ANTICIPATION, SIMULTANEITY/CONSECUTIVITY AND DISTINCTIVE FEATURES IN PHONOLOGY

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Abstract. The notion of distinctive features has had a firm position in phonology since the time of the Prague Linguistic Circle and especially that of one of its representatives, Roman Jakobson, whose well-known delimitation of a phoneme as "a bundle of distinctive features" (Jakobson, 1962, p. 421), that is, a set of simultaneous distinctive features, has inspired many scholars. Jakobson's attempt "to analyse the distribution of distinctive features along two axes: that of simultaneity and that of successiveness" (ibid., p. 435) helped cover several phonetic and/or phonological processes and phenomena. Distinctive features, although theoretical constructs (Giegerich, 1992, p. 89), reflect phonetic, that is, articulatory and acoustic, properties of sounds. In the flow of speech, some features tend to influence the neighbouring phonemes. Sometimes speech organs produce something that the brain just 'plans' to produce (anticipatory speech errors). There are situations where it seems as if the successive organization of phonemes went hand in hand with the simultaneous nature of certain articulatory characteristics of those phonemes (the transgression of consonants and inherence of vowels in Romportl's theory), or the given feature seems to be anticipated by the preceding segment. This is the case with nasalization and/or anticipatory coarticulation, as well as regressive (anticipatory) assimilation. In addition, simultaneity/consecutivity is a decisive criterion for the difference between the so-called complex segments, as specified in Feature Geometry, and simple segments (Duanmu, 2009). Moreover, the phonological opposition of simultaneity- successivity (that is, consecutivity) itself functions as a feature making a difference between segmental and suprasegmental elements in the sound system of a language, as was first mentioned by Harris (1944), later indicated by Jakobson (1962) and then fully developed by Sabol (2007, 2012).

Keywords: *distinctive features, simultaneity, consecutivity, anticipation.*

1. Introduction

Anticipation is one of the crucial components of cognition (Swarup & Gasser, 2007, p. 42). There is a correlation between anticipation and language: the complexity of a communication system of a population depends on the refinement of the population's anticipatory behaviour (ibid., p. 43). Language utterances are primarily organized in a sequence (consecutive organization of phonemes, morphemes, words), but many linguistic phenomena are realized simultaneously, that is, at the same time (Kremers, 2012). The concepts of anticipation, sequence and simultaneity have been studied from various perspectives by various authors (for details, see e.g. Natsopulos & Abadzi, 1986). The aim of this article is to show how anticipation, consecutivity and simultaneity penetrate the fields of phonetics and phonology. Attention will be paid to those issues that are – in one way or another – connected with distinctive features of phonemes, the essential notion in phonology. Distinctive features are theoretical constructs (Giegerich, 1992), but they reflect phonetic, that is, articulatory and acoustic, properties of sounds.

I will start my survey with anticipatory speech errors and slips of the tongue. This issue is quite specific, being, at first sight, a question of psychology rather than of linguistics, but is one with an impact on communication: it is a phenomenon that violates communication. Then, attention will be paid to the transgression of consonants and the inherence of vowels, a phonological opposition that is very important in an acoustic analysis based on the segmentation of the flow of speech. Third, the problem of nasalization as anticipatory coarticulation and anticipatory coarticulation itself will be specified. After this, anticipatory assimilation, an important sound phenomenon in many languages, will be explained, using examples from Slovak. Then, I will concentrate on the difference

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between the contour segment, the complex segment, and the simple segment, as specified in Articulatory Phonology and Feature Geometry. Finally, the difference between segments – i.e. vowels and consonants on the one hand and suprasegments, that is, prosodic features on the other – will be explained from the viewpoint of the opposition of simultaneity-consecutivity.

2. Anticipatory speech errors

As indicated above, speech errors and slips of the tongue are studied in psychology but also in linguistics. They are connected with the mechanism of speech production, and scientists divide them into several categories (see e.g. Hill, 1973 for further details). One of them is simply called anticipation. A speaker can anticipate a phoneme, the onset of the syllable, or the whole syllable. However, Fromkin (1973) provides examples showing that sometimes it is only a distinctive feature of a phoneme – as a minimal constituent of this sound unit – that is anticipated:

(1) **D**ick Carter is a musician. ➡ **N**ick Carter is a musician.

(2) sit all day ➡ **z**it all day

(3) a nasal infix ➡ a navel infix (Fromkin, 1973, p. 17).

Speech errors of this kind are usually classified as phonemic errors because it seems that a person produces a sound that should be pronounced later in a sentence (or a phrase). But looking at the examples above in detail, it is clear that it is not the whole phoneme that is anticipated, but its distinctive feature: the only difference between /d/ and /n/ is that of nasality[1], /s/ and /z/ differ by voicing[2], and /z/ and /v/ have different places of articulation[3]. Example (1) illustrates nasality anticipation, in example (2), there is so-called voicing anticipation, and example (3) is a case of labiality anticipation (ibid.).

Both speakers and listeners perceive speech errors (including anticipation) as something negative, but linguists, as well as psychologists, agree on their usefulness for the analysis of the whole process of the production of speech. It is proven that speech errors are not made by chance, and thus they provide interesting material for the analysis of what is behind the speech, what happens between the brain and the articulators. They reveal much about mental processes during human speech: "Contemporary investigations of the psychological processes underlying language production have their roots in the investigation of spontaneous speech errors […]" (McClain & Goldrick, 2018, p. 47). Moreover, examples like those in (1) – (3) demonstrate that "features do play a role in […] phonology" and are "[…] real elements in performance" (Fromkin, 1973, p. 17–18). Both citations support the relevance of distinctive features, contrary to some theories that cast doubts on their validity in phonology (for example, consider Absolute Slicing Hypothesis for a different approach to the notion of distinctive features in phonology).

3. Transgression of consonants and the inherence of vowels

The phonological opposition of transgression-inherence was introduced by the Czech linguist Milan Romportl (1973), who named consonants as 'transgressive' because certain features of their acoustic spectrum overlap into the sound spectrum of the neighbouring sound, which is then necessary for the correct identification of the given consonant. Vowels are 'inherent' because all important acoustic features are realized within their own sound spectrum (Romportl, 1962, p. 284; see also Gregová, 2016, p. 111–112). What does this mean in practice? In the process of the segmentation of continuous speech, the border between the neighbouring sounds is not always clear-cut, because the fundamental acoustic features of a consonant infiltrate the acoustic spectrum of the following vowel. As is well-known, acoustic features depend on articulation. Thus, in other words, the final phase of the realization of a consonant 'happens' simultaneously with the initial phase of the articulation of the following vowel, as illustrated in Figure 1. There are three articulatory phases of a consonant (C): on-glide, intension (the preparatory, initial phase); retention, tension (medial stage, the peak phase); and off-glide, detension (final phase). The following vowel (V) has three

[1] The English /d/ is alveolar, stop/plosive, oral and voiced, while /n/ is alveolar, stop/plosive, nasal and voiced.

[2] In English, /s/ is alveolar, spirant/fricative, oral and voiceless, and /z/ is characterized by being alveolar, spirant/fricative, oral and voiced.

[3] /z/ is characterized by being alveolar, spirant/fricative, oral and voiced, and /v/ is labio-dental, spirant/fricative, oral and voiced.

stages of articulation, too. In the case of the transgression of consonants, the off-glide of the consonant is realized simultaneously with the on-glide of the following vowel (indicated by the circle).

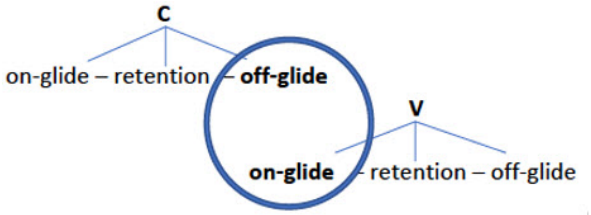

Figure 1. The 'transgression-inherence' opposition in terms of articulation

This phenomenon was first observed when parsing sonorant + vowel combinations, for example, j + i. As a consequence, the 'transgressive' feature is phonologically relevant for sonorants (r, l, m, n, j, v).

The whole issue can be visualized by the oscillogram and the spectrogram of the Slovak word *krajiny*, meaning 'countries'.

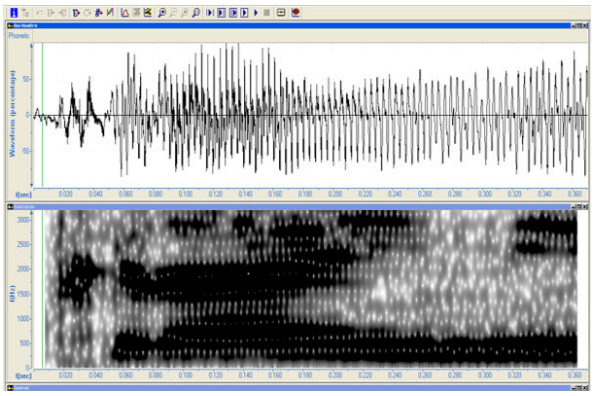

Figure 2. The oscillogram and the spectrogram of the word *krajiny* ('countries') (Gregová, 2016, p. 113)

The basic categories of sounds – vowels and consonants – are characterized by a given shape of an oscillographic curve and a spectrogram. The differences in the acoustic structure (depending on the differences in the production of sounds) have their reflection in the sound wave, as well as in the structure of the spectrogram, and serve as a tool for the segmentation of the flow of speech into smaller units. However, when the acoustic structures of the neighbouring sounds are interconnected (when the articulatory phases overlap, see Fig. 1), it also has an effect on the form of an oscillogram and spectrogram. In such cases, the boundaries between the sounds are difficult, or even impossible, to delimit. In Figure 2, the differences between the initial sounds k – r – a are quite clear; however, the boundaries between j and i, as well as between n and i, are blurred. Here, the successive organization of sounds is accompanied by the simultaneous realization of certain acoustic characteristics of those sounds. These 'tight bonds' between neighbouring sounds have their reflection in the structure of the syllable. If speech sounds are acoustically interconnected, together they form the onset or the coda of the same syllable (see also Vachek, 1989, p. 37). This information is very useful in syllable theory (for further details, see Gregová, 2016).

Nevertheless, the transition of a certain acoustic feature, that is, an articulatory feature, of one sound to another sometimes results in the modification of the articulatory phase, and we can thus speak of coarticulation.

4. Nasalization as/and anticipatory coarticulation

Coarticulation is a well-known phenomenon in many languages. There are assorted definitions of this phenomenon, one of which is that it is a type of articulation during which there is a reciprocal influence of the articulatory (motoric) movements of sounds (Dvončová, 1980, p. 76).

The thorough cross-language research of articulatory control in speech production reveals the existence of several types of coarticulation – lingual, laryngeal, labial and velar (Hardcastle & Hewlett, 1999). The one which can be considered the most universal is velar coarticulation or, in other words, nasalization, or nasal coarticulation. This is because, as Peter Roach says, in all languages one can observe "some degree of coarticulatory nasalisation of vowels adjacent to nasal consonants" (Roach n.d.). The phenomenon of coarticulation has its roots in the way the human brain controls the production of speech. When we speak, many muscles are active at the same time, and sometimes the brain wants them to make sudden changes that they are not capable of. For example, in the English word 'none [nʌn]', the vowel is normally an oral sound (the soft palate is raised, thus preventing the air from escaping through the nose). During the articulation of the two 'n' sounds, the soft palate must be lowered because /[n]/ is a nasal sound in English. However, the velum (soft palate) cannot be lowered and then raised and lowered again as quickly as required for the given combination of sounds, so the

vowel is pronounced with the soft palate still slightly lowered, giving a nasalized quality to this vowel (Gregová, 2016, p. 116). The nasalization is a coarticulation effect caused by the nasal consonant environment (Roach n.d.).

Having established that nasal sounds are coarticulated with adjacent segments, a question arises "as to the direction in which nasality produces its greatest effects. In other words, which type of velopharyngeal coarticulation" – anticipatory (that is, 'right-to-left' or 'backward') or carryover (that is, 'perseverative', 'left-to-right' or 'forward' when an earlier segment influences a later one) – prevails in the spreading of nasality to neighbouring units (Chafcouloff & Marchal, 1999, p. 73)?

Various authors (see Hardcastle & Hewlett, 1999 for further details) provide physiological, acoustic and perceptual evidence to support the existence of both anticipatory as well as carryover velopharyngeal coarticulation (nasalization) in languages. For example, early velum lowering, that is, anticipatory nasalization, has been observed in American English and Brazilian Portuguese, whereas lowering was initiated later in French, Chinese and Swedish, evidencing carryover nasalization. However, sometimes there are contradictory results of the evaluations of the data from one and the same language; for example, Clumeck speaks of anticipatory nasalisation in Hindi, but Ohala reports carryover nasalization in this language (Chafcouloff & Marchal, 1999, p. 79). So, what does it depend on? The nasal coarticulatory pattern may depend on the number of vowels in a language, on whether the sounds are nasal or nasalized, or on whether nasality has a distinctive function in a given language (as, for example, in French or Portuguese) or not (ibid.).

There are several coarticulation models (for details, see Farnetani & Recasents, 1999); however, considering that distinctive features are a 'guiding thread' of this paper, in featural phonology, the existence of coarticulation is explained by the theory of feature spreading (ibid., p. 41), wherein "[…] coarticulation cannot be the product of inertia, as some authors mention, but rather a deliberate spread of features" (Daniloff & Hammarberg, 1973, p. 41).

For example, in Italian, the nasality–non-nasality feature in the consonantal oppositions /n/–/d/ and /m/–/b/ is affected by the presence or absence of the same feature in the following vowel. The nasality feature does not have the same perceptual weight for vowels and consonants, and appears to be more important for the former speech sounds than the latter (Maturi, 1991), at least in Italian. But, a certain degree of an anticipatory effect of nasality can be observed in English and Slovak, for example (Hučka, 2012). However, it has no phonological value. There are neither nasal nor nasalized consonants in standard English or Slovak.

Thus, nasalization is a phenomenon that occurs in many languages. However, its directionality, extent and phonological value vary from language to language, and the whole issue is still open for further research. What all authors agree on is that nasalization is a consequence of velopharyngeal coarticulation.

In standard generative phonology, coarticulation is defined as "the transitions between a vowel and an adjacent consonant, the adjustments in the vocal tract shape made in anticipation of a subsequent motion, etc." (Chomsky & Halle, 1968, p. 295).

Coarticulatory variations originate from the physical properties of speech and are determined by universal rules. Also, the huge amount of research carried out in this field from the 1960s up until today show that the distinctive 'nasal' feature, with its either anticipatory or perseverative nature, behaves differently across languages (see above). Thus, there are cross-language similarities as well as cross-language differences in coarticulation.

For generative phonology, the language-specific/language-universal difference helps to delimit the difference between coarticulation and the other important sound change – assimilation, since assimilations in standard generative phonology involve operations on phonological features (the minimal classificatory constituents of a phoneme) and are accounted for by phonological rules. They are controlled by the speaker and perceived by the listener, and are language-specific (ibid.).

5. Anticipatory assimilation: evidence from Slovak

Generally speaking, assimilation is a process in which two dissimilar sounds become more similar when they are close to each other. It is an accommodation of a sound to its environment. Depending on the direction of the influence, it can be progressive or regressive; here, I will concentrate on the latter, also known as anticipatory assimilation.

Assimilation sound changes affect distinctive features, and in phonology, they are known as neutralizations. Neutralization is a phonological phenomenon. It is the change of one phoneme into another, and is caused by the sound environment (Kráľ & Sabol, 1989, p. 319). The anticipatory assimilation (regressive neutralization) of voicing is a typical feature of many Slavic languages. The whole issue of this sound phenomenon will now be illustrated by data from the Slovak language, which belongs to the west Slavic language family. In Slovak, the neutralization of the phonological opposition voiced-voiceless takes place on the word boundaries, at the boundary between the prefix and the word base, the word base and the suffix, and at the boundary between word bases (Kráľ, 2005, p. 54). The general rule[4] is that when a voiceless obstruent meets any voiced sound (i.e. a voiced obstruent, a sonorant or a vowel), the voiceless obstruent assimilates into its voiced counterpart (ibid.). For example,

(4) graphic form: pes **l**eží ‘a dog lies’ ➡ sound form: [pe**z l**eží] ‘a dog lies’.

When a voiced obstruent meets a voiceless counterpart, the result is two voiceless obstruents (ibid.), as illustrated below:

(5) graphic form: du**b** stojí ‘an oak stands’ ➡ sound form: [du**p** stojí] ‘an oak stands’

There are three other anticipatory (regressive) assimilations in Slovak. The neutralization of the consonantal phonological opposition diffuse-non-diffuse[5] affects the pairs t – ť, d – ď, n – ň and l – ľ. The diffuse sounds d, t, n and l are pronounced as the non-diffuse sounds ď, ť, ň and ľ, respectively, when followed by e, i, ia, ie or iu (Sabol, 1989, p. 159).

For example, consider the graphic and the sound forms of the Slovak words nedeľa and deti:

(6) graphic form: **nede**ľa ‘Sunday’ ➡ sound form: [**ňeď’e**ľa]

(7) graphic form: ➡ **deti** ‘children’ sound form: [**ď’eť’i**]

The neutralization of the consonantal phonological opposition sibilant-non-sibilant [6]has a regressive nature, too. The basic rule is that when a non-sibilant sound gets into contact with a sibilant consonant (e.g. t + s), the result is a simple or a geminate sibilant consonant (ibid., p. 161), for instance:

(8) graphic form: o**tc**a ‘of father’ ➡ sound form: [o>**c**a]

(9) graphic form: ľu**ds**ký ‘human’ ➡ sound form: [ľu**c**kí]

The anticipatory assimilation of the opposition acute-non-acute[7] is connected with the pairs m–n and m–ň. The phonemes n and ň with the acute feature are pronounced as a non-acute m when followed by the non-acute b, that is, the distinctive acute feature is neutralized (ibid., p. 165):

(10) graphic form: ha**nb**a ‘shame’ ➡ sound form: [ha**mb**a]

(11) graphic form: bo**nb**ón ‘sugar’ ➡ sound form: [bo**mb**ón]

All those anticipatory changes (illustrated by examples (4)-(11)) are very important; their violation is perceived as an orthoepy mistake, that is, an incorrect pronunciation, and they may violate communication. Neutralizations, especially the neutralization of the voicing feature, are part of the phonological system of the Slovak language and belong to the phenomena interfering with the sound system of the foreign language when studying a second language, for example, English.

[4] There are four exceptions to this general principle of the anticipatory assimilation of voicing in Slovak, but these will not be specified here since they are beyond the scope of this paper (see e.g. Sabol, 1989 or Kráľ, 2005 for further details).

[5] Diffuse sounds are those that are articulated in the front part of the oral cavity (bilabial, labio-dental and pre-alveolar places of articulation); all the other consonantal sounds are labelled as non-diffuse (Sabol, 1989, p. 158–159).

[6] The sibilant feature is phonologically relevant for the sibilants s, z, š, ž, c, dz, č and dž, and the non-sibilant feature is delimited for the consonants t, d, ť and ď (Sabol, 1989, p. 161).

[7] The sounds produced in the middle of the oral cavity (alveolar and palatal sounds) are labelled as acute, and those sounds that are articulated at the edges of the oral cavity are called non-acute (Sabol, 1989, p. 164).

6. Simple segments, contour segments, and complex segments

The simultaneity - consecutivity interaction not only helps to identify various sound processes and phenomena, as has been illustrated so far, but may also explain the difference between types of segments depending on their articulation.

As is well-known, Jakobson (1962) and the representatives of so-called linear phonology, following Jakobson's tradition, see a phoneme as a bundle of simultaneously organized distinctive features. For example, the phoneme /b/ is a combination of consonantal, anterior, oral and voiced features (cf. e.g. Giegerich, 1992). But Feature Geometry and Nonlinear Phonology in general assume that features are arranged hierarchically in a feature tree (Hall, 2006, p. 313).

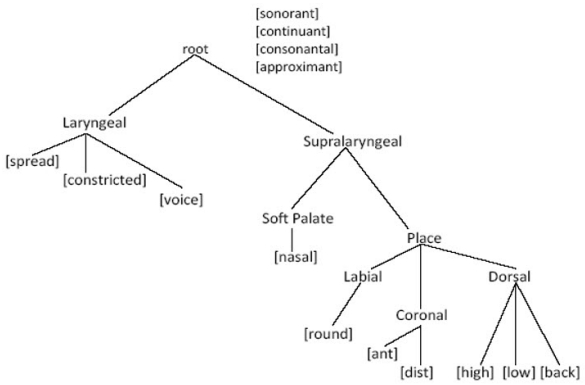

Figure 3. A feature tree (Gregová, 2016, p. 18)

In other words, each segment is presented as a hierarchically-organized node configuration whose terminal nodes represent feature values, and whose intermediate nodes represent constituents, as illustrated by Figure 3. A root node indicates the speech sound itself. The lower-level nodes (in capital letters), the so-called class nodes, represent articulators that may but do not have to be further extended. In square brackets are the individual features of a sound, which are known as terminal features since they do not further expand into other features. There are two categories of terminal features: articulator-bound features – allocated to the appropriate articulator (for example, [high], [nasal]) – and articulator-free features that are not connected with a specific articulator and indicate the degree of stricture (for example, [consonantal], [approximant]). Only relevant class nodes and terminal nodes are used for the description of individual phonemes, depending on the phonetic properties of the phoneme (see also Gregová, 2016, p. 18–19). For example, a simple segment, /b/, is simply labial, wherein a root dominates one articulator. However, in non-linear phonology, there are also contour segments and complex segments that are both characterized by multiple articulations.

A contour segment – in Sagey's theory (1986) – is a sequence of different features by the same articulator within one timing slot. For example, the English affricate /ʧ/ is a contour segment with a coronal articulator and [+stop] and [+fricative] features. In this case, the multiple articulations means a sequence of articulations. And, as is well-known, the phonetic length of an affricate is that of a single consonant and, functionally, it is a single segment, too. On the other hand, a complex segment is a root node with two or more simultaneous oral tract restrictions (i.e. simultaneous articulations). To be more specific, a complex segment is a segment with multiple articulations that has a phonetic duration of a single segment (Sagey, 1986, p. 79; Newman, 1997, p. 8) and that phonemically occupies only one X-slot, i.e. one timing unit in an autosegmental sense (Scheer, 2012, p. 868), and thus it behaves like a simple sound (Newman, 1997, p. 9).

However, there is no general agreement on which sound sequences can be treated as a complex segment and which should be evaluated only as a consonant cluster. When comparing several sources, one may come to the conclusion that what is a complex segment in, for example, Sagey's classification (1986) can be treated as a consonant cluster in Duanmu's approach (2009) and vice versa.

As already mentioned, the simple and generally accepted definition of a complex segment says that it is a segment with multiple articulations and a single-segment timing.

In Duanmu's theory, the existence of possible and impossible complex sounds depends on the so-called no-contour principle, wherein "an articulator cannot make the same feature twice within one sound" (Duanmu, 2009, p. 26). The principle assumes that all features in a complex segment (sound) are simultaneous (ibid.). What follows from this is that a single complex sound cannot be characterized simultaneously by, for instance, both [+nasal] and [-nasal], or by [+anterior] and [-anterior], because conflicting gestures cannot overlap, must be made in sequence, and require more than one timing slot (Duanmu, 2010, p. 16). For example, [bm] cannot form a complex sound, because [b] is characterized

by labial, soft palate [-nasal] and [m] is labial, soft palate [+nasal]. On the other hand, [fr] is a possible complex sound (Duanmu, 2010, p. 17), although [f] is [+fricative] and [r] is [-fricative]. But there are two articulators, and that is why there are no conflicting gestures: the articulator for [f] is labial and that for [r] is coronal (see Duanmu, 2009, 2010 for further details).

Here the opposition of simultaneity-consecutivity plays a very important role, since simultaneous articulation, typical of many Niger-Congo and Tsimshianic languages, leads to complex segments (multiple articulation but single timing), for example, t͡k or d͡g, but the consecutive articulation of individual simple sounds in other languages (for example, most Indo-European languages) says that these are sequences of two stops (cf. e.g. Sagey, 1989; Ladefoged & Maddieson, 1996). Simply put, if, for example, [p] and [t] are pronounced nearly simultaneously, the result is the labio-coronal complex sound /p͡t/. However, if the pronunciation is not simultaneous, but in a sequence (Hall, 2003, p. 331), we are speaking of two separate sounds.

The difference between a complex sound and a sequence of consonants has an impact on the structure of the syllable in a language: if, for example, the above-mentioned combination of the sounds [p] and [t] is a complex segment, it occupies one slot in the syllable structure, and when [pt] is a consonant cluster, the syllable boundary can be placed between these two sounds (cf. Gregová, 2016).

7. Segment vs. suprasegment

The phonological opposition of successivity-simultaneity is one of the oppositions characterizing the difference between the segmental and suprasegmental subsystems of a language.

The suggestion that phonemes (or utterances in general) can be broken down into simultaneously occurring components was first mentioned by Harris as early as 1944, and was later indicated by Jakobson in his delimitation of distinctive features: "The whole pattern is based on eight dichotomous properties; among them six inherent (or qualitative) features concerning the axis of simultaneity only (vocality, nasality, saturation, gravity, continuousness, and voicing), and two prosodic features involving also the axis of successiveness (length, and hightone)" (1962, p. 21).

The whole idea was fully developed by Sabol (2012), who says that segments are created successively, linearly, and syntagmatically. In continuous speech, each segment (sound, phone) is realized within its own time. We can speak of a sequence, of continuity. Suprasegments are created at the same time, concurrently, simultaneously. We can speak of simultaneity, concurrence (Sabol, 2012, p. 59). An element interconnecting both segments and suprasegments is the syllable. This unit is created by segments, and it is the bearer of all prosodic features.

In Sabol's theory, the opposition 'successivity-simultaneity' is one of the four oppositions characterizing the co-operation and the countermovement of segments and suprasegments. The second opposition is 'articulation-modulation': segments are the result of the direct work of speech organs (articulations), whereas suprasegments are given by the modulation of the articulatory air stream. These two oppositions, 'successivity-simultaneity' and 'articulation-modulation', are given by the way in which segments and suprasegments are realized (ibid., p. 59–69).

The third opposition, 'phonotactic difference-phonotactic affinity', and the fourth one, 'phonological/distinctive function-stylistic function', are given by the functions of segments and suprasegments. 'Phonotactic difference-phonotactic affinity' means that a tendency towards phonotactic difference accompanies segments, and it is given by the basic opposition of CV in the syllable structure. However, suprasegments (in neighbouring syllables) are characterized by smaller differences, similarities, and affinities. And as for the opposition 'phonological/distinctive function-stylistic function', the first one dominates in segments, whereas the latter is typical of suprasegments (ibid.).

8. Conclusion

The aim of this paper was to show how the cognitive category of anticipation, as well as the notions of consecutivity and simultaneity, are incorporated in the sound level of language (speech). The survey of the phenomena connected with one of these three categories was opened by anticipatory speech errors that confirm the relevance of the distinctive features of phonemes, which initiated the investigation of the psychological processes connected with language production (Hill, 1973). Anticipatory coarticulation

perceived as nasalization has an important phonological value in some languages, and anticipatory assimilation changes of certain distinctive features are crucial for successful communication. All those phenomena are connected with the economy of speech and with efforts to reduce the amount and range of articulatory movements and articulatory work on the speaker's side, though of course only to the extent permitted by the language system so as not to violate communication. Then, I have shown that the successive or simultaneous 'action' of speech organs leads to certain modifications in the acoustics of sounds, that is, the transgression and inherence of vowels, or to different types of sounds: complex segments, contour segments, or sequences of sounds. All these phenomena are reflected in the structure of the syllable, the interconnecting unit that is realized successively in segments and simultaneously in suprasegments.

Conflict of interests

The author declares no conflict of interest.

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