THE ROLE OF DISTINCTIVE FEATURES
IN THE STRUCTURE OF THE SYLLABLE.
A COMPARATIVE ANALYSIS OF ENGLISH AND SLOVAK

UDC 811.162.4'342.7:811.111'342.7

Renáta Gregová, Renáta Panocová

Department of British and American Studies, Faculty of Arts,
P. J. Šafárik University, Košice, Slovakia

Abstract. *The placement of the syllable boundary in consonant clusters occurring word-medially is a perennial problem in phonological theory. The comprehension of the syllable as the "smallest binding unit of language" (Pauliny 1979: 101), as the unit necessary for the understanding of the phonological structure of the language, enables us to determine the boundaries of syllables on the basis of contrasts between the neighbouring phonemes in the syllable. The degree of contrast depends on the distinctive features of the given phonemes. To evaluate this approach, distinctive features of phonemes from two different languages – English and Slovak – were delimited according to two distinctive features theories – Feature Geometry and synthetic phonological theory. The sample analysis of the English and the Slovak words with word-medial consonant clusters indicates the validity of this approach for the demarcation of the syllable boundary in polysyllabic words.*

Key words: *syllable boundary, distinctive feature, phoneme, contrast*

1. INTRODUCTION

The syllable as the basic sound unit of a continuous speech is a good example of the fact that phenomena that appear to be the most natural in language are the most difficult ones to define (Sabol and Zimmermann 2014: 57). Although the syllable is the essential unit in the process of speech acquisition by children, and language speakers can usually count the number of syllables in a word or a word form intuitively, in linguistics, there is no general agreement regarding what the syllable is. Various theories provide different approaches to this sound element, and to its structure and function (for further details, see Cairns and Raimy 2011). Moreover, many of the theories do not tell us where the syllable boundary falls, particularly in case of consonant clusters in the word-medial position (see

Song 2007, for further details). What most linguists agree is that an adequate syllable theory should capture the extent to which syllable types vary across languages and should account for those aspects in the syllable structure that are identical for all (or most) languages at the same time (Blevins 1995: 213), as also expressed by Pulgram (1970: 23):

> If the syllable is an operative unit of all languages, it is also a universal of language. Its definition must be […] the same for all languages, regardless of the varying unit inventories in the different [languages] … there arises the interesting question whether it might not be possible to arrive at a phonotactic definition of the syllable which […] does have universal validity for all languages. The question is, in other words, whether the phonotactic rules on syllabation might not be formulated in such a way that they are applicable to all languages, even though their implementations in the different languages must differ because of the underlying differences of phonotactics. I believe that such general phonotactic rules on syllabicity are not only possible but also necessary for the proper syllabation of any utterance in any language.

With regard to the delimitation of the syllable boundaries, two tendencies occurring cross-linguistically can be observed in the current phonological theory:

1) The syllable boundary does not exceed the word boundary: "syllables are subcomponents of words, and therefore all the syllabification must be done within the domain of word boundary. The two segments that belong to two different words cannot be in the same syllable" (Sung 2007: 22), and

2) The syllabification seems to respect the morphological structure of words in the case of compounds and prefixes: "the fact that word-internal compound boundaries and prefix boundaries always form edges of a syllabification domain seems to be a universal tendency (Rubach and Booij 1990: 45)[1].

Nevertheless, the question of the placement of the syllable boundary in the case of polysyllabic words with consonant clusters in word-medial position does not have one answer.

Following the tradition of the Prague School[2], phonologists see the syllable as the unit that "has two functions, to serve as the locus for distinctive prosodic features and to account for phonotactic constraints […] (Cairns and Raimy 2011: 14). Distinctive "feature theory is an important part of phonological theory" (Giegerich 1992: 89), and the delimitation of the syllable as the basic unit of phonological analysis is also indisputable (see Hooper 1972; Blevins 1995, for further details).

Examining the syllables from the phonological point of view means – inter alia – "looking at the possible combinations of […] phonemes" (Roach 2000: 70); "without doubt the most economic and systematic description of phonemes is in terms of distinctive features" (Bondarko 1969: 1).

The comprehension of the syllable as the unit that is important for the cognition of the phonological structure of the given language was originally proposed by Jakobson and Halle (1956: 20): "The distinctive features are aligned into simultaneous bundles called phonemes; phonemes are concatenated into sequences; the elementary pattern underlying any grouping of phonemes is the syllable [...] and the pivotal principle of syllable

---

[1] The idea of the influence of the morpheme structure of words on their syllabification can be found, for example, in the CVX syllable theory proposed by Duanmu (2009) in Lexical Phonology (see Rubach 1993), or in the synthetic phonological theory (Sabol 1989).

[2] The merit and the importance of the Prague School of Linguistics for the present-day phonology is an undeniable and clear fact (see Černý 1996, and Cairns and Raimy 2011).

structure is the contrast of successive features within the syllable". The delimitation of the syllable as the "smallest binding unit of language" (Pauliny 1979: 101) allows us to determine the boundaries of syllables on the basis of phonematic contrasts.

The optimal contrast of phonemes in the syllable is the contrast 'consonant + vowel' (Pauliny 1979: 101, see also Jakobson and Halle 1956: 20). This is simultaneously the strongest syllable connection, since there is the highest number of differences (of contrasts). By contrast, the syllable boundary should be at the place containing the lowest number of contrasts; that is, at the place where neighbouring phonemes differ the least (Pauliny 1979: 169–70).

The number of the differences (of the contrasts) between two neighbouring segments is counted according to the identical and different distinctive features of these phonemes. Distinctive features result from the phonetic characteristics of sounds. This means that the contrast between phonemes depends on their phonetic properties. For example, the word *miska* 'small bowl' should be syllabified as *mis.ka,* because the contrast between the consonant /s/ and the consonant /k/ in the cluster 'sk' is given only by one phonetic difference and is thus very low: /s/ is fricative and /k/ is plosive (for details, see Pauliny 1979: 171–82, see also Gregová 2016).

As explained above, the degree of the contrast between the adjacent elements in a consonant cluster depends on the distinctive features of the individual phonemes in this cluster. Following from this, it is clear that the placement of the syllable boundary should depend on the feature theory being taken into account when analysing distinctive features of phonic elements and their mutual contrasts (Pauliny 1979: 104), as well as the morphological structure of words since – as the author continues – "syllables are delimited in words […] also in accordance with their morphemic composition" (ibid.: 164). In order to evaluate the validity of this assumption, the following research has been conducted: The syllable theory described above, based on the contrast between phonemes has been applied to two different languages – English and Slovak – the phonemes in which have been delimited according to two different theories of distinctive features.

2. DISTINCTIVE FEATURES

The following distinctive feature theories were chosen for the analysis, the Feature Geometry model that prefers the hierarchical arrangement of features (Hall 2007: 313), which is currently popular in English phonology, and features from the synthetic phonological theory (SPT) (Sabol 1989) that are delimited on account of the Slovak language. This selection of feature theories will assist us to evaluate not only the assumption regarding the relationship between the feature theory and the placement of the syllable boundary, but also the theory itself since it has only been applied to the Slavic languages thus far (see Sabol and Zimmermann 2014).

2.1. Feature Geometry and the description of the English and the Slovak consonant phonemes

In Feature Geometry (FG), distinctive features are organised according to the feature tree (Figure 1).
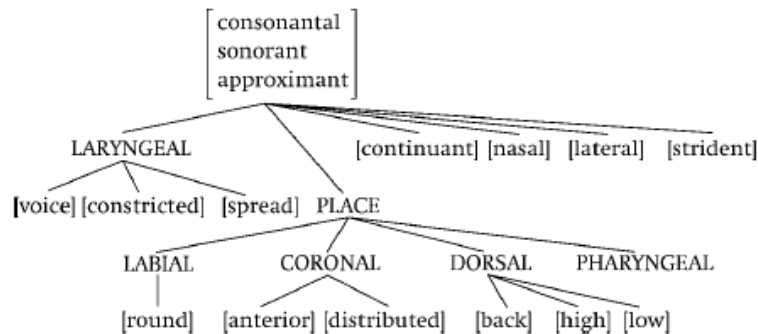
Fig. 1 A feature tree (Hall 2007: 313).

Further details regarding FG can be found in Sagey (1986) and Clements and Hume 1995, for example; please also refer to Hall (2007) for a discussion of features in FG and nonlinear phonology in general. In the following section, we will briefly describe only those features that are relevant to the specification of the English and the Slovak consonant phonemes.

The top of the "tree" is formed by the major class features that delimit large natural classes of sounds. These are the features of [consonantal] – [+consonantal] sounds that are produced including a vocal tract obstacle (obstruents, nasals and liquids); [-consonantal] segments are articulated without such a restriction to the air flow (glides[3]), while [sonorant] – [+sonorant] sounds are produced via such a configuration of the vocal tract that enables spontaneous voicing (glides, liquids and nasals), while [-sonorant] elements are obstruents; that is, spontaneous voicing is not possible during their articulation (stops, fricatives and affricates). In addition, [approximant] – [+approximant] sounds have a constriction allowing a frictionless escape of air; these are glides and liquids, while [-approximant] accounts for stops, fricatives and nasals (Hall 2007: 314 – 316; Halle and Clements 1983).

Laryngeal features (which capture differences in voicing) encompass the feature [voice] – [+ voice], indicating periodic vibration of the vocal cords during the articulation of the given sound (voiced consonants); [-voice] sounds are produced without periodic vibration (voiceless consonants), and [spread] – [+spread] sounds are articulated with the vocal cords drawn apart (Hall 2007: 316 – 318).

Manner features reflect the manner of articulation. These are [continuant] – [+continuant] sounds, during the articulation of which there is no obstruction to the air flow (glides, r-sounds and fricatives), while [-continuant] sounds are produced with such obstruction (nasal and oral stops and laterals). In addition, [nasal] – [+nasal] sounds are articulated with a lowered velum to allow the air to escape through the nasal cavity (nasal stops); a sound is [-nasal] when the soft palate is raised and the entrance into the nasal cavity is closed (all other sounds), while a [lateral] – [+lateral] sound is articulated via the obstacle formed by the tip of the tongue while the air stream is allowed to pass over one or both sides of the tongue (lateral sonorants and lateral fricatives). However, [-lateral] sounds are articulated in a different way (all other sounds); [strident] –

---

[3] Taking the aim of this contribution into account, vowels are not mentioned when explaining the individual features. We concentrate solely on consonants.

[+strident] sounds are acoustically characterised by greater noisiness (sibilants) than [-strident] sounds (all other sounds); in FG, this feature explains the contrast between dentals and alveolars (Hall 2007: 318 – 321, see also Halle and Clements 1983).

Place features are the features of the "Place node which dominates the class nodes Labial, Coronal and Dorsal" (Hall 2007: 21)[4]: Labial – "labial sounds are formed with a constriction at the lips"; that is, bilabial and labiodental consonants (Halle and Clements 1983: 6), while [round] – lips are rounded during the articulation of the [+round] sounds. To produce Coronal sounds, the tongue blade is raised (dentals, alveolars, palato-alveolars and palatals), while [anterior] – [+anterior] sounds are those that are articulated in front of the palato-alveolar region (labials, dentals and alveolars), and [distributed] – [+distributed] sounds are sounds with a relatively long constriction, such as dentals, palato-alveolars and palatals (Hall 2003: 325). Finally, the articulator [Dorsal] refers to articulation with the tongue body and, depending on the position of the tongue body, the sound can be can be [+/-high] – palatals, velars, glides versus all other consonants, [+/-low] (not relevant in English or Slovak) or [+/-back] – velars and glides versus all other consonants (Hall 2007: 327 – 330).

The feature specification of the English consonant phonemes in terms of FG can be found in Table 1, and the feature specification of the Slovak consonant phonemes is captured in Table 2.

Table 1 Feature value table of the English consonant phonemes (FG)

	p	b	m	w	f	v	θ	ð	t	d	n	s	z	r	l	ʃ	ʒ	tʃ	dʒ	j	k	g	ŋ	h
[consonantal]	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+
[sonorant]	-	-	+	+	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	+	-	-	+	-
[approximant]	-	-	-	+	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	-	-	-	-
[voice]	-	+	+	+	-	+	-	+	-	+	+	-	+	+	+	-	+	-	+	+	-	+	+	+
[spread]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
[continuant]	-	-	-	+	+	+	+	+	-	-	-	+	+	+	-	+	+	-	-	+	-	-	-	+
[nasal]	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-
[lateral]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
[strident]	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	+	-	-	-	-	-
Labial [round]	-[5]	-	-	+	-	-	0[6]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coronal [ant]	0[7]	0	0	0	0	0	+	+	+	+	+	+	+	+	+	-	-	-	-	-	0	0	0	0
Coronal [dist][8]	0	0	0	0	0	0	+	+	-	-	-	-	-	-	+	-	+	+	+	+	0	0	0	0
Dorsal [back][9]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	0
Dorsal [high]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	0

---

[4] The feature Pharyngeal is not included in the description because its position in the Feature Geometry model is still not clear (see Sagey 1986 and Hall 2007)

[5] Traditionally, the phoneme /p/ is Labial but [-round] and, in Feature Geometry, [round] is dependent on Labial (see Hall 2007: 322, for further details; see Figure 1 in this paper).

[6] This symbol means that the given feature is nor relevant to the delimitation of the given phoneme.

[7] From the articulatory point of view, the sounds /p, b, m, w, f, v/ are [+anterior], but they are not Coronal; in Feature Geometry, "[anterior] […] is restricted to sounds that are coronal" (Hall 2007: 324). See also note 5.

[8] Recall here that, in the approach applied in this analysis, a [distributive] is only bound to coronal sounds (see Figure 1).

[9] In the FG model used in this analysis of the English consonants, only velar sounds are Dorsal.

Table 2 Feature value table of the Slovak consonant phonemes (FG)[10]

	p	b	m	f	v	t	d	n	s	z	c	ʒ	š	ž	č	ǯ	r	l	ť	ď	ň	ľ	j	k	g	x	h
[consonantal]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
[sonorant]	-	-	+	-	-[11]	-	-	+	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	-	-	-	-
[approximant]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	+	-	-	-	-	-
[voice]	-	+	+	-	+	-	+	+	-	+	-	+	-	+	-	+	+	+	-	+	+	+	+	-	+	-	+
[spread]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
[continuant]	-	-	-	+	+	-	-	-	+	+	-	-	+	+	-	-	+	+	-	-	-	+	+	-	-	+	+
[nasal]	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
[lateral]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
[strident]	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
Labial [round]	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coronal [ant]	0	0	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	0	0	0	0
Coronal [dist]	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	0	0	0	0
Dorsal [back]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	0
Dorsal [high]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	0

2.2. The synthetic phonological theory and the description of the English and the Slovak consonant phonemes

In the synthetic phonological theory (SPT), the delimitation of distinctive features is based on the articulatory, acoustic and perceptual properties of the individual speech segments.

According to this theory (Sabol 1989), two basic distinctive features are applicable to all phonemes in a language:

(1) *Consonantal – non-consonantal*: [+ consonantal][12] sounds are sonorants (except for glides such as the English /j/, /w/) and obstruents, while non-consonantal sounds [-consonantal] are vowels and glides; and

(2) *Vocalic – non-vocalic*: the feature [+vocalic] is typical of vowels and sonorants (except for glides such as the English /j/, /w/), while obstruents and glides are [–vocalic].

Contrary to Jakobson and Halle's (1956) theory, other features are defined separately for vocalic[13] and consonant phonemes (Sabol 1989: 78 – 79).

Distinctive features of consonant phonemes are *diffuse – non-diffuse;* [+ diffuse] are sounds articulated in the front part of the oral cavity, such as bilabials, labiodentals, dentals and pre-alveolars[14], while post-alveolar, palatal, velar and laryngeal sounds are [–diffuse]. With regard to the feature *acute – non-acute*, [+acute] consonants are produced in the central part of the oral cavity (alveolars, palato-alveolars[15] and palatals), while labials, labiodentals, dentals, velars and laryngeals are non-acute; that is, [-acute], and the *occlusive – non-occlusive* distinction is determined by the type of obstacle during the articulation and the subsequent acoustic properties – stops and semi-occlusives are [+occlusive], and fricatives and approximants are [-occlusive]. The feature *lateral – non-lateral* reflects the special "lateral" type of articulation and is relevant to laterals that are

---

[10] Recall here the information from notes 5 – 9

[11] In Slovak, the consonant /v/ is either an obstruent ([-sonorant]) or it behaves like a sonorant with the feature specification [+sonorant] (for details, see Sabol 1989: 125).

[12] To be consistent with FG, features from the SPT are inserted in square brackets [].

[13] Distinctive features for vowel phonemes are irrelevant to the goal of this contribution, which is why they are not mentioned here.

[14] In some languages, for example in Slovak, the alveolar place of articulation is divided into pre-alveolar and post-alveolar positions. In such languages, the post-alveolar place of articulation is not identical to the palato-alveolar (alveo-palatal) articulation, which is unlike English.

[15] See note 14.

[+lateral] and the phonemes /r/ and /j/, which are [-lateral]. The *sibilant – non-sibilant* feature is given by the acoustic impression; spirants are [+sibilant], while the feature [-sibilant] is phonologically relevant only for the sounds /t, d, ť, ď/. The feature *voice – non-voice* reflects the presence or absence of vocal cord vibration; [+voice] are voiced consonants and [-voice] are voiceless consonants, while *nasal – non-nasal* is a feature connected to the position of soft palate: Nasals are [+nasal] and all other sounds are [-nasal] (for details, see Sabol 1989: 94 – 100). Tables 3 and 4 contain the feature specifications of the English and the Slovak consonant phonemes, respectively.

Table 3 Feature value table of the English consonant phonemes (SPT)

	p	b	m	w	f	v	θ	ð	t	d	n	s	z	l	r	ʃ	ʒ	tʃ	dʒ	j	k	g	ŋ	h
[consonantal]	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+
[vocalic]	-	-	+	+	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	+	-	-	+	-
[diffuse]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-
[acute]	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-
[occlusive]	+	+	+	-	-	-	-	-	+	+	+	-	-	-	-	-	-	+	+	-	+	+	+	-
[lateral]	0[16]	0	0	0	0	0	0	0	0	0	0	0	0	+	-	0	0	0	0	0	0	0	0	0
[sibilant]	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	+	-	-	-	-	-
[voice]	-	+	+	+	-	+	-	+	-	+	+	-	+	+	+	-	+	-	+	+	-	+	+	+
[nasal]	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-

Table 4 Feature value table of the Slovak consonant phonemes (SPT)

	p	b	m	f	v	t	d	n	s	z	c	ʒ	š	ž	č	ǯ	r	l	ť	ď	ň	ľ	j	k	g	x	h
[consonantal]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
[vocalic]	-	-	+	-	-[17]	-	-	+	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	-	-	-	-
[diffuse]	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[acute]	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-
[occlusive]	+	+	+	-	-	+	+	+	-	-	+	+	-	-	+	+	-	-	+	+	+	-	-	+	+	-	-
[lateral]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	+	0	0	0	+	-	0	0	0	0
[sibilant]	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
[voice]	-	+	+	-	+	-	+	+	-	+	-	+	-	+	-	+	+	+	-	+	+	+	+	-	+	-	+
[nasal]	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-

3. THE ANALYSIS

As mentioned above, the distinctive features of the individual phonemes in a consonant cluster determine the degree of the contrast between the neighbouring segments in this cluster. The contrast value is represented by a number. For example, according to the FG model, the contrast for the Slovak phonemes /t/ and /n/ is three. Distinctive features of the Slovak /t/ (Table 2) are [+consonantal], [-vocalic], [+diffuse], [+acute], [+occlusive], [-sibilant], [-voice] and [-nasal], whereas the Slovak /n/ (Table 2) is [+consonantal], [+vocalic], [+diffuse], [+acute], [+occlusive], [-sibilant], [+voice] and [+nasal]. Three features – [vocalic], [voice] and [nasal] – show different values; they are negative for /t/, but positive for /n/. The number of the differences between distinctive

---

[16] See note 6.
[17] Feature specification [+vocalic] is also possible. See note 11.

features of consonant elements also represents the contrast value between the two segments. Missing features are also counted in the number of similarities and differences. For example, as is clear in Table 3, the English phonemes /z/ and /l/ differ by three features ([vocalic], [occlusive] and [sibilant]). Moreover, the phoneme /l/ is specified by the feature [lateral], which is phonologically irrelevant for the phoneme /z/. The contrast value for the English phonemes /z/ and /l/ is four.

3.1. The sample analysis of the Slovak consonant clusters in the word-medial position

Six three-consonant clusters (*-jst-, -mkn-, -stň-, -psľ-, -nšp-, -nkc-*), three four-consonant clusters (*-mstv-, -dzbr- -jzdr-*) and the sole five-consonant cluster (*-rvstv-*)[18] occurring word-medially were analysed from the perspective of FG and SPT, as described in more detail in Sections 2.1 and 2.2, respectively. The analysis of each of the above-mentioned types of the word-medial clusters is demonstrated by one word, and the overall results are presented in Table 5.

(1) *majster* 'master'
a. FG: contrast 5-2, syllable structure *majs.ter*
b. SPT: contrast 5-2, syllable structure *majs.ter*

In (1a) and (1b), the number of different distinctive features is identical. The contrast between /j/ and /s/ is five, whereas it is two between /s/ and /t/. Pauliny (1979: 169–70) determined a syllable boundary at the place containing the lowest number of contrasts. This explains the syllabification of the cluster /jst/ as *js.t*. Both theoretical frameworks, FG and SPT, confirm that the syllable connection between /j/ and /s/ is stronger than is the one between /s/ and /t/.

An example of a word-medial four-consonant cluster is analysed in (2).

(2) *tajomstvo* 'secret'
a. FG: contrast 8-2-5, syllable structure *ta.joms.tvo*
b. SPT: contrast 6-2-3, syllable structure *ta.joms.tvo*

In (2a) and (2b), the lowest degree of contrast is between the second consonant /s/ and the third consonant /t/. The number of different distinctive features is two. The neighbouring consonants differ in the features [continuant] and [strident], which are positive for the phoneme /s/ but negative for /t/ in (2a). In (2b), the number of different distinctive features is also two, [+occlusive] for /t/ but [-occlusive] for /s/, and [+sibilant] for /s/ but [-sibilant] for /t/. The four-consonant cluster /mstv/ should be syllabified as *ms.tv*.

Finally, the analysis of the word-medial five-consonant cluster is as follows:

(3) *nervstvo* 'nervous system'
a. FG: contrast 4-5-2-5, syllable structure *nervs.tvo*
b. SPT: contrast 4-3-2-3, syllable structure *nervs.tvo*

---

[18] Essentially, the random selection of consonant clusters followed one criterion – different combinations of phonemes.

The consonant cluster /rvstv/ has the lowest number of different distinctive features between /s/ and /t/. This result is identical in either of the two theories of distinctive features in (3a) and (3b). Therefore, the syllabification of this cluster should be $C_1C_2C_3.C_4C_5$.

Table 5 The analysis of the sample of the Slovak word-medial consonant clusters

consonant cluster in a sample word	contrast value		syllabification	
	in FG	in SPT	in FG	in SPT
ma**js**ter[19] 'master'	5-2	5-2	ma**js.**ter	ma**js.**ter
za**mk**núť 'to lock'	6-7	4-5	za**m.kn**úť	za**m.kn**úť
ko**stn**ý 'bone_adj'	2-3	2-3	ko**s.tn**ý	ko**s.tn**ý
ka**psľ**a 'capsule'	4-8	3-5	ka**p.sľ**a	ka**p.sľ**a
in**šp**ekcia 'inspection'	5-3	6-4	in**š.p**ekcia	in**š.p**ekcia
fu**nkc**ia 'function'	7-4	5-3	fu**nk.c**ia	fu**nk.c**ia
tajo**mstv**o 'secret'	8-2-5	6-2-3	tajo**ms.tv**o	tajo**ms.tv**o
o**dzbr**ojiť 'to disarm'	2-5-6	2-3-5	o**d.zbr**ojiť	o**d.zbr**ojiť
na**jzdr**avší 'the healthiest'	4-2-3	4-2-3	na**jz.dr**avší	na**jz.dr**avší
ne**rvstv**o 'nervous system'	4-5-2-5	4-3-2-3	ne**rvs.tv**o	ne**rvs.tv**o

3.2. The sample analysis of the English consonant clusters in the word-medial position

Similarly to the sample study of the Slovak consonant clusters (3.1), ten English word-medial consonant clusters were chosen for the analysis, six three-consonant clusters (*-ŋgr-, -ksp-, -mpk-, -ldr-, -ŋks-, -ntr-*) and four four-consonant clusters (*-kskl-, -nstr-, -mptr-, -kstr-*)[20]. The analysis of each of the two types of the word-medial clusters is demonstrated by one word, and the overall results are summarised in Table 6.

> (3) *minxes* /mɪŋksɪz/
> a. FG: contrast 2-6, syllable structure *mɪŋ.ksɪz*
> b. SPT: contrast 3-4, syllable *mɪŋ.ksɪz*

The number of different distinctive features between the neighbouring segments /ŋ/ and /k/ in (3a) is two. This means that the contrast is lower than is the one between /k/ and /s/, where it is six. Following Pauliny (1979), the three-consonant cluster /ŋks/ should be syllabified as *ŋ.ks*[21]. The number of contrasts in (3b) is different. It is three between /ŋ/ and /k/ and four between /k/ and /s/. Although the number of contrasts in (3a) and (3b) differs, the place containing the lowest number of contrasts remains the same; that is, between /ŋ/ and /k/. Thus, the syllable structure resulting from the analysis in FG corresponds fully to the one in the SPT.

An example of a word-medial four-consonant cluster is analysed in (4).

> (4) *temptress* /te**mptr**əs/
> a. FG: contrast 4-3-5, syllable structure *temp.trəs*
> b. SPT: contrast 3-1-4, syllable structure *temp.trəs*

---

[19] The graphic form of Slovak examples is identical to their sound form.

[20] In English, CCC word-medial consonant clusters are much less frequent than they are in Slovak, and CCCC clusters occurring word-medially are extremely rare (see Gregová 2016 and note 18).

[21] The aim of the sample analysis presented in this paper is to show the method that can be used in the event that the delimitation of the syllable boudary seems to be questionable.

The consonant cluster /mptr/ requires the syllabification $C_1C_2.C_3C_4$ because the lowest number of different distinctive features is between /p/ and /t/. This applies to the analysis based on FG in (4a) and to the one according to SPT in (4b). The neighbouring consonants /p/ and /t/ differ in the features labial [round], coronal [anterior] and coronal [distributed] based on FG. According to SPT, the number of different distinctive features is merely one; [+acute] for /t/ but [-acute] for /p/. This means that the four-consonant cluster /mptr/ should be syllabified as *mp.tr* in both theories.

Table 6 The analysis of the sample of the English word-medial consonant clusters

consonant cluster	contrast value		syllabification	
in a sample word	in FG	in SPT	in FG	in SPT
angry/ˈæŋgrɪ/	2-4	2-3	æŋ.grɪ	æŋ.grɪ
expert /ˈekspɜːt/	6-5	4-3	eks.pɜ:t	eks.pɜ:t
pumpkin /ˈpʌmpkɪn/	3-2	3-1	pʌmp.kɪn	pʌmp.kɪn
children / ˈtʃɪldrən/	2-4	2-3	tʃɪl.drən	tʃɪl.drən
minxes /ˈmɪŋksɪz/	2-6	3-4	mɪŋ.ksɪz	mɪŋ.ksɪz
contra /ˈkɒntrə/	3-5	3-4	kɒn.trə	kɒn.trə
exclude /ɪksklu:d/	6-6-8	4-4-5	ɪk.sklu:d	ɪk.sklu:d
			ɪks.klu:d	ɪks.klu:d
construct /kɒnstrʌkt/	5-2-5	5-2-4	kɒns.trʌkt	kɒns.trʌkt
temptress /temptrəs/	4-3-5	3-1-4	temp.trəs	temp.trəs
extra /ekstrə/	6-2-5	4-2-4	eks.trə	eks.trə

The degree of contrast between the neighbouring phonemes in the word *exclude* /ɪksklu:d/ leads to two syllabifications according to each of the distinctive feature theories, FG and SPT: ɪk.sklu:d or ɪks.klu:d (Table 6). As mentioned previously, one of the universal tendencies connected with the syllabification of words is the placement of the syllable boundary at the morpheme boundary at the prefix-stem juncture and in compounds. This criterion is also accepted by the syllable theories analysed (see above). The morpheme structure of the English word *exclude* is *ex-clude*. Consequently, the syllabification ɪks.klu:d should be preferred.

4. CONCLUSIONS

The understanding of the syllable as a unit constructed according to the similar and different distinctive features of phonemes enables us to find the position of the syllable boundary on the basis of the degree of contrast between neighbouring elements in word-medial consonant clusters. The sample analysis of words from two different languages – English and Slovak – indicates the justification of such a determination of the syllable boundaries. Distinctive feature of phonemes in the analysed word-medial consonant clusters were delimited in accordance with two different feature theories, and the syllabification resulting from the degree of contrasts (differences) between phonemes was identical in all the English and Slovak words investigated. Of course, this small research study does not offer a comprehensive solution to the problem of the syllable boundary demarcation in complex word-medial consonant clusters, but it opens up the opportunities for further research in this field. A more detailed analysis of a larger number of consonant clusters can serve as a basis for the formulation of conclusions that are more generally valid.

REFERENCES

Blevins, J., (1995), "The Syllable in Phonological Theory", In: Goldsmith, J. (ed.) *Handbook of Phonological Theory,* Oxford, Basil Blackwell, pp. 206 – 244.

Bondarko, L. V., (1969), "The Syllable Structure of Speech and Distinctive Features of Phonemes", *Phonetica* 20, pp. 1 – 40.

Cairns, Ch. E. & Raimy, E., (2011), Handbook of the Syllable, Leiden, Brill.

Clements, G. N. & Hume, E., (1995), "The Internal Organization of Speech Sounds" In: Goldsmith, J. (ed.) *Handbook of Phonological Theory*, Oxford, Basil Blackwell, pp. 245–306.

Černý, J., (1996), *Dějiny lingvistiky*, Praha, Votobia.

Duanmu, S., (2009), *Syllable Structure. The Limits of Variation,* Oxford, Oxford University Press.

Giegerich, H. J., (1992), *English phonology. An introduction,* Edinburgh, Edinburgh University Press.

Gregová, R., (2016), *The Generative and the Structuralist Approach to the Syllable. A comparative analysis of English and Slovak*, Newcastle upon Tyne, Cambridge Scholars Publishing.

Hall, T. A., (2007), "Segmental Features", In: de Lacy, P. (ed.) *A Cambridge Handbook of Phonology*, Cambridge, Cambridge University Press, pp. 311 – 334.

Halle. M. & Clements, G. N., (1983), *Problem Book in Phonology: A Workbook for Courses in Introductory Linguistics and Modern Phonology*, MIT Press.

Hooper, J. B., (1972), "The syllable in phonological theory", *Language* 48: pp. 525 – 540.

Jakobson, R. & Halle, M., (1956), *Fundamentals of Language*, Gravenhage, Mouton & Co.

Pauliny, E., (1979), *Slovenská fonológia*, Bratislava, Slovenské pedagogické nakladateľstvo.

Pulgram, E., (1970), *Syllable, Word, Nexus, Cursus*, The Hague, Mouton.

Rubach, J. (1993), *The Lexical Phonology of Slovak*, New York, Oxford University Press.

Rubach, J. & Booij, G. E., (1990), 'Syllable structure assignment in Polish.' *Phonology 7*, pp. 121 – 157.

Sabol, J., (1994), "Slovenská slabika (Náčrt problematiky)" In: Mlacek, J. (Ed.) *Studia Academica Slovaca 23*. Prednášky XXX. letného seminára slovenského jazyka a kultúry, Bratislava, STIMUL – centrum informatiky a vzdelávania FF UK, pp. 214 – 224.

Sabol, J., (1989), *Syntetická fonologická teória,* Bratislava, Jazykovedný ústav Ľudovíta Štúra Slovenskej akadémie vied.

Sabol, J. & Zimmermann, J., (2014), Akusticko-auditívna komunikácia, Univerzita Pavla Jozefa Šafárika v Košiciach.

Sung, L. Y. (2007), Syllable structure and syllabification, pp. 9 – 42. Available at: http://cms.bufs.ac.kr/yslee/research/papers/07_Syllable%20structure%20and%20syllabification.pdf

ULOGA DISTINKTIVNIH OBELEŽJA U STRUKTURI SLOGA. KOMPARATIVNA ANALIZA ENGLESKOG I SLOVAČKOG

Određivanje granice sloga kod grupa suglasnika koji se javljaju u sredini reči predstavlja vekovni problem u fonološkoj teoriji. Poimanje sloga kao „najmanje vezivne jedinice jezika" (Pauliny 1979: 101), kao entiteta neophodnog za razumevanje fonološke strukture jezika, pomaže nam da odredimo granice slogova na osnovu razlika između susednih fonema u slogu. Stepen različitosti zavisi od distinktivnih obeležja datih fonema. Kako bi se dala procena ovakvog pristupa određivanju granice sloga, distinktivna obeležja fonema iz dva različita jezika – engleskog i slovačkog – analizirana su na osnovu dve teorije distinktivnih obeležja – Geometrije obeležja i Sintetičke teorije. Pilot-analiza engleskih i slovačkih reči sa skupom suglasnika u sredini reči ukazuje na valjanost ovog pristupa kod određivanja granice sloga u višesložnim rečima.

Ključne reči*: granica sloga, distinktivno obeležje, fonema, kontrast*