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CHAPTER 4

SELECTED ASPECTS IN THE ACQUISITION OF ENGLISH PHONOLOGY BY POLISH LEARNERS – SEGMENTS AND PROSODY

Arkadiusz Rojczyk, Andrzej Porzuczek

4.1 INTRODUCTION

The purpose of this chapter is to review and discuss research on English segments and prosody in the light of how they are acquired by Polish learners. It concentrates on pinpointing key differences between English and Polish phonology that will have an impact on the acquisition process. Additionally, some methodological issues in studying second-language speech are discussed in terms of which acoustic parameters can be used to compare native English and English pronounced by Polish learners.

The acquisition of FL phonology is an integral part of the acquisition of a foreign language in general. It shares many similarities with the acquisition of other language strata, such as morphology, syntax, or semantics. However, unlike those other strata, it involves the most **physical** aspect of language. It results from the fact that articulation is the final-stage manifestation of mental processes involved in utterance planning. Driven by neural stimulation, articulators engage in sequences of movements in order to produce sounds that will further make up meaningful units such as words. Because of its physicality, FL phonology appears to be unarguably the most challenging element of language learning, very often resulting in the so-called **foreign** or **non-native** accent. Even very proficient speakers of FL may have detectable non-native features in their pronunciation. This phenomenon is sometimes referred to as the Joseph Conrad Syndrome. While Conrad's mastery of English vocabulary and style well exceeded that of typical native speakers, his pronunciation became anecdotal for having a strong Polish accent.

The difficulties with attaining native-like accent in FL come as a consequence of different principles governing the phonology of L1 and FL. FL phonetics and phonology research is therefore interested in pinpointing those differences and making predictions about which sounds or groups of sounds will be hard to learn. For example, because Polish lacks dental fricatives /θ/ and /ð/, it may be predicted, using a contrastive analysis, that Polish learners will find those sounds particularly challenging to learn. The next stage is to verify contrastive predictions in controlled experiments. Using the example of English dental fricatives, if a group of Polish beginner learners records words with /θ/ and /ð/ and the analysis of recordings reveals that a number of those dentals sound like /s/, /z/ or /f/ /v/, then it may be concluded that the contrastive predictions were correct and dental fricatives are indeed difficult for Polish learners. This strong connection between contrastive predictions from phonological and phonetic differences between L1 and FL, and empirical validation underlies all the current research in foreign-language speech.

The analysis of speech customarily concentrates on two levels. The first level is concerned with segments such as vowels and consonants. Research in this domain is predominantly interested in acoustic parameters that differ in production of vowels and consonants between L1 and FL. Moreover, it investigates how pronunciation of non-native speakers diverges from that of native speakers. Both production and perception experiments can be used because they are equally informative about the nature of FL phonology learning. Prosody refers to higher-order phenomena in the speech signal such as timing, stress, prominence, or intonation. Both the segmental and prosodic levels reveal the differences in pronunciation between native speakers and FL learners, and so they can be successfully used in foreign-language speech research.

In the following sections, we discuss the analysis of segments and prosody in SL speech. We particularly concentrate on research dealing with the acquisition of English sound system by Polish learners. First, however, some methodological issues in phonetic research will be introduced.

4.2 METHODOLOGICAL ISSUES IN SL SPEECH RESEARCH

When planning phonetic experiments, a researcher is faced with a choice of a method of analysis of collected material (detailed discussion in Rojczyk 2011a). For example, the researcher may record Polish learners of English producing words with /θ/ or /ð/. The next step is to select a method of analysis that will determine if obtained tokens are actual instances of native-like dental fricatives, or rather they have been substituted by Polish consonants /s/, /z/ or /f/, /v/. The easiest and, at the same time, the worst choice is when the researcher

themselves decides to analyse auditorily the recordings. Such a method is subject to a substantial load of bias that is likely to distort the results. First, an individual perceptual system is not always sensitive to subtle phonetic features that characterize analysed speech sounds. In other words, what one listener may classify as a likely instance of /θ/, the other listener may categorize as an instance of /f/. Second, the researcher may be unconsciously biased by his or her predictions for the results. Knowing the research hypothesis may influence the categorization of tested sounds towards confirming the hypothesis even beyond the conscious control.

As the second method, the researcher may choose to present recorded tokens to a group of native speakers or proficient FL speakers. This method eliminates the researcher's bias, because classifications are provided by judges who will be, most preferably, unacquainted with the object of the study. However, this method is not immune to imperfections either. Human listeners may perceptually assimilate classified segments to their own L1 segments (Thomson *et al.* 2009), as it is the case for non-native judges. Other judges may be influenced by particular words in which tested sounds are located (Levi *et al.* 2007). In longer stretches of recorded speech, classifications from listeners can be distorted by rhythm (White and Mattys 2007), fluency (Derwing *et al.* 2008), intonation (Trofimovich and Baker 2006) or even speaker's voice characteristics (Gick *et al.* 2008, Munro *et al.* 2010). More importantly, however, classifications by listeners may not capture significant acoustic variability within a sound that does not necessarily lead to a category change. Using our example, /θ/ and /ð/ consonants produced by Polish learners may be classified as acceptable tokens of this category even if their detailed acoustic properties differ dramatically from those typical for native speakers. Identifying and describing this within-category variability requires a technique that is able to detect fine-grained phonetic properties of sounds.

Fine-grained phonetic features can be analysed by means of acoustic analysis. Because speech is a physical event, its properties are best revealed through physical parameters. These parameters are represented visually in a waveform and spectrogram. The development of computer technology in the last few decades have enabled spectral analysis of speech on PC. A number of speech-analysis software packages are available online free for download. The most commonly used software is Praat (Boersma 2001) available for download at <http://www.fon.hum.uva.nl/praat/>. It is characterized by its power for detailed acoustic analyses and functionality, which is, however, obtained at a cost of simplicity. Nevertheless, a little practice will suffice to carry out some basic analyses and measurements.

The "editor window" in Praat provides visualization of the speech signal, with a top window showing a waveform and a bottom window showing a spectrogram (Figure 1).

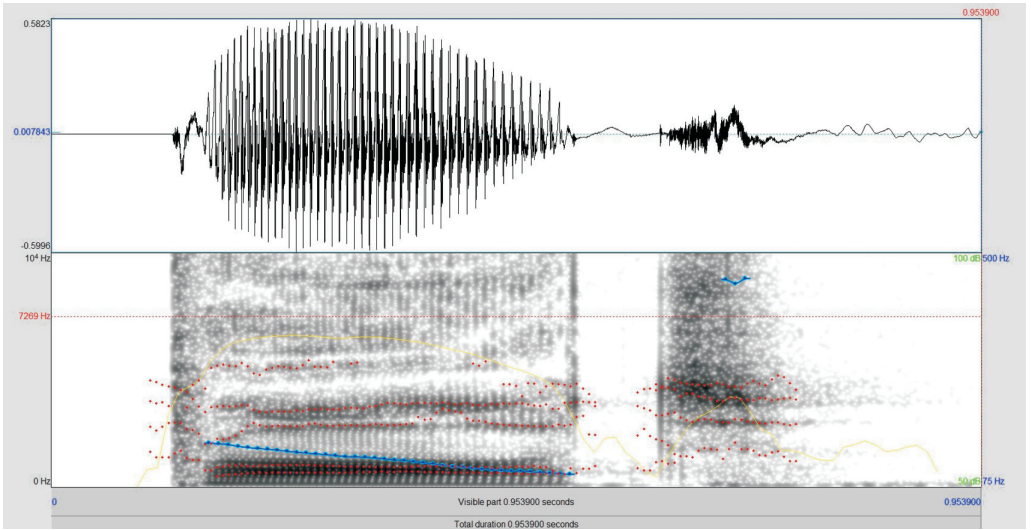


Figure 1 Waveform and spectrogram of the word *Praat*

The waveform displays air pressure variations as recorded over a certain period of time. The spectrogram shows frequency and amplitude of vibrations along the time dimension. The red lines indicate changes in frequencies of sounds. The blue line shows the contour of the fundamental frequency (F0), which is primary parameter of intonation. The yellow line calculates the intensity of the signal.

4.3 VOWELS

Vowels are a rich source for studies investigating the acquisition of English sound system by Poles. While Polish makes do with only six vowels, British English uses as many as 12 different single vowel categories. Moreover, no single Polish vowel has spectral properties that could make it a perfect substitute for an English vowel. It is therefore particularly challenging for Polish learners to learn to produce and recognize a whole set of vowels that are different and more numerous from those observed in their native language. Another aspect is duration or length of vowels. While Polish is generally characterized by durational invariability of its vowels (Jassem 1962; but see Rojczyk 2010a), English varies duration of vowels as a cue to the voicing of following consonants (Chen 1970, Denes 1955, Klatt 1973, Raphael 1972) or a correlate of stress (Beckman 1986, Fry 1955, 1958; Lieberman 1960, Slujter and van Heuven 1996b). There is also empirical evidence that duration of vowels may also depend on vowel quality in English (**short** and **long** vowels: Catford 1977, Crystal and House 1988, House 1961, Lehiste 1970, Lindau 1978); however vowel quality is a primary cue over

duration in native perception of vowels (Ainsworth 1972, Hillenbrand *et al.* 2000, Mermelstein 1978). Some textbooks (e.g. Sobkowiak 1996) prefer the terms **lax** and **tense** (Jakobson *et al.* 1952) rather than short and long. This distinction seems to be controversial (Buder and Stoel-Gammon 2002), because it is based on an articulatory label that refers to different aspects of articulation in different languages (Clark and Yallop 1995, Maddieson and Ladefoged 1985).

Both vowel quality and duration can be analysed with great detail using acoustic analysis. Measurements of vowel duration depend to a large extent on neighbouring sounds. The researcher should be wary to avoid constructing experimental words that will have vowels flanked by continuants, such as approximants, liquids or nasals. In such contexts, measuring vowel duration is difficult and prone to error, because there are no clear discontinuities in the speech signal. Most preferably, vowels should be flanked by either stops or fricatives. Since phonologically voiced consonants have voicing into closure or constriction from the preceding vowel, it may blur the boundaries of a vowel. As a consequence, neighbouring voiceless stops or fricatives are the best choice, while preparing items for experiments with vowel duration.

Figure 2 shows a waveform and spectrogram of words *sat* and *sad*. In this particular context, when flanked by fricative /s/ and plosive /t/ or /d/, vowel onset was measured as the end of high energy noise typical for fricatives and vowel offset was measured as the beginning of closure for the following stop.

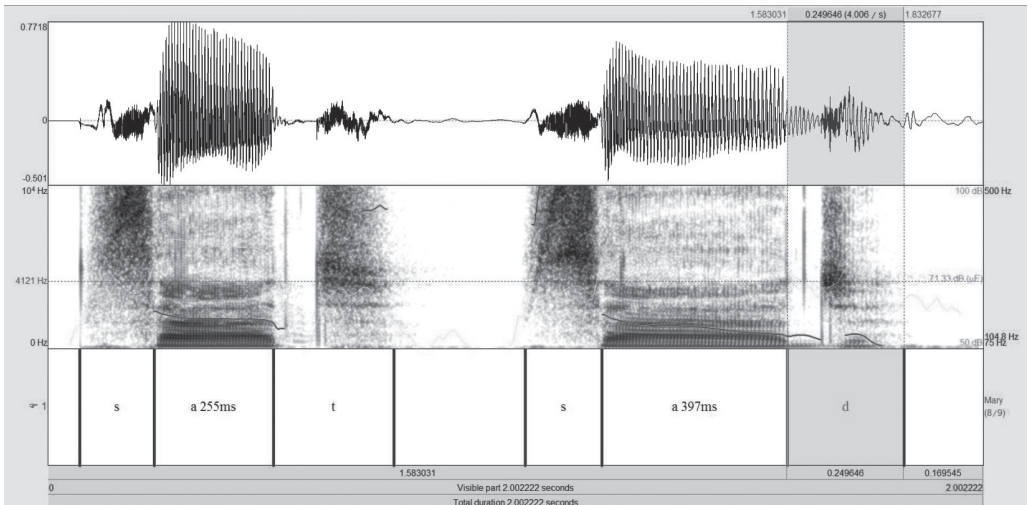


Figure 2 Waveform and spectrogram of *sat* and *sad*

Vowel quality is determined by measuring frequencies of the first two formants. High Formant 1 (F1) is associated with low, open vowels, and low F1 is

associated with high, close vowels. High Formant 2 (F2) is associated with front vowels, while low F2 is associated with back vowels (more details in Baart 2010 and Harrington 2010). Although F1 and F2 are not restricted to only height and frontness/backness of vowels, but may also indicate e.g. lip rounding (Ladefoged and Madieson 1996), they have been successfully used to compare vowels on two-dimensional plots in linguistic and sociolinguistic phonetics (Labov 2001, Ladefoged 1971).

Figure 3 shows an analysis window for vowels /i:/ and /a:/ in words *heat* and *heart*. Formants are generally measured at a vowel midpoint which is assumed

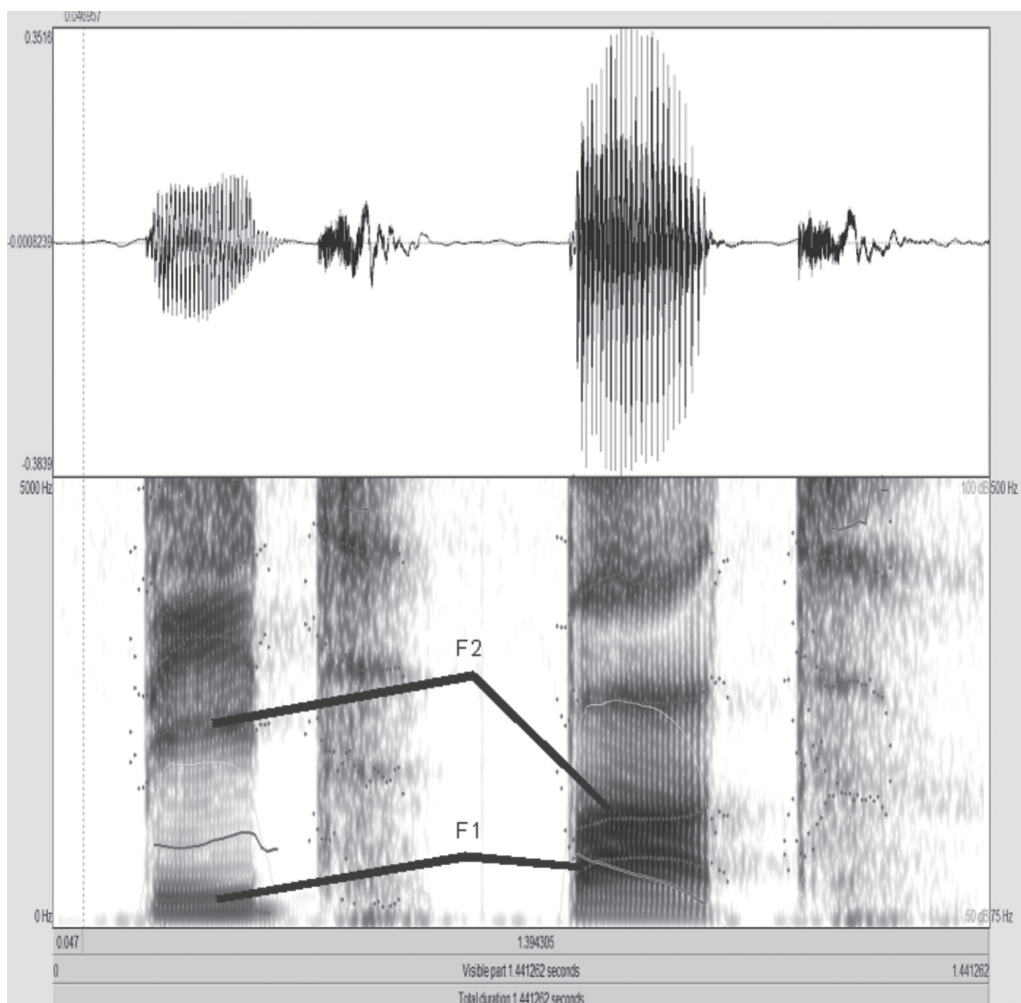


Figure 3 Frequencies of F1 and F2 in vowels /i:/ *heat* (left) and /a:/ *heart* (right)

to represent target articulation. Measurements towards any of the flanking consonants will reflect acoustic properties of those consonants encoded in vowel onglide or offglide (Lindblom 1963, Stevens and House 1963).

Measured formants can be next plotted on a vowel plane to graphically visualize a vowel space for a given speaker (Figure 4). The x-axis represents the dimension of F₂, the y-axis represents the dimension of F₁.

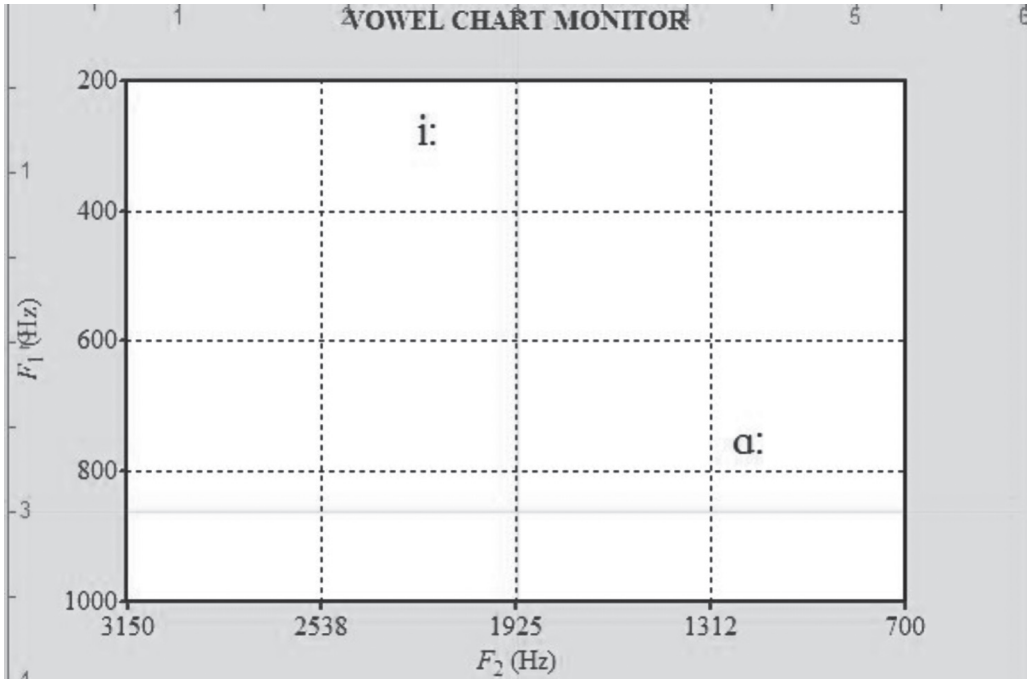


Figure 4 Vowel plane with plotted /i:/ and /a:/

Research investigating the acquisition of English vowel system by Polish learners concentrated on both duration and quality. Studies dealing with vowel duration showed that Polish learners insufficiently modify length to distinguish between short and long vowels (Waniek-Klimczak 2005, Porzuczek 2007), insufficiently modify length as a cue to the voicing of following consonants (Waniek-Klimczak 2005, Rojczyk 2010b, 2010c for perception), give more weight to duration relative to spectral information for vowel categories (Bogacka 2004, Rojczyk 2011b), or do not temporally reduce in unstressed positions (Porzuczek 2008, 2009; Rojczyk and Porzuczek in press). Studies analysing quality of English vowels produced by Poles concentrated on categories such as /i:/ and /ɪ/ (Bogacka 2004, Rojczyk 2010d), /e/ (Rojczyk 2010d), /æ/ (Gonet et al. 2010b; Rojczyk 2011b), /ʌ/ (Rojczyk 2011b), or /ə/ (Gonet et al. 2010a, Bogacka et al. 2006), demonstrating that Polish learners have difficulties with forming target FL vowel

categories that are not assimilated to a certain degree by their native categories. Not surprisingly, this merger of L1 and FL vowels has been corroborated in perception studies that indicated Polish learners' difficulties with perceptually identifying tokens of vowel categories in English (Bogacka 2004, Bogacka *et al.* 2006, Nowacka 2008, Porzuczek 1998, Rojczyk 2011b).

4.4 CONSONANTS

Consonants constitute another group of sounds that may be researched from the point of view of their acquisition in FL. Textbooks on English pronunciation for Poles (Arabski 1987, Bałutowa 1974, Jassem 1973, Sobkowiak 1996) point to problematic areas resulting from differences in consonantal systems of English and Polish. They may generally be grouped as follows:

- 1 aspiration in English
- 2 unreleased stops in English
- 2 dental fricatives in English
- 3 velar nasals in English
- 4 approximant /r/ in English
- 5 velarized /l/ in English.

Unfortunately, most of those differences are largely underresearched both experimentally and instrumentally. It is a consequence of the fact that consonants are complex sounds and thus their spectral analysis must include several parameters. As a result, the above problematic areas reported in textbooks are based primarily on auditory observations by phonetics teachers, and have not been appropriately quantified in experimental research to date.

An exception here is aspiration in English and the lack thereof in Polish. A number of instrumental and experimental studies looked into aspiration in productions of word-initial voiceless stops in English by Poles. Simply put, English voiceless stops are characterized by a puff of air between their plosion and the following vowel. Since Polish stops are unaspirated, the learners need to learn aspiration in English not only to substantially improve on how they sound, but also to produce stops that will be perceived as voiceless by native speakers. In order to compare the voicing and voicelessness of stops in Polish and English, most acoustic studies have used the parameter of Voice Onset Time (VOT) (Lisker and Abramson 1964). VOT is a temporal parameter that is measured as the time interval between the release of stop and the onset of voicing of a following vowel. VOT can have negative values, when vocal cords start vibrating before the release of a stop, short positive values, when voicing

begins soon after the release (0 to 30 ms), or long positive values when voicing begins long after the release (+50 ms or more). It is when stops have long VOT values that they are said to be aspirated.

The comparison of VOT for Polish and English reveals consistent differences. Polish voiced /b, d, g/ have negative VOT values, in that voicing begins before they are released, while voiceless /p, t, k/ are characterized by short positive VOT values (Keating 1980, Kopczyński 1977, Mikoś *et al.* 1978). On the other hand, English /b, d, g/ have short positive VOT values and /p, t, k/ have long positive values (Keating 1984, Lisker and Abramson 1964). Discarding a traditional phonological voiced-voiceless opposition, we can say that, while Polish /b, d, g/ are voiced and /p, t, k/ are voiceless, English /b, d, g/ are voiceless unaspirated and /p, t, k/ are voiceless aspirated.

Different implementations of the voicing contrast in Polish and English stops have observable consequences for Polish learners of English. First, Polish learners will pronounce English /b, d, g/ with negative VOT values. Second, Polish learners will pronounce English /p, t, k/ with short positive VOT values, i.e. without aspiration. The first divergence from the English norm will not impede the comprehensibility, simply because, on the one hand, prevoiced stops will be still perceived as /b, d, g/ and, on the other hand, some native speakers in certain conditions also prevoice /b, d, g/ (Kessinger and Blumstein 1997, Magloire and Green 1999, Miller *et al.* 1986). The second divergence will, however, result in misperception, because English /p, t, k/ produced with short VOT values, without aspiration, will be perceived as /b, d, g/ by English listeners. That is to say, words like *ten* or *pet* produced without aspiration will sound like *den* or *bet* to English ears.

Those difficulties of Polish learners to distinguish between English unaspirated /b, d, g/ and aspirated /p, t, k/ have been studied experimentally both in production and perception. Waniek-Klimczak (2005) measured VOT in English for early and late Polish-English bilinguals and reported that they produced intermediate values for English /p, t, k/, in that they were higher than for Polish /p, t, k/, but not high enough to match those typical for native speakers. Perception experiments showed that Poles do not distinguish between unaspirated /b, d, g/ and aspirated /p, t, k/ in a native-like fashion. Kopczyński (1977) found that many instances of English /b, d, g/ were perceived as voiceless. Rojczyk (2011c) used a VOT continuum ranging from 0 to +70 ms to investigate how Polish learners categorized stops between unaspirated and aspirated. The results revealed that, unlike native speakers, Polish listeners did not consistently locate a phonemic boundary in this region, indicating that the perceptual boundary was not fully established even for advanced learners. Finally, Rojczyk (2010e) analysed those results from the point of view of pronunciation pedagogy.

Measuring and quantifying aspiration (long VOT values) is relatively easy. The time between the release burst of a stop and the following vowel can be precisely delimited in both a waveform and spectrogram, even without experience in acoustic analysis. This parameter can, therefore, be used in the analysis of Polish learners' pronunciation of English at all levels and in any experimental condition. Figure 5 shows spectral analysis of the Polish word *ten* and English *ten*. Plosive /t/ in Polish is characterized by a lack of aspiration, indicated by low VOT values (+18 ms). English /t/ is strongly aspirated, as demonstrated by a significant portion of a voiceless period between the release of /t/ and the following vowel (+198 ms).

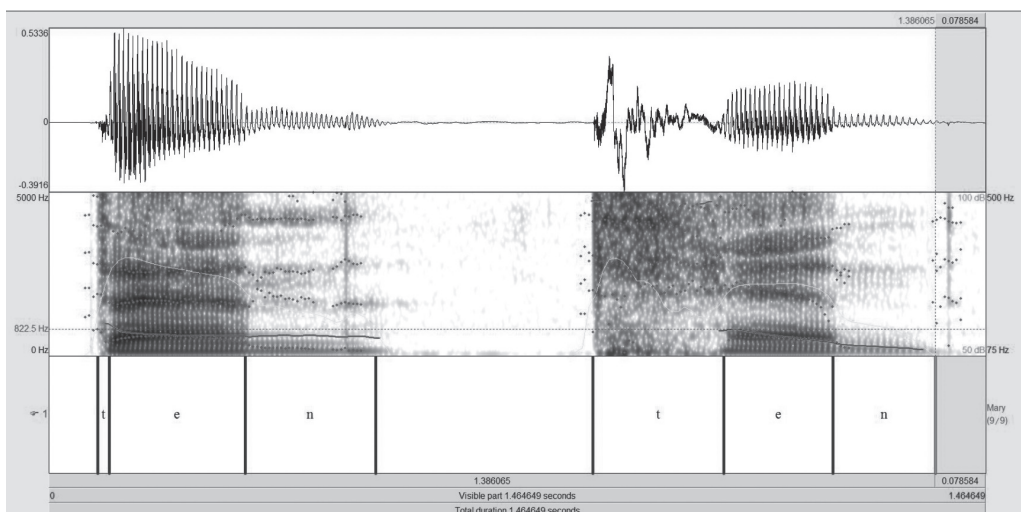


Figure 5 Measurements of VOT for /t/ Polish *ten* (+18 ms) and English *ten* (+198 ms)

Another advantage of using VOT as an experimental parameter is its immunity to distortions in the signal. It means that recordings do not need to be performed in a sound-proof boot, but a researcher may freely use a portable recorder or a notebook with a microphone in field or classroom recording. Unless there is severe background noise, the researcher may obtain precise and reliable measurements for his or her project.

4.5 PROSODY AND ITS FUNCTIONS

The acquisition of FL speech does not only involve the speech sound system and phonotactic issues but also FL prosody, the suprasegmental organization of utterances. Prosody in particular refers to voice pitch variation, the timing of speech units and distribution of prominent elements. Distribution of

prominences in an utterance and speech melody are by no means just accessory to the semantic content of lexical units combined in syntactic structures. Prosodic features are widely exploited by language users for pragmatic purposes and very often the intended meaning of an utterance depends on its intonation pattern more than on its semantics. The three features are strictly interrelated and although each will be discussed in a separate section, constant references will be made to the other two.

This section presents the main notions of prosody, their significance in FL acquisition and the current research directions.

4.6 PROMINENCE

Prominence distribution is central to all topics connected with prosody, as it forms the framework for rhythm and intonation. The general term comprises at least two main concepts: stress and accent. The two notions are used in different meanings in literature (see Sluijter and Van Heuven 1996a), reflecting the hierarchic nature of prominence. In this paper we will adopt the approach proposed by Halliday (1967), Vanderslice and Ladefoged (1972), also supported by Sluijter and Van Heuven (1996a). According to this view, stress is an intrinsic property of a lexical item, which has one most prominent syllable. Stressed syllables bear a potential for phrasal accent in actual utterances.

In many languages, including English, a word always has an intrinsically prominent syllable, which is often phonologically significant, and the realization of word stress in language performance is crucial for successful speech perception. The realization of stress involves several physical properties of sound waves, their production and perception. The speaker may use relatively greater articulatory effort leading to increased intensity of the speech unit – either regarded as total energy expenditure (loudness) or only in higher frequency regions of the spectrum (spectral tilt). Then, fundamental frequency (F0) variation (tonic/melodic stress) can be employed to signal prominent syllables, as well as increased duration of the stressed units. The impression of prominence may also be achieved by qualitative and quantitative reduction of the unstressed units that surround the prominent one.

Individual prominence cues are normally combined and, as Fry (1958: 127) points out, “the listener is never concerned exclusively with one of them” but rather “his linguistic judgments are determined by their interaction.” A lot of research has been done to establish the relative salience of individual cues for prominence perception. According to Fry (1955, 1958) duration is more indicative of stress than intensity, but pitch excursions can override their effects. The dominant role of pitch variation has been confirmed by Bolinger

(1958), Morton and Jassem (1965), Jassem *et al.* (1968). A later empirical study of stress perception by adult English speakers (Streeter 1978) brought similar results. The influence of vowel quality (F1-F2 structure) on stress perception was found to be smaller than in the case of the other stress correlates (Fry 1965). Generally, the acoustic studies of the 1950s and 1960s led to conclusions roughly summarized by a hierarchy of acoustic and corresponding prominence cues in Table 1 (cf. Jensen 2004).

Table 1 A hierarchy of perceptual and acoustic prominence cues

Acoustic cues	Perceptual cues
(fundamental frequency) F0	pitch
duration	length
intensity	loudness
formant structure	quality

Figure 6 shows the word *infinity* pronounced in isolation. The stressed syllable nucleus (highlighted) bears relatively high pitch (lower line), higher intensity (upper, continuous line) and lower F1.

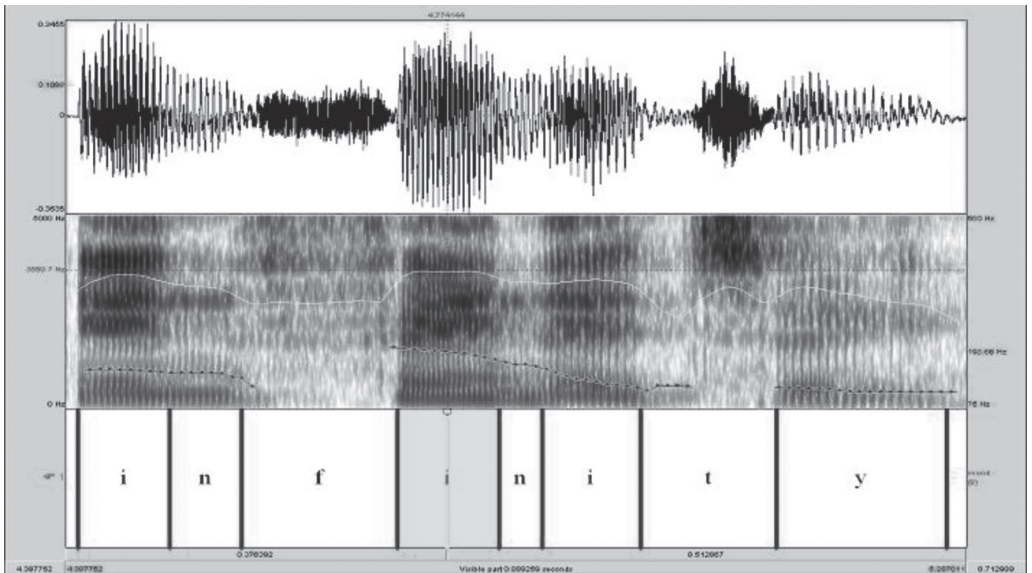


Figure 6 Stress cues in the word *infinity* pronounced in isolation

References to vowel quality as a prominence cue are also present in more recent studies on hyperspeech by Lindblom (1990) or hyperarticulation by de Jong (1995) and Erickson (2002), who found that the phonetic space of

phonemic contrast expands under the influence of stress. A similar conclusion was proposed by Beckman and Edwards (1992), who claimed that an accented position makes the vocal tract more open (sonority expansion). These observations were further supported by Cho (2005), who confirmed the relation between the two processes.

Views regarding pitch as the most salient prominence cue have lately been challenged, again in favour of intensity as the main factor. Kochanski *et al.* (2005) consider it a better predictor of prominence than duration. They further claim that F0 becomes significant only if a speaker uses large pitch movements. Similarly, Rietveld and Gussenhoven (1985), and Terken (1991) pointed out that large (1/2 octave) F0 excursions induce perception of prominence.

Recently, speech synthesis and acoustic parameter manipulation have been used in search for better understanding of their interaction. The obtained results differ across studies. Beckman (1986) points out possibly different experimental conditions as one source of discrepancies. She also observes that “[t]he mapping between the physical attributes being manipulated and the psychological attributes supposedly being tested is too complicated for direct comparisons of the results” (1986: 157).

Finally, the difficulty may not only lie in establishing the relations between the physical cues but also in subjective psychological reaction of the listener. According to Cooper (1998: 24), “the perception of stress in speech is, like the perception of rhythm generally, a subjective and interpretive activity rather than simply the registering of some objective feature.” The discrepancy between the acoustics of speech and the listener’s perception will be addressed in section 4.8 devoted to timing and rhythm.

4.7 INTONATION

Pitch variation performs important functions in communication. As mentioned before, it may be used to mark prominence, both on the lexical level (cf. Figure 6) and on the phrase level (cf. Figure 7).

However, numerous complex combinations of prominence and pitch variation patterns can be used for other purposes as well. Wells (2006: 11ff) distinguishes several functions of intonation:

- attitudinal (expressing attitudes and emotions)
- grammatical (signalling grammatical structures and unit boundaries)
- focussing (highlighting informationally important units)
- discourse (interaction management, e.g. turn taking)
- psychological (organising speech into cognitively manageable chunks)
- indexical (indicating the speaker’s personal or social identity).

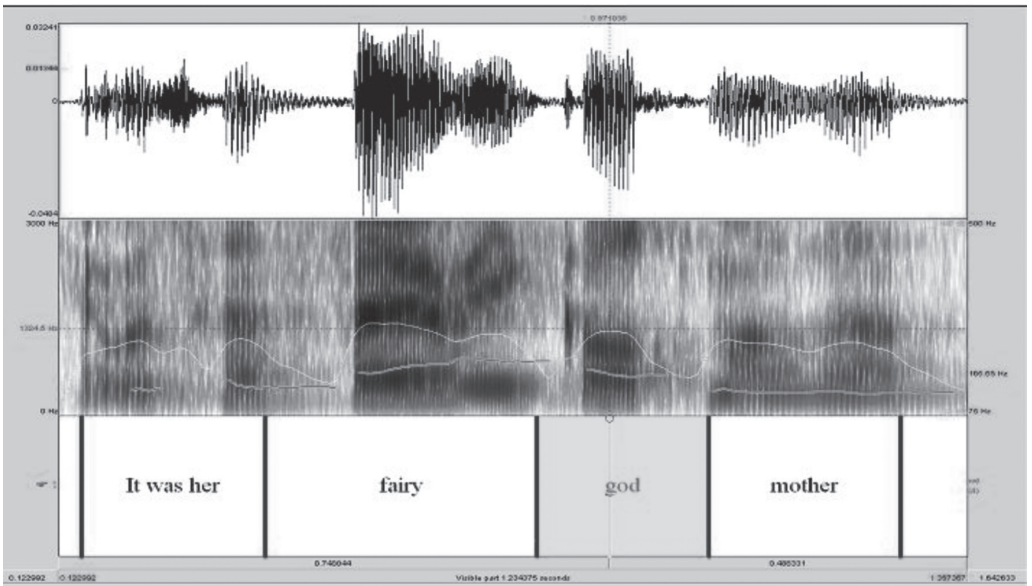


Figure 7 Pitch accented syllables (*fair-* and *god-*) in an utterance

These functions, which are crucial for successful communication, can hardly be performed by other means. Therefore intonation is also an important aspect of EFL learning, especially if, as Wells (2006: 11) suggests, “[i]t may well be the case that English makes more elaborate use of intonation to signal meaning than do most other languages.”

The importance of intonation for FL communication and learning has never been questioned, and pedagogical purposes were important when formal descriptions of intonation contours were proposed within the British School tradition. Several main patterns were distinguished, based on pitch changes initiated with the most prominent syllable of the unit called a tone group. This prominent syllable, normally the last pitch-accented one in a tone group, constituted its nucleus. The first pitch-accented syllable was called the head. Any unstressed syllables before the head formed a prehead, while tonally neutral syllables following the nucleus were referred to as the tail. This nuclear tone approach represented by the British School (e.g. Kingdon 1958, O’Connor and Arnold 1973 [1961], Crystal 1969, Gimson 1974 [1962], Brazil *et al.* 1980, Cruttenden 1997) has been very popular for decades, also in FL pedagogy.

A new approach appeared with the rise of Autosegmental-Metrical phonology (Pierrehumbert 1980, Beckman and Pierrehumbert 1986, Ladd 1986, 1996). The new description system called Tone and Break Indices (ToBI) (Silverman *et al.* 1992) indicates high (*H) and low (*L) tones in an intonational phrase as well as boundary tones and the degree of cohesiveness between words.

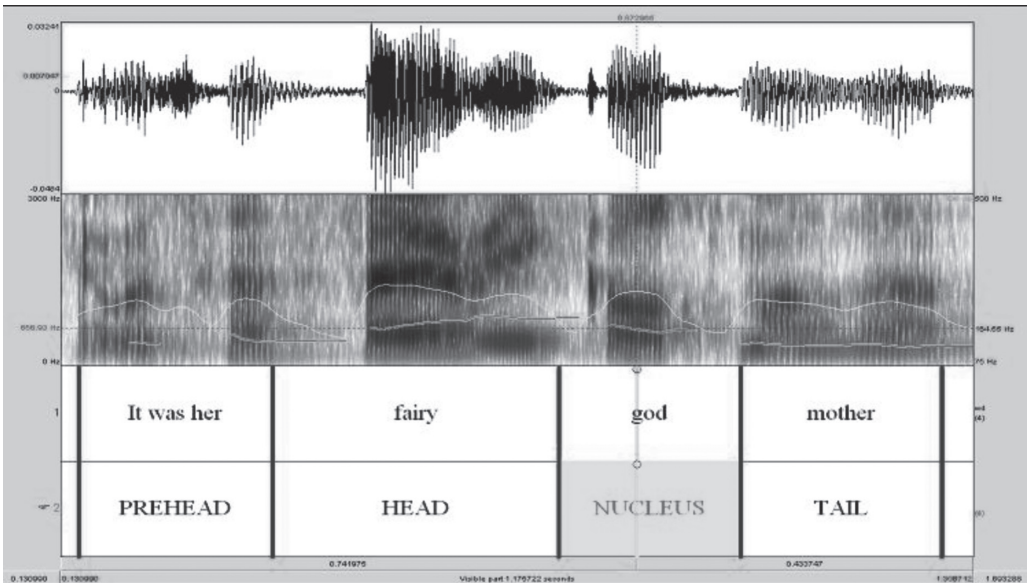


Figure 8 An intonational phrase (tone group) parsed according to nuclear tone approach

Figures 8 and 9 show an utterance the intonation of which is described in terms of the two approaches already discussed.

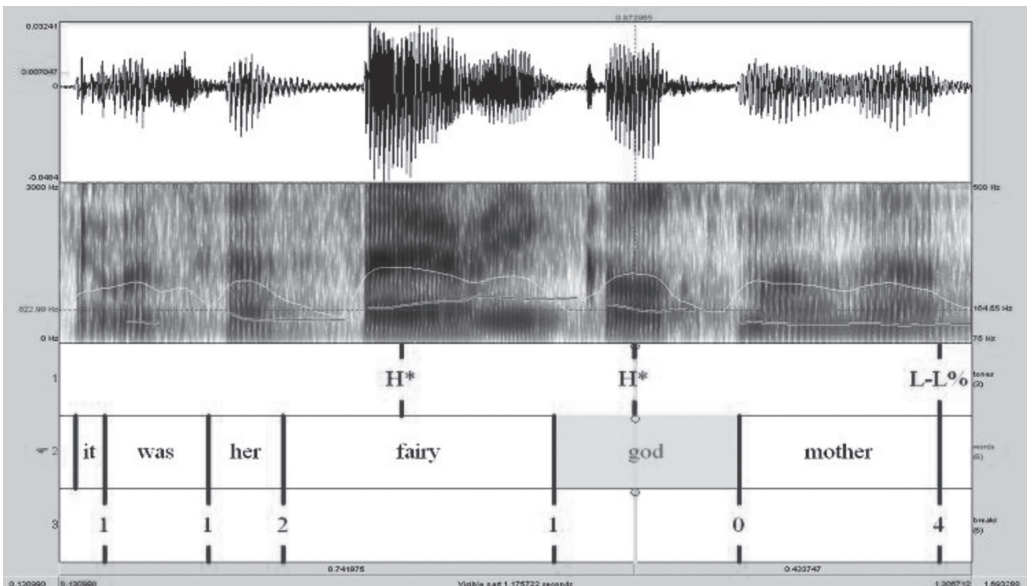


Figure 9 An intonational phrase according to ToBI description

A simplified practical representation of intonation contour for pronunciation textbooks (e.g. O'Connor 1967) would refer to the two accented syllables, indicating the Low Fall pattern in the following way:

It was her ¹fairy \ godmother.

The same pattern shown in ToBI convention would be represented by the symbols **H* H* L-L%**, as in Tier 1 of the full description in Figure 9.

The ToBi system is still developing, with specific variants elaborated for the description of different languages.

4.8 TIMING AND RHYTHM

The duration of speech units may also perform phonological and pragmatic functions. In English, intrinsic segmental length is traditionally considered a distinctive feature of vowels. Vocalic duration is also used to resolve the voiced/voiceless consonant contrast in the coda. Increased duration of segments and larger prosodic domains is often indicative of prominence and domain boundaries. Finally, speech unit duration may be adjusted as a result of natural tendency for rhythm observed in human actions.

Since 1945, when Pike proposed a distinction between stress-timed and syllable-timed languages, which formed the foundation for Rhythm Class Hypothesis, rhythm studies have become an important direction of research into prosody. Although isochrony of speech units has never been confirmed, rhythmic patterns are still being sought in other aspects of speech, and scholars who argue for complete irrhythmicity of language production (e.g. Cauldwell 2002) are in the minority.

The inability to find evidence for timing regularities by means of instrumental studies on the one hand and the subjective perception of speech rhythmicity (cf. Lehiste 1977) on the other, moved rhythm studies and Rhythm Class Hypothesis to a new direction. It was observed (e.g. Dauer 1983) that rhythmic differences between languages are correlated with permitted syllable structure diversity and presence or absence of unstressed vowel reduction. This has led to new rhythm class measures based on the two characteristics of language phonology, such as %V (vocalic content in a measured speech sample) and ΔC (consonantal interval variance) (Ramus *et al.* 1999) or Pairwise Variability Index (consecutive consonantal and vocalic interval variance) (Grabe and Low 2002).¹ These measures classify languages on a two-dimensional continuous scale rather than assign

¹ See also VarcoV and VarcoC (Dellwo 2006).

“stress-timed” or “syllable-timed” labels. However, disregarding prominences may be one reason for criticism of measures aimed at rhythm evaluation. Therefore, recently more attention has been given to cross-linguistic variation of stressed and unstressed syllable duration contrast (cf. Wiget *et al.* 2010).

4.9 EFL PROSODY ACQUISITION BY POLISH LEARNERS

Systematic differences between L1 and FL prosody may naturally lead to interference in the learners’ performance. There are reports that Polish learners find it difficult to master the following English pronunciation features which either do not occur or are less significant in Polish:

- long/short vowel distinction (e.g. Szpyra-Kozłowska 2003, Sobkowiak 1996, Nowacka 2008)
- unstressed syllable/vowel reduction (e.g. Sobkowiak 1996, Hewings 2004, Dziubalska-Kończak *et al.* 2006, Porzuczek 2007, 2010)
- accentual lengthening (Avery and Ehrlich 1996, Gonet *et al.* 2010a)
- stress timing² (Śpiewak and Gołębiowska 2001).

The above-mentioned features are important determinants of utterance timing, connected with the notion of rhythm. To complete the list of potential problems with English prosody, we must also mention interference related to differences in intonation contours used in the two languages. Intonation is considered very difficult to teach (e.g. Setter 2008) or even unteachable (Taylor 1993, Jenkins 2000). This is connected with the diversity of patterns used by language communities and individual speakers, the complexity of relations between the contours and pragmatic meanings (cf. Grabe 2002) and the difficulty of conscious control of voice pitch. Roach (2000) suggests that typical melodic patterns are best acquired via immersion in a given language community.

4.10 CONCLUSION

The task of learning correct pronunciation of FL requires the formation of new phonetic patterns typical for that language. The extent of novel formations depends on how much FL phonetic patterns diverge from those used in L1. In the current paper, we discussed the challenges that Polish learners must face when learning the pronunciation of English, distinguishing between a segmental and prosodic level. Out of several segmental differences between English and Polish, the emphasis was put on learning single vowel categories and aspiration. On the

² Understood as a tendency to keep regular interstress intervals.

prosodic level, the discussion concentrated on intonation, timing and rhythm. The acquaintance with those problematic areas is not only helpful in attaining native-like pronunciation of English, but also allows a researcher in FL to select one or some of them in an analysis of the acquisition of English by Poles. To this end, we attempted to provide rudimentary information on speech analysis, with particular emphasis on investigating Polish pronunciation of English.

All current approaches to FL speech acquisition and learning assume that learning a new language entails concentrating on previously ignored acoustic patterns (Francis and Nusbaum 2002, Francis *et al.* 2008, Guion and Pederson 2007). An acoustic cue that is not exploited in L1 may be relevant in FL (Garcia-Sierra *et al.* 2009, Polka *et al.* 2001, Sundra *et al.* 2008). As a consequence, successful teaching/learning of FL pronunciation should be based on a set of patterns that need to be incorporated into foreign-language speech. One of such patterns is aspiration which is non-functional in Polish and functional in English. It has been reported that students who receive systematic phonetic training relying on explicit instructions about the differences between L1 and FL are much more successful than the ones without such training (Matthews 1997, Catford and Pisoni 1970).

Despite vast regional and even individual differences in the prosody of English speech, which make it difficult for teachers and textbook authors to establish precise models of English suprasegmental phonetics to be followed by the learner, these aspects traditionally rank high on priority lists of scholars dealing with EFL teaching and learning. Such opinions are expressed, among others, by Kenworthy (1987), Bogle (1996), Celce-Murcia *et al.* (1996), Szpyra-Kozłowska *et al.* (2003) and Setter (2008).

Finally, it must be borne in mind that segmental and suprasegmental phonetics are not two separate strata of language that can be treated independently. The intrinsic language-specific qualities of segments, their distribution and phonemic contrasts influence the duration of higher level speech units while at the same time the distribution of prominences (including word stress patterns) determines the shape of individual speech sounds. Consequently, it is hardly possible for a learner who has problems with the pronunciation of FL speech sounds to produce native-like prosodic patterns, and it is equally difficult for a learner who does not understand the influence of word stress and phrasal accent (or lack of prominence) on individual vowels and consonants to pronounce the FL segments correctly.

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WYBRANE ASPEKTY PRZYSWAJANIA SYSTEMU FONOLOGICZNEGO JĘZYKA ANGIELSKIEGO PRZEZ POLSKIEGO UCZNIĄ

Streszczenie

Rozdział poświęcony jest przyswajaniu systemu fonologicznego języka angielskiego przez polskich uczniów. Omówiono w nim typowe problemy występujące w procesie uczenia się wymowy angielskiej, szczególnie te wynikające z interferencji, a więc spowodowane różnicami pomiędzy systemem języka ojczystego a językiem obcym. W wypadku ucznia polskiego, w zakresie fonetyki segmentalnej, są to przede wszystkim fonemiczne kontrasty samogłoskowe, różnice w realizacji kontrastu pomiędzy samogłoskami dźwięcznymi a bezdźwięcznymi (np. aspiracja i skracanie samogłoski przed spółgłoską bezdźwięczną), wymowa szczelinowych spółgłosek zębowych oraz procesy związane z realizacją wariantów pozycyjnych spółgłosek wybuchowych, płynnych i nosowych. W zakresie prozodii skoncentrowano się przede wszystkim na sposobach realizacji akcentu wyrazowego i zdaniowego, funkcjach intonacji w komunikacji werbalnej oraz relacjach czasowych i rytmie wypowiedzi. Podkreślono również ścisły związek i wzajemne zależności pomiędzy fonetyką segmentalną i suprasegmentalną, które nader często rozpatrywane są jako zagadnienia odrębne z punktu widzenia dydaktyki wymowy. W odniesieniu do wspomnianych problemów przedstawione zostały metodologiczne aspekty współczesnych badań empirycznych z wykorzystaniem akustycznej analizy mowy, aktualny stan rozwoju badań w omawianych dziedzinach, jak również literatura zalecana dla słuchaczy studiów filologicznych zainteresowanych problematyką przyswajania wymowy języka angielskiego przez Polaków.

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AUSGEWÄHLTE ASPEKTE VON DER ERWERBUNG
DES PHONOLOGISCHEN SYSTEMS
DER ENGLISCHEN SPRACHE VON POLNISCHEN SCHÜLERN

Zusammenfassung

Das Kapitel ist der Erwerbung des phonologischen Systems der englischen Sprache von polnischen Schülern gewidmet. Die Verfasser besprechen typische, besonders mit der Interferenz verbundene, also aus den Unterschieden zwischen der Heimatsprache und der Fremdsprache entstehende Probleme mit der englischen Aussprache. Bei einem polnischen Schüler sind es im Bereich der segmentalen Phonetik vor allem: phonemische Vokalkontraste, Unterschiede in der Aussprache des Kontrastes zwischen stimmhaften und stimmlosen Vokalen (z.B.: Aspiration und Abkürzung des Vokals vor einem stimmlosen Konsonanten), die Aussprache von dentalen Engelaute und die mit der Aussprache von isolierenden, flüssigen und nasalen Plosivlauten verbundenen Prozesse. Im Bereich der Prosodie sind es hauptsächlich: der Wortakzent, die Intonation in der verbalen Kommunikation, die Sprechquantität und der Sprechrhythmus. Die Verfasser betonen auch eine Wechselbeziehung zwischen der segmentalen und suprasegmentalen Phonetik, die vom Standpunkt der Sprechdidaktik sehr häufig getrennt betrachtet werden. In Bezug auf oben genannte Probleme werden hier geschildert: methodologische Aspekte der gegenwärtigen empirischen Forschungen bei Ausnutzung der akustischen Sprachanalyse, der heutige Stand der Forschungen auf vorliegenden Gebieten und die den polnischen Hörern des philologischen Studiums, welche für die Aussprache des Englischen Interesse haben, empfohlene Fachliteratur.