Generative Transformational Study of English Core Syllables

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Abstract

Syllable is a very important unit of phonological analysis. It forms the template upon which other phonological elements are organised. This study takes a descriptive approach as it describes and analyzes the constituents of the syllable based on the Generative Transformational approach. The study x-rays the structure of the syllable and discovers that based on the phonotactic and Sonority Sequencing Generalisation (SSG) rule; there are constraints on the syllable structure. The constraints envisage that English syllables appear to be organised into maximally a sequence of six segments (CCVVCC) covering both the onset and the rhyme positions. Segments which conform to this CV- template are referred to as CORE syllables, and those segments which do not fall into the CORE SYLLABLE template, form a pattern in them and are called *Appendix*. Those segments that are referred to as appendices are those that violate the Sonority Sequencing Generalisation (SSG). This pattern of violation can occur at both onset and rhyme positions. At onset, the voiceless fricative /s/ constitutes the segment which violates the sonority generalisation as in the example (string, spin, stick). The study however reveals that the onset appendices are not as complex as the rhyme appendices. For at the rhyme we can identify three types of violations. First are those that can violate the three x-position generalisation, second are those that can violate the sonority based definition, and third are those that can combine both violations.

Keywords: Phonological analysis, English syllable, Generative Transformational Theory, phonotactics.

Introduction

Description of a language is very important in language study because it helps learners to compare and contrast features which are related and those which are not. Gimson (2001) says, the function of any communication is not just to produce sounds, for the sound quality must also be considered, since it is the organization of the discrete units of sounds that are utilized in speech. Speech sounds can be described based on phonetic and phonological grounds. The phonetic description considers the production process, meanwhile, phonologically, it considers how these sounds function in specific linguistic structural environments. This study is concerned with the phonological aspect of the syllable. Every human natural language has a peculiar way in which their sound system is organised. According to Rogerson-Revell (93), the basic difference between consonants and vowels are the way they are produced and how they occupy slots within the syllable structure. Going further, Revell (123) says it is not enough to learn the syllable structure of a language but that "without receiving training or materials that explain how syllable works and their role in second language or foreign language (L2) development, language instructors and non-native English speakers are unlikely to fully recognize the extent to which these constituents may be affecting L2 phonological acquisition".

It a fact that not all languages have the same number of allowable consonants and vowels inventory, while some have more, others have fewer. The English language is one example with more consonants and vowel sounds inventory. Therefore, learners of English with fewer speech sounds find it difficult, confusing and to some extent, that affects their pronunciation of English words. The English language has a complex syllable structure, therefore, learners of English language have to

understand and learn these complexities both in a descriptive as well as in a practical manner. This study explores these complexities which when learners do not learn properly may affect their pronunciation of English words.

Concept of Syllable

The syllable is difficult to define and there has been little consensus about what a syllable is, even though it has been in the literature of English for a very long time as Hogg and McCully had pointed out. The syllable is a phonological constituent which is very important in linguistic analysis, but it has been ignored by early works in **Generative** Phonology as evident in the work of Chomsky and Halle (1968), where the word 'syllable' does not appear as a separate entity. But for present linguists and phonologists like Katamba (1989), the syllable is at the heart of phonological representations for it is the unit in terms of which phonological systems are organised. It is purely a phonological entity which cannot be identified with a semantic or grammatical unit. For example, there are syllables like [ʌn] as in 'unusual' which are co-extensive with the morpheme, syllables like [kæt] - 'cat', are co-extensive with the words, syllables like [kæts] - 'cats' represent more than one morpheme etc.

The problem of definition has not made the syllable less significant in phonological analysis for there are various views and approaches which aim at giving a working definition of the term for the purpose of a functional phonological description. Eka (1996) and Roach (2006), point out that the syllable can be described from the viewpoints of phonetics and of phonology. With regards to phonetics, we see it from the viewpoint of articulatory and auditory phonetics. From the viewpoint of phonology, the concern is with specific

functional explications in terms of specific languages. The phonetic explication of the syllable has to do with the way sounds are produced (articulatory) and the way the sounds are received (auditory), while the phonological explication of the syllable has to do with the possible combination of the sounds in a specific language. The concern for this study is with the possible combination of sounds within the syllable in English language.

Theories of Syllable

The treatment of the syllable is based on a theoretical background which is the Sonority or the Prominence Theory. Hogg & McCully (1987) present a description of the syllable which is associated with the Theory of Metrical Phonology. To them, the syllable is "a single unit of a lung initiator which includes but one crest of speed and that include other criteria such as relative loudness of the phonemes, sonority, prominence etc. and change in stress or pitch" (32).

Giegerich (1992) describes how this lung initiator works in relation to the syllable. As speech comes from the lungs to the trachea (the windpipe), it then goes through the oral and nasal cavities, the result is, the air is modified by different processes which starts from the lungs, to its phonation in the larynx, which occurs through the operation of the vocal folds. This action is then directed to the velum into the oral cavity or the nasal cavity, so that finally, what we have is the articulation. This air does not flow at a constant rate, but comes out with pulsation, which is as a result of the activity of the pulse. Therefore, the Pulse Theory maintains that each syllable corresponds to a peak in the flow rate of pulmonic air. The problem identified with this theory is that it explains very little, since the air-stream is inaudible and cannot explain why words like 'poetical' be perceived as having four syllables. The

answer lies in the fact that the Kinetic energy of the air-stream is in speech translated into acoustic energy, one manifestation of which is SONORITY. The pulses of air-stream correspond to peaks in sonority. Therefore, the sonority of a sound as defined by Giegerich, is the relative loudness of a sound when compared with other sounds with the same length, stress and pitch (132).

To determine the sonority of a sound, Gimson (2001), points out that the carrying power of the sound should be considered. A vowel like [a] has more carrying power than a consonant like [z] which in turn has more carrying power than [b]. This suggests that each speech sound can be assessed on its degree of variability. Speech sounds are therefore, as Giegerich (1992) says, graded in terms of their relative sonority which indicates that the voiceless oral stops are of minimal sonority value, while low vowels have the highest degree of sonority of all speech sounds. All other sounds are ranked in between them. Therefore, "a sonority scale or hierarchy can be set up which represents the relative sonority of various classes of sound; although there is some little argument over some of the details of such a hierarchy, the main elements are not disputed" (49). The combination of the speech sounds in the syllable can be distinguished in terms of their peaks and valleys in sonority. The 'peak' as Eka (1996) explains, denotes the areas where the sound comes out most audibly, and 'valley' denotes the areas with less audible sound. This shows that the main phonetic difference between vowels and consonants is that vowel articulation involves no audible obstruction of the airstream, while consonant articulation involves audible obstruction in the air stream. This is one factor which helps in determining the quality of speech sounds. Factors like pitch which has to do with melody or intonation, of loudness which shows that some sounds are louder than

others, of length - which shows that some sounds are longer than others especially in vowels, also determine the quality of speech sounds. The feature ‘height’ is another vowel quality which helps to account for vowels on the basis of high, mid and low. The feature 'voice' is an important quality which helps in determining the rank of a sound. Since voice naturally increases sonority, therefore, voiced fricatives are more sonorous than their voiceless counterparts.

Below is a rundown of the hierarchy of the speech sounds, where we can find that each speech sound falls into one category or class within the hierarchy. We have adopted the sonority scale given by Hogg & McCully (33).

SOUNDS	SONORITY VALUES	EXAMPLES
Low vowels	10	/a, ɑ/
Mid vowels	9	/e, o/
High vowels	8	/i, o/
Flabs	7	/ r/
Laterals	6	/I/
Nasals	5	/n, m, ŋ/
Voiced fricatives	4	/v, a, z/
Voiceless fricatives	3	/f,θ, s/
Voiced stops	2	/b, d, g/
Voiceless stops	1	/p, t, k/

How importance is the Sonority Theory or Hierarchy? Hogg &McCully says, the usefulness of this concept of sonority in definition of a syllable lies in the fact that where sonority is greatest, we have the centre of the syllable, whereas where sonority is lowest, we are near the edge of the syllable (33). Katamba (1989) further explains that one of the functions of the syllable in all languages is to define syllabicity for segments. Any segment dominated by a C-element of the CV-

tier is non syllabic, while any segment dominated by a V-element is syllabic. The V-element is associated with the centre of the syllable, and the C-element with the edge of the syllable. Summing it up, Giegerich (1992) says, with the help of the sonority scale, the theory that syllables are associated with peaks of sonority is able to predict the right number of syllables in a given word (133). For example, the word 'cat consists of three segments [K, æ and t] assigning the sonority value, we will have 1, 10, 1 which suggest that the word has only one syllable, and in the word 'modest' we have the following sonority value 5, 9, 2, 9, 3, 1 which suggests that the word is a two syllable word. Using our sonority value and scale, we can get the number of syllables in a lot more of longer words. This theory, as Giegerich (1992) maintains, can predict with a high degree of reliability the right number of syllables in a given word, leaving only a small number of cases unexplained.

Syllable Structure and Constituency

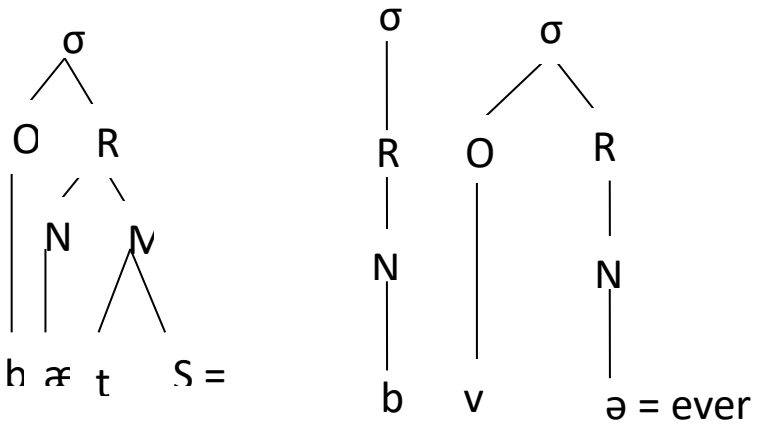
Considering that the syllable consists of the basic sounds of consonants and vowels, and are phonologically referred to as phonemes, these phonemes are organized within the syllable. For example, the word ‘bat’ has three segments, the first and last are consonants, and the middle is a vowel. This description suggests that the syllable can be defined and described in terms of its structure and distribution. In Hogg & McCully (1987), Selkirk states that:

> In any syllable, there is a segment constituting a sonority peak that is preceded and/or followed by a sequence of segments with progressively decreasing sonority values (34).

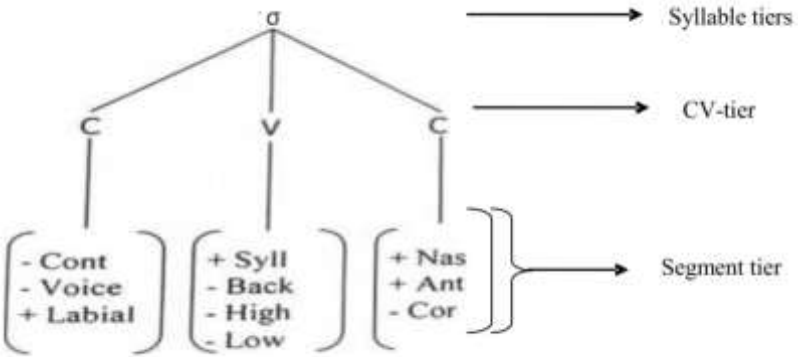
Selkirk calls it a SONORITY SEQUENCING GENERALISATION (SSG). Words like 'cat', 'brand', 'band'

etc. are examples of this generalisation. But one observation we want to make here is, it is not any syllable that must have preceded or decreasing segments in sonority values. Words like 'eye', 'oh', 'err', 'bar', 'on', 'am' etc. are possible in English. Some of them are open and some of them are closed. The definition is useful here because it suggests that the syllable consists of some different yet related components. "Where we find a sequence of segments preceding or following that sonority peak, then sonority values increase as one nears that peak, and decrease as one moves away from that peak (Hogg & McCully, 34). The most sonorous segment is variously referred to as the peak or nucleus and is assigned to the V-element. The less sonorous-preceding segment is called the ONSET and C-elements are normally associated with this component. The other less sonorous part which is also associated with a C-element is called a CODA, MARGIN or TAIL. Just as in syntax, we can conclude that the syllable consist of three different constituents which are onset, peak and coda.

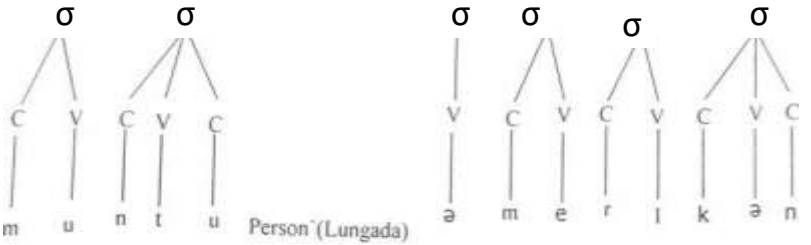
Some phonologists view that the relationship among the constituents is not necessarily internal, therefore can be analysed as separate entities, others view that there is some form of an internal relationship which informs some kind of a hierarchical analysis. Presenting a multi-tiered phonological theory, Katamba (1989) states that phonological representations are viewed as consisting of a number of independent levels that are linked with each other. Based on this view, the syllable can be said to consist of the following structure.



On the other hand, he presents the CV- phonology model of the syllable which was expounded by Clement and Keyser (1983). Their model assumes that the syllable consists of a syllable node 'δ', a 'CV-tier' and a segment tier.



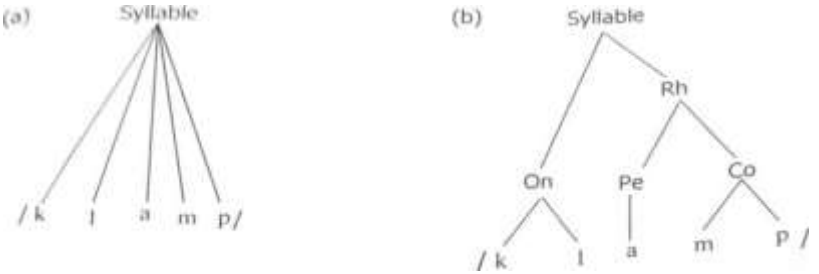
Just as in syntax, the tree shows immediate constituent structure. An element is an immediate constituent of a higher element within which it is contained. This shows how a constituent is immediately dominated by a higher element. One important thing to note is, the tiers are linked by what he calls ASSOCIATION LINES. He opines that this method is useful because it shows how segments are distributed within the syllable. Using an example with Luganda word (muntu) and an English word (American), he says they both can be represented as in the diagram below



This shows that between the syllable node and segmental-tier is a 'flat' CV- tier which lacks an internal constituent, which is in contrast with the other model he presented. Current study in phonology prefers the multi-tiered phonology than the CV-tier phonology. Hogg & McCully (1987) reasons that:

> Just as there are good distributional reasons for supposing that there are at least three separate constituents which go to make up a syllable, there are also good reasons for supposing that these three constituents do not merely stand in a linear relationship to one another but are rather related by some kind of hierarchy (36).

Agreeing with this opinion, Gicrgerich (1992) says, in a monosyllabic words like ‘clamp' it would best be analysed in terms of the structure (b) than the structure (a).



In structure (b), we see a greater coherence between the peak and the coda than it is between the onset and the peak. For as Giegerich says, it is the number of X-positions in the rhyme (rather than the number of X-positions in peak and coda counted separately that determines whether a syllable is well formed or not, again, the rhyme helps in determining the syllable weight as in whether the syllable is heavy or light. Syllable weight helps in stress placement in most English words. According to Hogg & McCully (1887), "a heavy syllable is one in which the rhyme (or in case the rhyme does not itself directly branch, the constituent dominated by the rhyme namely nucleus) branches" (38). While a light syllable is one in which neither the rhyme nor the nucleus branches, that is, it contains only one segment.

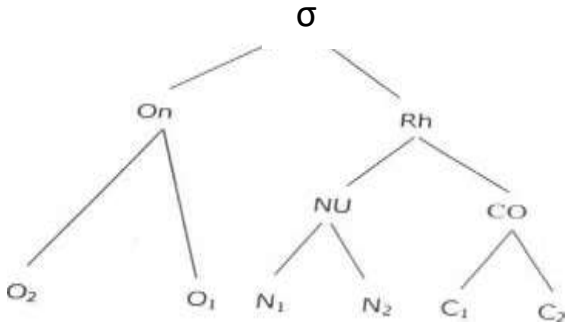
This research supports the view of the current thinking that the constituents do not merely stand in a linear order or are merely concatenated strings but stand in a hierarchy which has an internal structure. And recognizing the peak and coda as a unit is also important because it will help in accounting for a number of segments and features in a neat and economical way.

The Phonotactics of English

Every language has a rule which guides or governs the ways in which sequences of sounds are organized to produce a well-formed syllable. These rules are referred to as phonotactic rules. Just as the syllable constituents do not stand in a linear order or concatenated strings, here, the segments are distributed within the constituents in a linear order, but they do not stand as merely concatenated strings.

There are some constraints on how they occur within the syllable. And as Katamba (1989) says ***"constraints on*** syllable structure serve as a filter allowing only certain to occur, these constraints are specific to a particular language" (166) for what may be obtainable in English may not be in another language and vice versa.

One limitation of the Sonority Theory is that it could not specify the number of allowable segments and ***how they*** can stand next to each other in a syllable. The phonotactic rule helps in addressing such a limitation. Hogg & McCully (1987) envisage that English syllable appears to be organized into maximally a sequence of six segments (CCVVCC), and the analysis of segments into onset and rhyme makes it possible to suggest a syllable template like the one below:



This template, according to them, would be an abstract tree structure which all syllables would have to fit into in order

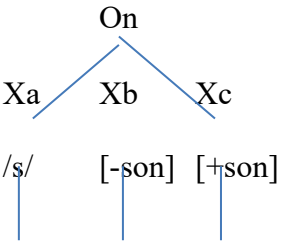
to be recognized as acceptable syllables in English. Syllable template for English can be organized in terms of the sonority scale, for the sonority scale will help stipulate a maximum or minimum sonority value for each segment. The rule of this template is that O2 position must not be filled by segments that are of higher sonority value than the voiceless fricatives i.e. sonority value 3 and below, which consist of p, b, t d, k, g, f, θ, s. The O1 position can only be filled by a lateral, flab or the consonantal j, w. Therefore, the minimum sonority value of O1 is 6, and the maximum is eight.

In Giegerich (1992) we find a useful possible consonant clusters in onsets, in (table 6.4:155) which is copied below:

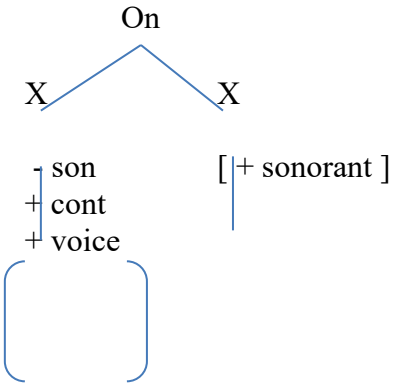
	m	n	ŋ	I	R	w	Examples
p				+	+		play, pray
b				+	+		blue, brew
f				+	+		fly, fry
v							
t				+	+		try, twig
d				+	+		dry, dwell
ð				+	+		throw, thwart
s	+	+		+		+	smear, sneer, slow, swing
z							
ʃ	?	?		?	+		?shmuk, ?schnapps, ?shlelps, shrew
ʒ							
ʧ							
ʤ							
k				+	+	+	Clue, crew,

							queen
g				+	+	+	Glue, grey gwen
x							
h							

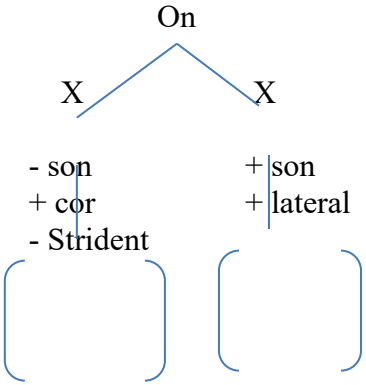
We notice that we will run into trouble if we should follow Hogg & McCully's suggestion that O2 position must be occupied segments that are of the sonority value1-3 and O_1 position with values that are from 6-8, and again, Giegerich's onset template which we present below



It is far too permissive. Both suggestions do not fully describe the facts. If 'blunt', 'bring' are possible in English, 'dling', 'pming', 'pfain' etc. are not possible. This specifically shows that it is not every English consonant sequence that is possible. To this effect, Giegerich (1992) proposes what he calls the negative onset conditions, or filters, so as to help account for such problems. For example, the segments /v, ð, z, ʒ/ do not occur in onset clusters, and they all share the feature specification [- sonorant, + continuant, + voice]. Therefore, the rule states that any onset of the form below is not possible in English:



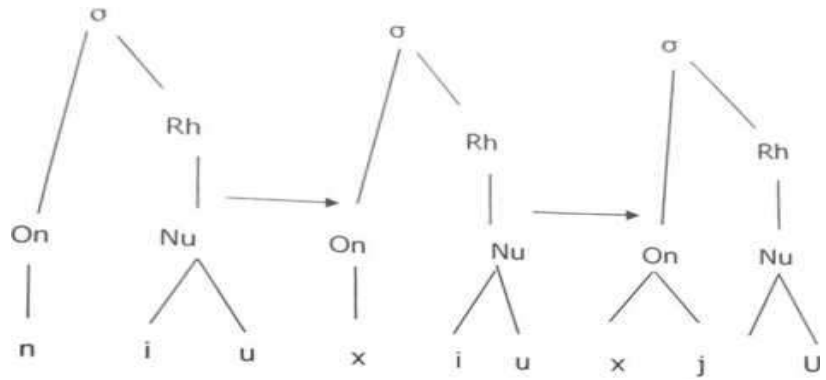
It is only /s/ that can occur with either /m/ or /n/. Given that /s/ is [+ strident] no non strident phonemes can occur with /m, n/. This too has a problem since /f/ is also a strident and cannot occur with /m, n/. Similarly /t, d, θ/ are forbidden to occur with /l/



We can have several instances of non occurring elements and as Giegerich maintains, the gaps in the table above are not entirely random, and the filters as exemplified above would be significantly shorter than a list of all the individual ill- formed onset clusters.

Analysis of Segments into Constituent Structure

At onset, we sometimes find more than two segments. In such situations; phonologists have agreed that the additional segment is treated as a violation to the SSG (Sonority Sequencing Generalisation). Hogg & McCully have identified two classes of such violations. One, which occurs only when /s/ fills 0_2 position and the other, which occurs (and this is restricted to only onsets) in segments like /j/. This points to words like new /nju:/ and lewd /lju:d/ which clearly violate the onset template conditions since O2 is filled by a segment with a sonority value greater than 3 and /j/ has the sonority value 8 which is assigned to the high vowels. To avoid such a violation of the template, they have suggested that the synchronic rule of English can be applied to account for such a problem. The rule posits that /i/ is shifted from the nucleus to the onset and by applying such a rule; we will have the following structures;

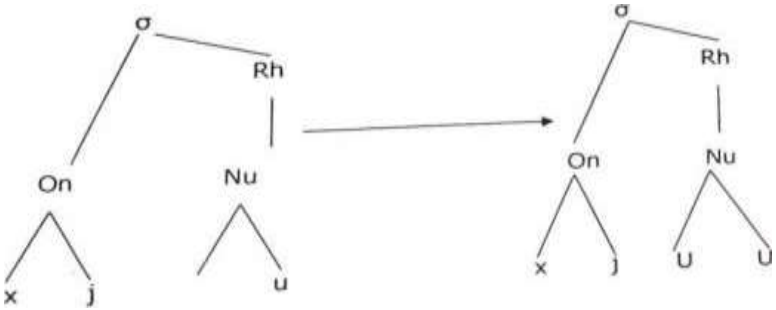


The node is still retained, and that can be accounted for based on Ingria's idea of EMPTY NODE CONVENTION as quoted by Hogg & McCully (1967).

If some segment is moved leftwards out of the nucleus into the onset, then the empty node which remains in the nucleus is filled by a copy of the segment which fills the sister node in the nucleus (44).

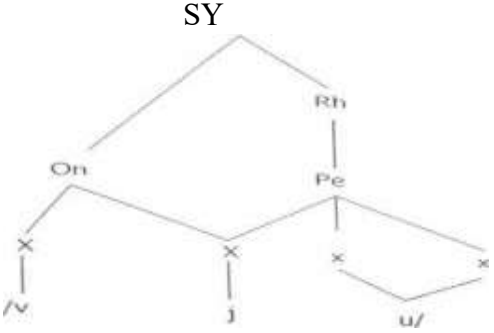
The result of the application will be,

Where X is any segment or zero, by this we can obtain the surface form- new. /nju /, view /vju./ etc. The analysis helps in explaining why sequences of consonant + /j/ are always followed by a long vowel, since the empty node convention automatically supplies such long vowels.

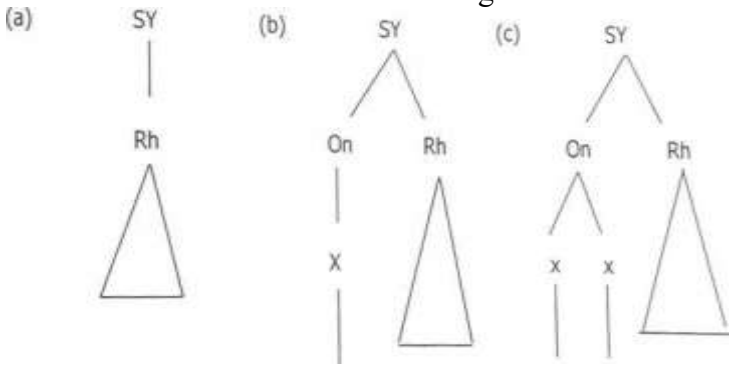


Now, turning our attention to the rhyme, cluster /j/ and peak have a particularly close relationship than with the onset. In a cluster of the form consonant plus /j/, the /j/ must be part of the peak. Therefore, if */j/* is part of the peak it cannot be expected that it will be constrained by conditions that hold within onsets such as is seen in the template and filters which Giegerich formulated. /j/ as a [+ sonorant], can occur after [+ sonorant] phonemes as well as after [- sonorant] phonemes that otherwise fail to cluster altogether. Giegerich agrees to the fact that cluster /j/ demonstrates to be part of the onset - "if /j/ were not part of the onset then we would expect to encounter full onsets occurring before /ju/ such as */fLju/, */splju/ etc. But

the facts are different. Whenever cluster /j/ occurs, it occupies the x-positions provided by the onset template, such that it can only appear after a single consonant or after appendix /s/ plus one consonant, /fju:/, /spju/ etc." Thus he argues cluster /j/ then, must belong to the onset as well as to the peak.



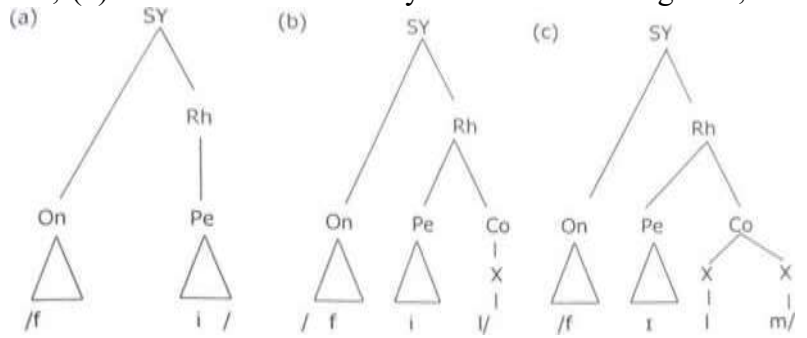
Summarizing the structure of the onset, Giegerich (1992) employs a method of presentation which we view as though complex, but is detailed and comprehensive. At onset, it is possible to find words with the following structures:



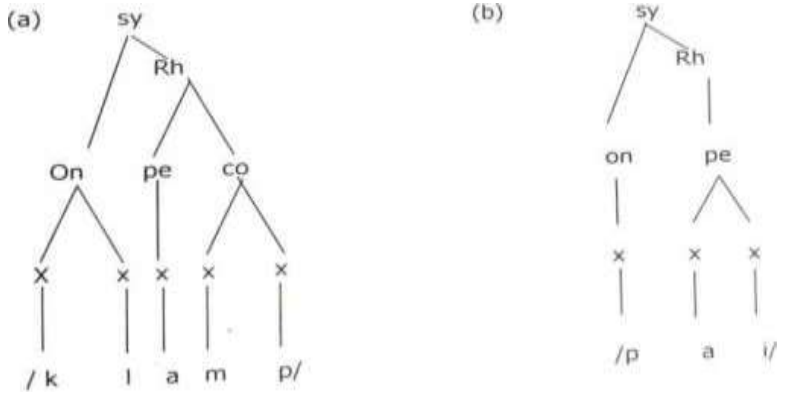
It = eat p a I = pie pr a I = pry

The triangles represent any unanalysed material and x-positions represent short hand notation for single phonemes. The structure simply explains that an onset can be empty as in structure (a) above and (b) represents syllables that have one consonant phoneme at onset, while structure (c) points that two consonants phonemes can occupy the onset. Similar analysis can be extended to the coda.

Figure (a) shows the possibility of a rhyme without a coda, (b) shows a coda filled by one consonant segment, and



(c) shows a coda filled by two-consonant segments. The peak can consist of the following segments.

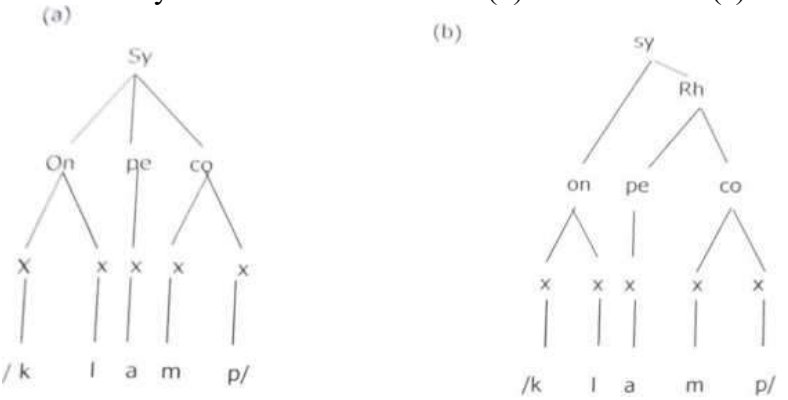


This explains that X-positions and consonant phonemes are simply corresponding one-to-one. Lax vowels in RP and GA (General America) are short, while tense vowels and diphthongs are long. Based on this, Giegerich has formulated the vowel length rule which will help account for lax, tense, and diphthongs in English.

Vowel Length Rule (RP, GA)

a. Associate a [- tense] vowel with one x-position.
b. Associate each element of a diphthong with one x-position.
c. Associate a [+ tense] vowel with two x-positions.

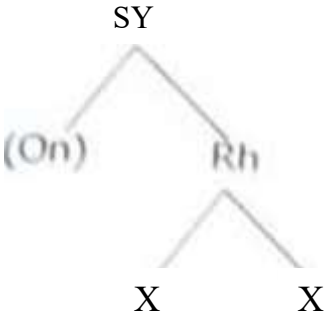
This he explains may not only make the analysis complex, but somehow vague for x- positions are not only one-to-one corresponding units but they are also timing units. Having established that the peak and coda forms a phonological unit called the 'rhyme' as a result of that the rhyme as a unit can best be analysed in terms of structure (b) rather than in (a):



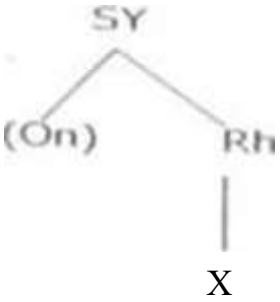
The reason is, it is the number of x-positions in the rhyme (rather than the number of x-positions in peak and coda counted separately) that determines whether a syllable is well formed or not. A well-formed syllable he says contains not more than three x-positions in the rhyme and two x-positions at the onset. Any other segments that may add up to the number either at onset or at the rhyme are accounted for as appendices.

To account for the nucleus or the peak of the syllable, Giegerich (1992) presents the rule as follows, a two x-rhyme is heavy, and a single x-rhyme is a light syllable. Stress is an important variable, therefore, it is important we distinguish between a heavy and light syllable.

Heavy Syllable



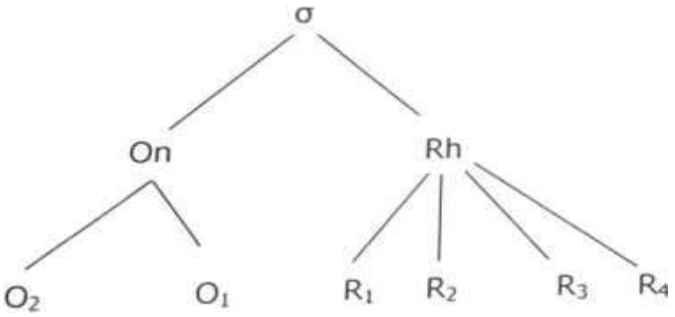
Light Syllable



Lax vowels only occur in syllables that are closed by a consonant such as in (bit), while tense vowels can occur in open as well as in closed syllables as in (bee and beat).

However, considering the view by Hogg & McCully (1987) in their opinion, the rhyme should not be subdivided into the nucleus and coda, for such a division may not account for a lot of English syllables, therefore making such a division false and misleading. They maintain that the syllable should be

considered heavy if and only if the rhyme branches, not if the nucleus or the rhyme branches, because the rhyme consists of a single entity not two. For the rhyme to be considered a single entity, it will have a template as below:



Their argument is, how can we account for words like clamp, *claimb (cf climb), grunt, ground, punk, ‘pounk etc. if we assume a separate nucleus and coda constituents.

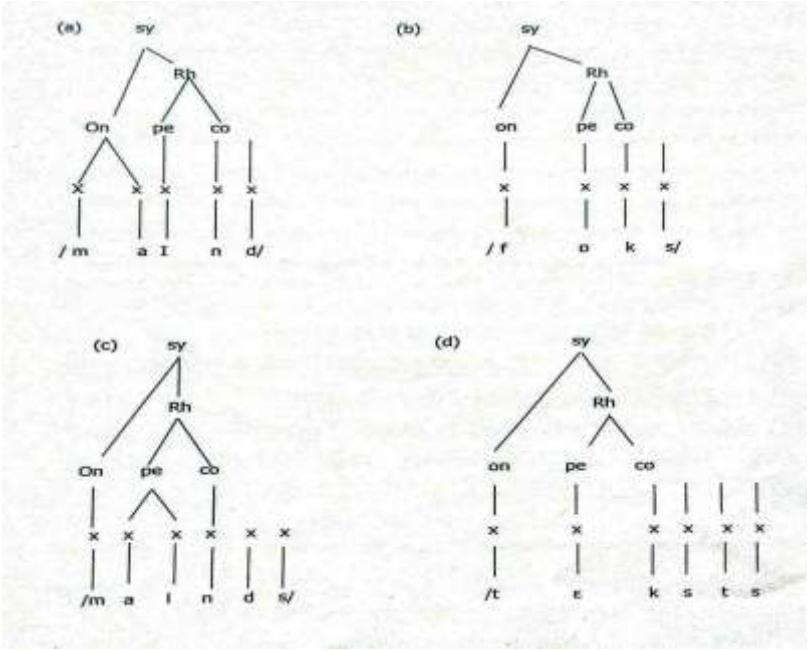
Giegerich (1992) gives us a reason to think otherwise. Remember, he says that it is the number of x-positions in the rhyme (rather than the number of x- positions in peak and coda counted separately) that determines whether or not a syllable is well-formed.

This fact does not alter peak and coda to be inconsequential, but are still units which are held by a higher hierarchy within the rhyme and again, it is the peak and the coda that forms a phonological unit which is called the 'rhyme'. A well- formed syllable as we have seen earlier, contains not more than three x-position in the rhyme i.e. a peak may contain two x-position and the coda one, or the peak one x-position and the coda two. In a general statement by Giegerich, the maximum number of x-position in the onset is two and the minimum number is one, and in the rhyme, the minimum number is one for unstressed syllable and two for stressed

syllables, the maximum number of x-position is three. Therefore, any syllable which conforms to this description is called a '**CORE**' syllable in English phonology. The notion of the core syllable is a linguistic reality which Katamba (1989) states that Clements and Keyser's (1983) CV-model of phonology seek to describe the syllable typology of a language by including a range of **CORE SYLLABLES**, for linguistic elements which are part of the CORE GRAMMAR are present in all languages.

As Giegerich further explains, segments which do not fall into the CORE SYLLABLE form a pattern in themselves and are called **APPENDIX**. Those segments that are referred to as appendices are those that violate the Sonority Sequencing Generalisation (SSG). As noted earlier, there is a general agreement on the pattern of this violation whichcan occur at onset and at the rhyme. At onset, the voiceless fricative /s/ constitutes a third x-position which violates the sonority generalisation as in the following examples, spin, string, spring, stick etc. Hogg & McCully (1987) says, many linguists were of differing theoretical stance on how best to account for it within the syllable. While some were of the opinion that sequences of (sp, st, sk) should be treated as single constituents both at onset and at the rhyme, others were of the opinion they should be treated as separate constituents. We find that the onset appendices are not as complex as the rhyme appendices. For at the rhyme we can identify three types of violations. First are those that can violate the three x-position generalisation, second are those that can violate the sonority based definition, and the third are those that can combine both violations.

Examples:



The offending segments are appended to the core syllable by a rule which states that "we allow a rhyme to contain a core rhyme plus further x-positions which must contain coronal obstruents and which we refer to as the APPENDIX (Geigerich 149). This indicates that not any random consonant phoneme can follow the core syllable. The class of consonants that can follow the core syllable can well be defined in terms of distinctive features. Such consonants must have feature composition [-sonorant, + coronal]. This restriction is quite different from the constraint that holds within the core syllable. There, it has to do with a constraint that only allows a certain

place of articulation and here it has to do with sonority constraint.

Conclusion

The paper gives an account of the syllable structure of English language paying attention to the complexities around its components. These complexities have the tendency of affecting the pronunciation of L2 users of English especially those whose syllable structure is simple. For example, learners with a simple syllable structure have the tendency of inserting a vowel between the [s] and [t] of the word 'stick'. This problem may also extend to the complexities at the rhyme. Learners therefore need to learn the differences which lie between their own syllable structure and that of the English language.

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