A Phonological Assessment of the Features and Roles of Pitch in Spoken Discourse

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Abstract
This review paper is an assessment of the features of voice pitch and its roles in spoken discourse. Pitch refers to the highness and lowness of the voice as humans produce verbal utterances. Speakers pronounce sounds at different pitch levels for grammatical, semantic, physiological and psychological reasons. However, the concept appears not to have been given much attention by scholars and phonologists, particularly as it relates to the influence of hormonal alterations on its usage. This paper therefore examines the meaning of pitch and the differences between pitch and fundamental frequency. It equally looked at its levels, range, heights and its roles in speech production. The review employed the descriptive research design and secondary sources of data / information gathering as it relied mainly on textbooks, journals and other online materials. Its findings revealed that pitch is an auditory property of speech which is determined by speakers' fundamental frequencies, the thickness of their vocal chords, their emotional state and hormonal changes in the human body. It also showed that while pitch modulation changes the dictionary meanings of words in tonal languages, in intonation languages, it only alters their semantic and pragmatic meanings. The paper recommends that teachers and lecturers of second language learners (L2) of Oral English and General English in secondary and tertiary institutions across the nation and beyond, should teach pitch more consciously, using relevant instructional materials like voice recorders, CD players, headsets, television sets, projectors, and speech analyzing instruments.
Keywords: Fundamental frequency, pitch height, pitch range. tonal languages, intonation languages

Introduction
All over the world**,** speech is fundamental to human existence, for it is through it that ideas, information, instructions, good wishes, areas of interest, cultural norms and beliefs, different emotions and intentions among many others, are transmitted from one person or group to the other. Therefore, spoken messages must be carefully presented to prevent misrepresentation (of the speaker, as a person's voice pitch usually influence other's perception of them) and, or misinformation (of the message, as an utterance' intelligibility level is often determined by its manner of presentation and not through the utterance itself) (Apple et al.,1979; Klofstad et al, 2016 ; Kim, 2020). A major way of achieving speech clarity is through the proper application of voice pitch, for with proper pitch modifications during communications, utterances become clearer and more interesting (Anyanwu, 2013). In the light of the foregoing, explanations on the meaning, features and roles of human voice pitch and so forth are presented in the conceptual framework below.

Conceptual Framework
Pitch: Pitch has been described as the level of the highness or lowness of the voice when speech sounds are being produced (Anagbogu et al., (2010). This highness or lowness of a voice is related to the vibration of the vocal chords (Elugbe, 2015; Hasa, 2020). Consequently, sounds are produced with different pitches owing to the fact that the vibration of the vocal chords takes place at different frequencies. Thus, a low pitch indicates a low frequency, while a high pitch employs a high frequency (Hasa, 2020). Pitch frequency is predicated on the size of the vocal chords that is, their thickness, length and tension (Esen, 2022). Hence, while men often have thick and long vocal cords which make them employ low pitches in speech, women are considered to have non thick vocal cords which accounts for the general highness of their voice pitch (Esen, 2022). In addition, pitch is usually realizable according

to the listener's perception. That is, pitch exists only when perceived by hearers, it cannot exist in isolation but certainly has some kinds of frequencies which are translated into pitch by the hear (Moore, 2020).

Differentiating between Pitch and Fundamental Frequency (F0)

The frequency of pitch, which has been described by Roach (2010) as fundamental frequency (F0) is the acoustic or physical property of oral sounds . It represents the number of complete repetitious cycles of a pattern of air pressure variations occurring in a second. That is, it reveals the total number of opening and closing movements of the vocal chords in a second. It is a speaker based phenomenon and it is measured in Hertz (Hz) with the aid of speech analyzing instruments such as the Oscillogram. The oscillogram is used to check the number of times a pitch pattern is repeated. Other technologically more advanced computer programmes such as the spectrogram which tracks the progress of a speaker's fundamental frequencies, voice amplitude, quantity and quality of speech segments among others, are also being used to arrive at speakers' fundamental frequencies in a more sophisticated manner (Cruttenden, 2014). Consequently, fundamental frequency (F0) is different from the pitch which is the auditory feature of sound as perceived by the hearer. Pitch, as pointed out earlier is a listener related speech prosody which is dependent on listeners' perceptual ability. Utterances are therefore considered intelligible or non intelligible, depending on listeners' assessment of the pitch levels employed by their speakers. Nonetheless, both phenomena are interrelated, as pitch levels depend largely on the fundamental frequencies of sounds.

Variations in the pitch reveal different types of information about speakers as well as their qualities/ features. Some of these are (i) the sex of the speaker (ii) the age the speaker (iii) the emotional state of the speaker as at the time of the speech event.. That is, whether they are excited, angry, or unhappy and so forth (Ladefoged and Johnson 2011). Pitch analysis does not consider non-linguistic pitch variations which are not under the control of the speaker as they are not linguistically relevant and meaningful (Yadugiri 2013). For instance, pitch modulations shown in a speaker's voice if they talk while running, jumping or dancing, do not fall under this category as they involve non-conventional movements.

Pitch levels: These are described from the lowest to the highest and are numbered in the following order, 1,2,3,4. Level 1 is the 'low', level 2 is the 'mid', level 3 is the 'high' while level 4 is the 'very high' level (LaPalombara, 1976; Pronuncian.com). The levels can also be represented diagrammatically as presented below.

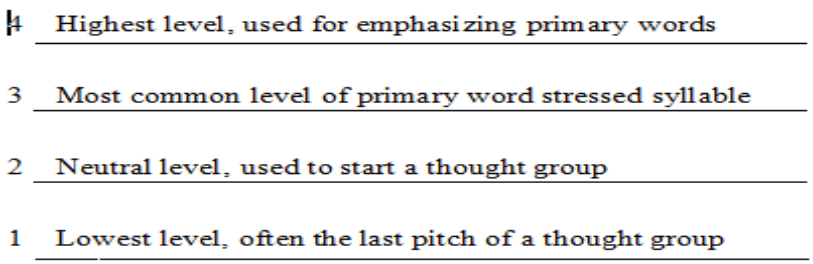


Figure 1: Diagram representing different pitch levels (Pronuncian)

Speakers' utterances from a single word to longer utterances are all uttered using different pitch levels. The average human's voice pitch begins at level 2 (mid), which is for ordinary declarative sentences, it rises gradually to level 3 (high) but quickly falls to level 1 as the sentence ends. Yes-no question equally begins at level 2 but rises to and remains at level 3 at the close of the sentence, Wh-questions begin at level 2, rise to level 3 (high) and fall to level 1 (low) towards the end, while exclamations begin at level 2, as it is with other sentence types, and rise to level 4 without falling (LaPalombara, 1976; Levis, 1998; Demeren, 1986 in Topal, 2018). The following conversation exemplifies this.

A: "Lady May, the new kindergarten attendant, bought a duplex house at Lekki yesterday."

At the same time
B: For real!
C: For real
D: For real?

In the above conversation, utterance A elicited 'the same response' from the listeners 'B', 'C' and D. However, the meaning of each of the three responses is different from the others'. Utterance 'B' ' for real!' which has the mid, high, very high pitch levels is an exclamation which means 'this is surprising', utterance 'C' with the mid, high, low pitch levels means 'I'm happy for him', while utterance 'D' with mid, high means 'can that be true?'. These have been diagrammatically illustrated as follows;

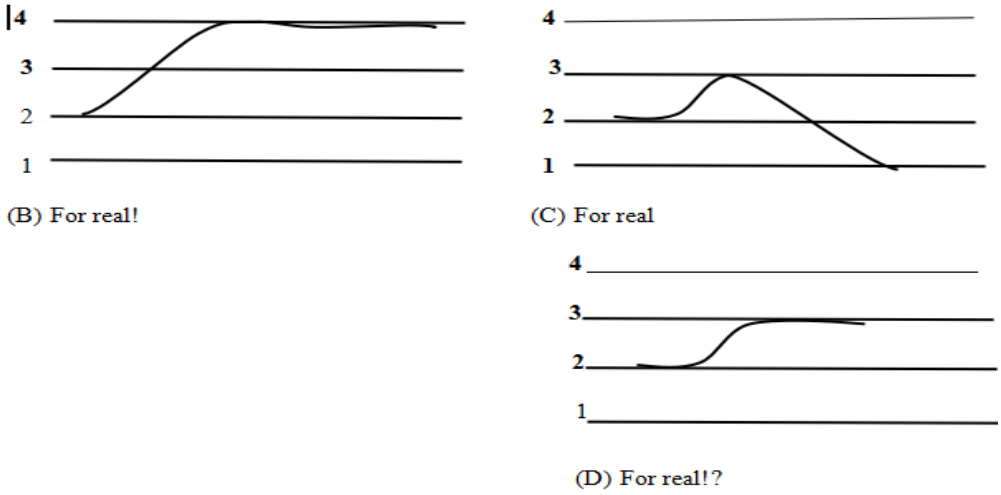
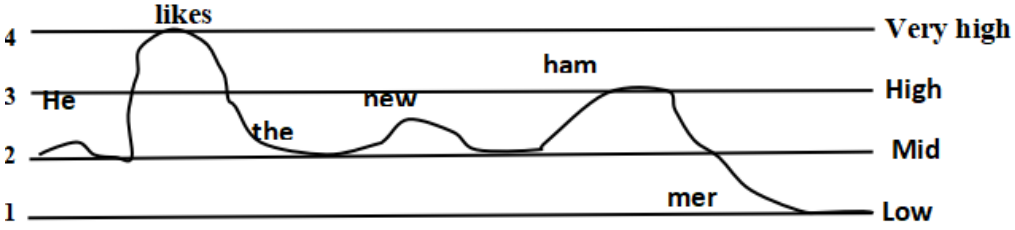


Figure 2: Diagrams representing different pitch levels for the utterance, 'For real!'

The pitch of the voice equally undergoes constant changes which occur in an unsteady manner during the production of sentences and longer structures. Thus, Ladefoged and Johnson (2011) avers that in normal daily conversations, the pitch usually goes up and down as every syllable is uttered. The implication then is that the spoken English sentence, no matter its type, is spoken with varied pitch levels as earlier discussed. The following diagram illustrates this better.



1) He likes the new hammer.

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Figure 3: Diagram showing pitch variations for the sentence 'he likes the new hammer.'

In the above sentence, the pitch rose to the highest level (very high) on the stressed syllable 'likes', then fell with the pronunciation of the word 'the' down to the mid-level, it rose again with a low rise as the word 'new' is pronounced a little above the mid-level and then a rise to the high level during the pronunciation of the first syllable of the word 'hammer' was observed, after which there was a fall to the low level as the final syllable of the word/sentence is pronounced. It is important to stress that though

the word 'likes' is produced with the highest pitch level, the most prominent word in the sentence is 'hammer.'

Pitch levels are therefore highly relative and can only be realized in context of utterance. Thus, LaPalombara (1976) maintains that a major way to discover the meanings of utterances is through the variations in pitch levels. Pitch levels exist and are employed by all speakers of English regardless of individual differences (LaPalombara, 1976; Jones, 2011).

Pitch levels possess grammatical significance (Spaai & Hermes, 2018 cited in Topal, 2018). This means that variations in the pitch of the voice help us to determine the following; (i) The category to which a sentence belongs particularly in terms of the function. That is, whether the sentence is a statement, a question, a command or an exclamation, (ii) the word that conveys the emphasis in an utterance since stressed words are often spoken with high/ very high pitches and (iii) the relationship between the grammatical units. This means that pitch variations help us to determine the ideas or elements which are related to each other in sentences (LaPalombara, 1976; Anagbogu et al., 2010)

Pitch Range: This represents the highest and the lowest pitch levels of every speaker. Every speaker of any language whatsoever has their personal pitch range, that is the highest pitch level their voice does not go beyond and lowest pitch level their voice does not go below when they are speaking (Yadugiri, 2013; Roach 2010). The diagram below illustrates this further.

Figure 4: Diagrams showing pitch range culled from Roach 2010.

The above represents the lowest and the highest pitch levels of an average individual's pitch range with the arrows neither descending below nor exceeding the two parallel lines. It is noteworthy to state at this point that the male voice pitch range differs markedly from that of females. The average human pitch range is between 85Hz and 180Hz for men and 125Hz to 225Hz for women (Klofstad et al., 2016).

Pitch Height: This refers to the extra pitch height of a speaker's voice outside their normal pitch range. Pitch height is often realized as a result of the speakers' expression of strong feelings. The lower part of the pitch range is usually employed by speakers during normal conversations. However, in event of a display of strong emotional feelings, a speakers' pitch height suddenly increases giving room for the high-rise intonational pattern (Yadugiri 2013; Roach, 2010). Hence, there is the possibility of two types of rise, which are (i) low rise and (ii) high rise and two types of fall that is (i) low fall and (ii) high fall.

The role of the pitch in speech production

Pitch plays very vital roles in speech which cannot be over emphasized. As a matter of fact, all prosodies have direct link with pitch and pitch variations (Anagbogu et al., 2010). Generally, all spoken languages employ pitch for intonation (Moore, 2020). This means that speakers across the globe naturally modify their voice pitch to reflect their emotions and intentions regardless of their language, as according to, Anyanwu, (2013); Yadugiri, (2013); Moore, (2020), a human speech without any form of intonation is unimaginable and would be rather monotonous. Specifically however, intonation languages and tonal languages (the two broad categories into which human languages have been divided in relation to the application of pitch) employ pitch variation for different purposes.

In intonation languages like English, Russian and Swedish for instance, variations in the pitch of the voice give rise to different intonation patterns each of which signals specific syntactic, semantic or pragmatic interpretations without changing the lexical meanings of the affected words. Hence, the word

'yes' said with a mid/ low pitch variation (falling intonation) is a statement, while the same word (yes) with a mid/ high pitch variation (rising intonation) is a question (Roach, 2010). In tonal languages like Hausa, Igbo and many varieties of Chinese however, pitch variations which only affect the vowels or some syllabic consonants in syllables result in lexically contrastive words although with their spellings unchanged (Ladefoged & Johnson, 2011; Moore, 2020). Thus, the Hausa word 'fito' said with high/high pitches on both syllables means ' come out'. However, if the same word, 'fito' is said with a low/ high pitch pattern, it means 'guinea-corn bear' (Elugbe, 2015). In the same vein, the mandarin word 'ma' means 'horse' when said with a mid/high pitch contour but means 'scold' when said with a sharply falling pitch. This type of Mandarin pitch begins at the high pitch level and later falls to the bottom of the speaker's vocal/ pitch range. Also worthy of note is the fact that tonal languages do not apply pitch at sentence level (Ladefoged & Johnson, 2011).

Additionally, an individual's pitch readily influences people's perception of them. People's usage of pitch also affects the way other people interact with them (Apple et al., 1979 ; Klofstad et al., 2016 ; Kim,2020). Previous researches on the importance of the employment of pitch by men and women reveal that men with high-pitched voice are considered less truthful, less persuasive, readily nervous and irresolute while their low-pitched counterparts are considered to be more eloquent, forceful, influential, physically attractive and courageous (Bryant & Haselton; Archer & Puts in Klofstad et al.,2016). The studies equally found out that women with high- pitched voices are generally charming, pleasant and appealing while women with low-pitched voices are viewed as being assertive and authoritative (Apple et al., 1979 ; Klofstad et al., 2016). Another major issue arising from these researches is that the pitch of women's voices usually rises on their fertile days during their menstrual cycle as a result of hormonal changes while on the contrary, the pitch of men's voices becomes lower due to increase in the level of testosterone circulation in the blood stream which in addition naturally yields a rise in physical and social aggressiveness in men. Hence, women with 'low- pitched' voices may also employ the high or very high voice pitch on some days of the month, while those with typically high voice pitch may also employ the low pitch from time to time. Men may also experience fluctuations in their voice pitch from time to time owing to hormonal changes.

Methodology

This is a review study which employs the descriptive research design for the description of the meaning, features and roles of the suprasegmental phonological concept discussed. It is a research approach which carefully examines and describes current issues, such as ongoing traditions and usages (Nkwocha (2010, p.17). The research relied mainly on secondary sources as it used textbooks, journal articles, published and unpublished documents and internet materials for information gathering and review of concepts.

Summary of Findings

This paper reveals that pitch, which has been described as the highness or lowness of the level of human voices during verbal interactions is listener related, for its realization is largely dependent on the listener's perception. It is an auditory property of speech which is equally determined by speakers' fundamental frequencies as well as the thickness of their vocal chords, their emotional state and hormonal changes in the human body. Pitch is very important in human communications as it helps speakers to express their inner thoughts, feelings and emotions and to change the grammatical types and functions of sentences in lexically non- contrastive ways. Variations in pitch which are phonologically referred to as pitch levels represent different aspects of interactants' utterances such as the beginning of a thought group or tone unit, the middle of a statement or a question and the end of an exclamation.

Furthermore, the study revealed that every speaker has their pitch range, which means the highest pitch level their voice does not go beyond and lowest pitch level their voice does not go below. It also showed that in intonation languages modifications in the pitch of the voice result in different intonation patterns which indicate specific syntactic, semantic or pragmatic interpretations of utterances without altering the lexical meanings of the affected words while in tonal languages pitch modulation brings about lexically contrastive words even if the spelling is unchanged. The investigation equally revealed that

the pitch of the voice employed by male and female speakers during conversations are afffected by hormonal changes while their regular choice of pitch level variation determines how they are perceived by other members of the society.

Conclusion

In conclusion, the study stresses that it is imperative for speakers to employ pitch modulation and personal voice pitch control carefully and tactically in day-to-day communications. This will prevent undue misunderstanding of other people's utterances and intentions as well as a wrong perception of their character (Kim,2020), especially at these times when people find it hard to trust both their contemporaries and their (political or occupational) leaders but at the same time desire good, truthful, influential and trustworthy acquaintances and leaders whose lofty and people- centred intentions can be judged through the pitch of their voices while they speak.

An awareness of the dynamics of pitch is equally required on the part of listeners, as this has the capacity to enhance easy comprehension and interpretation of utterances. Pitch is very fundamental for smooth flow of communication and is employed in every utterance we make whether for tonal or intonational, physiological or psychological, lexical or grammatical, discoursal or attitudinal purposes (Kim, 2020). Although, other prosodies like rhythm, loudness and timing are contributory to the realization of the differences noticeable in the meanings and functions of words and longer utterances in both intonational and tonal languages, changes realized on account of pitch modifications are more predominant and function driven.

Recommendations

Consequently, the paper recommends that every interactant (speakers and listeners alike) at all levels should arm themselves with a good knowledge of the concept- pitch, its features and roles in speech as employed in different languages and by people of different sexes, ages and statuses together with tactical pitch variation strategies and pitch range control. This can be realized through conscious teaching of the different aspects and roles of the suprasegmental feature - pitch by teachers and lecturers of second language learners (L2) of Oral English and General English / Use of English in secondary and tertiary institutions respectively across the nation and beyond, using relevant instructional materials like voice recorders, CD players, headsets, projectors, oscillogram and spectrograms among others, in addition to textbooks.

Additionally, all language users (speakers and listeners) are encouraged to seek proper understanding of the ways speaker pitches are realised, that is, the various psychological and physiological factors responsible for the choice of pitch levels in speech, as this can help prevent wrong perception of people's personality, promote mutual trust and foster communal, regional and national unity.

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