

Chapter 4

Case studies of phonological development in six preschool-aged Russian-Finnish bilingual children

Olga Nenonen

Introduction

Traditionally, language development in bilingual children has been considered to resemble that of monolinguals, though it often appears to be slower (Bialystok & Feng, 2011; Bialystok, Luk, Peets, & Yang, 2010; Hoff, 2015; Silvén, Voeten, Kouvo, & Lundén, 2014). The same can be said with regard to phonology: young bilingual children acquire phonology in two languages in the same way as their monolingual peers. Still, monolingual children are often ahead of bilinguals in the acquisition of some phonological features (e.g. Fabiano-Smith & Barlow, 2010; Gildersleeve-Neumann, Kester, Davis, & Peña, 2008). Furthermore, bilingual children tend to demonstrate language patterns similar to those of children with specific language impairment (SLI) (Armon-Lotem, de Jong, & Meir, 2015). This accounts for bilingual children repeatedly being considered as having problems with language development (Armon-Lotem et al., 2015; Launonen, 2007; Paradis, 2010). As a result, it is necessary to conduct further research on the phonological development of bilingual children in order to obtain additional information on the specific mechanisms involved in typical bilingual language acquisition.

The present chapter explores a number of points in relation to this issue. In particular, we focus on the following: (a) individual variation and common features in the phonetic production of bilingual children, (b) bilinguals' errors in production, (c) the acceleration or deceleration of bilingual phonetic development in comparison to monolingual phonetic development. We also address the question of whether young bilingual children have one phonological system for both languages or they have two separate phonological language systems. This chapter is structured as follows. The background section below presents a very brief review of previous work that has been done in the area of phonological assessment. We then describe the current study and discuss the results with regard to assessment of bilingual phonological development. Finally, we outline the limitations of the study and propose directions for further research.

The phonological systems of Russian and Finnish and a hypothesis for bilingual acquisition

A review of theory helps to create specific predictions that can be tested by empirical research. In the present study, we compare the phonological systems of Russian and Finnish to generate a linguistic prognosis of possible problems in bilingual phonological acquisition (i.e. bilingual errors) involving these languages. Information will be presented in the following order: vocalic and consonantal inventory (Tables 1 and 2, respectively), duration of vowels and consonants, and word level prosody. The Russian inventory of 6 vocalic phonemes is rather modest compared to that of Finnish with 8 monophthongs (which can have short and long varieties) and 18 diphthongs. However, Russian vocalic phonemes can have a large number of allophones depending on their position in the word and their distance from the stressed syllable. While unstressed vowels are the subject of qualitative and quantitative reduction in Russian, in Finnish quantitative reduction only occurs in unstressed vowels. De Silva (1999:46, 167) and Ljubimova (2010:346) point out that the most problematic Russian vowels for Finns are [i] and [i̯]. Correspondingly, [æ], [y] and [ø], the long vowels (all short vowels can also occur doubled), and the diphthongs found in Finnish are

challenging for Russians. These typologically less common (language-specific) vowels ([i], [i̯] in Russian and [æ], [y], [ø], long vowels, and diphthongs in Finnish) are also infrequent in both languages (Bondarko, 2009:35; Iivonen, 2009:62; Suomi, Toivanen, & Ylitalo, 2008:21–23). Taking these into account, all the aforementioned vowels ([i], [i̯], [æ], [y] and [ø]) could prove difficult for bilingual children to acquire. For example, the Finnish [æ] could be perceived as [e] or [ja], and [ø] could be perceived as [e] or [jo] (Nenonen, 2016:29). Conversely, primary vowels are usually acquired early (Cejtlin, 2000; Gvozdev, 1961; Stoel-Gammon & Herrington, 1990) and therefore might not be problematic to bilingual children.

Table 1. The vocalic inventory of Russian and Finnish (language-specific phonemes are in bold)

| Russian | Finnish |
|-------------------|------------------|
| /a/ | /a/ |
| /o/ | /o/ |
| /u/ | /u/ |
| /e/ | /e/ |
| /i/ | /i/ |
| /i̯/ | /æ/ (/ä/) |
| reduced [ɐ] / [ʌ] | /y/ |
| reduced [ə] | /ø/ (/ö/) |

The Russian consonantal inventory is rather large according to different classifications (Avanesov, 1972:34; Bondarko, 1998:7, 32; Bulanin, 2009:1–53, 81–84; Maslov, 2007:59). It has between 34 and 37 consonants. The large amount of consonants can be explained by the existence of soft (palatalized) sounds. The most important typological characteristics of consonants in Russian are the binary oppositions of hard-soft (unpalatalized-palatalized) and voiceless-voiced. These features together with Russian language-specific consonants – including the sibilants /z, ts, s, z, tɕ and ɕ:/ – are problematic for Finnish-speakers. According to Karlsson (1983), the consonant paradigm in Finnish is different, being defined as polysystemic with respect to its consonantal variants. In short, there are 17 consonant phonemes in Finnish, of which 11 consonants are common in all variants (dialects) of the language. The phoneme /ŋ/ occurs in all variants of the language but has a narrow distribution. The defective phoneme /d/ (Karlsson, 1983:57–58; Swadesh, 1995:15) also has a narrow distribution, but it does not occur in all the variants of the language. Finally, there are the marginal consonants, /f, b, s and g/, which appeared in Finnish only recently and are found in loan words (Kallioinen, 1969:7; Karlsson, 1983:57–59; Suomi, Toivanen, & Ylitalo, 2008:23–38). One of the most important typological features of Finnish is the opposition of consonants with regard to duration; this feature concerns phonetically short-long sounds (e.g. [k]–[k:], [m]–[m:]) and phonemically single-double phonemes (e.g. /k/–/kk/, /m/–/mm/). Geminates that are considered to be double consonants (sequences of two similar consonants) (Kraehenmann, 2001) and /ŋ/ are usually difficult for Russian-speakers (Toivola, 2011).

Vowel and consonant duration is an important feature of the Finnish phonological system. According to the standard interpretation, quantitatively long segments are described as sequences of two identical phonemes (i.e. as double vowels and consonants) in contrast to short or single phonemes, and diphthongs are viewed as sequences of two dissimilar vowels. When examined qualitatively, phonetically short and long (phonemically single and double) vowels appear very similar to native speakers (Karlsson, 1969:354; Suomi et al., 2008:19, 39). In the Russian language, vowel and consonant duration is not phonemically significant. This explains why one may hear the Finnish accent in Russian words when Russian stressed vowels are perceived as diphthongs or long vowels, or if Russian reduced vowels are reproduced as non-reduced stressed vowels.

Correspondingly, the Russian accent can be heard when Finnish long vowels are produced as short vowels – i.e. as reduced both qualitatively and quantitatively.

Table 2. The consonant inventory of Russian and Finnish (language-specific phonemes are in bold; all phonemes in the table are independent phonemes, not allophones)

| | Russian | Finnish |
|-------------------|--|------------------|
| stops | p, b, t, d, k, g p^j, b^j, t^j, d^j, k^j, g^j | p, b, t, d, k, g |
| fricatives | f, v, s, z, ʒ, zʲ, ʒʲ, ʂ, ʐ, ʂʲ, ʐʲ , h f^j, v^j, s^j, z^j, h^j | f, v, s, ʃ, h |
| affricates | ʧ, ʨ | |
| nasals | m, n m^j, n^j | m, n, ŋ |
| laterals | l, l^j | l |
| rhotics | r, r^j | r |
| glides | j | j |

When discussing word-level prosody, we must point out that the primary stress in Finnish is fixed on the first syllable of a word, and the secondary stress usually falls on the third or fourth syllable. In Russian, the syllabic stress of a word is free and unfixed; it may also be still or mobile in the inflectional paradigm of the word. Due to these prosodic features, Russian-speakers might move the word stress to the second or third syllable in Finnish words, and Finnish-speakers might stress the first syllable in Russian words (Nenonen, 2016:29).

Based on this information a linguistic prognosis in this study would be that bilinguals may experience difficulties in the acquisition of language-specific features in each language, and in defective and marginal consonants in Finnish. Additionally, some phonemically similar consonants that have different articulations in Russian and Finnish (e.g. /t, s, n and h/) are also potentially problematic and could be pronounced with an accent. As the Russian consonantal inventory is much larger than the Finnish consonant inventory, it may require more time for bilinguals to acquire.

Child phonological development

Early child phonological development is generally described as a complex process that does not follow a linear route (e.g. Mohanan, 1992; Bernhardt & Stemberger, 1998). On the path to adult-like production, the child passes through different phases of both fast and arrested development, showing substitutions as well as distortions. The presence of errors is not necessarily problematic in child speech productions; on the other hand, such errors are considered a normal feature in child language which is a result of the child's undeveloped resources in speech production. In fact, some of these errors are so systematic that they are regarded as specific to developmental child speech rather than deviations from the target form. Further discussion of this stance may be found in several sources (e.g. Bialystock, 2001; Cejtin, 2000, 2008; Eliseeva, 2008; Menn & Stoel-Gammon, 2005). In this study, we use the terms “error”, “pronunciation error”, “mistake” or “mispronunciation” synonymously as shorthand to denote a deviation from the typical adult realisation of the phonetic form of the word or word segment. We also point out pronunciation errors on the paradigmatic level that comprise both phonemic and phonetic errors. By phonemic error here we mean substitutions of the target phoneme by other sounds in the phonemic inventory of the same language. Phonetic errors involve cases of sound distortions or developmental errors, e.g. pronouncing interdental [θ] instead of Russian [s]. Correspondingly, pronunciation errors on

the syntagmatic level denote word structure transformation, such as omissions, assimilations, additions, etc. (Nenonen, 2016:70).

Monolingual phonological development in Russian and Finnish

Numerous researchers have described early monolingual phonological development in Russian and Finnish (e.g. Eliseeva, 2008; Gvozdev, 1961; Kunnari, 2000; Kunnari & Savinainen-Makkonen, 2012; Piotrovskaja, 2011; Savinainen-Makkonen, 2001). Phonemic errors (sound substitutions) are generally defined as early developmental errors which tend to disappear at the start of the period of complete phonological acquisition (around 4;0). However, some exceptions hold for both the Finnish and Russian languages. Some Finnish children still substitute the defective phoneme /d/ by the age of 6;0 or 7;0 years (Kunnari & Savinainen-Makkonen, 2012). In Russian monolinguals, all sibilants are marked and substituted by other consonants for a long time, they are finally acquired between 4;0-5;0 (Bel'tjukov & Salakhova, 1975; Eliseeva, 2008; Gvozdev, 1961). In addition, in both languages liquid phonemes, /l r/, are subject to steady substitutions. Phonetic errors (sound distortions) mostly concern late-acquired sounds in both languages: /s r l j k g h/ and the sibilants in Russian. In contrast to phonemic errors, phonetic errors appear at a later stage of development within the age range 5;0-8;0 (Kunnari & Savinainen-Makkonen, 2012:97; Piotrovskaja, 2011:99-101) (see Tables 3 and 4).

A number of researchers (e.g. Ingram, 1976; Kehoe, 2010; Menn & Stoel-Gammon, 2005; Stoel-Gammon, 1985, 1998; Stoel-Gammon & Herrington, 1990; Vihman, 1988, 1996, 2010; Vihman & Keren-Portnoy, 2013) have described children's strategy of simplification during different stages of phonological development. Simplification results in pronunciation errors on the syntagmatic level, such as sound and syllable omissions, cluster simplifications, and errors belonging to phonological processes. Both Russian and Finnish monolingual children omit consonants, and it is reported that consonants in Russian may be omitted in any syllable but more commonly at the end of the word (Švačkin, 1995:107), while in Finnish consonant omission is more common at the beginning of the word (Savinainen-Makkonen, 2001:43). Cluster simplification is also observed in children acquiring both languages (Cejtlin, 2000:78-79; Eliseeva, 2008:45-48; Gvozdev, 1961:98; Jortikka, 1993:81-83; Kunnari & Savinainen-Makkonen, 2012:122-126; Savinainen-Makkonen, 2001:39-43). Monolingual Finnish-speaking children are sometimes unable to produce different vowels within a single word; instead, they assimilate all targets to a single vowel in all syllables. Some children also tend to reduce diphthongs to monophthongs (Jortikka, 1993:83; Kunnari & Savinainen-Makkonen, 2012:121). Syntagmatic pronunciation errors are much more common in the production of consonants. They are produced with the effect of such phonological processes as consonant assimilation, cluster simplification, consonant and syllable omission, metathesis (transposition of both sounds and syllables), compensatory elongation or prolongation (addition), contamination, etc. In Finnish, the aforementioned errors mostly affect /v l n j h/, especially at the beginning of a word and in clusters. In Russian, nearly all the consonants can be subject to the aforementioned phonological processes.

A review of studies cited earlier reveals that Russian- and Finnish-speaking monolingual children undergo the same stages of phonological development. There are similarities, particularly in respect to the order and age of acquisition as well as the typology of the children's errors. Thus, the first vowels and consonants (minimum vocalic and consonant systems) appear in children's language approximately at the same time (/a, i, o, u, e/; /p, t, k, m, n/). The next stage is characterized by the acquisition of language-specific features in each language. Russian- and Finnish-speaking monolingual children attain vowel accuracy by the age of 3;0 after mastering late-acquired /i/ in Russian and /y, ø and æ/ in Finnish. The process of consonant acquisition differs in Russian and Finnish monolingual children; many consonants that do not belong to the minimum consonantal system and are similar in both languages are mastered by Finns later than by Russians, as shown in Table 3.

Table 3. Age of the acquisition of similar consonants by monolingual Finnish and Russian children

| | Finnish | Russian |
|------------|----------------|----------------|
| [v] | 3;0–3;11 | 1;10–2;0 |
| [h] | 3;0–3;11 | 1;10–2;0 |
| [s] | 3;0–3;11 | 2;8–3;3 |
| [l] | 4;0–4;11 | 2;8–3;3 |
| [r] | 5;0–6;11 | 3;1–5;0 |
| [d] | 4;0–4;11 | 2;0–2;7 |

The final consonants to be established are the lateral /l/, trill /r/, fricative /s/, the language-specific sibilants in Russian and the defective phoneme /d/ in Finnish. Geminates are usually mastered by Finnish children during the early stages of development, around 2;0 (Kunnari, 2000:28-29). The age of complete acquisition of consonants (see Tables 4 and 5) varies between 3;0 and 8;0 in Russian monolinguals (Bel'tjukov & Salakhova, 1975; Gvozdev, 1961) and between 4;0 and 7;0 in Finnish monolinguals (Kunnari & Savinainen-Makkonen, 2012). Typically, children achieve complete consonant accuracy before primary school age (7;0) in both Finland and Russia.

Table 4. Normative age of acquisition of consonantal sounds in monolingual Russian children

| Age of acquisition | Consonants |
|---------------------------|-----------------------------------|
| 1;0-1;9 | p, t, k, m, b |
| 1;10-2;0 | j, f, v, tʲ, dʲ, nʲ, kʲ, g, gʲ, h |
| 2;0-2;7 | sʲ, zʲ, pʲ, bʲ, mʲ, d, n |
| 2;8-3;3 | fʲ, vʲ, s, z, hʲ, l, lʲ |
| 3;4-3;8 | ɕ:, ts, tɕ |
| 3;1-5;0 | ʂ, zʲ, r, rʲ |

Table 5. Normative age of acquisition of consonantal sounds in monolingual Finnish children

| Age of acquisition | Consonants |
|---------------------------|-------------------|
| 2;0-2;5 | p, t, k, n |
| 2;6-2;11 | m |
| 3;0-3;11 | ŋ, s, h, v, j |
| 4;0-4;11 | d, l |
| 5;0-6;11 | r |

Phonological development in bilingual children

In the current study, bilingual phonological development is understood as the acquisition of the phonology in two languages, i.e. the acquisition of two phonological systems. Phonetic

development comprises the acquisition of phonetic inventories, the adult-like production of sounds and sound combinations, the growth of articulatory abilities, and the identification and practice of word stress.

Bilingual language acquisition is generally associated with language contact and interaction (e.g. Döpke, 2000; Lanza, 2000; Paradis & Genesee, 1996; Weinreich, 1972). Language contact often results in cross-linguistic influence which means that separate phonological systems interact. This interaction may have a different impact on phonological development. For example, Paradis and Genesee (1996), and Fabiano-Smith and Barlow (2010) give the evidence of the deceleration (delay) and acceleration (facilitation) of bilingual phonological development. This means that the transfer is no longer considered only as “negative”; it can have positive manifestations as well. “Positive transfer” can affect identical features, such as identical phonemes. The impacts of “negative transfer” are more evident; they can be seen in the avoidance of features that do not exist in either the L1 or the L2 – like language-specific phonemes – or in the form of a foreign accent (a non-native pattern of pronunciation). For a comprehensive review of phonological interaction, see Kehoe (2018). To our knowledge, there are few studies on Russian accent (that is, second language ‘transfer’, Major, 2008) in Finnish (Toivola, 2011) or Finnish accent in Russian (Ljubimova, 2010), and what studies there are, they focus on adult second language productions. Some observations on the accent of Russian-Finnish bilingual children before primary school age are given in a study by Protasova and Rodina (2005).

One of the most important questions in bilingual language development deals with that of language systems: do children start with one system and later move to a gradual differentiation of separate language systems (the one-system model), or do they start with two language systems that are differentiated from the start and develop separately (the two-system model)? There is experimental evidence for the latter viewpoint. For instance, Polka and Sundra (2003) argue that small children are able to differentiate the sounds of different phonological systems already in the preverbal period. In addition, Fabiano-Smith and Barlow (2010) have shown that English-Spanish bilingual small children (3;0-4;0) had two different phonological systems organized in the same way as the phonological system in monolinguals – the small amount of transfer did not affect the findings. Vihman (2002) has shown that small children (at age 0;6) differentiated their two languages in perception, while they used the same phonetic templates in production. In addition, their first words, which emerged subsequently, were so unclear that one could hardly identify the source language. Based on these findings, Vihman proposes a non-system hypothesis, asserting that it is too early to talk about one or two phonological systems in the initial stages of phonological development.

Phonological development in monolingual children with specific language impairment

Specific language impairment (SLI) is defined as a primary deficit in linguistic skills and language development which is unrelated to hearing loss, intelligence or neurological problems (Leonard, 1998). In children with SLI, the patterns of language disorder exhibited have a systematic nature across different language levels, though different linguistic skills are not equally impaired. Phonological processing and auditory memory are reported to be impaired in children with SLI and intact in typically developing bilingual children. For example, previous research has shown that monolingual and bilingual children with SLI perform poorly on non-word repetition tasks, while typically developing monolingual and bilingual children have no difficulties in repeating non-words (Armon-Lotem et al., 2015). Finnish and Russian children with SLI make errors related to developmental phonology that are found in typically developing children, as well as, non-typical errors. Detailed information may be found in works on impaired phonological development (Filičeva & Čeveleva, 1987:73–75; Ingram, 1976:29–44, 120; Jortikka, 1993:79–80, 96–97; Korpinen & Nasretidin, 2009:60–67; Kunnari & Savinainen-Makkonen, 2012:442–443; Ljakso, 2008:60–76). Among the general markers of SLI, the following features can be found: (1) the child

is far behind peers in language development; (2) he or she has imprecise articulation; (3) the child makes errors in the minimal vocalic and consonantal systems, such as overwhelming omissions; (4) the child uses very few patterns of word structure and tries to simplify the structure of words; (5) the child makes unsystematic pronunciation errors; and (6) the child makes a large number of substitutions and demonstrates many phonological processes, so that words and phrases become distorted beyond recognition.

The current study

The current study addresses phonological development in preschool-aged Russian-Finnish bilingual children. In this chapter, we describe six independent case studies that were conducted as longitudinal research. We observed six (6) typically developing bilingual (BL) children over a period of 2.5 years (for age ranges see section on participants in Methodology below). The study describes the development of sound inventories in the group of young bilingual children compared to three control groups: (a) monolingual Russian peers (MLR), (b) monolingual Finnish peers (MLF) and (c) bilingual children with SLI. All six typically developing bilingual children were born in Finland and grew up learning Russian and Finnish at preschool age. By the term “monolingual” (ML), we refer to (a) Russian native speakers who grew up in Moscow learning only Russian and (b) Finnish native speakers who grew up in Helsinki learning only Finnish. The third control group represents bilingual children who were diagnosed with SLI in Helsinki and attended speech therapy lessons. We chose the bilingual SLI control group in order to compare phonetic production in typically developing bilinguals and bilinguals with SLI and thus attempt to disentangle features in bilingualism from those of SLI. All three control groups participated in a cross-sectional study from 2010 to 2014. The findings of this earlier study are given in Nenonen (2016).

The main objective here was to describe phonological development in Russian-Finnish bilingual children with a view to outlining the trajectories of typical bilingual phonological development in children speaking this pair of languages. In assessing the phonology of young children, the study was guided by the following aims:

- to compare the time of the acquisition of vowels and consonants in BL children with that control groups of ML children and those with SLI;
- to analyse phonological and phonetic errors and processes in the BL children;
- to describe transfer in the BL children;
- to present findings on bilingual phonological development, with a focus on those phonetic characteristics that are easier or more difficult to acquire for BL children;
- to discuss the question of whether BL children construct two different phonological systems or create a synthesis of two systems where the sounds of the two languages coexist.

Stoel-Gammon and Stone (1985) state that a child with a large vocabulary, and a capacity for word combinations will have “an expanding phonological system, with a full range of sound classes and syllable and word shapes” (25). Correspondingly, a child with delayed language acquisition is expected to have a more limited phonological system.

Considering previous research, as cited in the introduction, the following hypothesis is made: phonological development of the bilingual children in the study is expected to be slower (or more limited) than that of monolingual controls; the bilinguals’ productions will include: (1) typical developmental errors, (2) typical language-specific errors, (3) transfer/interaction, and (4) errors found in children with SLI.

Methodology

The present chapter is based on mixed-methods research conducted in the framework of child language development studies and contrastive and contact linguistics. The study utilizes both qualitative and quantitative data analyses.

Participants

The sample of participants of this longitudinal study consists of six typically developing Russian-Finnish bilingual children from a Russian-Finnish bilingual kindergarten. Four children (B, C, E, F) are simultaneous bilinguals from Russian-Finnish bilingual families (Russian mothers, Finnish fathers). Informant A is a sequential bilingual from a Russian-speaking family. Informant D is a trilingual who acquired two L1s (Russian and Farsi) with parental exposure and Finnish as an L3 later (at age 3;0) in day care. The parents of all participants filled out a background questionnaire, providing information on the child, family, parents' education, languages, and parents' evaluation of the child's language skills as well as dominant language. All children come from middle-class families with educated parents. More detailed information on the participants is presented in Table 6.

Table 6. Subjects of the longitudinal study

| | A | B | C | D | E | F |
|---|----------|----------|----------|----------|----------|----------|
| Sex | f | f | m | m | f | m |
| Date of birth | 09.10.08 | 15.09.07 | 30.08.07 | 17.08.07 | 30.07.07 | 26.04.07 |
| Age at the beginning of the study | 3;1 | 4;2 | 4;3 | 4;3 | 4;4 | 4;7 |
| Age at the end of the study | 5;7 | 6;7 | 6;8 | 6;8 | 6;9 | 7;0 |
| 1st, 2nd or 3rd child in the family | 3rd | 2nd | 2nd | 2nd | 1st | 1st |
| Age at emergence of speech | 2;0 | 1;6 | 1;6 | 2;0 | 1;0 | 2;6 |
| Age when the child started to attend day care | 3;0 | 4;0 | 3;0 | 3;0 | 3;0 | 3;5 |

The sample of the cross-sectional study in Nenonen (2016) used as control groups for the present study consists of (i) 40 typically developing Russian monolinguals (MLR), (ii) 20 typically developing Finnish monolinguals (MLF), and (iii) 20 Russian-Finnish bilinguals with SLI.

Procedure

The study explores data collected using the articulation test designed by Remes and Ojanen (1997). The test, which involves picture-naming tasks, was used to assess pronunciation in both Finnish and Russian. The test included the original words in Finnish and an adaptation made for Russian (See Appendix). The 63 target words have various phonetic structures and contain all the vowels and consonants of both languages in different positions and combinations. Each test session was documented by filling a form in which the errors were registered. Some spontaneous utterances of

the participants were also analysed. The test sessions were video recorded. The longitudinal study lasted for 2.5 years, and every child participated in five test sessions (for details see tables 7.1-12.2). Participants were tested individually in each language separately. They were given the choice of which language to start with. According to our observations, the children preferred to start with their dominant language. The time needed to execute the test varied greatly among the children and correlated with their language proficiency: informants used less time to perform the test in the stronger language, older children were faster, and the later sessions of the test were much shorter (around 11 minutes) than the first sessions (the maximum length of the first session was 45 minutes). In the cases of balanced bilingualism, the time for test execution in Russian and Finnish was nearly the same. However, some of the final testing sessions required more time, because the children interrupted testing with spontaneous speech. Overall, the participants tried to do their best and therefore pronounced the words accurately, sometimes stressing nearly every syllable, which made it impossible to assess the prosodic features of the words or evaluate the realisation of word stress. Nevertheless, the collected data enabled us to analyse their phonemic inventories in Russian and Finnish, which was the main task of this study.

Analysis

The participant's production of target words was transcribed phonetically. Next, phonetic and phonological errors were analysed. In addition, errors in the informant's spontaneous utterances were also registered during the sessions. The pronunciation was assessed by auditory analyses, and the results were analysed according to the principles of relational analysis, which compares the child's productions with the corresponding adult target productions (Stoel-Gammon, 1985). The pronunciation errors were approached with an orientation towards a "nativeness" principle (i.e. with the target of native-like pronunciation). The test data were transposed into tables and graphics. During the analyses, the results were analysed in terms of the linguistic prognosis made (difficult and language-specific targets) and in comparison with the data on the phonological development of monolingual controls and the bilingual children with SLI.

Results

The results of the study on the six bilingual children are discussed below. At first, we present the case studies of four simultaneous bilingual children (F, C, E, B) from Russian-Finnish families, then we describe the case study of a trilingual (D) in Russian, Farsi and Finnish, and finally we introduce the case study of the sequential bilingual (A) from a Russian-speaking family. Overall, the data show considerable individual differences, so the children's productions are introduced separately. We start with the child's background information and then move on to a brief overview of the pronunciation errors.

Case 1: F

Participant F is the first child in a Russian-Finnish family. At the age of 2;6, he started to speak both languages. At the beginning of the test period, the boy had good proficiency in both languages and he preferred to speak Russian with his siblings. During the longitudinal study, F showed unstable but progressive development in Russian pronunciation; there were no vowel errors at the beginning of the study (4;7). With regard to Russian consonants, he had certain difficulties in the acquisition of the hard-soft opposition, the late acquired [r], [rʲ], [l], [lʲ], and the sibilants. The latter were especially difficult; in the last testing session (7;0), [s] and [ts] errors still remained (see Table 3). As for the nature of the error, the trills were omitted by F at the beginning of the study and substituted by [l], [lʲ] and [j] later on; the sibilants were interchangeable. Phonological processes (assimilation, addition, omission and metathesis) were observed mostly in Russian words. In

Finnish, there was definite progress in phonological development, though some regression of certain vowels and consonants was observed at the end of the study (7;0). Vowel errors (/æ, ææ, øi/) persisted until 7;0, and consonant errors remained in the late-acquired and language-specific sounds (ŋ and geminates) (see Table 7.2). The boy's [s] sounds in Finnish were transferred from Russian. Regression in the pronunciation of Finnish sounds coincided with attendance of the preparatory grade, when most attention was given to the Russian language, so this might explain why F's Finnish pronunciation temporarily worsened. Other reasons for such regression could be the influence of new Russian-speaking schoolmates with weaker Finnish or even the influence or imitation of a younger sibling.

Table 7.1. Pronunciation errors in Russian made by informant F during the longitudinal study (100% means that the participant mispronounced the sound every time in all the words; 0% means that the participant did not make a single error in the sound)

| | 4;7 | 4;10 | 5;4 | 6;0 | 7;0 |
|-----------|------------|-------------|------------|------------|------------|
| r | 64 % | 79 % | 79 % | 64 % | 0 % |
| rʲ | 100 % | 67 % | 67 % | 100 % | 0 % |
| l | 33 % | 0 % | 0 % | 0 % | 0 % |
| lʲ | 33 % | 17 % | 0 % | 0 % | 0 % |
| s | 56 % | 50 % | 56 % | 81 % | 44 % |
| sʲ | 50 % | 50 % | 50 % | 0 % | 0 % |
| ʈɕ | 20 % | 40 % | 20 % | 0 % | 0 % |
| ʈʂ | 33 % | 100 % | 67 % | 33 % | 67 % |
| ʒ | 50 % | 50 % | 0 % | 0 % | 0 % |
| z | 100 % | 100 % | 67 % | 33 % | 0 % |
| ʂ | 33 % | 17 % | 17 % | 17 % | 0 % |
| f | 50 % | 0 % | 0 % | 0 % | 0 % |

Table 7.2. Pronunciation errors in Finnish made by informant F during the longitudinal study

| | 4;7 | 4;10 | 5;4 | 6;0 | 7;0 |
|-----------|------------|-------------|------------|------------|------------|
| r | 100 % | 100 % | 50 % | 50 % | 0 % |
| s | 7 % | 21 % | 14 % | 21 % | 43 % |
| l | 16 % | 5 % | 5 % | 5 % | 0 % |
| ŋ | 100 % | 100 % | 100 % | 100 % | 100 % |
| j | 17 % | 17 % | 17 % | 17 % | 0 % |
| t | 0 % | 0 % | 0 % | 5 % | 0 % |
| pp | 0 % | 0 % | 0 % | 0 % | 50 % |
| mm | 0 % | 0 % | 0 % | 0 % | 50 % |
| kk | 0 % | 0 % | 0 % | 0 % | 33 % |
| ie | 100 % | 100 % | 0 % | 0 % | 0 % |
| a | 3 % | 0 % | 0 % | 3 % | 0 % |
| æ | 0 % | 0 % | 0 % | 0 % | 8 % |
| ææ | 0 % | 0 % | 0 % | 0 % | 50 % |
| øi | 0 % | 0 % | 0 % | 0 % | 100 % |

Case 2: C

Participant C is the second child in a Russian-Finnish family and an early bilingual speaker; he started to speak both languages at the age of 1;6. During the entire testing period, his Russian was stronger than his Finnish, so he preferred to speak Russian with his sibling. C made visible progress in Russian. Minor vowel errors appeared until the age of 5;8, and certain consonant errors became less frequent. Nevertheless, he produced a large amount of consonant mismatches expected of his bilingual status, with regard to the hard-soft opposition, the late-acquired [r], [rʲ], [l], [lʲ], and the sibilants (see Table 8.1). In Finnish, there was uneven and slow development with a regression in difficult sounds. A number of errors expected to result from his bilingual status were registered, such as consonant mismatches in late-acquired and language-specific sounds. The informant also made atypical mistakes, which are typically found in the production of children with SLI, specifically consistent vowel errors in monophthongs and diphthongs, and some unexpected consonant errors (e.g. [d], [n] and [h]; see Table 8.2). Vowel errors (substitutions) (4;3–4;9) were noticed not only in language-specific vocalic phonemes but also in the primary vowels [i], [a] and [u], which could be the result of poor skills in Finnish; the boy was unsure when pronouncing the endings of some words (e.g. *tuoli* /tuoli/ [tuola] ‘chair’, *lapsi* /lapsi/ [lapse] ‘child’, *kampa* /kampa/ [kampi] ‘hairbrush’, *viulu* /viulu/ [viula] ‘violin’). C’s productions showed a large number of phonological processes (sound omissions, assimilations and metatheses), especially in Finnish words. Several cases of transfer were noted; the transfer was mostly from dominant Russian to weaker Finnish (a Russian accent was observed in Finnish words), but also vice versa, which was an unexpected result.

Table 8.1. Pronunciation errors in Russian made by informant C during the longitudinal study

| | 4;3 | 4;6 | 4;9 | 5;8 | 6;8 |
|------------|-------|-------|-------|-------|-------|
| r | 64 % | 57 % | 21 % | 29 % | 29 % |
| rʲ | 100 % | 75 % | 25 % | 25 % | 0 % |
| l | 17 % | 17 % | 8 % | 17 % | 0 % |
| lʲ | 17 % | 17 % | 17 % | 17 % | 0 % |
| s | 81 % | 75 % | 81 % | 94 % | 81 % |
| sʲ | 50 % | 50 % | 50 % | 50 % | 100 % |
| t͡ɕ | 60 % | 40 % | 0 % | 0 % | 0 % |
| t͡s | 100 % | 100 % | 67 % | 67 % | 100 % |
| ʒ | 67 % | 67 % | 67 % | 100 % | 67 % |
| z | 100 % | 100 % | 100 % | 100 % | 100 % |
| ʂ | 60 % | 80 % | 100 % | 60 % | 60 % |
| t͡ʃ | 33 % | 33 % | 0 % | 33 % | 0 % |
| b | 0 % | 0 % | 0 % | 0 % | 40 % |
| ɣ | 0 % | 0 % | 0 % | 0 % | 40 % |
| ə | 0 % | 0 % | 0 % | 33 % | 0 % |

Table 8.2. Pronunciation errors in Finnish made by informant C during the longitudinal study

| | 4;3 | 4;9 | 4;9 | 5;8 | 6;8 |
|----------|------|------|------|------|------|
| r | 83 % | 33 % | 33 % | 17 % | 17 % |
| s | 57 % | 64 % | 64 % | 93 % | 93 % |
| l | 11 % | 11 % | 11 % | 58 % | 63 % |

| | | | | | |
|-----------|-------|-------|-------|-------|-------|
| ŋ | 100 % | 100 % | 100 % | 100 % | 100 % |
| j | 17 % | 17 % | 17 % | 17 % | 0 % |
| d | 0 % | 50 % | 0 % | 0 % | 0 % |
| v | 0 % | 0 % | 0 % | 25 % | 0 % |
| n | 0 % | 0 % | 0 % | 6 % | 0 % |
| h | 0 % | 0 % | 0 % | 0 % | 14 % |
| k | 7 % | 0 % | 0 % | 7 % | 0 % |
| kk | 0 % | 33 % | 33 % | 0 % | 33 % |
| tt | 33 % | 0 % | 33 % | 33 % | 0 % |
| ll | 0 % | 0 % | 0 % | 33 % | 0 % |
| a | 3 % | 10 % | 0 % | 0 % | 0 % |
| i | 0 % | 13 % | 0 % | 0 % | 0 % |
| u | 0 % | 0 % | 0 % | 0 % | 9 % |
| y | 29 % | 0 % | 0 % | 0 % | 0 % |
| æ | 0 % | 8 % | 0 % | 0 % | 8 % |
| uo | 100 % | 100 % | 0 % | 100 % | 0 % |
| au | 50 % | 0 % | 0 % | 0 % | 0 % |
| ie | 0 % | 100 % | 0 % | 0 % | 0 % |

Case 3: E

Participant E is the first child in a Russian-Finnish family. She started to speak both languages early, at the age of 1;6. According to her parents, her Russian was dominant before the age of 3;0 when she started to attend day care. After that, her Finnish got stronger and it became unquestionably dominant at the age of 6;8. E spoke Finnish with her sister and also constantly tried to speak it with her Russian-speaking mother. Her language proficiency in Finnish was strong, and the phonological system in Finnish was complete; in Finnish, E showed nearly correct pronunciation. In particular, there were no vowel errors, while in the consonants only /s/ and /r/ mismatches were observed (see Table 9.2). E's acquisition of her dominant language phonology followed the same pattern as that of monolingual children. For example, while acquiring the most difficult sounds, E went through the following stages: omissions, substitutions, later in some cases distortions, and gradually final acquisition. In Russian, which was the weaker language, E developed her own individual trajectory. Some sound groups were formed in a rather chaotic way, e.g. all fricatives and affricates were interchangeable, and there did not seem to be any systematic substitutions. Testing revealed a large amount of pronunciation errors, slow progress and non-linear development in Russian. Errors in vowels persisted from the age of 4;4 to 5;8. Consonantal errors were observed especially in some soft and voiced consonants, the sibilants, and the late-acquired [r], [s] and [l] (see Table 9.1.) The following types of phonological processes were noted in Russian words: omission of syllables, addition, assimilation and metathesis. Transfer from Finnish to Russian was especially evident in the production of hard-soft pairs; E usually failed to pronounce the Russian hard or soft consonant and therefore substituted it with the corresponding Finnish sound. In addition, the Russian vowels [i] and [ɨ] were substituted with the Finnish [I]. Another typical transfer was a voiced consonant substitution by a voiceless sound, as voiced consonants are illegal elements in the Finnish phonological system. The words in Russian were often pronounced with a Finnish accent, which was sustained during the entire longitudinal study. Though the normal direction of transfer was from Finnish to Russian, evidence of the reverse direction in transfer was also found. The findings suggest that at the age of 5;8, E had not yet acquired the main phonological contrasts in Russian, though the situation improved by the age of 6;8. In addition, E

had difficulties in the acquisition of reduced vowels. All of the above indicated that E was lagging behind her monolingual Russian peers.

Table 9.1. Pronunciation errors in Russian made by informant E during the longitudinal study

| | 4;4 | 4;10 | 5;1 | 5;8 | 6;8 |
|-----------|------------|-------------|------------|------------|------------|
| r | 64 % | 71 % | 71 % | 29 % | 36 % |
| rʲ | 25 % | 75 % | 75 % | 100 % | 0 % |
| l | 8 % | 0 % | 0 % | 0 % | 0 % |
| lʲ | 33 % | 17 % | 0 % | 0 % | 0 % |
| s | 31 % | 25 % | 38 % | 38 % | 19 % |
| sʲ | 0 % | 0 % | 0 % | 0 % | 50 % |
| ʈɕ | 71 % | 100 % | 29 % | 86 % | 29 % |
| ʈs | 33 % | 67 % | 33 % | 33 % | 0 % |
| ʐ | 67 % | 100 % | 67 % | 33 % | 33 % |
| z | 33 % | 67 % | 33 % | 67 % | 67 % |
| ʂ | 50 % | 100 % | 17 % | 17 % | 0 % |
| tʃ | 0 % | 0 % | 0 % | 33 % | 0 % |
| d | 100 % | 100 % | 100 % | 0 % | 0 % |
| b | 17 % | 0 % | 0 % | 0 % | 0 % |
| g | 100 % | 25 % | 50 % | 0 % | 0 % |
| n | 10 % | 0 % | 10 % | 0 % | 0 % |
| nʲ | 0 % | 0 % | 100 % | 100 % | 0 % |
| mʲ | 100 % | 100 % | 100 % | 100 % | 0 % |
| vʲ | 33 % | 33 % | 33 % | 33 % | 0 % |
| bʲ | 50 % | 50 % | 50 % | 50 % | 0 % |
| h | 50 % | 0 % | 0 % | 0 % | 0 % |
| f | 50 % | 50 % | 0 % | 0 % | 0 % |
| i | 13 % | 13 % | 0 % | 25 % | 0 % |
| ɨ | 0 % | 50 % | 0 % | 0 % | 0 % |
| ə | 100 % | 80 % | 50 % | 0 % | 0 % |

Table 9.2. Pronunciation errors in Finnish made by informant E during the longitudinal study

| | 4;4 | 4;10 | 5;1 | 5;8 | 6;8 |
|----------|------------|-------------|------------|------------|------------|
| r | 100% | 100 % | 83 % | 100 % | 0 % |
| s | 21 % | 57 % | 21 % | 21 % | 36 % |

Case 4: B

B is the second child in a Russian-Finnish family. She also started to speak both languages at the age of 1;6. The parents reported that her Finnish was dominant, and she usually preferred to speak her stronger language when possible, e.g. with her sister and relatives. In Finnish, B had only a few consonant errors during the first stages of testing. She showed very fast progress in phonological development, so that at the final stage (6;7) only /s/ errors remained (as indicated in Table 10.2). B's phonological development was in line with the monolingual phonological development of Finnish children. The acquisition of Russian phonology was rather fast. The girl never produced vowel errors. Among the consonants, the following sounds proved difficult: voiced consonants,

sibilants and the late-acquired [r]. On the whole, B was consistent in using substitutions, and the overall number of substituted sounds was small. All the problematic sounds seemed to be acquired at the end of the study, except for the affricate [tʃ], in which B showed no progress during the 2.5 years of the research (see Table 10.1). It is also worth noting that the girl systematically transferred word stress to the first syllable in Russian words, thus following the Finnish prosodic pattern. The results of the study show that phonological development was faster in Finnish than in Russian.

Table 10.1. Pronunciation errors in Russian made by informant B during the longitudinal study

| | 4;2 | 4;6 | 4;11 | 5;7 | 6;7 |
|------------|-------|-------|-------|-------|-------|
| r | 93 % | 86 % | 7 % | 7 % | 0 % |
| rʲ | 75 % | 75 % | 75 % | 0 % | 0 % |
| s | 58 % | 58 % | 51 % | 47 % | 5 % |
| sʲ | 100 % | 100 % | 100 % | 50 % | 50 % |
| tʃ | 62 % | 62 % | 100 % | 38 % | 0 % |
| tʃʲ | 100 % | 100 % | 100 % | 100 % | 100 % |
| z | 100 % | 67 % | 100 % | 67 % | 33 % |
| zʲ | 100 % | 40 % | 80 % | 40 % | 0 % |
| ʃ | 80 % | 80 % | 100 % | 40 % | 0 % |
| ɕ: | 100 % | 100 % | 100 % | 0 % | 0 % |
| d | 0 % | 0 % | 100 % | 100 % | 100 % |
| g | 100 % | 100 % | 0 % | 0 % | 0 % |

Table 10.2. Pronunciation errors in Finnish made by informant B during the longitudinal study

| | 4;2 | 4;6 | 4;11 | 5;7 | 6;7 |
|-----------|-------|-------|------|-------|------|
| r | 83 % | 100 % | 17 % | 0 % | 0 % |
| s | 75 % | 81 % | 88 % | 100 % | 44 % |
| l | 11 % | 11 % | 0 % | 0 % | 0 % |
| d | 0 % | 50 % | 0 % | 0 % | 0 % |
| v | 13 % | 25 % | 0 % | 0 % | 0 % |
| p | 0 % | 8 % | 0 % | 0 % | 0 % |
| h | 14 % | 0 % | 0 % | 0 % | 0 % |
| k | 7 % | 0 % | 0 % | 0 % | 7 % |
| a | 0 % | 0 % | 0 % | 3 % | 0 % |
| eu | 100 % | 0 % | 0 % | 0 % | 0 % |

Case 5: D

Participant D is trilingual. He is the second child in a Russian-Persian family. The emergence of speech for both Russian and Farsi was at 2;0. Finnish, being the L3 language, appeared at the age of 3;0 when the boy started to attend day care. The boy mostly spoke Russian at home and Finnish in the kindergarten. The results of the first testing already showed that the boy's language proficiency (including phonetic and phonological skills) in both Russian and Finnish was very high – in fact clearly better compared to the other participants. D demonstrated a small number of pronunciation

errors expected typical of his bilingual status, which did not have an impact on his good progress in Russian. Among D's errors were vowel errors in [i] and [i̇] (4;8–5;8), some problems with voiced sibilants – regression in [s], [ts̺] and [ts̺̺] – the substitution of voiced consonants by the voiceless equivalents, the substitution of soft consonants by their hard pairs and the omission of [j] (see Table 11.1). Phonological development in Finnish was definitely faster than in Russian, and no vowel errors were observed. D made minor consonant errors in late-acquired sounds, [j] was omitted a few times, [t] was substituted by [d], and double consonants were shortened. There is evidence that some difficult sounds were acquired the same way in both Russian and Finnish. At the age of 5;0, D started to distort Russian /s/ and Finnish /s/ in the same way – interdental sibilantism appeared (see Table 11.2). The findings suggest that this trilingual child was ahead of the other participants in the longitudinal study in phonological development in both Russian and Finnish. Regrettably, we were not able to assess the boy's phonological skills in Farsi.

Table 11.1. Pronunciation errors in Russian made by informant D during the longitudinal study

| | 3;6 | 4;8 | 5;0 | 5;8 | 6;9 |
|------------|------------|------------|------------|------------|------------|
| r | 7 % | 14 % | 0 % | 7 % | 7 % |
| s | 5 % | 5 % | 21 % | 16 % | 37 % |
| sʲ | 0 % | 0 % | 50 % | 50 % | 0 % |
| te̞ | 13 % | 13 % | 50 % | 13 % | 25 % |
| ts̺ | 0 % | 0 % | 0 % | 0 % | 33 % |
| z̺ | 33 % | 0 % | 33 % | 0 % | 0 % |
| z | 60 % | 0 % | 0 % | 40 % | 0 % |
| ʃ | 0 % | 10 % | 0 % | 0 % | 0 % |
| j | 33 % | 33 % | 33 % | 33 % | 0 % |
| b | 17 % | 0 % | 0 % | 0 % | 0 % |
| g | 100 % | 100 % | 0 % | 0 % | 0 % |
| nʲ | 0 % | 0 % | 100 % | 100 % | 0 % |
| vʲ | 0 % | 0 % | 33 % | 0 % | 0 % |
| i | 0 % | 13 % | 0 % | 0 % | 0 % |
| i̇ | 0 % | 0 % | 0 % | 50 % | 0 % |

Table 11.2. Pronunciation errors in Finnish made by informant D during the longitudinal study

| | 3;6 | 4;8 | 5;0 | 5;8 | 6;9 |
|-----------|------------|------------|------------|------------|------------|
| r | 0 % | 0 % | 17 % | 0 % | 17 % |
| s | 0 % | 0 % | 93 % | 0 % | 7 % |
| l | 11 % | 0 % | 0 % | 0 % | 0 % |
| j | 0 % | 17 % | 0 % | 17 % | 0 % |
| t | 0 % | 0 % | 5 % | 5 % | 0 % |
| ll | 0 % | 0 % | 33 % | 0 % | 0 % |

Case 6: A

Participant A is the third child in a Russian-speaking family. She started to speak Russian at the age of 2;0. At the age of 3;0, she started to attend day care, where she became acquainted with her L2, the Finnish language. In the very first test session (at 3;1), she showed very low proficiency in both languages, though Russian was naturally her dominant language. The girl's productions – with very

unclear and indistinct pronunciation, substituted and distorted sounds, together with a large number of phonological processes – sometimes resembled the protowords produced by an infant and the utterances of a child with SLI. She demonstrated very little progress in Russian and Finnish between the ages of 3;1 and 4;6. Her pronunciation remained unclear, though the rhythmic structure of words was well reproduced. Despite the long period with no noticeable improvement, A made certain progress in the acquisition of some Russian sounds. The pronunciation errors in Russian comprised vowel errors in [i] and [i̯], and a large amount of various consonant errors that affected hard-soft and voiced consonants, sibilants, and the late-acquired [r], [s] and [l] (see Table 12.1). Additionally, A demonstrated errors typical of children with SLI, such as overuse of a combination of phonological processes. In Finnish, there were numerous vowel errors (at 3;1) and consonant errors (between 3;1–4;6), as well as errors typical of children with SLI in the form of combining various phonological processes. Transfer from Russian to Finnish occurred in A’s production for a long time, and the girl had a strong Russian accent while speaking Finnish. However, following the very slow progression in her development that lasted nearly two years, the girl did achieve very high scores in Russian and Finnish by age 5;7 that was the last testing session. At that time, A spoke both languages fluently with her siblings, friends and relatives. Shortly after exposure to her L2 started, A’s phonological development in Finnish accelerated. At the age of 5;7, only a few errors in Finnish were observed (see Table 12.2). Overall, the progress in Finnish, that was initially the weaker language, was faster than in Russian. She showed the delayed onset and slow development of expressive language of a late talker, but she was subsequently able to follow an otherwise age-appropriate developmental path (e.g. Roos & Weismer, 2008), denoting her sequential bilingualism. The findings show that this girl produced the largest number of pronunciation errors, including developmental errors (i.e. typical of monolingual children), and errors typical of bilingual children and of children with SLI. At the early stage of her development, many sounds were shared in the two languages (i.e. they sounded identical) and her two systems showed clear evidence of interaction. However, at the end of the study, A showed fast progress both in lexical and phonological development. The transfer from Russian to Finnish disappeared, and the girl was very close to balanced bilingualism.

Table 12.1 Pronunciation errors in Russian made by informant A during the longitudinal study

| | 3;1 | 3;5 | 3;10 | 4;6 | 5;7 |
|-----------|------------|------------|-------------|------------|------------|
| r | 64 % | 79 % | 79 % | 79 % | 0 % |
| rʲ | 25 % | 50 % | 25 % | 25 % | 0 % |
| l | 67 % | 33 % | 50 % | 42 % | 0 % |
| lʲ | 83 % | 17 % | 67 % | 33 % | 0 % |
| s | 50 % | 50 % | 69 % | 44 % | 6 % |
| sʲ | 50 % | 0 % | 0 % | 0 % | 0 % |
| ʈe | 69 % | 85 % | 100 % | 69 % | 0 % |
| ʈs | 67 % | 33 % | 67 % | 100 % | 0 % |
| ʒ | 75 % | 100 % | 75 % | 75 % | 0 % |
| z | 100 % | 40 % | 60 % | 60 % | 0 % |
| ʂ | 100 % | 71 % | 100 % | 100 % | 0 % |
| ɕ: | 100 % | 100 % | 100 % | 100 % | 0 % |
| tʲ | 0 % | 0 % | 0 % | 0 % | 33 % |
| d | 100 % | 100 % | 50 % | 0 % | 0 % |
| b | 50 % | 67 % | 17 % | 17 % | 0 % |
| bʲ | 100 % | 0 % | 0 % | 0 % | 0 % |
| p | 0 % | 0 % | 0 % | 20 % | 0 % |

| | | | | | |
|-----------|-------|-------|-------|-------|-----|
| g | 50 % | 25 % | 25 % | 25 % | 0 % |
| nʲ | 100 % | 100 % | 100 % | 100 % | 0 % |
| m | 17 % | 0 % | 0 % | 0 % | 0 % |
| vʲ | 33 % | 33 % | 0 % | 0 % | 0 % |
| f | 50 % | 0 % | 0 % | 0 % | 0 % |
| j | 67 % | 0 % | 0 % | 0 % | 0 % |
| i | 0 % | 13 % | 0 % | 0 % | 0 % |
| i | 100 % | 100 % | 50 % | 50 % | 0 % |

Table 12.2. Pronunciation errors in Finnish made by informant A during the longitudinal study

| | 3;1 | 3;5 | 3;10 | 4;6 | 5;7 |
|-----------|------------|------------|-------------|------------|------------|
| r | 83 % | 83 % | 83 % | 67 % | 0 % |
| s | 71 % | 79 % | 71 % | 79 % | 14 % |
| l | 63 % | 58 % | 58 % | 42 % | 0 % |
| ŋ | 100 % | 100 % | 100 % | 0 % | 0 % |
| j | 17 % | 0 % | 0 % | 0 % | 0 % |
| d | 50 % | 0 % | 0 % | 0 % | 0 % |
| h | 43 % | 0 % | 0 % | 0 % | 0 % |
| p | 0 % | 0 % | 0 % | 8 % | 0 % |
| nn | 100 % | 100 % | 100 % | 100 % | 0 % |
| kk | 33 % | 33 % | 33 % | 67 % | 0 % |
| ll | 67 % | 67 % | 67 % | 67 % | 0 % |
| a | 3 % | 0 % | 0 % | 0 % | 0 % |
| i | 0 % | 0 % | 6 % | 0 % | 0 % |
| e | 33 % | 0 % | 0 % | 0 % | 0 % |
| æ | 30 % | 20 % | 10 % | 0 % | 0 % |
| y | 14 % | 14 % | 0 % | 0 % | 0 % |
| yø | 100 % | 0 % | 0 % | 0 % | 0 % |
| au | 50 % | 50 % | 0 % | 0 % | 0 % |
| ie | 100 % | 0 % | 0 % | 0 % | 0 % |
| ou | 100 % | 100 % | 100 % | 0 % | 0 % |
| eu | 100 % | 0 % | 0 % | 0 % | 0 % |
| iu | 100 % | 100 % | 0 % | 0 % | 0 % |
| æy | 100 % | 0 % | 0 % | 0 % | 0 % |
| øy | 100 % | 0 % | 0 % | 0 % | 0 % |

Discussion

The pronunciation assessment of six bilingual children in the study revealed not only individual development trajectories but also some characteristics typical of bilingualism in the acquisition of sound inventories. In Russian, the most problematic sounds were [r] and [s]. In addition, nearly all children in the study had difficulties with [rʲ], [l] and [lʲ], and major problems concerned fricatives and affricates, and the sound oppositions of hard-soft and voiced-voiceless. Three out of six children made systematic errors while pronouncing the vowels [i], [i̯] and the unstressed [ə]. In Finnish, the most difficult sounds appeared to be [r], [s], and [l]; the language-specific consonant [ŋ]; double consonants; and nearly all vowels, even the “universal” (primary) vowels that are

usually acquired early by monolingual children. Still, the most problematic Finnish vowels were the language-specific [y], [ø] and [æ] and the diphthongs.

Five out of six children (all except the trilingual D) made a large number of pronunciation mistakes in Russian. Three children – the trilingual D and the bilingual B and E – were ahead of the other children in the acquisition of Finnish sound inventories. For B and E, Finnish was the dominant language during the whole period of the longitudinal study, while for D Finnish developed fast and became dominant soon after he started attending day care. The phonological development of the other three children was faster and easier in Finnish than in Russian, even when Finnish was the L2 (i.e. the weaker language). Participant A demonstrated how readily a child is able to cope with a significant delay in both the L1 and L2: after a difficult start, the girl became a rather balanced sequential bilingual (by 5;7). The case of A questions the view of simultaneous delay in two languages being a marker of language impairment.

The longitudinal study also helped to depict the different and sometimes changing profiles of the bilingual participants over the course of their development. A monolingual girl (A) became a sequential bilingual, a bilingual boy (D) with two languages (Russian and Persian) became trilingual having acquired an L3 (Finnish), one boy (C) retained Russian as his dominant language, and one girl (E) retained Finnish as her dominant language. One girl (B) had Russian as her dominant language in the early stages of development, but later on Finnish became her stronger language.

The data show that the phonological development of these bilingual children is not an even, steady process. Instead, development has a wave-like trajectory with ups and downs: earlier acquired phonetic features may get lost, new substitutions of speech sounds may appear and the phonetic systems of two languages may interact. Rather progressive and rectilinear development was observed in the acquisition of the trill [r] in both languages. Three participants (D, B and A) acquired this sound in Russian faster (3;1–5;0) than the Russian monolinguals (5;0–7;0; Bel'tjukov & Salakhova, 1975; Eliseeva, 2008, 2014; Gvozdev, 1961). In Finnish, all six children acquired the trill faster (3;1–6;6) than the Finnish monolinguals in general (around 7;0; Iivonen, 1994, 1998, 2009; Korpinen & Nasretidin 2009; Kunnari, 2000; Saaristo-Helin, Kunnari, & Savinainen-Makkonen, 2011; Savinainen-Makkonen, 2001; Toivainen, 1990). The trilingual child acquired the trills in both languages even earlier than the bilingual participants of the study. This example could be evidence of acceleration in this particular sound's acquisition in bilinguals. It is important to point out that the rhotics in Russian and Finnish are very similar, though the Finnish trill is longer and comprises more vibration movements than the Russian trill. While the Russian sound is produced with 1-2 contacts, the Finnish trill vibrates for 3 and more contacts (de Silva et al., 2010; Skaložub, 1963).

There were different pathways to the acquisition of the fricatives [s] and [sʲ] in Russian and [s] in Finnish. Many participants after periods of adult-like realisation of these sounds started to substitute them with other fricatives or affricates, and sometimes the substitutions were borrowed from the other language – i.e. from Russian to Finnish or vice versa. All six participants acquired [sʲ] much later (5;0–7;0) than their monolingual peers (2;0–2;7). The Russian unpalatalized [s] was also mastered by bilinguals later (around 6;0) than by monolinguals (2;8–3;3; Bel'tjukov & Salakhova, 1975; Gvozdev, 1961). While monolingual children usually acquire the palatalized [sʲ] before the unpalatalized [s], bilinguals acquire them in the reverse order, probably because palatalized sounds are generally difficult for them. Similarly, in Finnish [s] was acquired more slowly by bilinguals (not yet acquired by the age of 6;0–7;0) than by monolinguals (the sound is usually acquired by 3;0–3;11, though interdental sigmatism may still remain; Kunnari, 2000; Savinainen-Makkonen, 2001). The described case could be an example of decelerated sound acquisition in the bilinguals of the study.

The present study revealed the presence of transfer in the productions of five out of the six participants. The main direction of the transfer was from the dominant to the weaker language, e.g. from Finnish to Russian in participants B, E and A, and from Russian to Finnish in participant C.

However, participant C also showed some evidence of reverse transfer at the last stage of the longitudinal study, which is an indication of the boy's growing proficiency in Finnish. The transfer was especially noticeable in the productions of participant E, who had a strong Finnish accent in Russian. According to our observations, transfer tends to disappear in time, which was registered in the case of participant A.

Overall, the study has shown that interaction is rather common among the different bilingual children studied here. Our findings also support previous research that has shown the interaction of two phonological systems in bilingual children (e.g. Fabiano-Smith & Barlow, 2010; Kehoe, 2018; Polka & Sundra, 2003). The question of how closely the two systems are interconnected could be answered in different ways depending on the case. For instance, in the case of participant F, there was only minor interaction between the two phonological systems, while for participant E, the Finnish phonological system deeply infiltrated the Russian phonological system. We suppose that a clear marker of interaction between the two systems is isomorphism – that is, using shared sounds in both phonological systems. At the same time, there is plenty of evidence in favour of the two-system model in the participants of the present study. In particular, occurrences of transfer were limited, and the children's production in a certain language contained mostly phonetic material of this language. Finally, not a single participant – not even A, who had very poor language skills in Russian and Finnish at the beginning of the study – appeared to have a single phonological system. Taken together, these findings show that at the ages between 3;0–7:0, Russian-Finnish bilinguals have two different – albeit interacting – phonological systems, supporting previous findings in the literature.

Conclusion

Despite the considerable individual variation in phonetic production, the findings of the present case studies suggest that bilinguals acquire Russian and Finnish phonetic inventories, by and large, later than their monolingual peers. The difference is evident both in the speed of acquisition and in the number and nature of the errors. With regard to the nature of mispronunciation, four types of errors were distinguished in the bilingual participants of this longitudinal study: (1) developmental errors that are commonly made by bilinguals and monolinguals; (2) language-specific errors made by both monolinguals and bilinguals (however, the latter group made considerably more mistakes, especially at an older age); (3) cross-linguistic transfer mistakes (caused by the differences in the Russian and Finnish phonological systems) made by bilinguals, resembling the errors of second-language learners; and (4) unpredictable errors found in bilingual typically developing children and children with SLI.

The analysis from a longitudinal perspective reveals that phonological development is faster and easier for bilinguals in Finnish than in Russian. However, the relatively simpler Russian vocalic inventory is acquired faster than Finnish vocalic inventory, whereas the complex system of Russian consonants takes longer to develop than the Finnish consonantal system. Furthermore, language-specific features appear to be the most problematic in acquisition. The findings indicate that although bilinguals show initial similarities with Russian- and Finnish-speaking monolingual peers, their phonological development is by and large slower, and they make specific errors as a result of their bilingual status, as well as errors that resemble those of children with SLI.

This study provides further evidence of language interaction in bilingual phonological development, e.g. in the form of cross-language transfer, delay and acceleration. As a result, some bilingual children may have either a Russian or a Finnish accent. However, this accent tends to disappear gradually. As predicted, bilingual language acquisition demonstrates predominantly a deceleration in the acquisition of the Russian and Finnish phonological systems. Nevertheless, bilinguals also showed a few cases of accelerated sound acquisition in Finnish and Russian.

Limitations and further research

Several limitations of this study need to be acknowledged. The first limitation relates to the small sample size: six participants took part in the longitudinal experiment. Of the six, four were simultaneous bilinguals, one was a sequential bilingual and one a trilingual. It would be useful to carry out broader research focused on a larger group of participants. Secondly, the study was based on a single articulation test (picture naming) and a small number of spontaneous comments of the participants. Future research could focus on various tasks and the spontaneous speech production of the participants. Finally, further studies should aim at dense and more detailed observations of individual learning trajectories (for instance, every two weeks), since this type of research highlights important aspects of the nature of the developmental process. This would, in turn, help explore questions such as when and why “phase shifts” occur in the speech of developing children, like those portrayed in the cases of A and D.

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Appendix: Articulation test in Finnish and Russian

| | Word in Finnish | Targeted IPA | Word in Russian | Targeted IPA | English translation |
|----|-------------------|--------------|------------------|--------------|---------------------|
| 1 | <i>jäätelö</i> | [jæætɛlø] | <i>мороженое</i> | [mɔrøʒinøjə] | icecream |
| 2 | <i>pöllö</i> | [pøllø] | <i>сова</i> | [sɔvɔ] | owl |
| 3 | <i>tyyny</i> | [tyyny] | <i>подушка</i> | [pɔduʂkə] | pillow |
| 4 | <i>tuoli</i> | [tuoli] | <i>стул</i> | [stul] | chair |
| 5 | <i>sieni</i> | [sieni] | <i>гриб</i> | [grʲip] | mushroom |
| 6 | <i>syö</i> | [syø] | <i>ест</i> | [jest] | (he) eats |
| 7 | <i>auto</i> | [auto] | <i>машина</i> | [mɔʂinə] | car |
| 8 | <i>joulukuusi</i> | [joulukuusi] | <i>ёлка</i> | [jolkə] | Christmas tree |
| 9 | <i>neula</i> | [neula] | <i>иголка</i> | [igolkə] | needle |
| 10 | <i>viulu</i> | [viulu] | <i>скрипка</i> | [skrʲipkə] | violin |
| 11 | <i>laiva</i> | [laiva] | <i>корабль</i> | [kɔrablʲ] | ship |
| 12 | <i>poika</i> | [poika] | <i>мальчик</i> | [malʲtɕik] | boy |
| 13 | <i>ui</i> | [ui] | <i>плавает</i> | [plavəjit] | (he) swims |
| 14 | <i>leipä</i> | [leipæ] | <i>хлеб</i> | [hlʲep] | bread |
| 15 | <i>äiti</i> | [æiti] | <i>мама</i> | [mamə] | mother |
| 16 | <i>päärynöitä</i> | [pæærɯnøitæ] | <i>груши</i> | [gruʂi] | pears |
| 17 | <i>lyijykynä</i> | [lyijykynæ] | <i>карандаш</i> | [kərɔndaʂ] | pencil |
| 18 | <i>täynnä</i> | [tæynnæ] | <i>полный</i> | [polnʲij] | full |
| 19 | <i>pöytä</i> | [pøytæ] | <i>стол</i> | [stol] | table |

| | | | | | |
|----|-----------------|------------|-----------------|---------------|----------------------|
| 20 | <i>pallo</i> | [pallo] | <i>мяч</i> | [m'iate] | ball |
| 21 | <i>piippu</i> | [piippu] | <i>трубка</i> | [trupkə] | tobacco pipe |
| 22 | <i>talo</i> | [talo] | <i>дом</i> | [dom] | house |
| 23 | <i>tutti</i> | [tutti] | <i>соска</i> | [soskə] | pacifier |
| 24 | <i>sukat</i> | [sukat] | <i>носки</i> | [nʌskʲi] | socks |
| 25 | <i>sydän</i> | [sydæn] | <i>сердце</i> | [s'iert̩sə] | heart |
| 26 | <i>kala</i> | [kala] | <i>рыба</i> | [ribə] | fish |
| 27 | <i>kukka</i> | [kukka] | <i>цветок</i> | [t̩svʲitok] | flower |
| 28 | <i>vauva</i> | [vauva] | <i>малыш</i> | [mʌliʃ] | baby |
| 29 | <i>ovi</i> | [ovi] | <i>дверь</i> | [dvierʲ] | door |
| 30 | <i>suu</i> | [suu] | <i>рот</i> | [rot] | mouth |
| 31 | <i>kissa</i> | [kissa] | <i>кошка</i> | [koʃkə] | cat |
| 32 | <i>lammas</i> | [lammas] | <i>овца</i> | [ʌft̩sa] | sheep |
| 33 | <i>juna</i> | [juna] | <i>поезд</i> | [poʝist] | train |
| 34 | <i>leija</i> | [leija] | <i>змей</i> | [zm'ej] | kite |
| 35 | <i>hattu</i> | [hattu] | <i>шляпа</i> | [ʃl'apə] | hat |
| 36 | <i>puhelin</i> | [puhelin] | <i>телефон</i> | [t̩il'fon] | telephone |
| 37 | <i>radio</i> | [radio] | <i>радио</i> | [rad'io] | radio |
| 38 | <i>orava</i> | [orava] | <i>белка</i> | [b'ielkə] | squirrel |
| 39 | <i>lippu</i> | [lippu] | <i>флаг</i> | [flak] | flag |
| 40 | <i>kello</i> | [kello] | <i>часы</i> | [t̩eisi] | watch |
| 41 | <i>muna</i> | [muna] | <i>яйцо</i> | [j̩j̩t̩so] | egg |
| 42 | <i>mummo</i> | [mummo] | <i>бабушка</i> | [babuʃkə] | grandmother |
| 43 | <i>nenä</i> | [nenæ] | <i>нос</i> | [nos] | nose |
| 44 | <i>hevonen</i> | [hevonen] | <i>лошадь</i> | [loʃetʲ] | horse |
| 45 | <i>avain</i> | [avain] | <i>ключ</i> | [kl'ut̩e] | key |
| 46 | <i>kengät</i> | [keŋæt] | <i>ботинки</i> | [bʌt̩'inkʲi] | boots |
| 47 | <i>lapsi</i> | [lapsi] | <i>ребёнок</i> | [r̩ib'ʌnək] | child |
| 48 | <i>itkee</i> | [itkee] | <i>плачет</i> | [pl̩t̩eit] | (he) cries (to cry) |
| 49 | <i>veitset</i> | [veitset] | <i>ножи</i> | [nʌz̩t̩] | knives |
| 50 | <i>sakset</i> | [sakset] | <i>ножницы</i> | [noz̩n'its̩i] | scissors |
| 51 | <i>tasku</i> | [tasku] | <i>карман</i> | [kʌrman] | pocket |
| 52 | <i>istuu</i> | [istuu] | <i>сидит</i> | [s̩id'it] | (he) seats (to seat) |
| 53 | <i>lehmä</i> | [lehmæ] | <i>корова</i> | [kʌrovə] | cow |
| 54 | <i>tähti</i> | [tæhti] | <i>звезда</i> | [zv̩izda] | star |
| 55 | <i>perhonen</i> | [perhonen] | <i>бабочка</i> | [babət̩ekə] | butterfly |
| 56 | <i>porkkana</i> | [porkkana] | <i>морковка</i> | [mʌrkɔfkə] | carrot |
| 57 | <i>korva</i> | [korva] | <i>ухо</i> | [uhə] | ear |
| 58 | <i>hylje</i> | [hylje] | <i>тюлень</i> | [t̩ul'enʲ] | seal |
| 59 | <i>pulkka</i> | [pulkka] | <i>санки</i> | [sankʲi] | sled |
| 60 | <i>silmä</i> | [silmæ] | <i>глаз</i> | [glas] | eye |
| 61 | <i>kampa</i> | [kampa] | <i>расчёска</i> | [rʌ:oskə] | comb |
| 62 | <i>kynttilä</i> | [kynttilæ] | <i>свечка</i> | [sv̩iet̩kə] | candle |
| 63 | <i>kaktus</i> | [kaktus] | <i>кактус</i> | [kaktus] | cactus |

