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Challenges of writing in two languages

Aleksei Korneev and Ekaterina Protassova

1. Introduction

Investigations into biliteracy show some positive and negative influences during the language acquisition processes and usually reveal interesting outcomes in adults as well; these processes must be managed carefully (Durgunoglu and Goldenberg, 2011). Teachers' knowledge of the peculiarities of each linguistic system may enhance the instruction (Carreker et al., 2010). For example, the interrelations between L1 and L2 orthographies are crucial for spelling accuracy (Dixon et al., 2010; Kumar et al., 2010).

In dual-language classrooms, after five to six years of participation in a program, children develop special language ideologies (Morren López, 2012). Shoonen et al. (2003) pointed out the relative importance of linguistic and meta-linguistic knowledge for bilinguals, because the fluency measures correlate with overall writing performance in both languages; however, fluency cannot predict writing performance. At the same time, the first language is crucial for attaining competence in the second language. Drury (2007) explores the experience of young bilingual children as they begin formal schooling. Dworin and Moll (2006) combined studies on emergence of literate competencies in more than one language and proficiencies in two languages and their corresponding literacies, thereby facilitating a cross-contextual analysis of social relations and institutional practices.

Taking these previous studies into consideration, this article will focus on a computer-based, contrastive assessment of bilingual Finnish-Russian students with different linguistic backgrounds and examine their writing in two languages. The research was carried out at the Finnish-Russian School in Helsinki, which has a long tradition of bilingual education. Speakers of Russian are the biggest linguistic minority in Finland, especially in the capital area. The Finnish-Russian School admits children six years of age into preparatory education. In the first class, the children are divided according to their family language background, Finnish, Russian, or Finnish-Russian bilingual. They are educated in both of their languages simultaneously in parallel programs.

The sections of this article focus on the following topics: previous research on handwriting, pupils' linguistic and educational background, experimental tasks, and results, which take into consideration differences and similarities in the children's background. Discussion and conclusions will reveal some considerable differences in writing in Finnish as opposed to writing in Russian; dependence on the dominant language is demonstrated, as well as the interdependence of literacy skills in both languages.

1.1 Computer-based research on handwriting

Computer-based systems of handwriting assessment use digitized tablets that allow a person to record and precisely score the process of handwriting. Scholars began to develop such systems in the 1980s (Teuling and Maarse, 1984; Graham and Weintraub, 1996). This approach to the investigation of handwriting has facilitated the exploration of motor skills under different writing conditions. Recently, the number of handwriting studies using digitized tablets in different fields has grown considerably (Marquardt et al., 1999; Mergl et al., 1999; Rosenblum et al., 2006; Tucha et al., 2006; Hepp-Reymond, 2009). For instance, a group of Canadian researchers (Falk et al., 2011) developed a computer-based handwriting assessment tool modeled on the Minnesota Handwriting Assessment. This method allows an assessment of the spatial features of handwriting, e.g., legibility, form, alignment, and size of the letters. The temporal analysis in this case is founded on average per-stroke durations. Dictus is another computer tool used to record and analyze handwriting samples (Guinet and Kandel, 2010). This instrument allows the user to present a stimulus and record a subject's movements during handwriting. It has a data analysis module that allows the visualization and navigation of recorded samples, while segmenting them and computing the dynamic and spatial parameters of trajectories.

In our experiment, we used similar software (written in C language and Matlab) developed by Aleksei Korneev in collaboration with Andrei Kurgansky (the Laboratory of Neurophysiology of Cognitive Processes, the Institute of Developmental Physiology, Moscow). This software allows the recording of the handwriting process on a pen tablet connected to a computer. In processing the data, we also considered the experience of our previous studies (Korneev, 2004; Akhutina et al., 2008) and the understanding acquired in previous investigations as described below.

The computer-based system of evaluating handwriting allows us to analyze both theoretical issues of the structure of handwriting skill and practical-oriented problems, such as acquisition, development, and disturbances in handwriting skill. For example, one of the fundamental issues of handwriting involves the basic unit that comprises a motor program (cf. Vygotsky, 1983). Hulstijn and van Galen's study (1983) has shown that complete letters form the basic unit of motor programs. In addition, Teulings and co-authors established in a series of research studies that the bases of handwriting movements are spatial patterns that are translated into specific timing patterns (Shomaker et al., 1989; Teulings and Shomaker; 1993, Castello and Stelmach, 1993, for review). In other studies, syllables are considered the basic elements of handwriting movements (Bogaerts et al., 1996; Kandel et al., 2006). These findings

revealed that handwriting movements are organized in accordance with the syllabic structure of words. These results were obtained through analysis of the temporal features of handwriting using computer-based systems.

The computerized analysis of handwriting is particularly appropriate in comparing different groups of subjects. Among recent publications, many are dedicated to age differences in handwriting skills (Abbott et al., 2010; Rueckriegel et al., 2008). Another popular area that has been investigated in this framework has to do with comparative studies of children with and without learning disabilities (Overvelde and Hulstijn, 2011; Sumner et al., 2012).

In this study, we investigated handwriting in two groups

of bilingual schoolchildren and compared the results with monolingual groups. A computer-based method of registration of handwriting movements vs. tracks allows us to estimate accurately the temporal and spatial features of the children's handwriting and explore how it differs from one language to another and from bilinguals to monolinguals.

1.2. Linguistic background

The challenges of bilingual education are partly due to the comparative difficulties of the linguistic systems of Finnish and Russian. Some underlying issues that might be reflected in the use of writing principles by Finnish-Russian bilingual children are the following: Finnish uses the Roman alphabet, whereas Russian uses the Cyrillic alphabet. The Russian language has 33 letters, whereas Finnish has 29. Some letters, like A, represent the same shape and the approximate analogical sounds in both languages. Other letters have the same shape but different sounds, like the Roman *B* and Cyrillic *B* (the last pronounced like V), where the Russian variant is dissimilar. Some letters have similarities in certain fonts and/or size, but differ in other traits, such as the Roman D vs. Cyrillic Д. Some letters have the same shape but different sounds. Some Russian letters are represented by shapes that are completely different from the same letters in Finnish.

In Finnish, the differences between voiced and voiceless sounds are not relevant for the beginning of words; in Russian, these differences are not relevant at the end of words. Such differences are the subject of special instruction in the Finnish-Russian School.

Finnish speakers may replace sounds like the Russian S, S', Z, Z', Ž, Š, ŠČ, Č, and C with one sound – 'S' – or substitute others. Russian speakers may ignore differences between long and short vowels and consonants typical of Finnish. Finnish speakers may not perceive palatalized Russian sounds. Russian speakers may not perceive Finnish diphthongs.

There are special difficulties with Russian literacy, such as as using wrong letters for vowels in non-stressed syllables and inaccurate use of ы vs. *И*, ь vs. Ъ, which may be difficult for Finnish speakers to master. Special difficulties in Finnish literacy are few, because most of the words are written like they sound. Still, in some cases combined words (not necessary composita) are written together rather than separately. For emerging literates, double vs. single letters or long vs. short sounds may be traps, as are phonetic joints between words. Using typologically different languages, pupils have to apply ways of writing appropriate to the language. For example, Finnish is agglutinative, and location in space is shown by a word's ending, whereas Russian is inflectional and shows location both with prepositions written separately as well as with word endings.

1.3. School arrangements

Among Finnish-Russian bilinguals in the Finnish-Russian School, the Finnish-dominant bilinguals (FDBs) are placed in a separate class from the Russian-dominant bilinguals (RDBs). The teaching is the same number of hours in both languages, but the family linguistic situation supports the school efforts differently. The language of intergroup communication is usually Finnish among the FDBs and Russian among the RDBs. Moreover, teachers of Russian use calligraphic copybooks as early as the first grade, whereas teachers of Finnish use print writing patterns and introduce cursive handwriting in the second grade, although pupils are not required to learn this variant. Some teachers believe that it is easier and more practical to join letters together in cursive; others prefer printing because it is more readable. Today, some alumni of the Finnish-Russian School continue to print in Finnish, while they write Russian in cursive.

2. Method

2.1 Participants

In this study, 28 right-handed, second-grade children participated in the experiment. The mean age of the subjects was 8.23±0.5 years. They were divided into two experimental groups: the RDBs (15 children) and the FDBs (18 children). The subjects had to know cursive writing in Russian, but five of the FDB had not yet acquired those skills at the time of the experiment and were excluded from further analysis. In order to compare handwriting in

bilingual and monolingual children, we added two control groups. The Russian-speaking control group (RCG) consisted of 15 monolingual children from a Russian school in Moscow (mean age 8.35±0.2, 5 male, 5 female). The monolingual Finnish control group (FCG) consisted of ten children from a Finnish school in Helsinki (mean age 8.25±0.2, 4 male, 6 female). The control groups performed the same tasks as the bilingual children, but in their native language only. None of the subjects had any learning disabilities, nor did any of them have a known history of neurological disease. The experimental study of handwriting skills and reading was conducted at the beginning of September 2012 and 2013. Thus, the pupils just had regained the performance levels that they had achieved by the end of first grade. Together with permission to conduct the experiment, parents were asked to provide background information about the children's family languages and about reading practices in the family.

2.2 Procedure

The participants had to perform the following tasks:

(1) Write their names and the place they live in both Russian and Finnish.

(2) Copy one simple sentence in Russian and later, after they had read the text in Russian, copy its translation into Finnish:

Rus.: ***После весёлого лета трудно начинать учиться, но приятно увидеться с друзьями.***

Fin.: ***Iloisen kesän jälkeen on vaikeaa aloittaa opiskelu, mutta on kivaa tavata ystävät.***

'After a happy summer, it is difficult to begin studying, but it's nice to meet friends.'

The stimuli were presented visually; the sentences were printed on white sheets of paper and were shown to the subjects during the task administration. Both variants presented the pupils with spelling challenges.

(3) Write down three short sentences dictated by the teacher in Russian and Finnish:

Rus.: ***Я хожу во второй класс. Мне купили синий рюкзак. В нём много карманов***

Fin.: ***Olen toisella luokalla. Minulle ostettiin sininen reppu. Siinä on paljon taskuja***

'I'm in the second grade. I got a blue backpack for school (literally: A blue schoolbag was bought for me). It has a lot of pockets.'

The stimuli were recorded with the same number of stops by the same male voice, and the same recording was played for every participant in the same pace.

(4) Read aloud a short story in Russian (Akhutina and Inshakova, 2008, p. 100) (for RDBs, FDBs, and RCG) or in Finnish (Korneev and Protassova, 2015). The text consists of 56 words. It is an adaption of a story by Russian writer N.Nosov. The text is widely used for assessment of reading skills in Russian primary schools.

Participants were seated comfortably in front of a graphics tablet, which was positioned on the desk. On the tablet, a standard page from a horizontally-oriented school notebook with rows formed by two horizontal lines, usual in Finnish schools, was placed. The participants held an ink pen in their right hand. The researcher asked them to carry out several tasks. The order of tasks was as follows: (1) write their name and the name of city where they live in Russian; (2) write the same words in Finnish; (3) copy the sentence in Russian; (4) write dictation in Russian; (5) read the Russian text; (6) copy the sentence in Finnish; and (7) write dictation in Finnish. The whole session lasted about 20–25 minutes. It was rather demanding for the participants, but they remained interested in completing their tasks.

2.3 Apparatus

The subjects' movements were recorded using a Wacom Intuos 3 A5 pen tablet with 5,080 lines per inch spatial resolution and a sampling *rate of* 200 Hz. An ink pen was used in the experiment. The movement recording was controlled by our own software (written in C language and Matlab). The experimental program allowed both the

position of the pen and the pressure on the surface of the tablet to be recorded in real time. The reading was recorded by an Olympus VN-3000PC voice recorder.

2.4 Data processing and statistical analysis

The computer recordings of writing were processed offline with Matlab scripts, which made it possible to compute the following handwriting parameters:

1. Mean time of writing a letter (TOWL). It was computed as a ratio of the total time of the task execution (the difference between the registered times of the first and last contact of the pen with the surface of the tablet) to the number of letters in the task. This parameter was used as the general characteristic of writing speed.
2. For a more accurate estimation of the temporal parameters of writing, the exact time it took to write separate letters was computed. We chose a letter (a grapheme) that is similar in both the Russian and Finnish alphabets: *а*. We manually extracted the letter *а* in the words "н*а*чинать" ('to begin-INF,' Rus.) and "v*a*ikeaa" ('difficult-PART.SG,' Fin.) in the copying task. In dictation, the letter *а* in the words "к*а*рманов" ('pocket-GEN.PL,' Rus.) and "t*a*skuja" ('pocket-PART.PL,' Fin.) was taken. In order to eliminate the influence of the positions of the letter in the word, we took the letter *а* in the words "л*е*т*а*" ('summer-GEN.SG,' Rus) and "tavat*a*" ('meet-INF,' Fin.) in the copying task. Finally, we did the same in the second syllable "рюкз*а*к" ('backpack-NOM.SG,' Rus.) and "louk*a*lla" ('class-AD.SG' or 'grade-AD.SG,' depending on the context, Fin.) in the dictation task. The letters *а* was marked in the protocols manually by experimenter.
3. The main characteristic of the spatial quality of handwriting in the experiment was the stability of the edge of the line (SEL). This procedure was computed as follows: The experimenter manually marked the upper and lower edges of every letter and separately for every line analyzed. The coordinates of the edges were then entered into the computer. The regression line was computed by the method of least squares separately for the upper and lower edges of every line. The mean sum of squares of residuals was counted. This parameter was used as a measure of the spatial quality of the handwriting. Greater values on this parameter indicate worse spatial features of handwriting and vice versa. To facilitate the procedure, we counted this parameter only in the first lines of every task. The SEL for upper and lower edges differed insignificantly. The general values of SEL for every line were counted as a mean of the SEL of the upper and lower edges.

To analyze the differences of the parameters listed in different groups of subjects and in different writing tasks, we included them as dependent variables in an analysis of variance (ANOVA). We used the repeated measures ANOVA (hereafter, rmANOVA) with one between-subject factor, a group of children, and two within-subject factors, a type of task (copying and dictation), and language (Russian or Finnish). This statistical test is one of the most widespread statistical methods in social science and linguistics. It allows estimation of the differences in the mean values of a dependent variable in different groups and conditions and assessment of the significance of the influence of factors.

Besides the rmANOVAs, we used independent samples and paired-sample t-tests to compare mean values of dependent variables in two groups or two conditions. Also, to test the relationship between the time parameters of reading and writing, we used the Pearson product-moment correlation coefficient.

2.5 Research questions

Linguistic analysis of the designated tasks in either language presupposes a multilevel contrastive analysis of possible reactions. The following research questions were posed by the experiment with the children's writing samples:

(1) The proficiency and quality of writing are comparable in the groups of bilingual and monolingual children.
(2) How do the linguistic backgrounds of children in the sample influence their reading and writing skills?
(3) What types of mistakes and difficulties are typical of RDBs and FDBs?
(4) What are the crucial factors that enable pupils to have good results in writing?

Our hypothesis was:

(1) Bilingual children write better in the dominant language. This advantage relates to the number of orthographical mistakes in writing.

(2) Writing speed depends on the language; this difference is especially clear in comparing cursive and printing.

(3) Writing accuracy differs in cursive and printing. Practice in cursive leads to progress in motor skills, which in turn results in better spatial characteristics of handwriting movements.

3. Results

The following figures illustrate the areas in which writing was more and less successful.

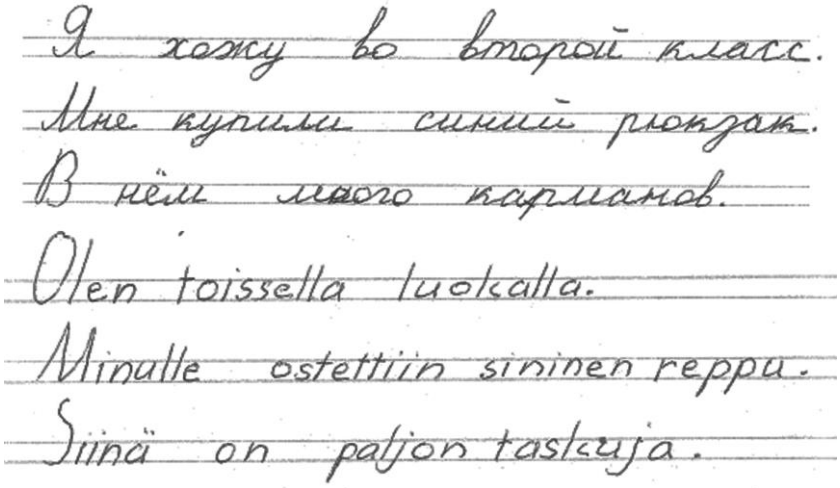

Figure 9.1 An example of good performance in the dictation task (Russian and Finnish).

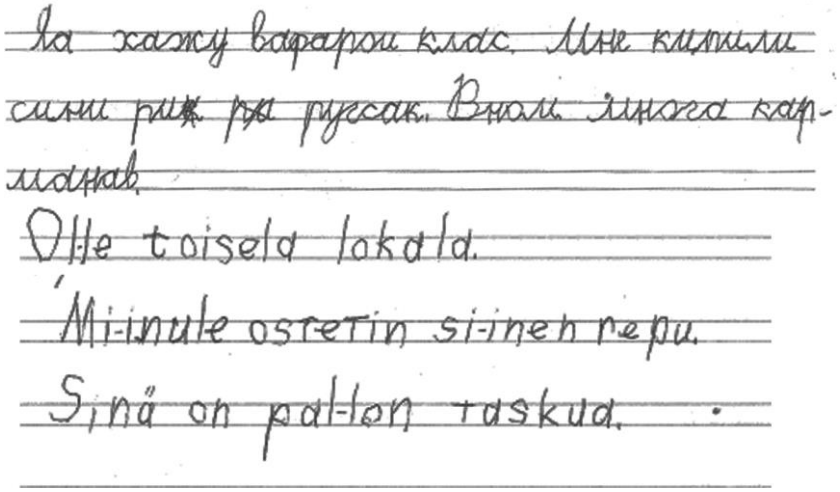

Figure 9.2 An example of poor performance in the dictation task (Russian and Finnish).

3.1 Reading proficiency

The background information provided by parents revealed the following practices in the children's homes:

Table 9.1. Results concerning reading practices in children's homes

Practices	*RDB*	*FDB*
Parents read to the child in Russian	100%	82.4%
Parents read to the child in Finnish	46.7%	100%
Parents read to the child in another language	6.7%	5.9%
The child reads in Russian him/herself	100%	76.5%
The child reads in Finnish him/herself	86.7%	94.1%
The child reads in another language him/herself	6.7%	0%

The responses in Table 9.1 show that parents read to their children in both languages but prefer to read in their own language, although more in Finnish-dominant families than in Russian-dominant families. The RDB are slightly more advanced in Russian than the FDB are in Finnish; Russian-speaking families seem to stimulate reading a bit more than Finnish-speaking families.

Furthermore, reading speed is also affected by mother-tongue origination. In the RDB group, the mean time of reading a letter was 0.22 sec, with a standard deviation of 0.09, while in the FDB group it was 0.35 with a standard deviation of 0.15. The difference between the two groups is significant (t(26)=-2.914, p=0.007). RDB read faster than FDB, because the reading occurs in their dominant language. The accuracy of reading varies with the participants from conscious, intonation filled, and content-reproducing reading by the RDB, to erroneous reading with poor comprehension by in FDB. When children were asked about the sense of what they had read, the correlation between the quality of reading and understanding was evident. The mean time of reading a letter in the RCG group was 0.24 sec. Comparison of the two bilingual groups with RCG showed that FDB spent significantly more time per letter (t(26)=2.361, p=0.026), but there was no significant difference with RDB (t(28) = -0.961, p = 0.345).

Table 9.2 Pearson correlation between the speed of reading and the mean TOWL in two experimental groups

	Copying in Russian	*Dictation in Russian*	*Copying in Finnish*	*Dictation in Finnish*
Reading in RDB	r=0.298 (p=0.28)	r=0.440 (p=0.10)	r=0.084 (p=0.77)	r=0.371 (p=0.17)
Reading in FDB	r=0.093 (p=0.76)	r=-0.109 (p=0.72)	r=0.022 (p=0.94)	r=-0.065 (p=0.83)

The correlations between the time of reading and the time for writing a letter (Table 9.2) in both experimental groups are not significant. We were more interested in the Russian than in the Finnish pupils here, yet the Finnish influence is more significant in the school.

3.2 Writing proficiency

3.2.1 Time parameters of writing

The mean values of the mean TOWL in four groups of subjects are presented in Figure 9.3. They indicate that surprisingly printing letters is more rapid than writing in cursive, and writing in the weaker language is slower than writing in the stronger language; yet it is not evident that copying is easier than in taking dictation: that is only true for the stronger language, Russian.

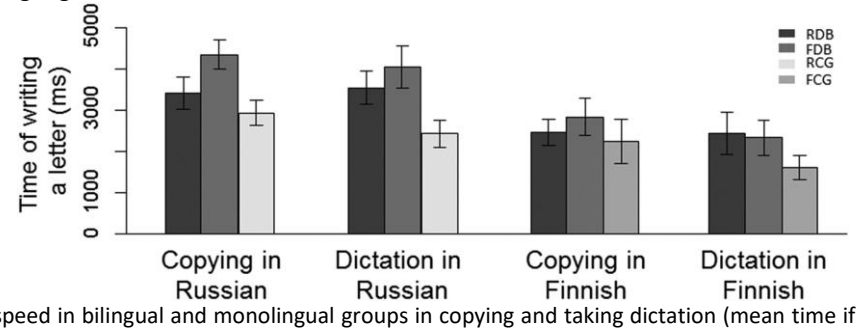

Figure 9.3 Writing speed in bilingual and monolingual groups in copying and taking dictation (mean time if writing a letter with 95% confidence intervals).

We analyzed the results in two ways. First, we used the rmANOVA described above with two within-subject factors (type of task [ToT] and Language) and one between-subject factor (experimental group [EG]). The results show significant influences of language: $F(1, 26)=161.822$, $p<0.001$. Considerably faster writing is observed in Finnish language in both experimental groups. The ToT influences are sub-significant ($F(1, 26)=3.796$, $p=0.062$). The participants generally wrote more slowly when copying a text than in taking dictation.

The between-subject factor influences sub-significantly ($F(1, 26)=3.442$, $p=0.075$). The RDB group spent less time in writing a letter than did the FDB group.

The interaction of factors ToT and EG is significant ($F(2, 26)=6.41$, $p=0.017$). The speed of writing by RDB participants did not differ in copying vs. taking dictation. The t-test of TOWL in two tasks shows independently that language is not a significant difference in the RDB group. A similar t-test in the FDB group shows a significant difference between the speed of writing in two tasks ($t(12)=2.71$, $p=0.019$): children in this group take dictation faster than writing when copying.

The interaction of the factors language and EG is significant ($F(2, 26)=7.97$ $p=0.009$). Pupils in both experimental groups demonstrated faster writing in the Finnish language, but in the FDB group this difference is greater than in the RDB group.

In the next analysis, we compared TOWL in Russian in bilingual groups (RDB and FDB) with the monolingual (RCG) group. The rmAnova with one between-subject factor (ToT) and one inter-subject factor (EG) showed the following: The EG factor had significant influence on TOWL ($F(2, 39)=21.032$, $p<0.001$). We observed the fastest writing in the FCG, the slowest in the FBD group. The additional two-way comparison with Tukey's Multiple Comparison Test revealed the biggest difference between RCG and FBD ($p=0.001$). The differences between RCG – RDB and RDB – FDB were smaller, but still significant ($p=0.003$ and $p=0.011$ respectively). The ToT factor demonstrated significance ($F(1, 39)=6.378$, $p=0.016$); we observed slower writing in the copying task. We found a significant interaction between the two factors ($F(2, 39)=4.740$, $p=0.014$).

Finally, we compared TOWL in Finnish in bilingual groups (RDB and FDB) with the monolingual (FCG) group. The rmANOVA demonstrated the sub-significant effect of the EG factor ($F(2, 35)=3.215$, $p=0.052$). The two-way comparison of groups revealed that there was a sub-significant difference between the FDB group and FCG ($p=0.052$); other pairs differed non-significantly ($p>0.127$ in all cases). TOWL in dictation was greater than in the copying task: the influence of the ToT factor was significant ($F(1, 35)=13.998$, $p=0.001$). We observed a significant interaction of the two factors ($F(2, 35)=4.740$, $p=0.014$; $F(2, 35)=3.346$, $p=0.046$).

The mean times of writing the letter *a* are shown in Table 9.3.

Table 9.3 Mean TOWL *a* under different conditions at the beginning and the end of a word

Task	*Letter position*	*Mean in ms (std. dev.)*
Copying in Russian	The letter *a* in the first syllable	1306.4 (419.4)
	The letter *a* at the end of the word	1422.8 (475.8)
Dictation in Russian	The letter *a* in the first syllable	1337.7 (477.9)
	The letter *a* in the second syllable	1209.8 (407.3)
Copying in Finnish	The letter *a* in the first syllable	925.8 (308.4)
	The letter *a* at the end of the word	878.8 (372.6)
Dictation in Finnish	The letter a in the first syllable	823.1 (261.2)

The statistical analysis of the mean time of writing the letter *a* in different positions in a word showed that there were no significant differences between the time of writing under all conditions (in both tasks and in both languages, but not between languages). We conducted paired-samples t-tests in all experimental conditions, $ps>0.1$ in all conditions. The results presented in Figure 9.4 indicate that taking dictation is technically easier (i.e., insofar as the physical writing skills are concerned) than copying; printing is faster than cursive writing.

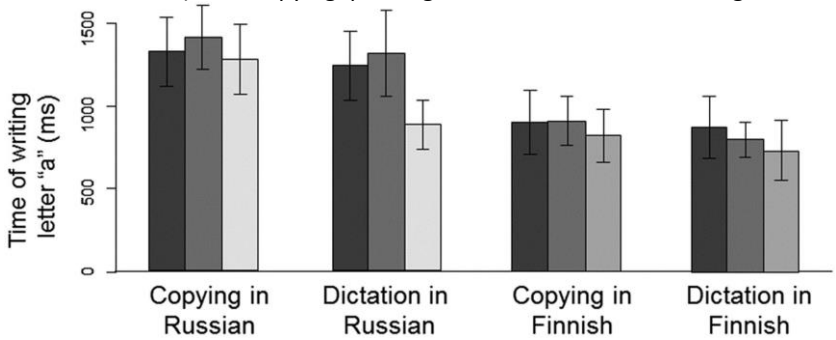

Figure 9.4 Writing the letter *a* in bilingual and monolingual groups in copying and in taking dictation (mean TOWL with 95% confidence intervals).

In order to assess the statistical significance of the differences between the experimental groups under different conditions, the rmANOVA was used. The same factors as in the previously described rmANOVA test were ToT and

language (within-subject) and EG (between-subject). The factor influence of EG is insignificant in this case (F(1, 26)=0.272, p=0.607). In general, there are no differences in writing the letter *a* in RDB and FDB. On the other hand, the factors of task and language influence significantly affected the dependent variable (F(1, 26)=96.249, p<0.001 and F(1, 26)=5.017, p=0.034 respectively). Taking dictation is faster, especially in the Finnish language, and writing in Finnish is appreciably faster than writing in Russian. All interactions of the factors were insignificant.

The interesting point is that, in this case, the difference between the two experimental groups in the Russian language is not the same as in TOWL. In copying, the RDB group demonstrated even slower writing of the letter *a* than did the FDB group (for the whole text, the opposite tendency was observed). These differences are not significant, but are mentioned as a tendency.

Next, we compared the time it took to write the letter *a* in the Russian bilingual groups (RDB and FDB) with the monolingual (RCG) group. We used the rmANOVA with the EG and ToT factors. We found significant influence of the EG factor (F(2, 39)=3.392, p=0.044); the children from the RCG wrote faster than bilingual children; the slowest writing was in the FDB group. The ToT factor also had a significant effect (F(1, 39)=12.636, p=0.001). The writing of the letter *a* was faster in the copying task than in dictation in all groups, but the greatest difference was observed in the RCG, supported by significant interaction between the two factors (F(2, 39)=3.243, p=0.050).

We compared the time it took to write the letter *a* in Finnish in bilingual groups (RDB and FDB) with monolinguals (FCG) using rmANOVA in a similar way. An analysis of this comparison showed that there was only one significant effect of the ToT factor (F(1, 35)=7.636, p=0.009, i.e., copying was slower than taking dictation. As an effect of the EG factor, interaction between the two factors was insignificant (ps>0.395).

1.2.2. Spatial quality of writing

The average SEL in four groups is presented in Figure 9.5.

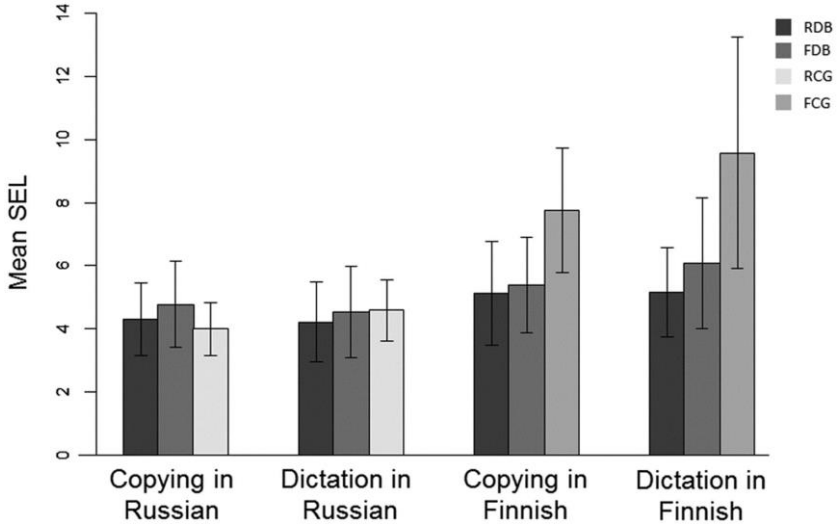

Figure 9.5 Accuracy of upper and lower edges in bilingual and monolingual groups in copying and in taking dictation (the mean SEL with 95% confidence intervals).

The rmANOVA with two within-subject factors (ToT and language) and one between-subject factor (EG) was used to compare the differences of TOWL under different writing conditions. The only significant influence observed was that of language factor (F(1, 26)=14.575, p<0.001). The better quality of handwriting in the Russian language was observed in both experimental groups. Neither ToT nor EG influenced SEL. Nor were significant interactions of factors observed. The FDB demonstrated the poorest SEL in all tasks, but this tendency is not statistically significant.

In order to compare the quality of the handwriting of bilingual and monolingual children in Russian, we used rmANOVA with the EG (three levels: RCG, RDB, and FDB) and ToT (two levels: copying task and dictation) factors. The results revealed no significant effects (ps>0.231); the quality of the handwriting was similar in all groups and under all conditions.

A similar analysis of handwriting in Finnish showed that there was only one significant effect of the EG factor (F(2, 35)=5.091, p=0.011). This was clearly a deterioration of the quality of handwriting in the group of Finnish monolinguals. The two-way comparison revealed significant differences in the parameters between the FCG and the RDB (p=0.01) and sub-significant differences between the FCG and FDB (p=0.053). In addition, the influence of the ToT factor was sub-significant (F(1, 35)=3.510, p=0.069); the quality of the Finnish handwriting in the copying task was better than in dictation.

3.3. Error analysis

The errors made by the children in both languages were predictable. For example, even in writing their own names and the name of the city where they live, the letters *E* and *Э* were sometimes confused; furthermore, the Russian *X* was replaced by the Finnish *H*, and vice versa. In copying, children made fewer grammatical mistakes than in taking dictation. The influence of the Finnish language on Russian may be seen in the difficulty students had in separating prepositions from words. The Russian word *рюкзак* '*backpack'* was well known, but it was the most difficult word for the children to write because of its orthographical complexity (once a loanword from German *Rücksack 'backpack,'* it is often pronounced like *rjugzak* because the rules of Russian pronunciation demand vocalization of *k* before *z*). In addition, commas, periods, and capitalization were often ignored. Other errors were typical of pupils of the same age among both Russian and Finnish children (writing unstressed vowels incorrectly in Russian and ignoring double letters in Finnish).

We counted the number of errors in each task in both languages. We then normalized the number of errors in relation to the number of letters in each task. The results are given in Figure 9.6.

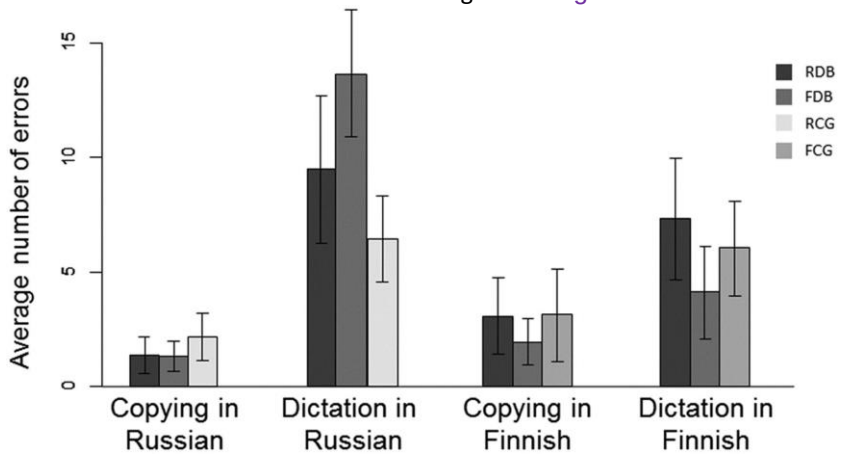

Figure 9.6 Average number of errors in bilingual copying and dictation (with 95% confidence intervals).

The rmANOVA with two between-subject factors (ToT and Language) and one inter-subject factor (EG) was used to compare the number of mistakes in different writing conditions. The results show significant influences of ToT ($F(1, 26)=78.070$, $p<0.001$), with more errors in dictation being made. The Language factor also influenced the performance significantly ($F(1, 26)=55.427$, $p<0.001$); the pupils made more errors in Russian. Furthermore, significant interaction between the Language and ToT factors was found ($F(2, 26)=88.243$, $p<0.001$). The interaction reflects the fact that the differences in the number of errors in copying and dictation are far greater in Russian than in Finnish. In Russian, the RDBs made fewer errors than the FDBs, while, conversely, in Finnish the FDBs made fewer errors than the RDBs, as would be expected. Moreover, in Russian, the two bilingual groups differed only in dictation, while in Finnish, the RDBs made more errors in both copying and dictation. In general, in carrying out the Russian tasks, the results of the two groups were more similar than in carrying out the Finnish tasks. The results obtained correspond to previous findings for bilingual writing with older subjects (Yurkov et al., 2012; Ikko, 2013).

We then compared the number of mistakes of the bilingual and monolingual children. We used rmANOVA with factors EG (three levels: RCG, RDB, and FDB) and ToT (two levels: copying and dictation). The results showed the significant effect of the EG factor ($F(2, 39)=5.349$, $p=0.009$), with the biggest number of mistakes observed in the FDB group, and the smallest number, in the FCG. The pairwise comparison showed the only significant difference in this parameter between the RCG and the FBD groups ($p=0.007$). The ToT factor was also significant ($F(1, 39) = 129.132$, $p<0.001$). It is not surprising that in the dictation most of children made far more mistakes than in the copying task. The effect of the interaction between the two factors was significant in this analysis ($F(2, 39)=10.017$, $p<0.001$), owing to the fact that the difference between the groups in the copying task was minimal, but increased considerably in the dictation task.

A similar analysis in Finnish showed only one significant effect of the ToT factor ($F(1, 35)=24.875$, $p<0.001$), with the number of mistakes in Finnish increasing in the dictation by comparison with the copying task. For the EG, the interaction of the two factors had only an insignificant influence on the number of mistakes ($ps>0.119$).

4. Discussion and conclusions

The results of our study mirror the variability in the amount of language input students had previously received and in the use of either language in their families and their society. We tried to match samples of Russian- vs. Finnish-dominant bilinguals performing a series of tasks under more or less controlled conditions. We attempted to shed light on reading and writing, examining the speed of reading, and the quality of writing.

For the present study, we chose samples of two types of participants, those who were Russian-dominant, that is, Russian-Finnish bilinguals, and those who were Finnish-dominant, that is, Finnish-Russian bilinguals. Alphabet books, primers, and basic textbooks for the Russian and Finnish languages differ considerably in their underlying methods.

According to interviews with teachers in preschool and the first grade, both groups became acquainted with print letters in pre-school at the age of six; cursive handwriting was introduced in the first grade at the age of seven only for the Russian language. (In Russian schools, there is no training in printing. We did not take into account the previous pre-primary experience in typing on the computer, which takes place in both countries.) Both language groups use the same textbooks to study Finnish and Russian; for the RDB, additional materials for Finnish as a second language are used.

The reading task was carried out only in Russian and demonstrated large differences between the RDBs and the FDBs. The results illustrated that all participants wrote faster in Finnish than in Russian, independent of type of task and experimental group. In the FDB group, this difference between speed of writing in two languages is greater than in the RDB group. The differences in writing speed in the two experimental groups are weak, but the RDB group demonstrates faster writing in comparison with the FDB group. This effect is connected mainly with a larger TOWL in the Russian language in the FDB group. In addition, in the FDB group, a significantly slower rate of writing in performing a copying task was observed.

We assume that writing a known letter of the alphabet in a familiar word may be an easier task than writing alphabetical letters in general. It is like a ready-made insertion that does not require special attention and happens automatically. Of course, the fund of familiar words differs for groups of different linguistic backgrounds. Thus, the differences between the groups in performing different tasks were less evident when only the technical part of handwriting was assessed by the time of writing the letter *a*. In calculating TOWL, the preparation time as well as pauses were included, whereas in the writing of a single letter, only movement time was considered. Technically, the task and the language of performance are factors that are more important than dominance of Russian or Finnish language. The dominant language is not significant for the writing of single letters, but it becomes crucial when cognitive processes are involved, which are reflected in pauses. It is then that the differences between the two groups become more obvious. The handwriting of the RDBs in cursive is quicker in Russian. The tendency in Finland is for Finnish children to print rather than to write in cursive.

Overall, there were fewer errors in the handwritten Finnish texts than in the Russian texts; Russian orthography is more opaque than Finnish spelling rules. Interestingly, there was a higher number of errors in the Russian dictation, but in the copying task, bilinguals made fewer errors in Russian than in Finnish. Yet, the accuracy rate of the writing was higher in Russian cursive than in Finnish printed letters, although the dominance of the language did not have an influence on this parameter.

Family literacy practices suggest that the differences in attitudes of Russian vs. Finnish parents might influence the results of double-literacy acquisition. Russian parents begin to introduce alphabetical letters to their children quite early and often see it as their duty to encourage children to read and write before they go to school. Finnish parents usually show their children letters when they are young, before school, but they trust the teachers' methods of instruction.

In our case, only emerging literacy was studied, and the creative use of languages was not practiced. Acquiring literacy in two different writing systems at the same time can be a challenging task. Both languages are mediums of instruction, but the struggle for academic success is more relevant for Finnish students than for Russian students, and the outcome is rather positive. As our previous studies show, the dream of balanced bilingualism is typical of Russian parents, who place great importance on the quality of the Russian language used by their children. For them, the Russian language is a source of great cultural capital, whereas the Finnish language is a key to social success. Overall, children are mostly successful in biliteracy (only a few errors demonstrate influences from one language to another), and the surroundings support use of the Finnish language more than Russian.

It is not evident that bilingual children write much better in the dominant language when the practice of writing is so different. The technical characteristics of handwriting (recognition, stability, speed, accuracy) depend on the system of writing (cursive vs. printing). The number of errors depends on the language and on the language dominance. The fact that participants were almost consistent in the quality of writing in both languages convinces us that the practice of writing in two languages trains children to be more competent in reading and writing and to switch from one language to another when necessary without negative outcomes. This research evidence is in line with other relevant studies of bilingual education (e.g., Fishman, 1980; Rossell, 1996; Benson, 2004; Bialystok et al., 2009).

A comparison of the bilingual children with the control monolingual groups gave more information about the specificity of writing in a bilingual situation. The analysis showed the following:

(1) The time spent writing in Russian differed significantly in both bilingual and control Russian monolingual groups. This is true for the TOWL and for the writing of the letter 'a.' With regard to writing in Finnish, we had similar results, which reflected a tendency shown in the comparison of the TOWL; technically, there are no differences between bilinguals and Finnish monolinguals. This means that bilinguals had difficulties in performing in their more opaque language, Russian, which was not supported in the wider environment, whereas they wrote in their more transparent language, Finnish, which was supported by the wider environment, and with the same speed as Finnish monolinguals.

(2) The quality of handwriting in Russian was equal among monolinguals and bilinguals. In Finnish, the performance of monolinguals was much poorer than that of bilinguals. This could mean that cursive writing practice, motorically more difficult, especially in a different language, might contribute to better quality of movements in typewriting.
(3) In Russian, monolinguals outperform bilinguals in accuracy (based on the number of errors). However, spelling in Finnish is not a challenging task, and monolinguals and bilinguals demonstrate similar results. Bilinguals with dominant Finnish have a slight tendency to write with minimal errors, which could signify that bilingualism helps them to be more orthographically competent.

Our study shows that the dominance of the language plays an important role in writing proficiency in bilinguals. The results obtained demonstrate that, in the case of Russian-Finnish bilingualism, children write faster and with fewer errors in the dominant language. Another important factor is the writing system. Cursive is slower but leads to better quality handwriting. In general, the language of the environment might support the language skills, but training in a different language and in a different script supports the quality of writing.

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