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Zdena Kralova – Julius Zimmermann *

SLOVAK-ENGLISH VOCALIC APPROXIMATION

The article is focused on the quality of English pronunciation of Slovak native speakers reflected in the formant structure of their short English vowels compared to the reference formant values of short English and Slovak vowels. The primary objective is to detect the level of phonic approximation within the system of English short vowels.

Key words: Pronunciation. Slovak. English. Short vowels.

1. Introduction

Besides the dominating behaviorist and structuralist theories of the Second Language Acquisition a new concept of the second language (L2) acquisition was formulated in the 1960s – the theory of interlanguage [1–5]. Some other names used for the interlanguage phenomenon are: transitive competence [1], approximative system [4], idiosyncratic dialect [6], multicompetence [7], transmitting or the third system [8].

The theory of interlanguage considers a foreign language competence to be a process of an autonomous language code creation which gradually (successively or continually) approximates to the foreign language quality in the process of qualitative and quantitative improvement [9]. Thus the interlanguage is a synchronic profile of a diachronic process of L2 acquisition/learning.

Interlanguage (current language competence of an individual) has some features of an idiolect and a dynamic character, therefore a mistake is considered part of language development [10]. Ideally, the interlanguage consists of less and less features of the mother tongue (L1) and of more and more features of the foreign language. The transitive intercode should reflect the potential quality of a L2 competence in 1–100% interval [8]. But, in fact, stagnation and fossilization are much more frequent.

Early trends in the Second Language Acquisition research considered mistake a negative phenomenon and the L2 sounds produced by a non-native speaker were evaluated as correct or incorrect discrete entities. Today, mistakes are thought as a continuum of approximations towards L2 sounds which is influenced by the current language competence more than by the language interference [11].

The Phonological Translation Hypothesis [12] analogically claims that the dominance of L1 sound system is a more probable reason of non-authentic L2 pronunciation than restrictions resulting from the neuro-physiological maturity of an individual. The Upper Limit/Level Hypothesis [13] similarly says that there exists a maximum limit of similar L1 and L2 sounds approximation, where the speakers mix L1 and L2 quality of phones (Merger Hypothesis) [14], but usually do not reach the authentic pronunciation of a native speaker.

Apart from the presupposition that each non-native speaker has an upper limit of approximation to the target level of pronunciation [13], some experiments [14–16] proved the possibility of continuous improvement in L2 phonic competence. Thus the phonetic categories should be gradually optimized and created before the equivalent phonological categories are created. According to L. J. Dickerson [16] the most significant pronunciation deviations are being eliminated first in this process. The close approximations seem to be the most persistent ones. According to the theory of language interference [17], the interlingual identification of sounds significantly contributes to the upper limit of approximation.

Phonological differences between L1 and L2 are not the only ones (or the most important) determinants of L2 sound production quality. The learners must acquire a new complex of articulatory gestures and modify the existing phonetic models, while they often produce the scale of sound variants for one phoneme – a continuum of approximations to the prototype L2 sounds. The phonic interference thus inhibits the approximation to the target system via similarity and difference of elements. The interference is one of the interlanguage phenomena and one, but not the only, reason of non-authentic L2 pronunciation.

2. Methodology

We focused on the quality of English pronunciation of Slovak speakers and its reflection in the formant structure of short vowels.

* **Zdena Kralova[1], Julius Zimmermann[2]**
[1] Department of English Language and Literature, Faculty of Humanities, University of Zilina, Slovakia; zdena.kralova@fpv.uniza.sk
[2] Department of Slovak Studies, Slavonic Philologies, and Communication, Faculty of Arts, P. J. Safarik University in Kosice, Slovakia

Our primary objective was to detect the level of the qualitative approximation of the short English vowels produced by Slovak speakers to the English reference values. The Slovak language is considered primary, native, dominant and interfering system (L1) and the English language is the secondary, non-native, non-dominant, interfered system (L2). We recorded spontaneous English monologues of the Slovak speakers. Then we segmented short English vowels from each text and we experimentally analyzed the values of the first and the second formants of seven short English vowels. Then we statistically compared the detected F1 a F2 values and the reference values of the given vowels mentioned in the relevant phonetic publications [18, 19] for the phonic approximation.

Subjects

We worked with the group of 40 Year 1 students (30 female, 10 male) all enrolled in the study program of English Language and Literature at the Faculty of Humanities, University of Zilina, Slovakia. The average age of the respondents was 19, they all were of Slovak nationality, their mother tongue was Slovak and they all reported normal hearing dispositions. Their average English lexical and grammatical competence was at B1 and B2 levels of the Common European Framework of Reference for Languages (CEFR) [20]. Most of them started learning English at the first level of elementary school with a non-native English teacher. Most of them have never stayed in an English-speaking country for a longer period.

Material

The recordings of the English monologues of each of the 40 respondents (average length 3.8 minutes) were the basic research material. To maintain a similar lexis and style of the respondents' utterances we chose an autobiographical topic. We considered spontaneous speech more natural than reading isolated lexical units. Though the canonic (non-coarticulated) form of vowels is the most suitable for the experimental analysis, we tried to simulate the real L2 performance in which the speaker concentrates more on the content than on its phonetic form. The dialogue with a native speaker would have corresponded with real communication better, but for the practical reasons we chose a one-way type of communication.

Because of the great formant variation of each individual and a relatively high contextual variability (transgresivity) of vowels it was necessary to respect the specificity of the speaker and to define the resulting data according to several measurements of several speakers. Concerning the type of text it was not always possible to keep the context compatibility and the preceding and following segmental environment in all analyzed units [e.g., 21]. The input data for the experimental analysis were segmented from the corpus of spoken texts in English. We selected each of the seven short English vowels /*I*/, /*e*/, /*æ*/, /Λ/, /*D*/, /ʊ/, /*ə*/ in five different manifestations from each text.

Procedure

a) We recorded the spontaneous English monologues of each respondent using a condenser microphone.
b) We segmented the short vowels from the texts.
c) The segments were experimentally analyzed in the Speech Analyzer system.
d) The results of the experimental analysis were statistically analyzed.

3. Results

We chose the formants of short English vowels as the locus of the English phonic competence dynamics. The selected segments were experimentally analyzed, in the Speech Analyzer program (Version 2.7) SIL International. JAARS – ITS, Waxhaw, NC.

The units of the corpus were analyzed by oscillography, spectrography and spectral analysis. In our phonetic research we applied the following procedure:

a) we displayed an oscillogram, wide-band sonagram and LPC spectrum in the Speech Analyzer program (Figure 1);
b) we marked the place in the given oscillogram, where the biggest alternation of the amplitude, frequency and acoustic wave was observed and we manually segmented the given segment via audio-correlation and visual-correlation methods;
c) we made a spectral analysis of the given segment and we read F1 and F2 from the LPC spectrum;
d) we calculated the mean values from the five measured F1 a F2 values of each analyzed sound of each respondent.

The data from the experimental analysis were statistically characterized by the parameters of position and parameters of variability (Table 3).

Parameters of position:

$\bar{x}$ – arithmetic average of the data (mean);
$\tilde{x}$ – median (medium value, which divides the statistical set into two equal parts);

Parameters of variability:

σ_x – standard deviation (absolute measure of variability);
V_x – variation coefficient (relative measure of variability).

Vowels are acoustically characterized by spectral areas defined by the relations of formant frequencies in two-dimensional (F1/F2) spectral structure in Hz. Their mutual articulatory and acoustic discreteness is lower than that of the consonants. The variation interval of the formants is rather big. A person is not able to create an absolutely identical articulatory position twice and the variance also depends on the characteristics of the neighbouring sounds.

The mean values of the formants of the English vowels produced by the respondents (A) are shown in Table 3. When displaying the vowels in the formant scheme the average values of formants are used. The variation of formant values was rather low (under 50%) except F2 [ə] (Vx = 55%). The reference values of the English (A^0) and Slovak (S^0) vowels used are cited from relevant linguistic publications [18, p. 100; 19, pp. 204–209] and are shown in Table 2.

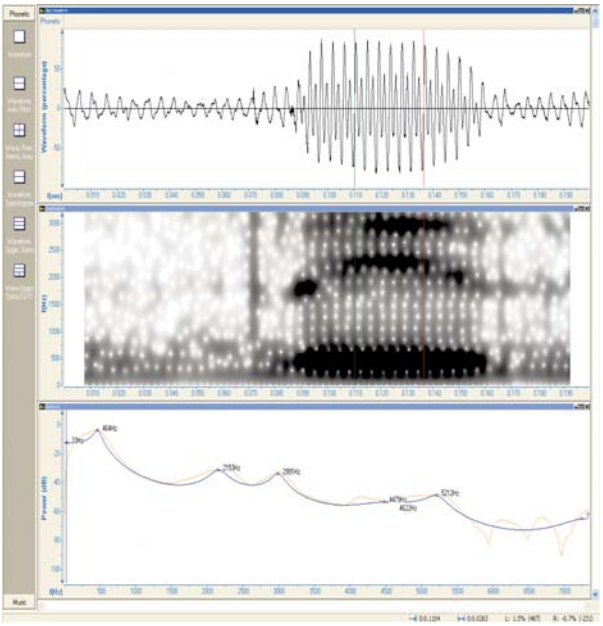

Fig. 1 Experimental analysis (a sample)

We observed a higher approximation of the produced vowels to the Slovak reference values than to the English reference values which can be seen in the formant scheme (Fig. 2). This is an obvious and expected result. The Slovak language as the dominant system significantly influences the production of the secondary (English) system elements. The interlanguage interference, especially at the intermediate level of L2 competence, is the dominant feature of the whole L2 performance.

System of Slovak and English short vowels — Table 1

	Front	Central	Back
High	/i/, /I/		/u/, /ʊ/
Mid	/e/, /e/	/ə/	/o/
Low	/æ/	/ä/, /a/, /Λ/	/D/

Reference values of F_1 and F_2 — Table 2

S^0	F_1	F_2	F_3	A^0	F_1	F_2	F_3
/i/	280	1916	2656	/I/	360	2220	2960
/e/	452	1718	2365	/e/	600	2060	2840
/ä/	700	1510	2300	/æ/	800	1760	2500
/a/	682	1315	2293	/Λ/	760	1320	2500
/o/	481	1084	2194	/D/	560	920	2560
/u/	326	967	2059	/ʊ/	380	940	2300
				/ə/	560	1480	2520

Experimental values of F_1 and F_2 (A) — Table 3

A	/I/		/e/		/æ/		/Λ/		/D/		/ʊ/		/ə/	
	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
1	308	1492	355	1702	689	1666	779	966	407	1009	281	982	301	1615
2	257	2279	478	2055	723	1680	793	1432	426	1296	368	1233	732	2003
3	253	1789	329	1838	495	1270	365	912	492	1091	318	1118	517	1227
4	306	2369	507	1995	388	1258	511	1478	388	1186	450	877	457	1873
5	318	2348	505	1938	989	1566	563	1430	457	1009	353	809	581	1744
6	264	1854	386	1943	668	1446	758	1497	381	963	465	882	397	1766
7	323	1456	518	1692	689	1593	904	1430	421	1570	486	914	711	2110
8	323	1310	410	2151	775	1744	806	1370	632	1197	409	1133	497	1830
9	235	1780	458	1689	474	1572	891	1357	721	1589	480	831	732	1852
10	234	2052	399	1157	495	1462	409	1379	571	981	366	790	366	926
11	283	1922	492	2133	797	1465	493	1138	651	861	317	903	454	2175
12	377	2098	372	1562	603	1400	507	1745	633	993	297	676	475	2369
13	314	2345	513	2028	732	1538	785	1177	492	1246	407	994	383	1016
14	358	2220	367	1842	632	1690	419	1311	399	1054	366	824	432	1637
15	354	2380	375	1634	538	1852	327	1195	581	1140	417	727	430	7809
16	359	1968	465	1818	517	1787	499	1428	253	713	274	834	280	1400
17	394	1940	480	1827	495	1481	886	1727	509	1163	443	1140	489	1744
18	296	2205	467	1800	603	1538	689	1721	543	1153	388	1191	603	2089

A	/I/		/e/		/æ/		/Λ/		/D/		/ʊ/		/ə/	
	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
19	298	2249	555	1749	770	1636	758	1384	368	1099	372	895	624	1830
20	329	2203	489	1725	452	1486	568	1329	504	1224	361	752	668	1680
21	359	1172	515	1890	431	1873	676	1291	382	1053	394	803	581	1723
22	359	2185	412	2331	452	1529	716	1259	326	891	315	876	495	1744
23	330	2325	576	1162	668	1809	579	1564	570	1150	354	764	646	1809
24	317	2114	436	1948	942	1670	780	1394	531	771	346	933	397	1830
25	338	2218	569	1791	560	1766	637	1410	562	786	453	965	388	1830
26	360	2233	503	1474	689	1615	993	1715	506	1135	390	897	383	1787
27	262	1489	465	1830	345	1916	702	1223	742	1070	469	934	646	1895
28	302	1543	508	1626	814	1461	542	1334	263	1303	364	1103	350	1030
29	270	1437	512	1614	732	1292	865	1338	262	1279	335	882	397	1314
30	300	1718	615	1802	775	1658	796	1300	698	1078	397	1121	711	2046
31	236	1592	592	2037	668	1852	827	1336	458	1235	449	1111	475	1787
32	332	2367	610	1959	603	1530	472	1224	577	1408	504	1094	754	1960
33	349	1996	517	1707	474	1464	526	1030	512	1214	338	819	301	1615
34	332	1646	744	2072	646	1560	408	1392	502	1246	369	1390	511	1744
35	426	1185	550	1289	861	1532	472	900	358	966	336	1046	380	1890
36	318	1578	886	1823	747	1420	876	1362	490	944	420	824	377	1016
37	308	2059	366	2039	431	1227	463	1512	590	1060	479	1087	517	1787
38	316	1590	615	1869	760	1555	624	1200	420	1295	374	955	383	1003
39	352	1899	619	2023	643	1787	637	1542	626	984	358	989	454	1744
40	268	1969	433	2147	417	1205	380	1352	435	1240	388	1120	388	1916
$\bar{x}$	**315**	**1914**	**499**	**1818**	**630**	**1571**	**642**	**1352**	**491**	**1116**	**386**	**955**	**492**	**1854**
$\tilde{x}$	**317.5**	**1968.5**	**497.5**	**1828.5**	**644.5**	**1557.5**	**637**	**1359.5**	**497**	**1117**	**373**	**923.5**	**466**	**1787**
σ_x	**44.18**	**355.34**	**108.48**	**253.62**	**155.05**	**182.65**	**177.87**	**200.36**	**122.16**	**190.37**	**58.69**	**157.01**	**132.20**	**1023.86**
Vx	**0.14**	**0.19**	**0.22**	**0.14**	**0.25**	**0.12**	**0.28**	**0.15**	**0.25**	**0.17**	**0.15**	**0.16**	**0.27**	**0.55**

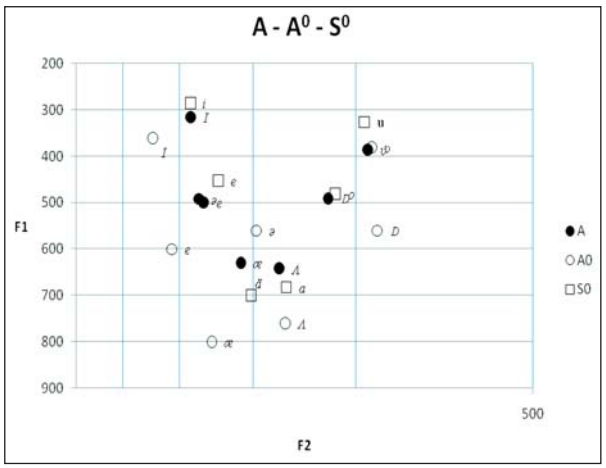

Fig. 2 Values F_1 a F_2 (A - A^0 - S^0)

4. Conclusions

In the experiment we applied the synthesis of the theoretical analysis and we detected the causal relations of the parameters by the statistical analysis of the variables. The consistency of repeated measurements of each text is verified by an adequate variance of measurements (V_x). To provide the internal validity of measurements we used the statistical analysis of variance. To increase the external validity of measurements, i.e., to generalize the research results, we performed the experiment in fairly natural conditions – in the school environment and we used the research material reflecting natural communication.

Content validity results from the fact that the results of vocalic formant measurement of individual respondents represent an overall level of their pronunciation. The criteria validity was evaluated according to the correspondence of experimental analysis and the reference values of the phonemes.

From the percipient's point of view, the auditive impression of a "good" or "bad" pronunciation is created by the complex of many subsegmental, segmental, plurisegmental and suprasegmental phonic phenomena. Some studies [e. g., 11] proved that the number of segmental substitutions highly correlates with marking the utterance as unidiomatic (non-native), though it does not mean that the substitutions are the only criterion. They are probably perceived and identified very easily, but the listener's impression of one`s pronunciation is created by the complex of many interrelated factors [22].

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