word (especially words that are new to the reader). This is logical. If, for example, a reader comes across the word *fete* for the first time, and pronounces it as /fɪ:t/, there is the tendency that such reader will be trying to interpret *fete* as *feat* or *feet*.

However, it is equally arguable that a reader may interpret *fete* as *fate* if they pronounce it as /feɪt/, which is the correct realization.

4. Methodology

The participants comprised 40 students who were at the moment of testing taking preparatory courses for onward admission to universities. This implies that the participants had all completed their secondary school education. All the participants spoke English as a second language. The medium of instruction in the secondary schools they finished from was English and still remained the language of tutorial in the preparatory centre. Situated in Lagos - the commercial capital of Nigeria, the preparatory centre was a converging point for many pre-varsity students from different secondary schools. They were all bilinguals in their native language and English. A few of them could be regarded as coordinate bilinguals, more as bilinguals with bias to their native language and the rest were bilinguals with bias to English. Some 18 students said that they could speak (but not necessarily write) one of French, German and Arabic in addition to English and their respective mother tongue.

5. Design & Procedure

The participants read five sentences each containing a target word: either a biased homographic heterophone (i.e. a word containing two meanings and two pronunciations, but spelt in the same way) or biased pseudo homophone (i.e. two words with two meanings and seemingly one pronunciation). The heterophones and pseudo-homophones were *biased* in the sense that they were purposively selected to meet both the cognitive ability of the participants and the experimental interest of the researcher (see appendixes 1 & 2 for the chosen words). In each sentence, the target word is either preceded or followed by contextualized disambiguating information, thus, instantiating the less frequent interpretation of the target word. However, the disambiguating part of the sentence was not highlighted for the reader, especially to avoid influencing their memory of the phonological properties of the target words (Birch and Garnsey, 1995).

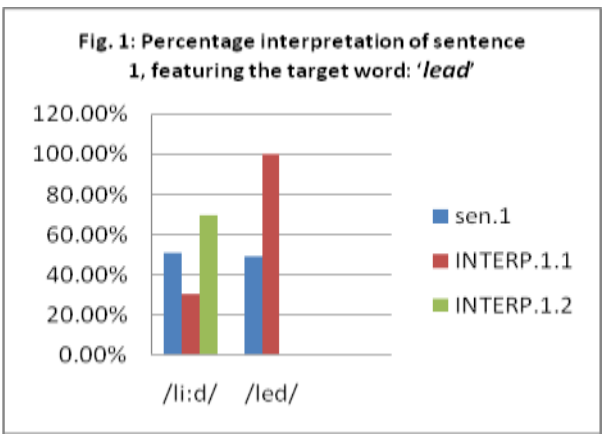
Each participant read the sentences twice. Before the first reading, they were given a list of heterophones and pseudo homophones (see appendixes 1 & 2) with their meanings to study. The words were not transcribed; nor were the participants drilled on their pronunciations. In the first reading experiment, they were asked to read the sentences and interpret them according to how they understood them.

Before the second reading experiment, the participants were drilled on the pronunciations and were reminded of the meanings of

the words. Participants were asked to interpret each sentence after the second reading. The responses of both reading experiments were subjected to a referential and descriptive statistics of percentage.

Sen.[1] 1From what I have heard, it is obvious that lead poison is dangerous.

The focus in this sentence is *lead*, which has dual meanings based on how it is realized. If pronounced as /lɪ:d/ it means *first place* and as /led/ it means a chemical element (represented by the symbol *pb*). Thus the sentence can be interpreted as either (1) *the poison from the chemical element (pb) is dangerous* (designated as INTERP[2].1.1) or (2) *the major/leading poison is dangerous* (designated here as INTERP.1.2)



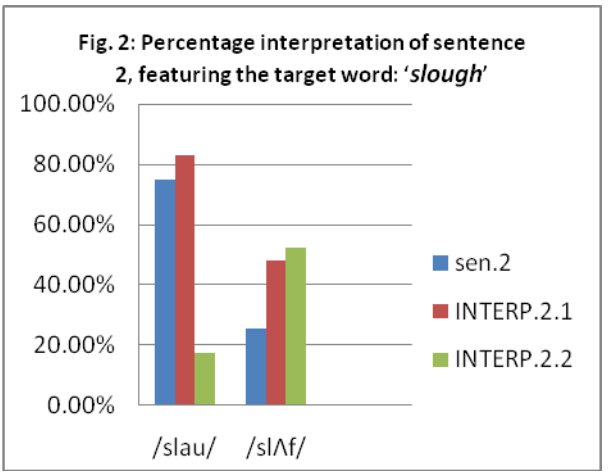
Sen. 2 Anytime it rains, the slough at the bush-path impedes walk.

The presence of the homograph *slough* made the subjects have different interpretations. The word *slough* can be realized as /slau/ to mean *wet ground* or *a swamp* and as /slʌf/ to mean *cast off skin of a snake*. Hence the sentence could mean that 1) *when it rains the ground is wet and this makes walking encumbering* (INTERP.2.1) and 2) *after it rains, cast-off skin of snake at the bush-path makes walking not easy* (INTERP.2.2).

Notes

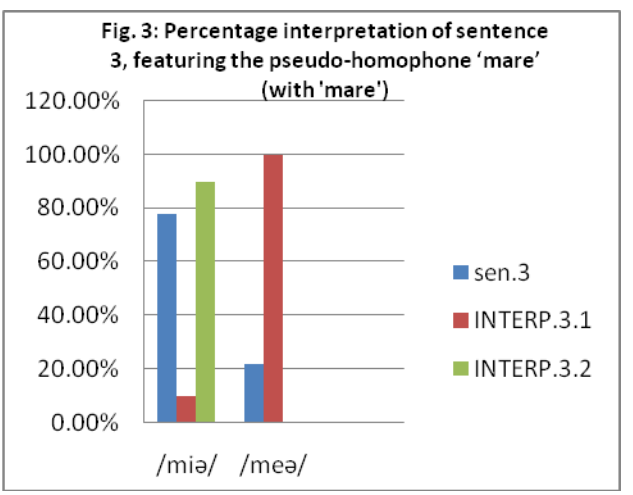
[1]Sen. stands for sentence.

[2]INTERP. means interpretation.



Sen. 3 He broke his leg in a mare accident during polo.

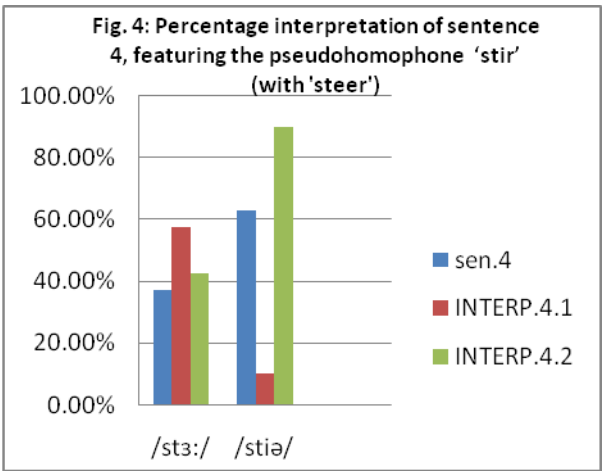
This sentence contains a pseudo-homophone *mare*, which slightly sounds like *mere*. The sentence literally means: *the man broke his leg in an accident involving a female horse at a polo* (INTERP.3.1). But when the word *mare* is rendered as /mɪə/ the meaning rendered above might be compromised to mean *the man broke his leg in a sheer accident at a polo* (INTERP.3.2)



Sen.4 She watched the baby stir in its cot in the opposite room.

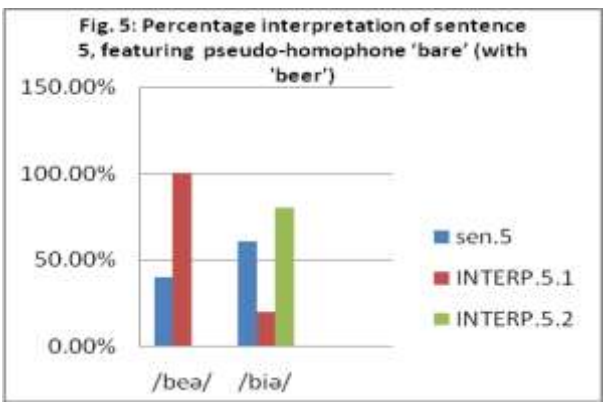
At issue here is *stir*, which is pronounced /stɜ:/ and means *slight movement* or *impression/feeling*, depending on the context it appears. It was observed that some of the participants realized it as /stɪə/, which means *moving in a particular*

direction. Thus, the sentence was given two interpretations by the subjects. The first was that *the baby moved its body while in the cot that is in the opposite room* (INTERP.4.1), and the second was that *the baby moved towards the cot or to the opposite room* (INTERP.4.2).



Sen. 5 Kate said that she'd like to have more drink to take her mind off the bear in the mountains.

The word bear, pronounced /beə/ in the sentence means a large plantigrade mammal with long shaggy hair. Therefore the sentence can be interpreted as Kate requested more drink because of the sight of a large plantigrade mammal in the mountains (INTERP.5.1). However, some of the subjects realized bear as /bɪə/ and as such rendered the sentence to mean that Kate requested more drinks because of the beer (alcoholic drink) she saw in the mountains (INTERP.5.2)



One salient observation running through the five sentences designed for this study is that they were each given two interpretations. And this was made possible due to the different realizations given to each target word in the sentence. That is, each participant interpreted every sentence mainly according to the sound of the target word registered. This is quite in consonance with the observation made by Perfetti (1994) and Cain & Oakhill (2008) that inaccurate word decoding often results in readers' inability to establish liaison between words, phrases, and sentences in their efforts to build coherent and meaningful interpretation of the text they are dealing with. Thus, the wrong meaning was inevitably arrived at as a result of wrong selection of the pronunciation of the target word; meaning, therefore, that the short-term phonological code available for the subjects was not correct.

By way of exemplification, in Sen.1, more than 50% of the participants realized 'lead' as /lɪ:d/ and less than this amount produced it as /led/. As figure 1 shows, all the subjects that gave 'lead' the latter pronunciation interpreted the sentence correctly, whereas only 30% of those that realized 'lead' as / lɪ:d / got the interpretation right. The rest 70%, in spite of the presence of the contextual disambiguation information – *poison is dangerous* – interpreted the sentence wrongly. One simple conclusion, therefore, is that when the sound sequence /led/ was articulated, logogens were stimulated, and the likely candidates in the lexicon of the subjects were 'led' (past tense of 'lead') and 'lead' (pb). And the latter happens to match with the target word, given the contextual information provided; thus, all the participants clung to it. On the other hand, however, it appears that, among the 30% that realized 'lead' as /lɪ:d/ but correctly interpreted the sentence, did so because they were able to quickly establish meaning between the target word and the contextual information part of the sentence. Thus one may be comfortable arguing that the other 70% ignored this vital clue.

However, the observation is slightly different in Sen.2. As figure 2 indicates, 75% of the subjects correctly realized the word 'slough' and 25% got it wrong according to the sentence. While over 80% of the participants of the former got the interpretation right, less than 50% got it right in the latter group. That more subjects among those that pronounced 'slough' as /slʌf/ interpreted the sentence wrongly, strongly testifies the prominence of phonology in the comprehension schema. Unlike in the case of 'lead', where the subjects had alternative

items in their mental lexicon stimulated by the logogen to choose from for any of the possible realizations, with 'slough', they had no realizable option readily available in their lexicon. For example, as /slɑu/, there is no other word available for them, so is /slʌf/.

At issue with the pseudo-homophones is the conflation of the sounds /ɪə/, /eə/ and /ɜ:/ among the subjects. Each of the three words (stir, bear and mare) was given two pronunciations, each of which resulted in different semantic output. For instance, 'mare' in Sen.3 was realized by 76% of the subjects as /mɪə/, and about 90% of this gave the sentence INTERP.2.2, while as few as 10% provided the correct interpretation, which is INTERP. 2.1. Interestingly, all the subjects that made up the 24% that correctly realized 'mare' as /meə/ assigned INTERP. 2.1, which was the correct interpretation. A similar pattern is salient in Sen.5, where all the subjects who correctly realized 'bear' as /beə/ correctly interpreted the sentence, whereas 80% of those that wrongly pronounced it as /bɪə/ assigned INTERP.5.2. Again, in Sen.4, more of the subjects wrongly pronounced 'stir' as /stɪə/ and 90% of this set wrongly assigned INTERP.4.2 to the sentence. Fifty-seven point five per cent of those that realized it as /stɜ:/ got the interpretation right, as against the 42.5% that got it wrong. The closeness here could be as a result of the closeness in meaning between 'stir' and 'steer'.

It appears that as a result of different realizations given to the target pseudo-homophones, the readers selected the more frequent sound, which by extension implies more frequent meaning (Duffy, Morris & Rayner, 1988). Incidentally, not even the disambiguating information could correct their misinterpretation.

6. Conclusion/Recommendations

The wrong choice of the sounds of the words presented to the participants could not elicit their background knowledge, the deficit of which denied them the necessary inferences that would have enabled them to understand the sentences. This implies that failure to ascertain the connection between sound and letters results in making readers to depend more on their visual memory. Such dependence on only orthographic access is capable of denying the reader vital semantic access. This, in turn, creates a form of ceiling on the lexical item on the one hand and raises the comprehension threshold on the other, and both result in downward spiral in meaning. This phenomenon is summarised in figure 6 below:

Figure 6: *The phonological mapping of reading*

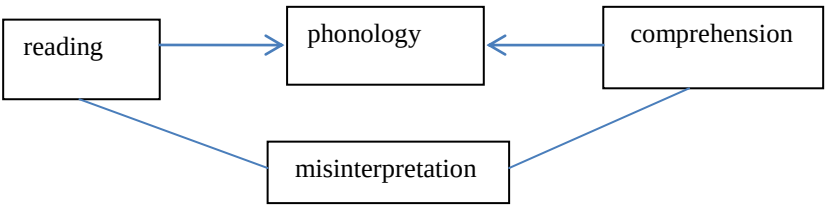


Figure 6 clearly shows that any attempt to overlook the phonological component of a text (or a lexical item) is capable of bringing in misinterpretation. In other words, texts are read and phonological activation is made which influences meaning. That the participants in this study were second language learners of English, confirms Brysbaert and Wijnendaele's (2004) argument that phonological priming does not only affect monolinguals, but also equally determines lexical processing in second language.

One important conclusion reached from this study is that as a result of the participants' inability to decode the target words accurately, there was a breakdown of comprehension. It is therefore recommended that learners of English in Nigeria should be explicitly drilled on various phonological properties of lexical items especially hetero-phones and various forms of homophones. There is also the need to carry out more research to determine whether training on phonology – such as phonological and phonemic awareness – will reduce the comprehension threshold among second language learner readers.

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Appendix 1

Homophones and Pseudo-homophones

i. Stir= /stɜ:/ to change position
   Steer= /stɪə/ to direct the movement
ii. Bear= /beə/ animal (mammal) with ling shaggy hair
   Beer= /bɪə/ alcohol
   Bare= /beə/ lacking cloth
iii. Mare= /meə/ female horse
   Mere= /mɪə/ sheer

iv. Fear= /fɪə/ feeling of being in danger
Fair= /feə/ reasonable
v. Straight= /streɪt/ not curved
Strait= /streɪt/ difficult situation
vi. Liver= /lɪvə/ an organ of the body
Lever= /lɪːvə/ a device
vii. Lager= /lɑːgə/ beer with low hops
Larger= /lɑːgə/ very big
viii. Overage= /əuvəreɪdʒ/ no longer useful (due to age)
Average= /ævərɪdʒ/ intermediate

Appendix 2

Heterophones

i. Lead= /led/ metal (pb)
/lɪːd/ go in front of
ii. Wind= /waɪnd/to follow a course that is not straight
/wɪnd/ a gust of air
iii. Bass= /beɪs/ low deep sound
/bæs/ a type of fish
iv. Slough= /slɒu/ wet ground
/slʌf/ cast-off skin of a snake
v. Grave= /grɒːv/ accent mark placed on a letter to show its specific sound
/greɪv/ burial place
vi. Bow= /bɑu/ bent
/bəu/ weapon
vii. Does= /dʌz/ performs an act
/dəuz/ female deer
viii. Dove= /dʌv/ pigeon
/dəuv/ past tense of dive
ix. Despot=/despɒt/ tyrant
/dɪːspɒt/ to remove spots
x. Glower=/gləuə/ something that glows
/glɑuə/ a scowl