

Phonological Rules

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Abstract

The study sheds light on the phonological rules as part of communication used through language. It tackles the reasons behind them, types, characteristics and functions. Finally, it focuses on conclusion that reaches at.

Key words: Phonological rules, Generative Theory, Assimilation, Dissimilation, Deletion, Insertion, Metathesis.

المخلص

الدراسة تسلط الضوء على القواعد الفونولوجية كجزء من الاتصال المستخدمة من خلال اللغة. وهو يتناول الأسباب التي تقف وراءها، وأنواع وخصائص ووظائف. وأخيراً، فإنه يركز على الاستنتاج الذي يصل في.

الكلمات المفتاحية: قواعد الصوتية، المولدة نظرية، الاستيعاب، عكس التمثيل، حذف، إدراج، وصفت الابدال والاحلال.

1- What are Phonological Rules?

Phonological rules are part of communication through language, whether spoken or written, and knowing what they are and why they exist can help us better understand our world. Understanding phonological rules is considered an important aspect in teaching English or working with people who have speech problems (2).

In order to understand the purpose of phonological rules, we need to understand what a phoneme is. According to the traditional phonological theories a phoneme is the minimal unit in the sound system of a language (Crystal,1997:287) . Phonological rules are the rules whether written or spoken that control how sounds change during vocal communication.

Phonological rules describe how phonemes are realized as their allophones in a given environment. Environment in phonology typically refers to neighboring phonemes (2). John Golden Smith (1995) defines phonological rules as mappings between two different levels of sound representation in this case, the abstract or underlying level and the surface level. Bruce Hayes (2009) describes them as "generalizations" about the different ways a sound can be pronounced in different environments. That is to say, phonological rules describe how a speaker goes from the abstract representation stored in their brain, to the actual sound they articulate when they speak. In general, phonological rules start with the underlying representation of a sound (the phoneme that is stored in the speaker's mind) and yield the final *surface form*, or what the speaker actually pronounces. For example, the English plural -s may be pronounced as [s] (in "cats"), [z] (in "cabs"), or as [ɪz] (in "buses"); these forms are all stored mentally as the same -s, but the surface pronunciations which are derived through a phonological rule are different (5).

2- The Idea behind Phonological Rules

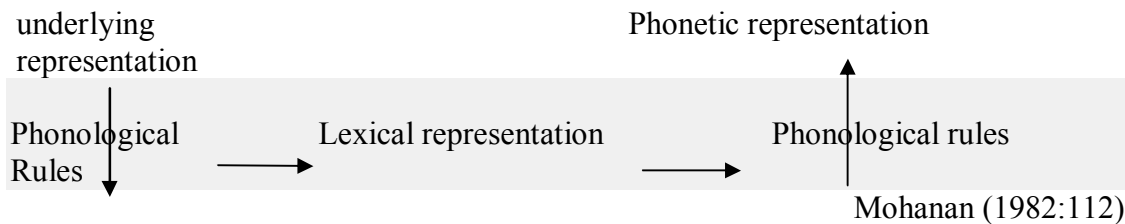
Generative phonologists, who have worked extensively with phonological rules, work on the basic assumption that every speaker has a mental lexicon full of abstract entries of phonological forms in his or her head. These abstract stored entries are **underlying representations** and serve as **input** for the **phonological rules**. These underlying forms then undergo a **derivational process** which is defined by the

phonological rule. The **output** of that process is the **phonetic representation** of the pronunciation (4).

underlying representation $\longrightarrow$ Phonological rules $\longrightarrow$ Phonetic representation

Mohanan (1982:112)

Also phonological rules are used with lexical phonology in a sense that it is a theory in which morphological and phonological rules are brought together within a single framework (McMahon, 2000, 35).



According to Katamba (1989:117) in English, we have the following phonetic realizations to account for the formulation of such rules:

[p $\square$ It] pit	[p $\square \square$ ul] pool
[th $\square$ Ik] tick	[t $\square \square$ uk] took
[k $\square$ i:l] keel	[k $\square \square$ ul] cool
[æt $\square$ nd] attend	[æk $\square \square$ ustik] acoustic

Katamba (ibid.) states that the rules needed to account for the above examples are listed as follows:

- (a) voiceless stops are aspirated at the beginning of a stressed syllable;
- (b) consonants are labialized (rounded) before rounded vowels;
- (c) velar consonants are fronted (palatalized) before high front vowels.

The above formal representation of the phonological rules will be changed into algorithms using distinctive feature and formal notation. The restatement of the rules from the forms above into the forms below will give us a clear conception about the basic formal conventions of GP :

- | | | | |
|----------------------------|---------------|------------------|---|
| Input | becomes | output | in the environment |
| (a) [-cont , - voice] | $\rightarrow$ | [+aspirated] / _ | (c) [-cons , +stress] |
| e.g. /k/ | becomes | [kh] | before a stressed vowel (as in <i>acoustic</i> |
| (b) [+cons] | $\rightarrow$ | [+round] / _ | [-cons , +round] |
| e.g. /t/ | becomes | [tw] | before a rounded vowel (as in <i>too</i>) |
| (c) [+cons, +back , +high] | $\rightarrow$ | [- back] / _ | [+high , - back] |
| e.g., /k/ | becomes | [k] | before a high vowel (as in <i>key</i>) |

As it has been mentioned above , a formal rule consists of the following:

- (1) the input, which states the sound or sounds affected by the rule;
- (2) the arrow, which means " re-write as" , "is realized as" or " becomes";

- (3) what occurs to the right of the arrow is the output of the rule;
 (4) following the output, there is a diagonal line '/' to the right of the line is the environment, the — line which forms part of the environment shows exactly where the changed segment is located;
 (5) the brackets round an element like (c) indicates that a given element is optional. In this instance, it indicates that a voiceless plosive is still aspirated even when a consonant intervenes, as in *prayer*.

3- Generative Theory

Generative phonology (GP) is the application of generative grammar to phonology. Generative means rules that will describe possibilities in the language, grammar, or phonology, they are developed to analyzed phonological systems of languages around the world. These rules have proposed by Chomsky and Halle(1964) as a central procedure of GP. The goal of this theory is to make precise and explicit the ability of native speakers to produce and perceive or understand utterances of a particular language. In generative phonology, the level of the phoneme is redefined to match the deeper level of abstraction aimed for in the most efficient conception of phonological processes. It is the task of the phonological rules to account for the predictable aspects of pronunciation whether they relate to alternate pronunciations of the same basic morpheme or different phonetic forms that a sound can take. These rules, made to look like "mathematical formulas", provide an explicit means of capturing the general principles of various phonological processes: 1) assimilation, 2) dissimilation, 3) deletion, 4) insertion, and 5) metathesis. The incorporation of distinctive features into a generative phonology allows the linguist to state explicitly important generalizations about the phonology of a language (1).

4- Types of Phonological Rules

Phonological rules can be best understood through the following phonological processes:

4-1 Assimilation

Hyman (1952:221-3) states that assimilation refers to all adaptive modifications of a segment in a chain of segments by a neighboring segment. According to Driven (2004:119), assimilation is a process whereby one sound causes an adjacent sound to be "more similar" to itself.

Sounds become more like neighboring sounds

[n] → [m]/__ [+bilabial]

Assimilation can be conditioned by preceding or following sounds.

Concerning types of assimilation, Hyman suggests that scholars classify assimilations differently and he presents the following figure for this classification.

Types of Assimilation

Distinctiveness and stability of change		Direction of change	
		Progressive	Regressive
Phonetic (Free variation) (Contextual)	Morphologic (Morphophonemic) (Historical)		
	Phonemic (Neutralization) (Syncretism)		

From the point of view of distinctiveness and stability of change, assimilation patterns manifest three sub- types:

1- Phonetic, free variation or contextual assimilation. The change affects a certain segment by selecting a certain variant of that segment.

For example, /m/ in triumph and nymph is rendered [ɱ]

(labiodental nasal) instead of bilabial [m] .

Similarly, infant /n/ is often rendered as [ɱ].

Also, /l/ is devoiced after /f/ and /k/ in flight and clean and lips are rounded in the articulation of /p/, /k/, and /l/ in pool, cool, loom, respectively due to the occurrence of rounded vowel /u:/ immediately after these consonant segments.

2- Phonemic assimilation is often referred to as "neutralisation" or "syncretism". This is more systematized, i.e., not subject to free variation. It also results in the neutralization of two phonemes. For example:

/n/ and [ɱ] are neutralized in think /ɱiŋk/, /v/ and /f/ in have to /haft tu/ , /z/ and /s/ in newspaper /'nju:speɪpə/, and so on. Dirven (2004:119) states that some assimilations such as in *newspaper* are obligatory within word boundaries, however, they are optional, and tend to be more frequent in the informal and relaxed the speaking style.

3-Morphological or morphophonemic assimilation is one which affects a whole morpheme. It usually decides the morpheme variant (allomorph) according to morphophonemic rule. For example:

- The distribution of - s suffix (plural, 3rd person singular, possessive, contracted forms is and has) show three allomorphs:

/- s / after voiceless consonants: stops, roots, Philip's, it's .

/- z/ after voiced segments : goes, boys, Tom's, he's.

/- iz/ after sibilant consonants: reaches, bridges, James's, George's.

Katamba (1989:82) points out that the alternation in the shape of a morpheme is not arbitrary. Rather, it is phonologically conditioned. This means that the allomorph of a morpheme that occurs in a given context is partly or wholly determined by the sounds found in the allomorphs of adjacent morphemes. It is not merely coincidence that is responsible for the allomorphs of the plural morpheme and the third person plural being [-z -s -iz]. The suffix agrees in voicing with the preceding sound.

-The distribution of – ed suffix (past and past participle) shows three allomorphs:

/- d/ voiced segments: killed , named .

/- t/ after voiceless consonants: looked, stopped, reached.

/- id/ after /t/ and /d/ : wanted, added.

- The distribution of the presuffix shows the following allomorphs:

/ il-/ before /l/ : illegal , illegitimate.

/ir-/ before /r/ " irregular.

/im/ before labial : immoral , impersonal, immortal.

From the point of view of the distribution of change, assimilation can be progressive or regressive. When the change involves the following sound, it is called "regressive assimilation" and when it involves a preceding sound it is called "progressive assimilation".

The nasal is realised as:

(i) [m] before bilabial consonants (e.g. when one of [p b m] follows)

(ii) [n] before alveolar consonants (e.g. when one of [t d n s] follows)

(iii) [ɱ] before palatal consonants (e.g. when one of [ç ʝ ɰ] follows)

(iv) [ŋ] before velar consonants (e.g. when [k or g] follows)

- Progressive assimilation can be seen in the following cases :

a- the / -s/ morpheme of the plural becomes / -z/ when preceded by a voiced consonant , e.g. , bag + s / bagz /, pencil + s / 'penslz/ .

b- /-d/ becomes /-t/ when preceded by a voiceless consonant: e.g., kick + ed /kikt/.

b- Regressive assimilation can be seen in the following patterns:

1- /n/ becomes /m/ under the influence of a labial consonant that follows. For example, ten minutes / tem'minits/.

2- /d/ becomes /t/ when followed by a voiceless consonant. For example, used to /'ju:st tu/.

3-/z/ becomes /s/ when followed by /p/ or /t/ , for example: newspaper /'nju:speipə/.

4- /n/ becomes /ŋ/ when followed by /k/ as in income /'iŋkʌm/.

5- /v/ becomes /f/ when followed by /p/or /t/. Examples: five pence /faif pens/, have to /haft u/ , fifth /fifθ/.

6- /s/ becomes /ʃ/ when followed by /t/. Example: horse shoe /ho: ʃ u:/.

7- Sometimes two sounds merge into one as in standpoint /'stampoint/ (Nathan,2008:77).

Another way in which assimilation processes can be seen is in terms of whether a vowel or consonant acquires vowel or consonant features of a neighbouring segment.

when a velar consonant is followed by a front vowel, there occurs some slight anticipatory fronting of the part of the tongue that makes contact with the roof of the mouth. This fronting is indicated by a subscript (+) under the consonant. The effect of the fronting is that the velar consonant is made partly in the palatal region. This process is called palatalisation .

Velar consonants often have slightly palatalised allophones which occur after front vowels because the tongue is raised towards the hard palate in the production of front vowels and speakers anticipate that gesture and start making it before they have completed the articulation of [k] or [g].

Palatalisation is not limited to velar consonants. It is equally possible to palatalise anterior consonants. In fast, speech, alveolar consonants are usually palatalised when they occur at the end of a word and are followed by another word which begins with an alveopalatal consonant:

his shoes [hiz Juz] —> [hiʒ Juz]

nice shirt [nais Jʒt] —> [naiʃ /ʒt]

miss Ure [mis jua] —> [mif jua]

John's shorts [dʒDnz Jots] —* [dʒDnʒ Jots]

Concerning labialization or rounding, anticipating the next segment which is a round vowel, the speaker starts rounding the lips before the articulation of the consonant is completed.

Pool [pʊl]

Two [tʊ u]

Shoe [ʃʊ u]

Luke [lʊ uk]

4-2 Dissimilation

When a sound changes one of its features to become *less* similar to an adjacent sound , usually to make the two sounds more distinguishable. This type of rule is often seen among people speaking a language that is not their native language

where the sound contrasts may be difficult so the rule is applied for ease of production and perception (6).

In other words, a phonological process that changes feature values of segments to make them less similar.

Annual annular
sexual secular
cultural cellular(cell)
penal perpendicular (7)

4-3 Deletion

When a sound, such as a stressless syllable or a weak consonant, is not pronounced; for example, most American English speakers do not pronounce the [d] in "handbag", [n] in "condemn", [k] in "know" (6).

So, it is a process by which a sound present in the phonemic form is removed from the phonetic form in certain environments for ease of production (3).

Lass (1984:186) suggests that there are three types of deletion: aphaeresis which is initial deletion as in (I am --- I'm, I have ----I 've) or the initial loss of /k/ before /n/ as in know, knight , syncope is formative internal deletion: the term is most frequently used with vowel loss, but some writers extend it to consonants as well. This can be seen in American and British forms of certain words: /sɪkrɪtəri/ vs. /sɪkrɪtrɪ/ 'secretary', 'sign', assign. Apocope is the loss of a final element as /t/ before a word beginning with another consonant, 'last time', also low stress words may lose their finals as in 'and', 'of'. Deletion is found in the Arabic language and the following examples are stated from the holy Quran:

النار ----- انار
الشمس ----- اشمس
من نفس ----- منفس
اركب معنا ----- اركمنا
يلهت ذلك ----- يلهذك
اذ ظلموا ----- اظلموا
قالت طائفة ----- قاطائفة
قد تبين ----- قتبين

4-4 Insertion

Nathan (2008:82) asserts that not only can segments be deleted, sometimes they can be inserted instead. There seem to be two basic reasons for insertion: preventing clusters of consonants that violate syllable structure constraints in the language, and easing transitions between segments that have multiple incompatibilities. We'll deal with each kind in turn. Again, there are Greek-based terms for insertions at the beginning, middle and end.

Insertion at the beginning is observed in Spanish, where the language does not permit onset clusters. Words that are inherited from Latin with such clusters changed to have an initial /e/ inserted:

especial [espesial] 'special'
estudiante [estudiante] 'student'
escuela [eskwela] 'school'

A particularly strange, but well-known kind of insertion is the famous 'intrusive/linking r' of British and some dialects of [American English]. In these dialects a historical /r/ has been deleted in word-final coda position, but when the word is followed by vowel initial words under complex and not-completely-understood circumstances, the /r/ reappears, an example of 'intrusive r' is:

idea [aI□diə]

idea is [aIdiərIz]

All of the examples we have seen so far involve insertion of vowels to break up sequences of consonants that violate syllable structure constraints. In other cases the /r/ reappears even when there was never an /r/ there in the first place (this is known as 'intrusive r'). Typical examples of 'linking r' are

rear [riə]

rear end [riənd]

He adds (ibid.) that there are two types of insertion: prothesis and epenthesis, the former refers to the insertion of a segment at the beginning while the latter refers to the insertion inside a word.

Snoopy + /e/ → /esnupi/ (prothesis)

glass + plural /s/ → /glæsəz/ (epenthesis)

- → [+stop] / [+nasal] __ [+fricative]
- → [ə] / [s] __ [z]

There is a special kind of epenthesis which involves inserting a schwa between a liquid and another consonant. This occurs in nonstandard English between [θ] and /r/ or /l/ in words such as the following:

arthritis [æθəraInIs]

athlete [æθəlit]

Furthermore, he (ibid.) suggests that here is a different kind of epenthesis that is fairly wide spread, involving the insertion of a stop between a nasal and a voiceless fricative. Since movement from a nasal stop to a voiceless fricative involves three simultaneous articulatory changes (lift velum, release closure, open vocal cords) languages often prefer to sequence the three gesture changes as follows: lift velum and open vocal cords simultaneously, then release closure. This amounts to inserting a voiceless stop after the nasal. This change is an ongoing process in English, and has also been a historical change. Here are some synchronic examples:

'warmth' [wæmpθ]

'hamster' [hæmpst]

'strength' [strɛŋkθ]

'youngster' [j • ŋkstə]

4-5 Metathesis

Phonological process that changes the order of phonemes

Old English vs. Contemporary English

asterix(ks) asterisk

comfterble comfortable

intregal integral

relator reator

 revelant relevant (7)

Lass (1984: 188) states that in old English there are interchanges of /p/ and /s/, as shown in spelling variants: /ps/ --- /sp/ in waspe 'wasp', /sp/---/ps/ in apse aspe 'aspen', cosp cops 'cope', wlips 'lipping'. He adds that the metathesized forms wasp,

copse are now standard. Another metathesis involves nasal sequences, specially /m/ and /n/: emnity for enmity, anemone for amenone.

5- Optional and Obligatory Rules

Some scholars make a distinction between optional phonological rules and obligatory ones in a sense that the former may or may not apply in an individual's speech such as palatalization, friction dissimilation, voiceless stop insertion, deletion; they contribute to rate/style of speech, dialect variation; whereas the latter are applied in the speech of all speakers of a language or dialect, regardless of style or rate of speech such as nasalization, aspiration, devoicing, palatalization; they contribute to native- sounding accent (3).

6- Characteristics

Hayes (2009) lists the following characteristics that all phonological rules have in common.

1-Language specificity: A phonological rule that is present in one language may not be present in other languages, or even in all dialects of a given language.

2-Productivity: Phonological rules apply even to new words. For example, if an English speaker is asked to pronounce the plural of the nonsense word "wug" (i.e. "wugs"), they pronounce the final *s* as [z], not [s], even though they have never used the word before. (This kind of test is called the wug test).

3-Untaught and unconscious: Speakers apply these rules without being aware of it, and they acquire the rules early in life without any explicit teaching.

4-Intuitive: The rules give speakers intuitions about what words are "well-formed" or "acceptable"; if a speaker hears a word that does not conform to the language's phonological rules, the word will sound foreign or ill-formed (10).

7- Functions of Phonological Rules

Phonological rules have a number of functions, among them are the following:

1. Change feature values.
2. Add new features (distinctive / non distinctive): aspiration in English.
3. Delete segments: contraction rules in English.
4. Add segments (schwa insertion in plural and past tense)
5. Reorder segments (metathesis: *sk* to [ks]).
6. Phonological rules often refer to entire classes of sounds rather than to the individual sounds(8).
- 7- Phonological rules are generated to account for what occurs in a language, they are not originally used to describe children's and disordered speech however, they have been applied to describe children's and disordered speech (11).

8- Conclusion

A phonological rule is a method for describing the way in which individual sounds are produced in spoken languages. These rules are written out in a specialized notation that codifies the way in which a sound or group of sounds is altered by appearing in a specific linguistic context. Phonological rules vary between languages and dialects, and they reflect the common pronunciation habits of various linguistic groups. By studying the way that a particular phonological rule operates in a spoken language, linguists are able to determine the physiological and neurological mechanisms that translate mental language into spoken language.

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