INFANTS LEARNING PHONOTACTIC PATTERNS

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ABSTRACT

The phonemes of any language do not combine freely in a random way. There are constraints of different types on the combination of the phonemes within a word. So, this study is an attempt to investigate the acceptable combination of phonemes since if these phonemes are combined in a wrong way, this wrong combination will affect on the meaning of the word and then the meaning of the whole sentence as well and which will, as a result, lead to ambiguity. This study aims at stating the main types of phonotactics and presenting a detailed account of phonotactic patterns and how infants learn them.

It is hypothesized that phonotactics plays an important role in how infants learn the correct combination of phonemes and that those infants develop knowledge of phonotactics from continuous speech by segmenting the speech.

Two sets of phoneme sequences are presented for the infants and the results can be summed up as follows: there is variation between the two types of stimuli (ABA) and (AAB). Infants have showed high variation between these two patterns. Some infants have showed preference for (AAB) and others for (ABA) pattern. So, infants learn phonotactics before they start learning lexicon and that they show preferences for certain combinations of phonemes.

1. INTRODUCTION

This paper is entitled "Infants Learning Phonotactic Patterns". Phonotactics plays a significant role in any language, since it refers to the possible ways in which phonemes can be combined together to form words or longer sequences. Learning phonotactics forms an important role in infants' language acquisition because those infants are going to acquire the acceptable sequences of their language and exclude the unacceptable ones.

The study consists of three parts. The first part is an introduction. It presents the problem, aims, the value, and the hypotheses of the study. The second part includes definitions of phonotactics, types of phonotactics, phonotactics processes, phonotactic patterns and phonotactics knowledge, and how infants develop knowledge of phonotactic patterns.

The third part involves data collection, the model for the analysis, the analysis of the data, evaluation and discussion of the results. The study ends with important conclusions and references.

2. INFANTS LEARNING PHONOTACTIC PATTERNS: INTRODUCTORY REMARKS

Before defining the phonological term 'phonotactics', it is first necessary to survey briefly the different viewpoints concerning the concept of 'phonotactics' as viewed and analyzed by a number of phoneticians and linguists in the field of English language. Then, types of phonotactics, phonotactic processes, infants developing knowledge of phonotactics will be explained.

2.1 Definitions of Phonotactics

Waengler (2009:9) defines phonotactic as "*the scientific branch of phonology that deals with restrictions in a language on the permissible combination of phonemes*".

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Phonotactics identifies permissible syllable structure, consonant clusters and vowel sequences within a particular language. It means that in order to have a full account of phonotactics in any language, we must have a considerable amount of information about consonant sequences as well as vowel sequences.

According to Clark & Yallop (2006:70), "*the term phonotactics is used to refer tothe general description of sequence and combination"*. They want to convey the idea that units of a particular language are not combined in a random way, but rather in a systematic way.

2.2 Vowel Phonotactic

There are two main types of vowel phonotactics; vowel sequences and vowel harmony:

2.2.1 Vowel Sequences

A sequence of two different short vowels within one syllable is known as 'diphthong'. Diphthongs are characterized by a gradual change or glide in a given direction. They are treated as separate phonemic entities, because like pure vowels, they form the nucleus of the syllable, (Catford, 1988 and Coxhead,2000).

Diphthongs also can be grouped into two classes in accordance with whether the tongue moves in the direction of a close or a central one, the first class is termed closing diphthong, like /eɪ/, /aɪ/, /ɔɪ/, /aʊ/ and /əʊ/ while the second is termed centringdiphthong,like /ɪə/,eə /, and /ʊə/, (Crystal,2004).

In addition to diphthongs, there are three vowel sequences. Generally, when one of them is going to be pronounced normally, but with a smooth glide between them. In English, the most common sequence of vowels is formed simply by adding /ə/ to a diphthong, specifically to /aɪ/ and /aʊ/ in words like: fire /f aɪ ə/ and our / aʊ ə/. However, the /ɪ/ in fire /f aɪ ə/ and /ʊ/ in our / aʊ ə/ will be pronounced rather weak. Actually, both the sequences sound rather like /ɑː/, but they must be pronounced as sequences /aɪ+ ə/ and/aʊ+ ə/ in which/ɪ/ and /ʊ/ should not be pronounced too strong. Another example includes. Tyre /t aɪ ə/, tower /t aʊ ə/, trail /tr aɪ ə l /,etc.,(O'Connor, 1980).

The less common sequences are /eɪ ə/, /əʊ ə/, /ɔɪ ə/. These are pronounced with the normal diphthong smoothly followed by /ə/. Here, /ɪ/ and /ʊ/ will not be weakened. For example,
1.greyer → / gr eɪ ə/
2.grower→ /gr əʊ ə/
3.employer→ / ɪmplɔɪ ə/ (ibid: 87)
Moreover, /iː/ and /uː/ are also followed by / ə/ in words like freer /friː ə/ and bluer /bl uː ə/. Furthermore, the verbs ending in (-ing) → / ɪŋ/ give different sequences as in words:
4. allowing → / əlaʊɪŋ/
5. doing → /g əʊɪŋ/
6. knowing → /n əʊɪŋ/
Other vowel sequences are found both within words and between words. These should also be pronounced with a smooth glide between the vowels as in the following examples:
7. chaos → /k eɪɒs/
8. co-operate → /k əʊɒpərt/ ,(ibid: 88).

2.2.2 Vowel Harmony

Katamba (1989: 211) says that
vowel harmony is a process whereby within a certain designated
domain, usually the word, all vowels are required to share one
or more phonological properties. The vowels of a language are
divided into two mutually exclusive sets and all vowels within
a particular domain must be, say, either front or back, high or
low,rounded or unrounded, etc.
In Igbo (Nigeria), for example, vowels belong to either set A, which is [+ ATR] or set B which is [-ATR], (ATR is a feature used in the derivation of Igbo forms). Normally, all the vowels used in a wordcome from just one of these two sets:
Set A: [i e u o]   Set B: [I a u ɔ]

Vowel harmony differs in a significant way from suprasegmental properties such as tone and stress, whereas harmonizing phonological features like [back], [round], [high] and [ATR], are part of the segmental representation of individual vowels. However, they are

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taken away from the segmental class and are placed on a distinct class and stop functioning as features of individual segments. Vowel harmony forms an appealingphenomenon which can shed light on the nature of phonological representations because of the way in which it functions partly as a segmental and partly as a suprasegmental property (ibid).

2.3 Consonant Phonotactics

Consonant Phonotactics are classified into two types which are: word- initial consonant sequences and final consonant sequences. These two types of sequences are going to be explained further in the following lines.

2.3.1 Word- initial Consonant Sequences

O'Connor (1980) explains that in English words there maybe either of two or three consonants that occur initially. Sequences of two consonants initially are of two main kinds; the first one is /s/ followed by one of the /p, t, k, f, m, n, l, w, j/ as in spy, stay, sky, sphere, small, snow, sleep, swear, suit. The second kind is when one of the /p, t, k, b, d, g, f, θ, ʃ, v, m, n, h/ followed by one of the /l, r, w, j/. For example: play, try, climb, blow, dress, glass, fly, throw, shriek, view, music, new, and huge, (ibid: 65).

In addition to sequences of two consonants that occur initially, there are also sequences of three consonants that occurinitially and these are clarified in the following table:

Three-consonant clusters			
First Sound	**Second Sound**	**Third Sound**	**Examples**
/s/	/p/	/l/, /r/, /y/	Splash, spring, spew
	/t/	/r/, /y/	String, (stew, stupid)
	/k/	/l/, /r/, /w/, /y/	[Sclerosis], scrap, squirrel, skewer
Words in ( ) = Many people pronounce these them without /y/.			
Words in [ ] = Very few words begin with this combination.			

(Table 1) Three- Consonant sequences (This table is adopted from Yoshida, 2014: 10).

2.3.2 Word Final Consonant Sequences

At the end of words one, two, three, or four consonants can occur together. Some of the longer clusters are in words with the grammatical endings –s or –ed, which add an extra sound.
A-Examples of words ending in two-consonant clusters: help, felt, sink, arm, girl, and so on.
B-Examples of words ending in three-consonant clusters: text, world, glimpse, against, and so on.
C-Examples of words ending in four-consonant clusters since the grammatical ending has been added:
Texts, sixths, worlds, and so on,(Yoshida, 2014).

2.4 Syllable

The 'syllable' is a basic unit of speech which has been studied on both phonetic and phonological levels of analysis.

Phonetically, syllables are usually described as "*consisting of a center which has little or no obstruction to airflow and which sounds comparatively loud and before and after this center (margins of the syllable), there will be greater obstruction to airflow and/or less loud sound*", (Roach, 2000:67).

Rogers (2000: 314) defines the syllable as " *a unit of phonological organization, typically larger than a*

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segment and smaller than a word". Every syllable has a nucleus, consisting of a vowel or syllabic consonant.

Katamba (1989:153) states that "*the syllable is at the heart of the phonological representation. It is the unit in terms of which phonological systems are organized".* It means thatsyllable is a phonological entity. It cannot be identified with a grammatical or semantic unit. There are syllables like [ʌn] as in unusual which are co-extensive with the morpheme; there are syllables like [kæt] cat which are co-extensive with the word, and there are syllables like [kæts] cats which represent more than one morpheme.

Syllables have internal structure that can be divided into parts. These parts are onset and rhyme; with the rhyme, nucleus and coda are found. It is important to point out that not all syllables have all these parts; the smallest possible syllable contains a nucleus only. Simply, onset means the beginning sound of the syllable which precedes the nucleus, and coda means the sound at the end of the syllable which follows the nucleus. The onset and coda are always consonants in English, (Roca and Johnson, 2000).

2.5 Phonotactic Processes

Waengler (2009:154) states that "phonotactic processes are those variations in which phonemes are added or deleted when compared to informal standard English ". For example, the words wolf [wʊf] and card [kɑd] are pronounced after deleting /l/ and /r/ this phenomenon occurs in some dialects.

Phonotactic process mainly affects constant cluster, especially sequences of consonants at the end of words resulting in words such as west [wɛs], find [faɪn], act [æk]. This type of final consonant sequence reduction is found in informal speaking styles of standard English.

2.6 Phonotactic Patterns and Phonotactic Knowledge

"Phonotactic patterns are the patterns which govern the distribution of sounds in well-formed words in a language. Explaining Phonotactic rules and the principles which underlay them allow speakers to have knowledge of these patterns", (Heinz, 2007: 22).

Phonologists have generally assumed that Phonotactic emerges as abstractions over word knowledge. This creates contradiction for language-learning infants. It suggests that infants have to acquire a limited lexicon one large enough to extract phonotactic knowledge from, before they can begin using phonotactic case that facilitates speech segmentation. Phonotactic knowledge can be acquired from continuous speech, (Avetisyan, 2012).

2.7 Infants Developing Knowledge of Phonotactic Patterns

As it is stated in (Bavin: 2009: 113), "between 6 and 9 months, infants develop knowledge of phonotactic regularities in their language". For example, an English learning infant will listen longer to a word beginning with 'str' cluster than the unacceptable 'rst' cluster and show opposite pattern for word endings. At 9-10 months infants when growing up in an environment where there is only one language spoken by the people around him, so they will show preference for listening to lists of words that are corresponded with their language. If the infants are growing in an environment where there are two languages spoken by their parents and the people around them, they will show preferences for the phonotactic patterns of the dominant language in their input.

Jusczyk et al. (1994) note that infant's preferences can be illustrated by input frequency. When infants are presented with nonsense words with two equally acceptable phonotactic patterns, infants of 10 months show preference for the stimuli with more commonly occurring sequences.

Similarly, Zamuner (2006) notes that Dutch 10 month-old infants differentiate voicing and place of articulation contrasts in word-initial position, but fail to differentiate these contrasts in word-final position. When infants become 16 months, they will be able to differentiate place of articulation contrasts in word-final position, but they still fail to differentiate voicing contrasts. It is worth mentioning that patterns that are difficult for infants who are considered to be the primary language learners in the community may be less likely to be preserved in language.

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3. PRACTICAL PROCEDURES

3.1 Participants

The participants are eleven 15 months old infants (6 girls and 5 boys). All infants are growing up in monolingual Standard English speaking families. These infants have suffered no complications during birth. Moreover, their parents do not have any language disorders.

3.2 Data

The data consists of two sequences of phonemes (CVC), one of them is called AAB and the other is called ABA. The real words for these two sequences are (dad) and (mom). These two sequences of phonemes are played for the infants on a tape recorder.

3.3 Procedures
There are two main procedures:
3.3.1 Familiarization Stimuli

The language of the test consists of two (CVC) syllables. The first one is called AAB and the real word for this syllable is (dad). The second syllable is called ABA and the real word for it is (mom). The choice of these two syllables is based
on excluding vowels because infants will have difficulty in the perception of vowel glides. Schwa /ə/ is also excluded because it has short duration compared with other vowels, two vowels /æ/ and /ɒ/ are chosen. The infants are first familiarized with the phonemes /d/, /m/, /æ/, and/ɒ/. Each phoneme is played for the infants on the tape recorder 15 times per day for about a week to see if it is easy for them to acquire these phonemes individually, or it is easier for them to acquire the same phonemes in whole words.

3.3.2 Test Stimuli

The phonemes are going to be played for the infants on the tape recorder in two words (dad) and (mom). Again, the infants are going to hear these two words 15 times per day for about a week. When the infants have heard the words, they pronounced the phonemes individually at the beginning, and then at about the fifth day they have

started to pronounce the words as a whole. Of course, there is variation among the infants for pronouncing these two words. Most of the infants have showed preference for pronouncing the word (dad) while others pronounced (mom) easily.

3.4 Results and Discussion

The results of the test are analyzed by comparing the results of the familiarization and test stimuli. The results show that infants learn the phonemes through words. They segment the words and pronounce the phonemes that are easy for them to pronounce. This means they segment the words they hear before being able to pronounce the word as a whole. The results also show that some phonemes are easier to be pronounced for the infants since most of the have showed preference for pronouncing the word (dad).

3.5 Conclusion

The results of the current testsuggest that phonotactics bootstrap the lexicon, and not vice versa. Phonotactics forms very important part of any language since it refers to the correct combinations of words.Infants learn the words by segmenting them. Infants use the continuous stream of speech that surrounds them to induce phonotactics knowledge of phoneme sequences. This knowledge aids them in detecting word boundaries. The infants segment the speech stream into proto words to take the first step in lexical acquisition.

REFERENCES

Avetisyan, N. b. (2012).*Phonotactics and Its Acquisition, Representation, and Use. An Experimental Phonological Study*. The Netherlands.

Bavin, E.L. (2009).*The Cambridge Handbook of Child Language.* Cambridge: Cambridge University Press.

Clark, J. and Yallop, C. (2006).*An Introduction to Phonetics & Phonology* (2nd) edition. Oxford and Cambridge: Blackwell publishing.

Catford, J. (1988). *A Practical Introduction to Phonetics*. Oxford: Clarendon Press.

Coxhead, A .(2000): *Glossary of Linguistic Terms.* New Zealand: Victoria University of Wellington.

Crystal, D. (2004). *The Cambridge Encyclopedia of the English Language*. Cambridge: Cambridge University Press.

Heinz, J. N.(2007).*Inductive Learning of Phonotactic Patterns*. Los Angles: University of California.

Jusczyk, P.W. and Luce, P.A. (1994).*Infants' Sensitivity to Phonotactic Patterns in the Native Language.* Journal of Memory and Language, 33, 630-645.

Katamba, F. (1989): *An Introduction to Phonology.* United Kingdom: Longman Group Limited.

O'Connor, J.D. (1980).*Better English Pronunciation.* United Kingdom: Cambridge University Press.

Roach, P. (2000). *English Phonetics and Phonology: A Practical   Course*. Cambridge: Cambridge University Press.

Rogers, H. (2000).*The Sounds of Language: An Introduction   toPhonetics.* Edinburgh: Pearson Education Limited.

Roca, I. and Johnson, W. (2000). *A Course in Phonology*. Oxford: Oxford University Press.

- Waengler, J.B. (2009). *An Introduction to Phonetics and Phonology.* United State of America: Pearson Education Limited.

- Yoshida, M. (2014).*The consonants of American English.*Irvine: University of California.

-Zamuner, T. S. (2006).*Sensitivity to Word- Final Phonotactics in 9- to 16 month- old infants. Infancy.*University of British Colombia.