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Perception of the English Vowel Schwa by Czech Learners

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Author: Zdeňka Fajtová
Study subjects: English – Mathematics
Supervisor: Mgr. Kristýna Poesová, Ph.D.

I hereby declare that this bachelor thesis is completely my own work and that no other sources were used in the preparation of the thesis than those listed on the works cited page.

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Zdeňka Fajtová

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Abstract

This thesis deals with the perception of English vowels by Czech listeners with special focus on the mid-central vowel schwa. The theoretical part presents the current research findings in the area of cross-language speech perception as well as it explores the differences between Czech and English vocalic systems. Further, it focuses on the negative transfer from the mother tongue. The aim of the practical part is to examine the impact of the Czech sound system on the discrimination of the neutral vowel schwa in different positions using a perception test devised specifically for the purposes of this research. The results indicate that the students' perception is influenced quite strongly by their native language as successful schwa identification occurred in approximately fifty per cent of all examined cases.

Key words

speech perception, schwa, second language acquisition, negative transfer

Abstrakt

Tato práce se zabývá percepcí anglických samohlásek českými studenty se zaměřením na střední středovou hlásku šva. Teoretická část popisuje percepci cizího jazyka, rozdíl mezi českým a anglickým vokalickým systémem a roli negativního transferu z mateřského jazyka v percepci segmentů. Cílem praktické části je prozkoumat vliv českého jazyka na rozpoznání neutrálního vokálu šva v různých pozicích pomocí percepčního testu speciálně vytvořeného pro účely tohoto výzkumu. Výsledky výzkumného šetření ukazují, že percepce je poměrně silně ovlivněna mateřským jazykem studentů, jelikož úspěšná identifikace cílového vokálu byla shledána v necelé polovině zkoumaných případů.

Klíčová slova

percepce řeči, šva, osvojování cizího jazyka, negativní transfer

Table of contents

Introduction

When people talk about the pronunciation of a language, what they usually mean is how individual sounds and words are produced. However, pronunciation also involves perception of a sound system. Many pronunciation experts believe that in the process of foreign or second language acquisition perception precedes production and that if we cannot hear certain sounds or patterns properly we may have difficulty producing them (Escudero 110, Llisteri 92). Speech perception, specifically the perception abilities of Czech listeners with regard to the English sound system, presents the theme of this bachelor thesis.

The aim of the thesis is to find out how Czech students perceive English vowels, especially the neutral vowel schwa which is not presented in the vocalic system of standard Czech. The theoretical part focuses on the description of the processes involved in speech perception. The cross-language speech perception is looked into via two speech perception models which clarify why some sounds are perceived with more difficulty than the others. Further, the Czech and English vocalic systems are compared and the main differences are outlined. Schwa, the key element of our research, is described from the phonetic and phonological perspective. Last but not least the notion of negative transfer from the mother tongue and its effect on second language perception is introduced.

The purpose of the practical part is to examine the Czech students' perception of English vowels with special focus on the mid-central English vowel schwa. The main goal of the research is to reveal the strength of negative transfer in the area of vowel perception. As schwa does not have a phonemic status in Czech and Czech speakers often tend to produce full vowels instead of schwa, we wished to find out whether similar tendency exists in schwa perception. We explored this phenomenon using a perception test specifically designed for the purposes of our study. The perception of schwa and other vowels was tested in the first and second syllable of two-syllable words.

THEORETICAL PART

1. Speech perception

Human ability to communicate depends crucially on our ability to hear. Speech plays a major role in our lives, yet almost no speaker knows what she or he does when perceiving and producing sounds. The process of communication consists of encoding the message by the speaker, transmission and decoding it by the listener (Crystal, *Language* 66). This process mirrors in the classification of phonetics into three branches: articulatory phonetics studies which organs and muscles the speaker uses for production, acoustic phonetics analyses the physical properties of sound waves as they travel through the medium of air and auditory phonetics focuses on how sounds are heard (Gut 6).

The two human organs are involved in the perception of speech – the ear and the brain. The knowledge about some of the fundamental processes of speech perception is not complete even today but we will try to simplify what happens during the process of audition. The peripheral auditory system comprises of the outer, the middle and the inner ear. When the sound waves arrive to the outer ear, they continue through the ear canal where they are resonated. Then the acoustic signals reach the middle ear which begins with a membrane called the *eardrum*. It sets the three following interconnected bones, the *auditory ossicles*, into vibration and the sound pressure vibrations are transmitted through the *oval window* to the inner ear. In the middle ear the incoming sound level is amplified or regulated. The mechanical movements from the oval window are passed to the snail-like structure called the *cochlea* – the most important organ for speech perception. It transforms the incoming movements into neural signals which are further passed on to the relevant parts of the brain creating the internal auditory system (Crystal, *Language* 39, Gut 183).

The perception happens only when the auditory sensations are processed by the brain. The electrical signals converted in the cochlea are transmitted, along with the information about the duration, intensity and frequency of the signal, through the auditory nerve to the relevant areas in the brain, especially the *auditory cortex*

which is located in the left hemisphere of the brain and is responsible for the decoding the speech into words and utterances (Gut 189). The part involved in the understanding of speech is called Wernicke's area. The damage to this part causes comprehension difficulties and failures. One of such language difficulties is called *slip of the ear* and it may result, for example, our hearing *great ape* instead of *grey tape.* Those slips, when experienced every day, are language disorders described as *aphasias* which lead to difficulties in understanding and/or producing sounds (Yule 139). Nonetheless, the neurological processes connected with speech perception are not understood absolutely yet and much further research is required to fully comprehend the function of the parts of the brain responsible for sound discrimination (Sebastián-Gallés 546).

One reason why the listener is able to recognise speech is that the speech signal contains a great deal of information for decoding the message. Some parts of this information form the distinguishing features of the signal like different frequencies, pitch, loudness, timbre and vowel quality. Such physical properties are known as acoustic cues (Crystal, *Language* 46).

To state some definitions, the term speech perception refers to the process from the perception of physical sound waves to the determination of the meaning of words (Sebastián-Gallés 547). It is the process in which humans receive and decode spoken language and are able to match certain acoustic cues to a stored representation (Crystal, *Dictionary* 356). The way in which we perceive speech sounds depends on their acoustic structure (Ladefoged and Johnson 6) and is strongly influenced by the speaker's voice and listener's assumptions and expectations about it (Roach, *English* 61). Crystal proposed two views of speech perception according to the role of the listener – the active and the passive. In the former, the listener hears a message and decodes its meaning with reference to how he would pronounce it. The knowledge of articulation thus plays an essential role in speech identification. In the latter, the listener hears a message, recognizes its characteristic features and decodes it by a sensory process of listening which triggers a response in the brain. Both active and passive theories are likely to interact. (Crystal, *Language* 48).

1.1. Infant speech perception

Concerning the first language acquisition, newborn babies are equipped by a wide range of perceptual abilities and recognition of all speech segments. Even one-month-old children are able to discriminate the native-language sounds and non-native contrasts as well. The perceptual detection of contrasts is crucial for the acquisition of the first language phonological system (Brown 15). However, this inborn capacity deteriorates gradually with rising age as children are developing their native language abilities. By ten months the infants are no longer able to recognize non-native segments that are not functional in their native language environment. During the first year of life, children establish and acquire the phonological knowledge of sounds in their language (Segui et al. in Dupoux 196).

2. Second-language speech perception

The acquisition of second language (L2) is different from that of a first language (L1). Adult second language learners have a great difficulty achieving the same native competence like children while learning their first language. Most researchers agree that the native language plays a role in second-language acquisition (Brown 5). According to a large body of evidence in the area of L2 acquisition perception precedes production so potential difficulties with perception may be reflected in production of foreign sounds (Llisterri 92). One example supporting this argument is *phonological symmetry* which describes the phenomenon when the learner is able to hear the sound errors but it does not guarantee that he will be able to avoid them in production (Neufeld qtd. in Escudero 110). On the other hand, some studies have questioned the precedence of perception as there exists some evidence that perception may lag behind accurate production. However, these findings can be argued on the basis of methodological shortcomings. The majority of studies state that perception needs to be developed before production.

In the second language acquisition, there are aspects similar to those in the first language acquisition, for instance the need to establish the appropriate number of sound categories. Nonetheless, second and first language acquisition differ in

many respects such as the onset of learning a foreign language, constraints affecting mature learners and relationship of phonological systems of two languages (Pennington 111).

The acquisition of a foreign language can be influenced by many factors; those factors can be related to language similarities and differences and the relationship of their sound systems. However, there are also other factors like age of acquisition, use of L1, language input, motivation, goals and amount of exposure, which determine individual differences (Sebastián-Gallés 560). For example, motivation proves to be the second strongest predictor of success in second language learning after aptitude (Gas and Selinker 445).

2.1. Age influence on the speech perception

One of the frequently studied issues concerning speech perception is the influence of age, in particular the age of first exposure to L2 or the age of arrival (AOA) in studies examining immigrants (Flege, *Age Constraints* 78). The statement "earlier is better" is true indeed when learning a foreign language. As many studies show, early bilinguals, who started learning their L2 in childhood, perceive vowels better than late bilinguals, who started learning their L2 after puberty (Flege, *Interactions* 217). For instance, the study of Flege, Bohn & Jang illustrated that the Koreans who started learning English in adulthood had difficulties perceiving and producing certain English vowels such as /æ/ and /ɛ/ like native speakers (1997).

The investigation of age effects suggests that accurate perception of L2 consonants and vowels is limited by the *critical* or *sensitive period* (Gass and Selinker 405). Even though adult learners' cognitive abilities are fully developed, learning the sound system of a foreign language may be demanding for them in contrast to children (Escudero 109). Some studies declare that after the age of 12 - 15, it is impossible to acquire native-like pronunciation because some mechanisms necessary for phonology acquisition become unapproachable after this period (Flege, *Interactions* 219). Even the learners who started learning L2 in the very early age showed some perceptual advantage for their L1 (Sebastián-Gallés 550). According to Yule, the optimal age for acquiring an L2 may be from ten to sixteen when cognitive skills are developed and the flexibility of our language

capacity has not been lost completely (164). The critical period hypothesis (CPH) can be explained by maturational changes when after puberty the brain loses some of its plasticity. However, another assumption is that changes in the L2 performance related to age are based on the interaction of the two sound systems (Flege, *Age Constraints* 79).

Not all researchers (e.g., Grosjean qtd. in Flege, *Interactions* 219*)* support the existence of CPH as there is some counterevidence; some individuals who began learning L2 after the critical period achieved native-like performance. It is important to emphasise that these learners were highly motivated. What is also worth mentioning is that early bilinguals who began learning their L2 before the sensitive period often continue to differ from monolinguals of the L2 in the accuracy of perception of vowels (Flege, *Interactions* 219). They still have some difficulties distinguishing L2 words and also many of them speak their L2 with slight accent (Sebastián-Gallés 550; Yule 164). The question, whether second phonology acquisition is constrained by the critical period after which native-like pronunciation cannot be attained, remains unanswered. Despite the prevalent disagreement, most researchers seem to support Flege's recommendation that the earlier we begin to learn a foreign language, the better (Flege, *Interactions* 222).

Cross-linguistic research in the area of speech perception revealed an interesting phenomenon – that even proficient L2 learners use different acoustic cues to distinguish foreign sound contrasts than natives (Sebastián-Gallés 550). For example, American English native speakers use spectral differences to identify /r/ and /l/, while Japanese speakers employ the information from the temporal domain (Underbakke et al. qtd. in Sebastián-Gallés 550). Another study examining the perception of voicing in fricatives demonstrated that native Swedish and Finnish learners of English may be able to identify L2 sounds correctly but they did not process perceptually the target sounds in the same way as native speakers of English. For native speakers, the distinction between /s/ and /z/ is cued by the co-varying vowel and fricative duration whereas the Swedish learners use only vowel duration as a cue (Flege, *Perception* 261). To summarise, the first and second-language speech perception differ in the way listeners use different acoustic

information. Our ability to use an L2 will never be equal to the ability to use our mother tongue (Yule 162).

2.2. Length of residence

The length of residence (LOR) seems to be closely linked with the age of arrival in an L2-speaking environment and exposure to the target language. However, the LOR did not, by itself, prove to guarantee progress in L2 learning. For the learners who arrive in the L2-speaking environment very young, attend school and enter interactions with native speakers on a daily basis, L2 gradually becomes their dominant language. On the other hand adult speakers tend to maintain their L1 as the dominant language since they tend to communicate with members of their community and have fewer opportunities to use L2. Thus, early and late bilinguals may not receive the same kind of input which is necessary for successful acquisition of L2 (Flege, *Interactions* 219).

2.3. The influence of mother tongue on speech perception

Another important factor influencing L2 speech perception is surely the mother tongue (Brown 5). A variety of studies proposed that L2 speech perception is constrained by the L1 phonological system. Trubetzkoy described the L1 phonological system as a *sieve* through which L2 sounds are filtered. For example it was observed that children learn to value acoustic features of speech in a way ideal for their L1. Thus when learning foreign language, L2 speech input will be *sieved* through L1 features (qtd. in Flege, *Assessing constraints* 4). Núria Sebastián-Gallés (547) talks about perceptual illusions and classifies them into three groups:

1) Deafness – e.g., when Japanese learners cannot hear the difference between English /r/ and /l/; they tend to ignore the contrasting information since the Japanese phonological system has only one phoneme (Flege, *Second Language* 239)

2) Mirage – e.g., when Spanish learners hear the vowel /e/ at the beginning of the English word *string*; they create something which is not present in the speech signal

3) Mutation – e.g., French and English listeners hear /tl/ clusters as /tr/ or /kl/ as they change the sound which does not exist in their native language into another, more familiar sound

In conclusion, the second language perception is highly affected by the learners' native phonetic system. The age of the first exposure, the length of L2 learning and the existence of the critical period may also exert the limited influence. However, there is always a chance to achieve native-like perception in spite of these possible constraints and barriers.

3. Perceptual models

In this chapter the impact of the L1 sound system on L2 perception remains in the centre of our attention. Numerous theories and models have attempted to explain why certain non-native contrasts are perceived more easily than others. Catherine T. Best's Perceptual Assimilation Model and James E. Flege's Speech Learning Model address the question of perceptual sensitivity and try to clarify how L2 sounds are mapped onto L1 sounds (Brown 9).

3.1. Perceptual Assimilation Model (PAM)

The fundamental assumption of the model is that non-native segments are perceived according to their similarities to the native sounds that are closest to them in the native phonological space (Best 193). The PAM proposes that the accuracy in the discrimination of L2 speech sounds depends on how they are perceptually assimilated to L1 speech sounds (Flege, *Assessing* 5). The listener is presumed to detect gestural similarities to the native phonemes. At the same time, the listener is able to detect dissimilarities from the articulatory gestures and in the extremely discrepant cases the non-native sounds can be recognized as non-speech sounds (e.g., choking) (Best 194). The degree of phonetic similarity will influence the accuracy of discrimination of L2 sounds. For example, if a pair of foreign speech sounds is assimilated to two different native phonemes, the discrimination will be better whereas if a pair of sounds are assimilated to a single native phoneme, the discrimination will be poor (Escudero 120).

3.2. Speech Learning Model (SLM)

The model focuses on bilinguals who have spoken their L2 for many years and it claims that some L2 production errors result from inaccurate perceptual targets (Flege, *Second Language* 238). The fundamental idea of the Speech Learning Model (SLM) stems from the observation that "correlations between age of arrival and degree of foreign accent might be due to changes in how the L1 and L2 interact rather than a maturationally-induced loss in the capacity for learning speech". Thus it may be possible to gradually develop speech learning abilities across the whole life span (Flege, *Interactions* 224). The same idea is suggested in various researches indicating that the perceptual system has a high degree of plasticity, therefore even late adults can improve their second-language perceptual skills and acquire new sounds (Sebastián-Gallés 550).

According to SLM, four main constraints exist in the development of L2 sounds. The first factor deals with perceived cross-language similarity. SLM proposes that L2 vowels are perceptually assimilated to L1 phonetic categories. L2 learners evaluate an L2 vowel within an already established L1 vowel category which prevents them from creating new L2 categories necessary for successful L2 acquisition (Flege, *Interactions* 224). For example Spanish adults are able to detect the differences between English /ɪ/ and Spanish /i/, though it may be difficult to hear differences between English /i/ and Spanish /i/ because Spanish learners tend to classify English /i/ as instances of Spanish /i/ (Flege, *Assessing constraints* 14). Another element influencing the creation of new categories is the language distance. The greater the dissimilarity of perceived vowels from the L1 vowel, the more likely a new phonetic category is created for the L2 vowel (Escudero 123). For example, native Spanish speaker is more likely to establish a new phonetic category for English /æ/ than for English /i/ which differs only slightly from Spanish /i/ (Flege, *Second Language* 243).

The second factor is the age of arrival into an English speaking country. Learners with an early AOA tend to have more native-like L2 perception than learners with a late AOA. The more developed L1 categories at the time of arrival happen to be, the more they will block the creation of new L2 categories.

The third factor involves the use of the L1. The frequency of L1 use influences the L2 perception. Learners who spend more time speaking their native language have more difficulty gaining native-like perception skills (Escudero 123).

Finally, the fourth factor represents *common phonological space* in which the elements of L1 and L2 sound systems exist. According to SLM, two mechanisms influence the interaction of phonetic categories: assimilation and dissimilation. When a new category for L2 is not created, the phonetic systems will interact through assimilation; as a consequence a learner may produce the foreign sound as if it were the corresponding L1 sound, with no modification even though the modification is expected when two sounds differ audibly (Flege, *Interactions* 225). To illustrate, a recent study provided evidence for category assimilation in four groups of Italian-English bilinguals comparing production and perception of English /b d g/ in the word-final position with values which are similar to Italian /p t k/. The study shows that Italian speakers did not establish a new category for English /b d g/ and they perceptually assimilated them to the already existing categories for Italian /p t k/ (Flege, *Interactions* 229). When a new category for an L2 sound is created, phonetic systems will interact through dissimilation. As the L2 learner adds a new category for the sound that does not exist in his L1, the combined phonetic system becomes crowded. (Flege, *Interactions* 225). This leads to the proposal that no bilingual can be like monolingual in both languages since they exist at the same time and affect each other mutually (Escudero 124).

4. The neutral vowel schwa

Czech language has fewer vowels than English does (13 versus 20). Specifically, Czech has 10 pure vowels and 3 diphthongs (Palková 170) whilst the English vocalic system contains 12 pure vowels and 8 diphthongs (Gut 63). The most frequent English vowel is schwa /ə/ and it is mainly associated with weak syllables (Roach, *Practical* 76). Schwa does not have a phonemic status in the Czech phonological system, although it is not completely unknown for the students of English. In informal Czech it can occur in reduced or inexplicit pronunciation. The existence of schwa can result from negligent or too fast speech and most frequently occurs between two consonants (e.g. *stabilita* = *stabəlita*) (Palková 325).

Schwa is a mid-central vowel which means that according to the vertical movement of the tongue it is between close and open vowels and simultaneously between front and back vowels in the horizontal position. Schwa is also a lax vowel since it does not need much energy for production. The position of lips when pronouncing it can be described as neutral. The vowel is extremely short (Cruttenden 133) and it forms the peak of unstressed syllables. Schwa frequently creates minimal pairs with zero vowel (e.g. about x bout) or with unaccented /ɪ/ (e.g. affect x effect). It is also the common pronunciation of vowels in weak forms of such words as *a, an, the, to, for, but, and,* etc. (Cruttenden 131).

Any of the vowel letter or combination of letters can represent schwa since it has no regular letter for its own in written texts (Volín 39). Table 1 presents possible spellings of /ə/ proposed by Cruttenden. The most common written form of schwa apart from weak forms is <a> 30%, <o> 24%, <e> 13% and <er> 12%. The vowel can occur in initial, mid and final position (132).

Spellings of /ə/	
Grapheme	**Examples**
a	woman, about, affect
o	oblige
e	gentlemen
er, re	mother, waiter, grocer, batter, mitre
i	possible
u	suppose
ar, or, our, ure	particular, doctor, razor, colour, figure
ou	famous

Table 1. Spelling of /ə/ with example words.

Schwa comprises of different allophones, for example, in the final positions of such words as *China* or *lava* schwa may be articulated in the open-mid central position and creates a strong illusion of /ʌ/ when written with <a>. (Volín 39, Cruttenden 132).

4.1. The vowel reduction

The process of weakening where vowels tend to become more schwa-like is called *vowel reduction* (Roach, *English* 71). Full vowels are centralized and reduced when they occur in unstressed syllables (e.g. /'teləgrɑːf/ become /tə'legrəfɪ/) (Crystal, *Dictionary* 406). A speech with lack of weak syllables and schwa sounds appears unnatural, unpleasant for the listener and it is often difficult to understand (Volín 39). The English stress-timed rhythm, when intervals between stressed syllables are equal regardless the number of intervening unstressed syllables, plays an important role in vowel reduction. Stressed syllables are more prominent since they are louder, longer and different in pitch and quality from the unstressed syllables (Roach, *Course* 86). On the contrary, the Czech language is syllable-timed which means that each syllable tends to have an equal time value. (Roach, *English* 85). In standard Czech all the vowels are full, relatively stable and do not yield the reduction (Palková 170).

It follows that Czech learners may have some difficulties with the perception of schwa. It does not function as a phoneme in Czech and therefore students may tend to mishear it as a full vowel. This is in agreement with Sebastián-Gallés' perceptual illusion called *mutation* (548). Many Czech students also ignore its existence. As a consequence, they may believe not to hear any vowel at all (Volín 39).

5. Testing the perception of vowels

The methodology of the research on vowel perception can include multiple techniques. The question arises whether each individual L2 learner is able to perceptually distinguish all different vowels. Some of the tools frequently used in testing L2 vowel perception are presented in the following paragraphs.

The first one is the identification test in which respondents are asked to identify L2 vowels. The obtained data, usually expressed in percentages, can be easily compared to the native speakers' perception as well as production for further evaluation. Possible difficulties in obtaining perceptual identification scores such as

labelling inconsistencies can be overcome by employing IPA transcription symbols (Flege, *Method* 22).

The second tool is the discrimination test which relies on the learners' ability to distinguish two sounds. The same/different (AX) discrimination test was used for example when French minimal pairs were recorded and presented to English-speaking children. The study showed better discrimination skills with older L2 learners. A special subtype represents categorial test. Participants are asked whether they judge the auditory differences to be examples of different categories. For instance, five tokens of English /i/ and five tokens of English /ɪ/ may be presented in this test to discriminate whether they are same or different (Flege, *Method* 25).

Flege's categorial discrimination test (CDT) is a technique to assess the perception of vowels. It was used in the experiment with 48 late learners of English who were native speakers of Korean, Japanese, Czech, Hungarian, Arabic, Portuguese, German and Dutch. Multiple tokens of English vowels were recorded by native speakers of American English in a /b_t/ context (e.g., /bʊt/, /bɪt/). Fourteen vowel contrast pairs were created – those with diphthongs which are easy to discriminate and those with close vowel pairs which are sometimes confusing even for native listeners. Each vowel was tested with 16 trials (with change or no-change in the vowel pair) and participants were told to circle the odd item if there was any. The purpose of this test was to find out which English vowel contrasts would be difficult for non-native speakers. The experiment gave various results showing differences between and within individual non-native groups. The contrasts depend on how large the L1 vowel system is and on the distance between L1 and L2 phonological systems. For instance, it was not difficult for Czech learners to contrast the /ʊ/-/u/ pair as it was for Korean learners. On the contrary, the /ɑ/-/ʌ/ contrast was difficult for Czechs but not for Koreans. The most likely these difficulties were due to the determination of both English vowels as instances of a single L1 vowel category (Flege, *Method*).

The results of the experiment suggested that to discriminate two English vowel pairs it is necessary to establish two distinct categories for them. The perceptual sensitivity is also related to the L1 background. The CDT is considered

stable as it provides very little change in scores and it supports the view that distinct phonetic categories change slowly over time. Thus the CDT is a usable tool for studying speech learning over a longer period of time. “A large increase over time in the scores obtained for an English vowel contrast might be taken as support for the claim that L2 learners are capable of establishing new phonetic categories for L2 vowels” (Flege, *Method* 39).

PRACTICAL PART

6. Aim and hypothesis

The practical part of the thesis focuses on testing the perception skills of Czech learners of English at three language levels, pre-intermediate, intermediate and upper-intermediate. The aim of the research is to find out the degree of negative transfer from the mother tongue on the perception of neutral vowel schwa. The research investigates to what extent students are influenced by their L1 in the perception of mid-central vowel and if there is any relationship between misperceptions and the fact that the word has a Czech equivalent. Furthermore, the impact of the position of the vowel within the word was examined as well as the representing grapheme. Other effects which might possibly influence the level of perception were also taken into consideration such as the beginning of English learning, length of learning and amount of exposure to the second language.

Based on the previous analysis of available literature presented in the theoretical part, two basic hypotheses were formulated and stated as follows:

1) Czech students will tend to hear full vowels instead of schwa in some words, especially in those which have a Czech equivalent due to the negative transfer from L1.

2) Students at a higher language level will be able to determine the vowel schwa better than students at a lower language level.

7. Method

The perception test was designed and afterwards performed among the Czech learners of English. Firstly, a native speaker was asked to record a list of two-syllable words out of which two thirds contained the target vowel schwa. Secondly, 91 students participated in the discrimination perception test and wrote down the answers. The students were also asked questions concerning their age, length of learning English and regular contact with native speakers. The instructions were given in Czech and the questionnaire was anonymous. The participants were

not told the real focus of the research in order not to influence the results of the test. The attained data were carefully noted, analysed and evaluated by the author of the thesis.

7.1. Preparation of the perception test

The test was created with respect to the main aim of the thesis which is to examine the perception of the English mid-central vowel schwa by Czech learners of English. The form of the test and the division into the vowel families was inspired by the perception test designed by Kristýna Poesová (Poesová, *Vliv* 177). However, different words were used and the test was redesigned for the purpose of the current research. In spite of the fact that the main aim of the task was to test the perception of schwa, other English full vowels were included in order to mask the original intention. All the contained sounds were divided into six vowel groups on the basis of their quality and resemblance. These so called vowel families (Poesová, *Testing* 73) were established in order to simplify the form of the test. In Table 2 these vowel families are introduced along with the key word for each group. The final set of vowels consisted of /ɪ/, /iː/, /ʊ/, /uː/, /e/, /ə/, /ɒ/, /ɔː/, /ʌ/, /ɑː/. The open front vowel /æ/ is not found in the test since it would belong to the both a- and e-family and the respondents could find it confusing. The tense mid-central vowel /ɜː/ was excluded, too.

Vowel family	**Key words**
i-family	tree, fish
o-family	horse, clock
a-family	car, sun
e-family	red, vet
u-family	moon, book
ə-family	b<u>a</u>nan<u>a</u>, <u>A</u>meric<u>a</u>

Table 2. Vowel families and key words

In total, 48 words were examined from which 32 included schwa. The perception test was divided into two parts according to the occurrence of the vowel in the first or second syllable. Four example words for each part were presented to

make participants familiar with the procedure. The subsequent criteria were followed when selecting the language material, namely the items with schwa.

Firstly, the words were selected according to various positions of the target vowel within the syllables. Only two-syllable words were chosen which means that the vowel could occur in the 1st syllable in the initial or non-initial position and in the 2nd syllable in the non-final or final position (see Table 3). Secondly, the attention was paid to the balanced representation of various graphemes in both syllable positions. Both familiar and less familiar words were used. The less known items were aimed to ensure that the respondents do not rely on their knowledge of the pronunciation and that they focus on what they actually hear instead (Poesová, *Testing* 74). Finally, at least half of the words containing schwa were intended to have common Czech equivalents in order to test the degree of negative transfer from L1 on the perception of L2 (see Table 4). Both versions of the test, the teacher's version with all the words and the respondents' answersheet can be seen in Appendix 1 and 2.

Position of the vowel		**Examples**
1st syllable	initial	across
	non-initial	problem
2nd syllable	non-final	level
	final	China

Table 3. Position of the vowel schwa within syllables.

Schwa words with Czech equivalents						**Schwa words without Czech equivalents**	
English	**Czech**	**English**	**Czech**	**English**	**Czech**		
police	policie	complete	kompletní	wagon	vagón	accord	leper
pistol	pistole	suspend	suspendovat	campus	kampus	per cent	valance
data	data	profess	profese	vulgar	vulgární	ferment	potent
success	sukses	offend	ofenzíva	Peru	Peru	purvey	enter
system	system	present	prezentovat	vodka	vodka	parole	
terror	terror	adopt	adoptovat	atlas	atlas	serene	
motor	motor	absorb	absorbovat	control	kontrola	rectum	

Table 4. Schwa words with and without Czech equivalents.

Altogether, eighty six words were chosen to be taped, 55 including schwa and 31 including other vowels. The final number of tested words was established to be 48 plus 8 examples. Nevertheless the list of recorded words was extended because of expected errors caused by background noise or different pronunciation. All recordings were made by a 23-year-old male speaker from Lowton, Northern England. The origin of the native speaker influenced the pronunciation of some words, for example the word *public* was pronounced with /ʊ/ in the first syllable instead of the standard British vowel /ʌ/. This regional variation was not in conflict with the purpose of the perception test.

The native speaker was given some time to read the words before the recording took place. The recordings were made indoors using the Samsung Galaxy S2 mobile in MPEG-4 format by the author of the thesis. Each word was recorded twice with the attention paid to the speed of reading and production of falling intonation. The recordings were then converted to WAV format and adjusted in AUDACITY 2.0.5 programme. The background noise was removed, the words were rearranged and interspersed with adequate intervals of silence. In the final perception test each item is introduced with a bell ring followed by two repetition of the word. Before burning the test to a CD, two Czech female students of English, a friend and a family member of the author, piloted the perception test in order to confirm the comprehensibility of instructions and appropriateness of timing. As a result of the piloting phase, the spaces between the words were slightly lengthened. The final structure of the perception test is: bell ring – 0,6 ms pause – word – 1,5 ms pause – word – 2 ms pause. The purpose of the longer pause after the second repetition was to give the respondents enough time to circle the symbol representing the vowel family.

The answersheet for students does not contain the written form of the words, therefore the direct influence of the graphemes on the perceived sounds was partly eliminated. It consists of lines of vowels representing the examined vowel families (i – o – a – e – u – ə). The respondents' task in this discrimination perception test was to circle one out of six symbols.

7.2. Participants

In total, 91 students participated in the research. All of them were Czech speakers studying English as a second language. There were 55 females and 36 males involved in the test at the age of 12 - 20. From all the participant 87 forms were analysed as some students gave irrelevant data, did not fill in any schwa or focused on the wrong syllable.

All respondents attended lower- or upper-secondary schools located in Prague. Overall, eight English classes were attended and the average number of students in one class was 11. Three language levels were evaluated; the first group of 29 students at pre-intermediate level with some lower-intermediate learners, the second group of 47 students at intermediate level and the third group of 11 students at upper-intermediate level. The average length of learning English was 7,5 years in the first group, 8,7 years in the second one and 9,3 years in the third one.

7.3. Procedure

Accurate instructions for assigning the test were described and followed by the author of this work as it was very important to secure the same conditions for the testing in all classes. Firstly, the author welcomed the participants and introduced the concept of vowel families which were written on the board. The students were then invited to divide the key words into these families. The author wanted to be sure that they fully understand the idea of vowel families and at the same time she wanted to involve them actively and engage their attention and curiosity. Secondly, the participants were instructed to focus specifically on what they hear and they were warned that they may not know all the words which should not startle them. Thirdly, the structure of the test was explained to the participants: the test contains two parts – in the first part the sound in the 1st syllable is explored, in the second part it is the sound in the 2nd syllable; each word is heard twice and individual items are separated by the bell sound.

The answersheets were distributed and the students were asked to fill in the four initial questions. Then their attention was drawn to the discrimination of sounds in the first syllable. Next, four example words were played, the respondents circled the sound they heard and their answers were immediately checked. The

answersheets included only lines of vowel families with no visual support of the tested words. During the test the recording was stopped after the first six words, the author made sure that the students had no problems with the task and reminded them to focus on the sound in the first syllable. The same procedure was repeated in the second part of the test. Both parts included twenty four words.

The collection of the data took place during the English lessons after the previous arrangement with individual teachers. The total length of the test including introduction, explanation, examples and completion took around 15 minutes. All data were anonymous. The testing passed off without any problems in all classes. All the data gained from the answersheets were carefully noted down using the Microsoft Excel 2007 programme and subsequently analysed.

8. Results and discussion

In this part of the thesis the results of the analysis will be presented and evaluated from different perspectives. Firstly, we will look if the position of the target vowel within the examined words has any impact on the perception of Czech listeners. Secondly, we will be interested if the existence of Czech equivalents influences the perception of the target sound. Thirdly, we will compare the results in the perception of three groups of respondents which were established according to the language level. We will also comment on the nature of selected misperceptions. The results presented in this part are followed by a short discussion after each section.

8.1. The perception of schwa

Figure 1 shows the results of perception in words with schwa in the first syllable. The average percentage of correct answers was 41 %. The words with the highest degree of schwa identification were *offend, accord, per cent, ferment, purvey, parole, success* and *adopt* (between 50-65 %). In 2 out of 16 items (*complete* and *control*) the correct perception reached 3,4 % which means that only 3 respondents circled the right answer in each word. The third worst result was found in the word *police* with 10 % of the right schwa perception.

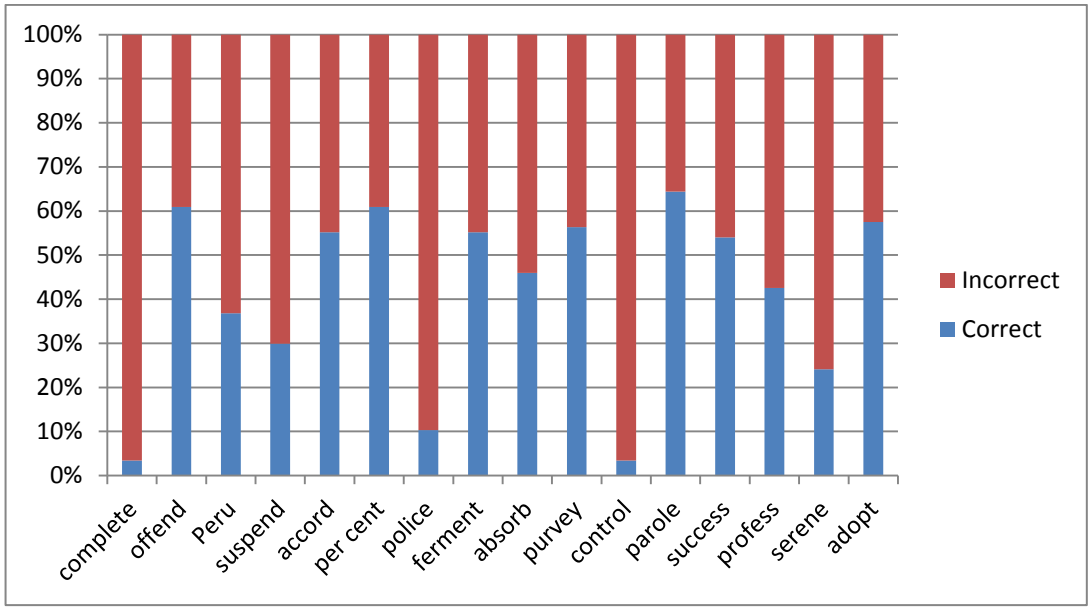

Figure 1. The results of students' perception of schwa in the first syllable.

The overall degree of schwa identification slightly improved in the second syllable (Figure 2). In 47 % the students perceived the target vowel correctly. The words with the best results (above 70 %) were *leper* and *enter*, followed by *data, wagon* (60-70 %) and *rectum, system, motor, potent* (50-60%). The items with the lowest percentage of successful schwa perception (10-20 %) were *pistol, vodka* and *atlas.*

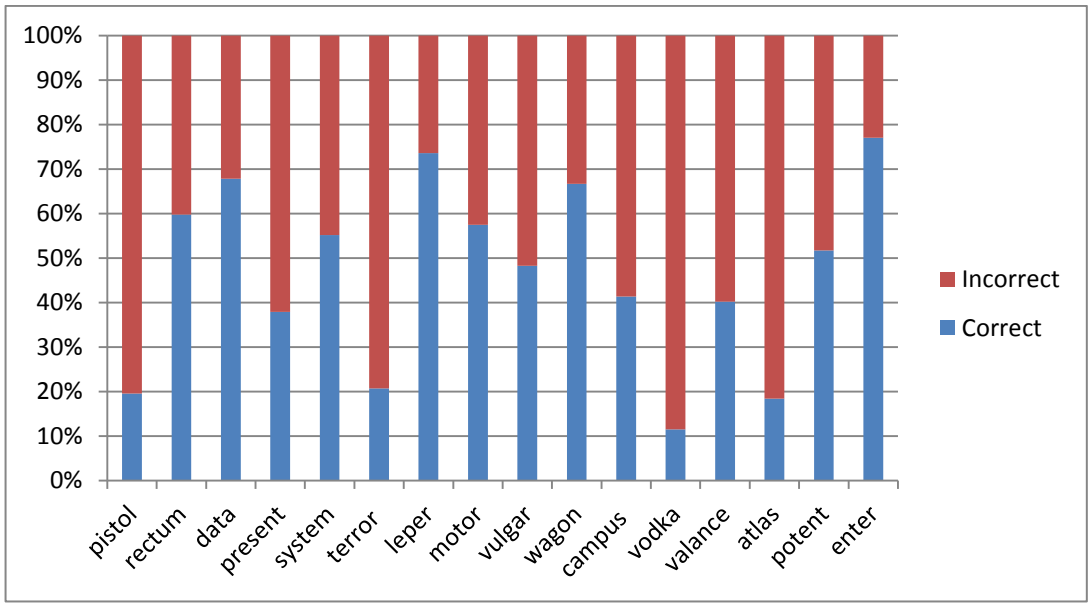

Figure 2. The results of students' perception of schwa in the second syllable.

Figures 1 and 2 above show that the perception of schwa was slightly more successful within the second syllable. Nevertheless, taking into consideration all words containing schwa, the overall success rate was below 50 % while the correct perception of words with full vowels reached 82 % (see Appendix 3). The data from the initial analysis confirmed that Czech listeners have difficulties identifying the reduced vowel schwa in two-syllable words and that even perception of English full vowels was not flawless.

8.2. Schwa in different positions within syllables

The next analysis focused on the perception of schwa occurring in various positions within syllables. Therefore we divided the items into those having schwa in initial, non-initial, final and non-final positions. Figure 3 and 4 illustrate that the words with schwa in initial position yielded more consistent results than those with schwa after a consonant. The rate of schwa recognition was 55 % in initial and 37 % in non-initial positions.

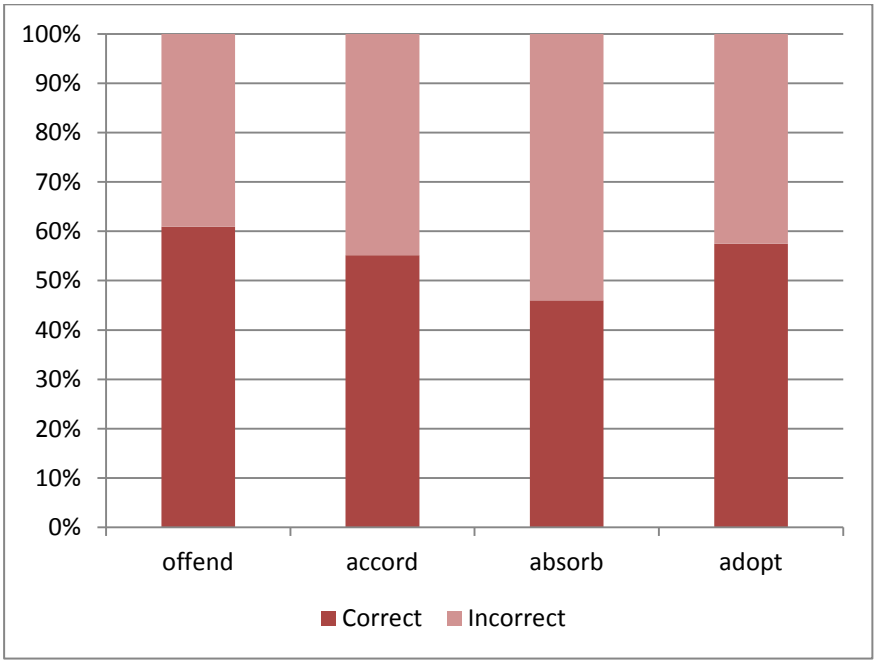

Figure 3. The perception of schwa in the initial position.

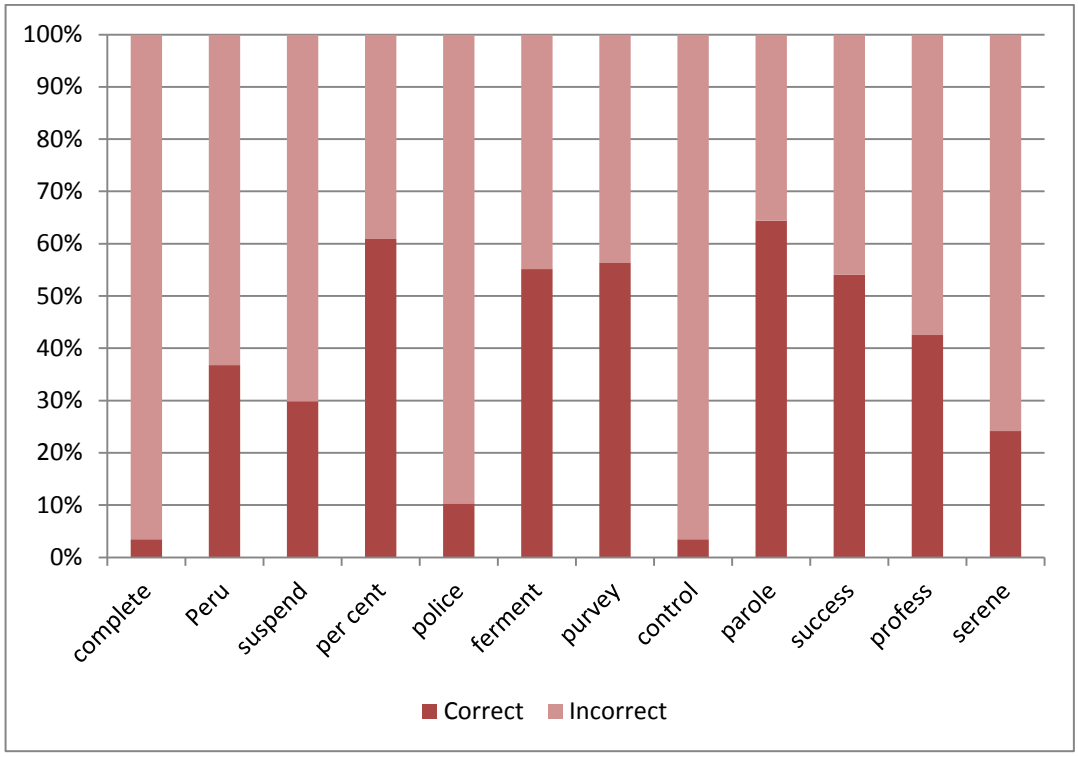

Figure 4. The perception of schwa in the non-initial position.

Looking at Figure 4 one may observe that the perception of words with schwa in non-initial position and with the grapheme <o> reached significantly lower scores than other words. While in *complete, police* and *control* schwa was largely misperceived, the respondents achieved much better results in the rest of the words (between 30-60 %). The existence of Czech counterparts (*kompletní, policie, kontrolovat*) may have influenced the extremely low scores in the discussed words.

Figures 5 and 6 display the perception of schwa in final and non-final positions respectively. The target sound was recognized a bit more frequently in final (50,9 %) than in non-final positions (43,4 %). Schwa in final position was most successfully perceived in the words *leper* (73,6 %) and *enter* (77 %). Both words share the spelling <er>. The striking difference between the words *data* (67,8 %) and *vodka* (11,5 %) seems difficult to interpret since both words have the same graphemic representation and they have Czech equivalents, too. Schwa in non-final position was correctly identified mainly in words having a nasal in the coda, the successful rate for *rectum, system, wagon* and *potent* ranged between 50 and 65 %.

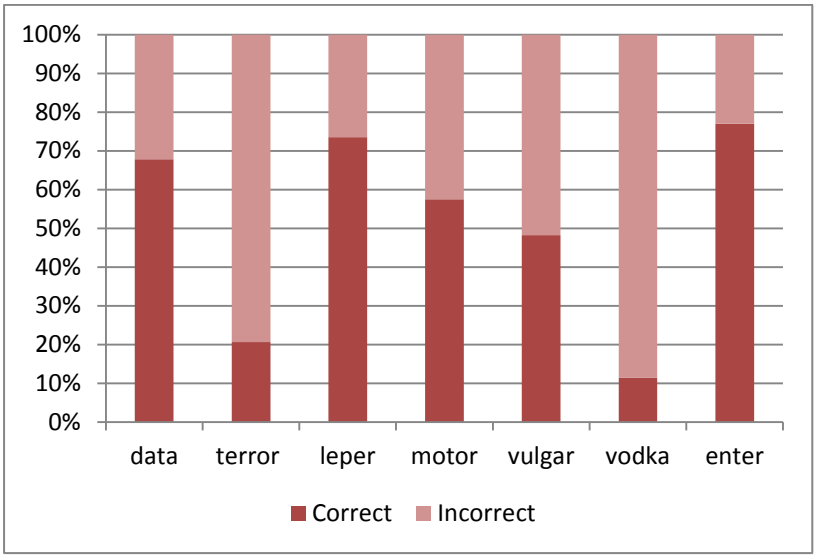

Figure 5. The perception of schwa in the final position.

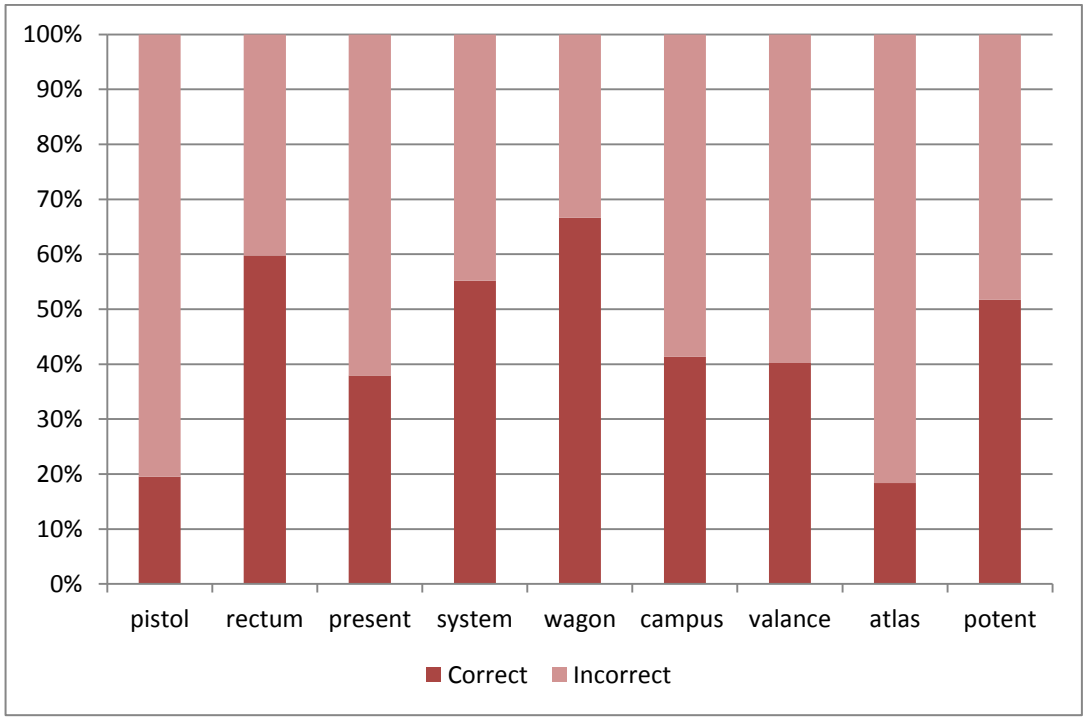

Figure 6. The perception of schwa in the non-final position.

The results depicted in the previous figures demonstrate that perception of schwa in initial and final positions appears to be more accurate than in non-initial and non-final environments. This tendency may suggest that the target vowel is more easily identifiable when it is not preceded or followed by consonants.

8.3. Words with and without Czech equivalents

Although the number of items with and without Czech counterparts is not equally balanced in our sample, we can observe a certain tendency in the data. The respondents perceived schwa more successfully in words without Czech equivalents (56,2 %) than with (37,6 %). However, the difference is rather small. Figure 7 shows that in the first syllable most problems in the perception of schwa concerned the words with the grapheme <o> in non-initial position. The negative transfer from the mother tongue seemed to operate in the items *complete* and *control.* On the other hand, the word *parole*, in which schwa was best perceived, does not have a Czech equivalent.

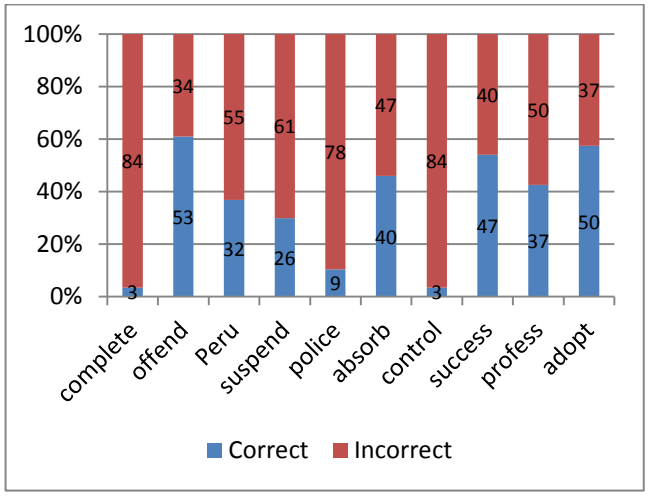

Figure 7. The perception of schwa in the first syllable of English words **with** Czech equivalents.

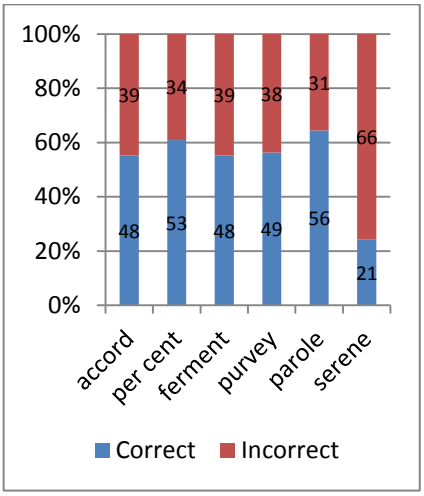

Figure 8. The perception of schwa in the first syllable of English words **without** Czech equivalents.

As we can see in figures 9 and 10, the perception of schwa in the second syllable of words without Czech equivalents was more successful (60,5 %) than the perception of words with them (40,4 %). The difference seems to be similar to the previous comparison.

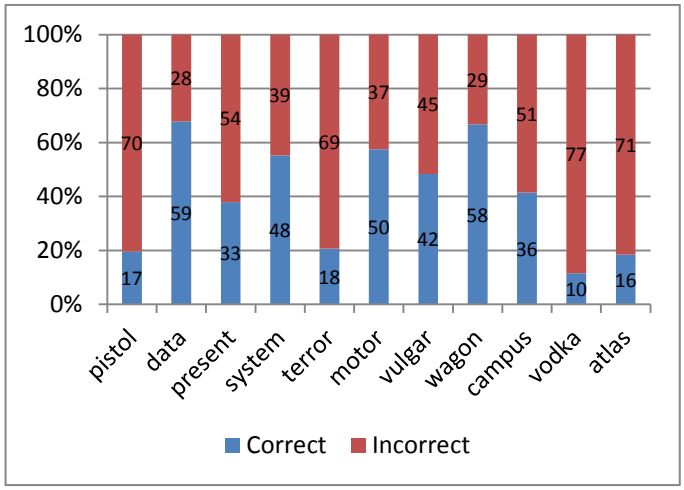

Figure 9. The perception of schwa in the second syllable of English words **with** Czech equivalents.

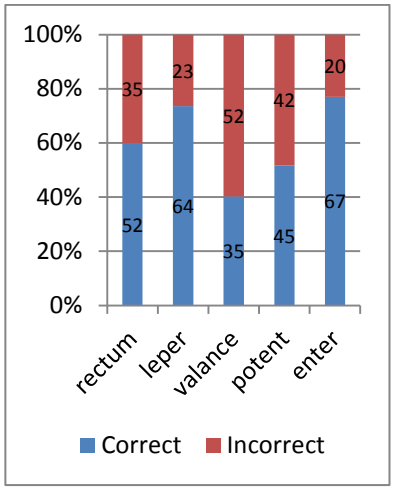

Figure 10. The perception of schwa in the second syllable of English words **without** Czech equivalents.

Figure 9 shows that the worst perceived expression in the group with Czech equivalents was *vodka* with only 10 correct answers and the best one was *data* with 59 correct answers. Figure 10 demonstrates that the worst perceived word among those without equivalents in Czech was *valance* with 35 correct answers and the best perceived one was *enter* with 67 correct answers.

The above mentioned results seem to be surprising since it was expected that the words with Czech equivalents and those with schwa in the final position represented by the grapheme <a> would be greatly misperceived due to the strong influence of the Czech language. The second assumption was supported by the fact that schwa at the end of the words with *a*-grapheme is phonetically similar to /ʌ/ sound (Cruttenden, 132). In the word *vodka* the misperception was in accord with the original expectation, however the high percentage of successful identification of schwa in the item *data* goes against the described pattern. The contrast between the perception of these two words may be due to the different production in English. The first syllable in the word *data* is pronounced differently in English than in Czech, thus the respondents may not have linked it with its Czech counterpart. The first syllable in the word *vodka* is pronounced almost the same in both languages, therefore the negative influence might have been more direct.

As we could notice from the results above the least successful perception was registered in the words *complete, police* and *control*. All these words have

Czech equivalents. Figures 11, 12 and 13 illustrate that the majority of students perceived the o-vowel in all three words. It was 83 % of cases in *police*, 92 % in *control* and 95% in *complete*.

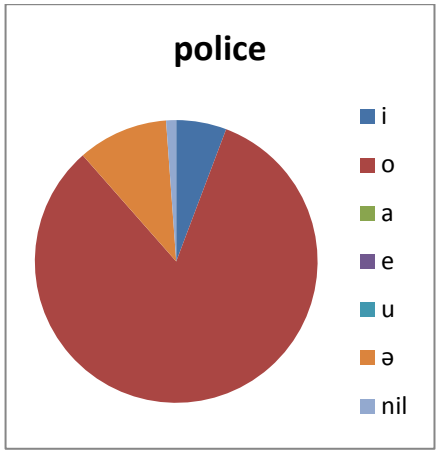

Figure 11. The perception of schwa in the word *police*.

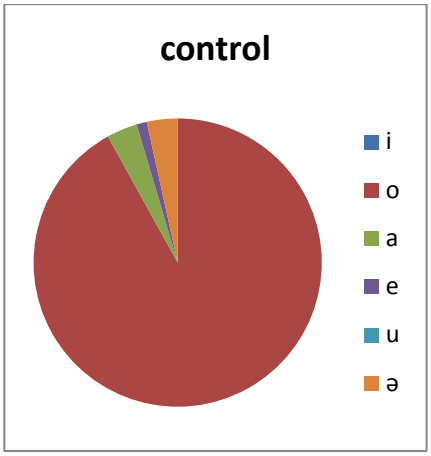

Figure 12. The perception of schwa in the word *control*.

Figure 13. The perception of schwa in the word *complete*.

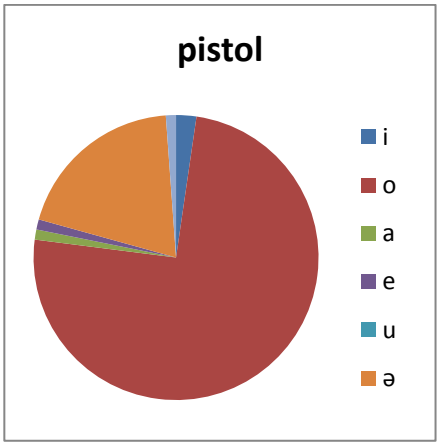

Figure 14. The perception of schwa in the word *pistol*.

Figure 14 shows that the word *pistol*, including also the grapheme <o>, was perceived as o-quality in 75 % of cases. Twenty per cent of students perceived the correct vowel /ə/. The words *vodka* and *atlas*, both with grapheme <a>, were heard mostly as a-quality, in 80 % of cases in *vodka* and 43 % of cases in *atlas*, as one can see in the figures 15 and 16. The word *atlas* was one of the most contradictory words. Apart from a-quality, the perceived vowels were identified as e-sound and /ə/ in 18 % of cases, o-sound in 14 % of cases and u-sound in 6 % of cases.

Figure 15. The perception of schwa in the word *vodka*.

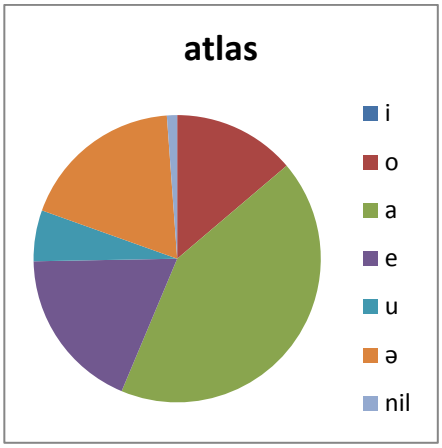

Figure 16. The perception of schwa in the word *atlas*.

Figures 17 and 18 demonstrate two other contradictory words both with Czech equivalents and with the target vowel schwa in the first syllable. The word *accord* was perceived correctly with /ə/ in 55 % of cases. The misperceived vowels belonged to a-type in 17 % of cases, e-type in 16 % of cases and o-type in 11 % of cases. One student perceived i-quality instead of /ə/. The word *success* was heard with /ə/ in 54 % of cases, u-sound in 16 % of cases, a-sound in 15 % of cases and i-sound in 6 % of cases. The equal misperception of schwa as either a- or u-vowel quality nicely reflects the two frequent productions of the word *success* in Czech.

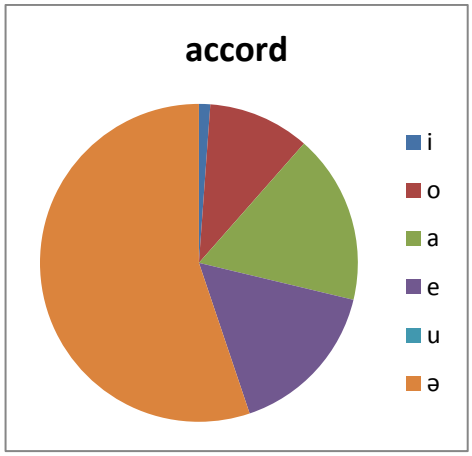

Figure 17. The perception of schwa in the word *accord*.

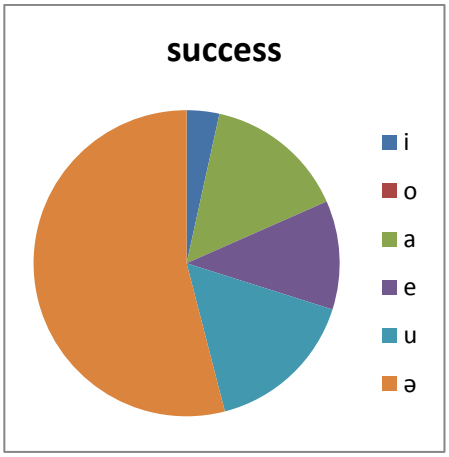

Figure 18. The perception of schwa in the word *success*.

To conclude, the three most frequently misperceived words have the grapheme <o> in the non-initial position and their Czech equivalents are quite

common words used in everyday language. The results also imply that there may be some negative transfer from the mother tongue which is supported by worse results in schwa perception in the words with Czech counterparts.

8.4. Language level of the respondents

The last analysis focused on the perception of students with different language levels. Figure 19 shows that the differences between individual groups turned out to be rather small. Nevertheless, they followed the expected pattern – the higher the language proficiency, the better ability to perceive the vocalic elements. The pre-intermediate respondents perceived correctly 54 % of all vowels, the intermediate students identified 57 % and the respondents at the upper-intermediate level recognized the vowel quality in 61 % of all cases. The same proportions were found in the perception of schwa; 40,4 %, 44,5 % and 51,4 % respectively (see figure 20).

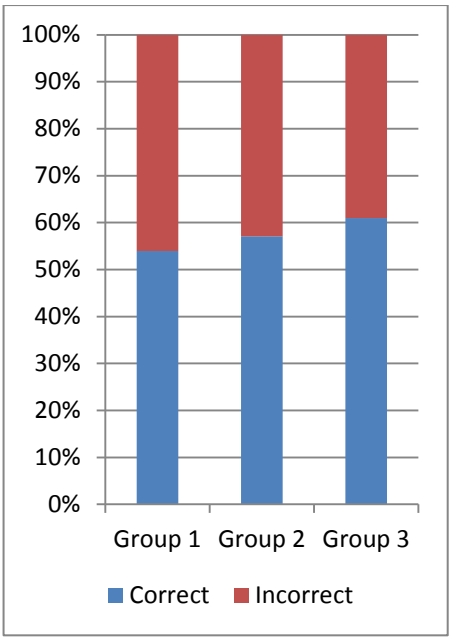

Figure 19. The perception of all examined vowels by students at three different language levels. Group 1 – pre-intermediate, Group 2 – intermediate, Group 3 – upper-intermediate.

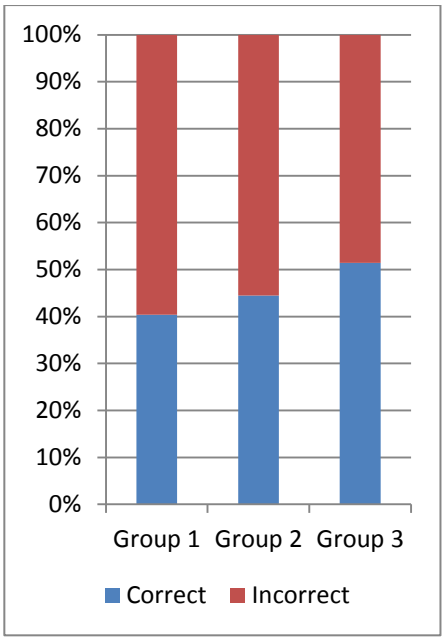

Figure 20. The perception of schwa by students at three different language levels. Group 1 – pre-intermediate, Group 2 – intermediate, Group 3 – upper-intermediate.

The regular contact with native speakers did not prove any advantage in the examined area. The percentage of correct answers of both groups, with and without contact, was completely the same – 56 %. One of many possible reasons of such

outcome may result from the fact that for 27 students out of 31 who stated to have the contact with a native speaker, the native speaker was their teacher of English conversation. No tendencies were found between age or gender and the number of misperceived words.

Conclusion

The thesis investigated the perception of the neutral vowel schwa by Czech students of English within two-syllable words. At the beginning of the practical part the two original hypotheses were formulated. The first hypothesis suggested that in the perception test Czech students will tend to hear full vowels instead of schwa in some words, especially in those which have Czech equivalents due to the negative transfer from the mother tongue. This hypothesis was more or less confirmed since on average only 44 % of schwas were perceived correctly. The respondents heard full vowels instead of schwa quality which often corresponded to the graphemic representation. The perception of words with Czech equivalents turned out to be slightly more difficult than the perception of the expressions without Czech equivalents. Especially schwas in the first syllable were perceived as full vowels. Moreover, the words with schwa in initial and final positions inclined to have better results than those with schwa preceded or followed by a consonant.

The second hypothesis, that students at a higher language will be able to perceive schwa better than the students at a lower level, did not prove to be confirmed. In fact, the differences between the perceptions of students at three language levels were too small. Nevertheless, the data suggested that more advanced students perceive the reduced vowel better than their colleagues at a lower language level.

The results of the research at least partly correspond with the information provided in the theoretical part of the thesis; the students' perception tends to be constrained by their first language phonological system. The importance of pronunciation teaching including speech perception tasks should be highlighted at Czech schools since the lack of perception skills may cause difficulties with production and subsequently forestall the Czech students to acquire near native-like performance in English.

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Appendices

Appendix 1

Teacher's version of the test

Percepční test

Angličtina má 12 samohlásek a 8 dvojhlásek. Nás dnes bude zajímat 10 z nich – takových, které můžeme rozdělit do 6ti samohláskových rodin (přečíst rodiny a napsat na tabuli):

i – o – a – e – u – ə

Do které z těchto skupin patří samohláska ve slově **horse**? (Přečíst následující slova a položit stejnou otázku – do jaké rodiny patří): **vet, clock, tree, car, moon, red, sun, fish, banana, book** (připsat každé slovo ke správné rodině již napsané na tabuli)

Soustřeďte se na to, co slyšíte. Nevadí, když slova nebudete znát.

Test: Každé slovo uslyšíte **dvakrát**. Jedná se o dvouslabičná slova. Nový výraz vždy oznámí zvuk zvonku. (Zdůraznit, že se mají soustředit na 1. slabiku (otázka Na kterou slabiku se soustředíme?) a na to, co uslyší.)

A) Samohláska v první slabice.

example 1 army (a)

example 2 perplex (ə)

example 3 brunette (u)

example 4 chevron (e)

Je všechno jasné? Stále se soustředíme na zvuk, který slyšíme v první slabice.

1. pudding (u)
2. Britain (i)
3. complete (ə)
4. offend (ə)
5. Peru (ə)
6. suspend (ə)
7. accord (ə)
8. lobster (o)
9. per cent (ə)
10. army (a)
11. police (ə)
12. ferment (ə)

13. absorb (ə)
14. larva (a)
15. purvey (ə)
16. lucid (u)
17. control (ə)
18. parole (ə)
19. leeway (i)
20. success (ə)
21. profess (ə)
22. serene (ə)
23. menace (e)
24. adopt (ə)

B) Samohláska ve druhé slabice (Zdůraznit, že se soustředíme na samohlásku ve 2. slabice)

example 1 voman (ə)

example 2 accord (o)

example 3 depend (e)

example 4 English (i)

Zopakovat, že se soustředíme na druhou samohásku.

1. pistol (ə)
2. rectum (ə)
3. succeed (i)
4. data (ə)
5. present (ə)
6. alarm (a)
7. system (ə)
8. terror (ə)
9. leper (ə)
10. absorb (o)
11. profess (e)
12. motor (ə)
13. vulgar (ə)
14. cigar (a)
15. wagon (ə)
16. campus (ə)
17. defog (o)
18. vodka (ə)
19. valance (ə)
20. atlas (ə)
21. potent (ə)
22. parking (i)
23. enter (ə)
24. delude (u)

Appendix 2

The students' answersheet

Poslechový test

věk:___ kolik let se učíš anglicky:___

pohlaví:___ pravidelný kontakt s rodilým mluvčím:___

Každé slovo uslyšíte **dvakrát**. Nový výraz vždy oznámí zvuk zvonku.

A) Do jaké rodiny patří samohláska v **první** slabice? Zakroužkuj vždy jednu samohlásku.

example 1 i – o – a – e – u – ə

example 2 i – o – a – e – u – ə

example 3 i – o – a – e – u – ə

example 4 i – o – a – e – u – ə

1. i – o – a – e – u – ə
2. i – o – a – e – u – ə
3. i – o – a – e – u – ə
4. i – o – a – e – u – ə
5. i – o – a – e – u – ə
6. i – o – a – e – u – ə
7. i – o – a – e – u – ə
8. i – o – a – e – u – ə
9. i – o – a – e – u – ə
10. i – o – a – e – u – ə
11. i – o – a – e – u – ə
12. i – o – a – e – u – ə
13. i – o – a – e – u – ə
14. i – o – a – e – u – ə
15. i – o – a – e – u – ə
16. i – o – a – e – u – ə
17. i – o – a – e – u – ə
18. i – o – a – e – u – ə
19. i – o – a – e – u – ə
20. i – o – a – e – u – ə
21. i – o – a – e – u – ə
22. i – o – a – e – u – ə
23. i – o – a – e – u – ə
24. i – o – a – e – u – ə

B) Do jaké rodiny patří samohláska v **druhé** slabice? Zakroužkuj vždy jednu samohlásku.

example 1 i – o – a – e – u – ə

example 2 i – o – a – e – u – ə

example 3 i – o – a – e – u – ə

example 4 i – o – a – e – u – ə

1. i – o – a – e – u – ə
2. i – o – a – e – u – ə
3. i – o – a – e – u – ə
4. i – o – a – e – u – ə
5. i – o – a – e – u – ə
6. i – o – a – e – u – ə
7. i – o – a – e – u – ə
8. i – o – a – e – u – ə
9. i – o – a – e – u – ə
10. i – o – a – e – u – ə
11. i – o – a – e – u – ə
12. i – o – a – e – u – ə
13. i – o – a – e – u – ə
14. i – o – a – e – u – ə
15. i – o – a – e – u – ə
16. i – o – a – e – u – ə
17. i – o – a – e – u – ə
18. i – o – a – e – u – ə
19. i – o – a – e – u – ə
20. i – o – a – e – u – ə
21. i – o – a – e – u – ə
22. i – o – a – e – u – ə
23. i – o – a – e – u – ə
24. i – o – a – e – u – ə

Děkuji Vám za spolupráci a přeji příjemný zbytek dne ☺

Appendix 3

The results of students' perception

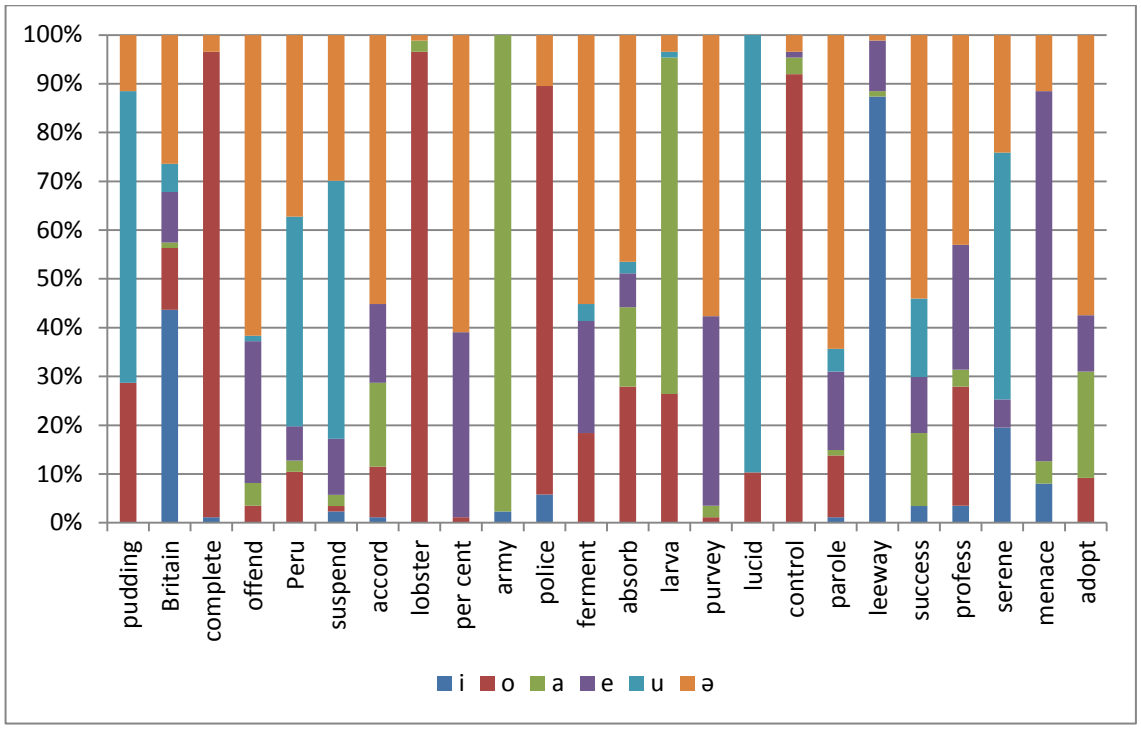

Figure 21. The perception of vowels in the first syllable by Czech students of English.

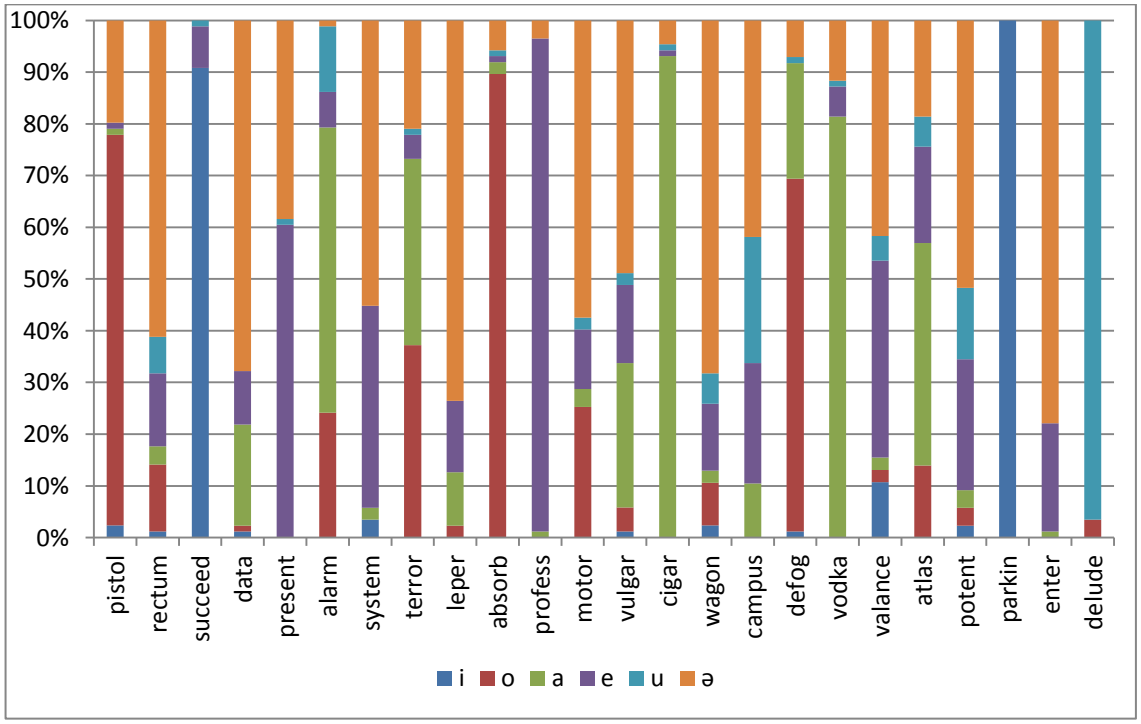

Figure 22. The perception of vowels in the second syllable by Czech students of English.

Appendix 4

A CD with the recordings used for the research is attached to the thesis.