

# PHONOLOGICAL DEVELOPMENT IN THE HOME LANGUAGE AMONG EARLY POLISH-ENGLISH BILINGUALS

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## ABSTRACT

The study involved the analysis of Polish speech samples of 59 Polish-English bilingual children of Polish immigrants to the UK. It aimed to explore differences in phonological performance between these early bilinguals and their Polish monolingual peers. The data collection procedure involved a sentence repetition task. 14 preselected sentences from this task were subsequently analysed auditorily by three phonetically trained raters. The measures of phonological performance included the number of speech errors made by children, and the assessment of cross-linguistic influence (CLI) in twelve areas (i.e. aspects of speech). Significant differences were found between the phonological performance measures of Polish-English bilinguals vs. 24 Polish monolingual controls. Bilinguals' speech was characterised by CLI from English, especially in the production of consonants and consonant clusters. As predicted, the phonology of the migrant Polish language in Polish-English bilingual children was found susceptible to the influence from English, the community language.

**Keywords:** early bilinguals, phonological development, CLI, Polish.

## 1. INTRODUCTION

Existing research on phonological development of bilingual children provides conflicting results. It remains unclear if bilingual children have two separate language-specific phonological repertoires. Some studies suggest that these children distinguish between two phonological systems [6] and that their phonological development is similar to that of monolinguals [5], while others show considerable differences between bilingual and monolingual children when it comes to the acquisition of phonology [3, 8].

There are reports that segmental phonology of bilingual children resembles that of their monolingual preschool peers with respect to phonetic substitutions and VOT or syllable reduplications. Yet other research findings point to

differences or delays in the same measures, which may be attributed to unequal or limited exposure to each of the languages and cross-linguistic influence in bilingual children [5, 9] (see Genesee & Nicoladis [4] for a detailed discussion).

The prevailing view is that bilingual children have different speech production patterns than monolingual children at both prosodic and segmental levels [11]. One study found that Mandarin-English bilingual children scored lower on the English Diagnostic Evaluation of Articulation and Phonology than English monolinguals [3]. Another demonstrated that English-Welsh bilinguals display more problems producing consonant clusters than their monolingual peers [8]. Mayr et al.'s [8] data suggest that minority languages seem to be less developed in bilinguals. Such languages could also be more susceptible to cross-linguistic influences (CLI) from the language dominant in the community. However, there are studies showing also a reverse direction of influence, i.e. from the minority language to the community language. In the study of Spanish-English bilinguals living in the USA, Barlow [2] demonstrated that the production of English /l/ is influenced by the Spanish pronunciation of this sound.

Regardless of the direction of influence, studies indicate that the two phonological systems in the bilingual mind can interact. Moreover, early bilingualism does not preclude cross-linguistic influence in the domain of phonology and the resulting foreign-accentedness. To evaluate these theories, we decided to analyse the speech of bilingual Polish-English children and assess how early bilingualism influences their phonological development in the home (i.e. minority) language.

## 2. STUDY

This study is part of a larger project intended to create a linguistic profile of Polish-English bilingual children of Polish immigrants to the UK. The present contribution aimed at investigating the phonological development of Polish, the home language of these early bilinguals. Up to this date there have been no systematic, large-scale studies on

speech development in this group. Therefore, the aims of conducting this research were two-fold. Firstly, we wanted to assess the extent of the interaction of two phonological systems in bilingual minds. Secondly, we aimed to conduct an analysis that could be used as a basis for language intervention and training programs for Polish migrant children. Many Polish people in the UK are temporary migrants who return to Poland with their children after several years. Upon return these children can face problems at school due to foreign accent and speech errors. Identifying the problem areas in their phonetic production can help in creating intervention programs. Therefore, the study investigated both the differences between bilingual and monolingual children, and the key pronunciation problems that bilinguals might encounter when speaking Polish due to CLI from English.

## 2.1. Participants

In the present study we used recordings of 59 children of Polish immigrants living in the UK. The children were early bilinguals who used Polish at home and English at school. All children had contact with Polish from birth. For comparison we used 24 recordings of Polish monolingual children matched for age and socio-economic status. Mean age was 5;9 (Max = 7;0, Min = 3;8, SD = 9 months) in the bilingual group and 5;7 (Max = 6;10, Min = 4;6, SD = 8 months) in the monolingual group. In both groups girls constituted 60% of the sample.

## 2.2. Materials and procedures

All speech samples came from a database collected by the Bi-SLI-Poland project within the European COST Action IS0804. The study focused on data from one of the elicitation procedures, namely the Polish Sentence Repetition Task SRT [1], originally designed to test grammar. In the testing procedure, the participants were asked to repeat 68 sentences that they heard through the headphones. The children were tested individually in a quiet room.

## 2.3. Data analysis

### 2.3.1. Preliminary analysis

In order to design the assessment procedures, three trained phoneticians performed a preliminary analysis of five randomly chosen recordings from the bilingual dataset. The phoneticians transcribed phonetically all the sentence repetitions and identified phonological processes exhibited by the participants that stemmed from CLI and contributed to the perception of foreign-accented speech. On the

basis of their analyses, a CLI diagnostic list was created, enumerating 12 problem areas in the speech of bilingual children. These are the following:

### Vowel production

1. Vowel quality distorted
2. Vowel quantity distorted
3. Vowel reduction applied to Polish
4. Polish nasal vowels misarticulated

### Consonant production

5. Production of non-native-like consonants
6. Reduction of consonantal clusters
7. Substitution of consonantal clusters (change of quality in the cluster, e.g. substitution of one consonant)
8. Lack of consonant palatalisation in appropriate context
9. Atypical VOT patterns in plosives
10. Voice assimilation process not applied

### Suprasegmentals

11. Incorrect number of syllables
12. Incorrect stress pattern

From the set of 68 original SRT sentences, 14 diagnostic sentences were selected for further analysis. They contained a wide range of phonetic contexts for the phonological processes described in the diagnostic lists.

### 2.3.2. Dataset analysis

For each child, both bilingual and monolingual, the selected 14 sentences were analysed auditorily by two independent phonetically trained raters, who used earlier-prepared transcription cards to mark speech errors committed by children. The raters also filled in a diagnostic grid with the list of 12 possible problem areas, as specified on the CLI diagnostic list. In the grid they indicated the number of errors made by the child in each problem area (i.e. the *speech errors variable*). Then on the basis of the number of errors they assessed to what extent a particular area was affected by CLI from English (i.e. the *overall assessment variable*). They assessed each of the 12 areas on a three-point scale (0 – significant CLI from English, 0.5 – occasional CLI, 1 – no CLI). All the assessments were cross-checked by a third rater.

The speech samples were coded and randomized so that the raters did not know if the assessed sample came from a bilingual or a monolingual child. The raters had to mark only the errors specified on the CLI diagnostic list. The same measure (i.e. CLI diagnostic list) was applied to both monolingual and bilingual speech samples because in a perceptual analysis the raters could interpret an idiosyncratic or developmental speech error as CLI. Our procedure

ensured that the error patterns found in the bilingual sample could not be attributed to misinterpretations of normally occurring developmental processes. Since the developmental or idiosyncratic errors should affect both groups equally, the difference in the scores between the monolingual and bilingual children would reflect sheer CLI.

The general level of children's phonological performance was measured by calculating the sum of all the committed speech errors and by counting the sum of assessment points for the 12 problem areas. Moreover, the average overall assessment score in each problem area was calculated to identify which aspects of speech were most susceptible to CLI.

These analyses allowed us to answer the following research questions:

RQ 1) Is the Polish speech of bilingual Polish-English children living in the UK different from the speech of Polish monolinguals?

RQ 2) If so, what are the most common problems exhibited by the Polish-English bilinguals?

RQ 3) Which phonetic contexts are particularly problematic for these bilinguals?

### 3. RESULTS

#### 3.1. Level of phonological performance

To address the first research question (RQ 1), we compared the speech error count and overall assessment scores between mono- and bilingual participants. Due to the distribution of results non-parametric Mann-Whitney U test with Bonferroni corrections was used for comparison. Table 1 presents the results of the assessment comparison.

**Table 1:** Average assessment scores for bilinguals vs. monolinguals

CLI problem area	Average assessment of monolinguals		Average assessment of bilinguals		Mann-Whitney U test
	M	SD	M	SD	
1 Vowel quality	0.96	0.14	0.68	0.4	U=973.0*
2 Vowel quantity	1	0	0.99	0.07	U=720.0
3 Vowel reduction	0.96	0.14	0.58	0.41	U=1072.0**
4 Nasal vowels	0.92	0.19	0.67	0.29	U=1028.0**
5 Non-native consonants	0.69	0.41	0.19	0.35	U=1127.0***
6 Cluster reduction	0.83	0.35	0.33	0.45	U=1094.0***
7 Cluster substitution	0.9	0.21	0.69	0.37	U=919.0
8 Palatalisation	0.96	0.2	0.75	0.39	U=913.5
9 VOT	0.96	0.14	0.76	0.34	U=919.0
10 Voice assimilation	1	0	0.98	0.09	U=732.0
11 Syllable number	0.98	0.1	0.94	0.23	U=728.0
12 Stress pattern	0.96	0.2	0.96	0.17	U=713.0
<b>IN TOTAL</b>	<b>11.1</b>	<b>1.14</b>	<b>8.5</b>	<b>1.88</b>	<b>U=1248.0***</b>

\* p < .05; \*\* p < .01; \*\*\*p < .001

The bilingual speech samples were, on average, assessed as more affected by CLI than the monolingual ones. Monolinguals on average scored near-perfect (11.1 points out of 12, SD = 1.14),

while bilinguals scored on average 8.52 out of 12 points (SD = 1.88). This trend is repeated in the error counts analysis (see Table 2). Monolingual children committed on average 7 speech errors (SD = 7.35), while bilingual children made on average 26.54 errors (SD = 14.57). These results indicate that the phonological performance in Polish of Polish-English bilingual children differed significantly from that of the monolingual Polish controls and that it was characterised by significant CLI from English.

**Table 2:** Average error counts for bilinguals vs. monolinguals

CLI problem area	Average for errors by monolinguals		Average for errors by bilinguals		Mann-Whitney U test
	M	SD	M	SD	
1 Vowel quality	0.33	0.64	2.31	3.4	U=311.0***
2 Vowel quantity	0.13	0.45	0.15	0.49	U=674.0
3 Vowel reduction	0.29	0.62	2.34	2.23	U=271.5***
4 Nasal vowels	0.88	0.95	2.27	1.71	U=342.0**
5 Non-native consonants	2.88	4.11	9.27	6.08	U=220.5***
6 Cluster reduction	1.04	1.57	4.71	3.14	U=195.0***
7 Cluster substitution	0.58	0.83	1.49	1.33	U=407.0*
8 Palatalisation	0.25	0.68	1.63	2.15	U=403.0**
9 VOT	0.21	0.72	1.47	1.84	U=341.5**
10 Voice assimilation	0.08	0.28	0.15	0.48	U=681.0
11 Syllable number	0.21	0.51	0.49	1.01	U=598.0
12 Stress pattern	0.13	0.45	0.25	0.65	U=648.0
<b>IN TOTAL</b>	<b>7.0</b>	<b>7.35</b>	<b>26.5</b>	<b>14.8</b>	<b>U=130.5***</b>

\* p < .05; \*\* p < .01; \*\*\*p < .001

#### 3.2. Common problem areas in bilingual performance

The second research question (RQ 2) concerned the most common problems in the speech of the bilingual participants. These were identified by analysing the assessment scores for each of the problem areas. Figure 1 presents a bar plot of these scores for each problem area (0 – significant CLI from English, 0.5 – occasional CLI, 1 – no CLI).

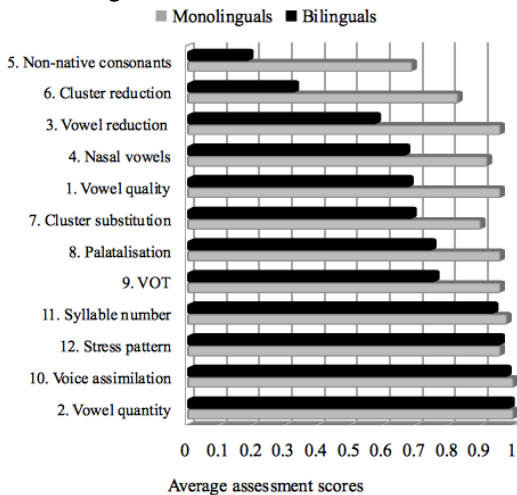
As demonstrated by the plot, the lowest average scores were assigned to the bilingual speakers for the production of Polish consonants (0.19) and consonant clusters (0.33). The vast majority of participants (over 70%) displayed significant CLI from English in the production of Polish consonants. On average, bilingual children made 9.27 consonant errors in their repetitions (vs. 2.87 in monolinguals).

Producing Polish consonant clusters was the second greatest difficulty for bilingual children. Over 60% consistently reduced consonant clusters that were atypical for English. On average, they made 4.71 reductions in sentence repetitions (vs. 1.04 in monolinguals).

The bilingual participants displayed moderate problems with vowels. They had a tendency to reduce vowels in unstressed positions - a process typical for English. However, about one third of all bilinguals did it only sporadically. The participants

had also occasional problems with producing Polish oral vowels (they substituted Polish vowels with the English ones) and with Polish nasal vowels. They exhibited only minor problems with palatalised consonants and target-like VOT. None of them had severe problems with word stress placement.

**Figure 1:** Average assessment scores for bilinguals vs. Monolinguals



### 3.3. Problematic phonological contexts in bilingual performance

The third research question (RQ 3) concerning the identification of contexts particularly problematic for bilinguals was tackled with a qualitative analysis of transcription cards. We focused on the areas that were most problematic for the speakers, i.e. the production of consonants and consonant clusters. The analysis of consonant errors revealed difficulties with the production of Polish sibilants, in particular the alveolo-palatal sibilants (/tɕ/, /ɕ/, /d͡z/ /z/), which were often substituted with English alveolar or post-alveolar sibilants (/s/, /z/, /ʃ/, /ʒ/). Also Polish retroflex sibilants (/ʂ/ /ʐ/ /tʂ/ /dʐ/) were regularly substituted with English postalveolars (/ʃ/, /ʒ/, /tʃ/, /dʒ/). When it comes to the cluster reduction errors, the structures affected were often complex and characterised by level sonority, as in the initial /xts/ in the word *chce* /xtɕe/ (“wants”) and /gʐ/ in the word *grzybów* /gʐɨbɔw/ (“mushrooms”) or /ftf/ across morpheme boundary in the phrase *w twoim pokoju* /fʲtʃɔjɨm pɔˈkɔju/ (“in your room”).

## 4. DISCUSSION

In RQ 1 we investigated the phonological differences between the bilingual and monolingual children in Polish. In the current study, the phonology of Polish-English bilingual children in their home language was demonstrated to differ from that of their Polish monolingual peers.

Bilingual productions were characterised by higher number of errors and assessed as affected by CLI from English. The identified CLI in the domain of phonology supports the claim that in bilingual children the two phonological systems interact. It is interesting to notice that Polish was chronologically the first language of the bilingual participants and yet it was found to be affected by CLI from English. This surprising pattern of results might be explained by limited exposure to the minority language in the participants' country of residence. For them, the Polish input is mostly limited to the home environment, whereas English is the community language and medium of communication at schools.

RQ 2 and 3 focused on identifying the most common problem areas in bilingual speech. The results indicate that these are the most marked features of Polish phonology, i.e. consonants and consonantal clusters. Polish is a heavily consonantal language with as many as 12 sibilant sounds, produced in close proximity to each other (dental, alveolo-palatal and retroflex). These sounds are both difficult to produce, since they require a significant articulatory precision, and to perceive, since the acoustic differences between them are very minute. Moreover, Polish alveolo-palatal and retroflex sibilants are very similar to English post-alveolars, which gives a lot of potential for CLI from English. Consequently, bilingual participants displayed significant difficulties with the production of these sounds.

Another common problem area was the production of consonant clusters, which is also a marked feature of Polish. Consonantal clusters are universally dispreferred and only 31% of world languages have initial triple clusters [7]. Polish has both triple and quadruple clusters and it allows for clusters that violate sonority hierarchies such as initial /mgw/, or /xts/. The participants in the study had a tendency to reduce especially such marked clusters.

Interestingly, the bilingual participants had only occasional problems with Polish vowels and no problems with word stress. It is possible that exposure to English, a vocalic language with a complex and rich stress system, made them more sensitive to stress patterns in Polish and to qualitative changes in vowels.

Summing up, significant differences were found between Polish-English bilinguals and Polish monolingual controls on phonological performance measures. The phonology of the migrant Polish language was susceptible to the influence from English, the community language. However, the CLI was observed primarily in those aspects of phonology that were more marked and complex.

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