Turun yliopisto
University of Turku

LANGUAGE-SPECIFIC ASPECTS OF READING ACQUISITION: THE CASE OF RUSSIAN

Evgenia Rubinov

TURUN YLIOPISTON JULKAISUJA – ANNALES UNIVERSITATIS TURKUENSIS
Sarja - ser. B osa - tom. 408 | Humaniora | Turku 2015

University of Turku

Faculty of Social Sciences
Department of Behavioural Sciences and Philosophy, Division of Psychology

Supervised by

Pekka Niemi, Ph.D.
Professor
Department of Behavioural Sciences
and Philosophy
University of Turku
Finland

Maarit Silvén, Ph.D.
Professor
Department of Teacher Education
University of Turku
Finland

Reviewed by

Eve Kikas
Professor of School Psychology
School of Natural Sciences and Health
Tallinn University
Estonia

Elinor Saiegh-Haddad
Professor of Linguistics
Department of English Literature
and Linguistics
Bar-Ilan University
Israel

Opponent

Eve Kikas, Ph.D.
Professor of School Psychology
School of Natural Sciences and Health
Tallinn University
Estonia

The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

ISBN 978-951-29-6268-6 (PRINT)
ISBN 978-951-29-6269-3 (PDF)
ISSN 0082-6987
Painosalama Oy - Turku, Finland 2015

To my family
for all their patience and love

Language-specific aspects of reading acquisition: the case of Russian

Evgenia Rubinov

Department of Behavioural Sciences and Philosophy
Division of Psychology
University of Turku
Finland

ABSTRACT

We have investigated Russian children's reading acquisition during an intermediate period in their development: after literacy onset, but before they have acquired well-developed decoding skills. The results of our study suggest that Russian first graders rely primarily on phonemes and syllables as reading grain-size units. Phonemic awareness seems to have reached the metalinguistic level more rapidly than syllabic awareness after the onset of reading instruction, the reversal which is typical for the initial stages of formal reading instruction creating external demand for phonemic awareness. Another reason might be the inherent instability of syllabic boundaries in Russian. We have shown that body-coda is a more natural representation of subsyllabic structure in Russian than onset-rime.

We also found that Russian children displayed variability of syllable onset and offset decisions which can be attributed to the lack of congruence between syllabic and morphemic word division in Russian. We suggest that fuzziness of syllable boundary decisions is a sign of the transitional nature of this stage in the reading development and it indicates progress towards an awareness of morphologically determined closed syllables.

Our study also showed that orthographic complexity exerts an influence on reading in Russian from the very start of reading acquisition. Besides, we found that Russian first graders experience fluency difficulties in reading orthographically simple words and nonwords of two and more syllables. The transition from monosyllabic to bisyllabic lexical items constitutes a certain threshold, for which the syllabic structure seemed to be of no difference.

When we compared the outcomes of the Russian children with the ones produced by speakers of other languages, we discovered that in the tasks which could be performed with the help of alphabetic recoding Russian children's accuracy was comparable to that of children learning to read in relatively shallow orthographies. In tasks where this approach works only partially, Russian children demonstrated accuracy results similar to those in deeper orthographies. This pattern of moderate results in accuracy and excellent performance in terms of reaction times is an indication that children apply phonological recoding as their dominant strategy to various reading tasks and are only beginning to develop suitable multiple strategies in dealing with orthographically complex material. The development of these strategies is not completed during Grade 1 and the shift towards diversification of strategies apparently continues in Grade 2.

Lukemaan oppimisen erityispiirteet venäjän kielessä

Evgenia Rubinov

Käyttäytymistietieteiden ja filosofian laitos
Psykologian oppiaine
Turun yliopisto

TIIVISTELMÄ

Venäjänkielisten lasten lukemaan oppimista tutkittiin sen välivaiheessa eli ensi askelien jälkeen mutta ennen kuin tekninen lukeminen oli ehtinyt kehittyä varmaksi ja sujuvaksi. Tulokset antavat tukea näkemykselle, että venäläiset ensiluokkalaiset tukeutuvat ensisijaisesti äänteisiin ja tavuihin lukemisen perusyksikköinä. Lukemisen opetuksen alettua äännetietoisuus saavuttaa metakielellisen tason nopeammin kuin tavutietoisuus, koska muodollinen opetus luo painetta äännetietoisuuden hyväksi. Toinen syy saattaa olla venäjän kielelle ominainen tavurajojen epävakaus.

Venäjänkielisten ensiluokkalaisten välillä on tuntuvia eroja siinä, miten hyvin he pystyvät havaitsemaan tavun alkamisen ja päättymisen kohdat. Taustalla vaikuttavat tavuihin ja morfeemeihin perustuvien sanarajojen ero. Lukijan edistyminen morfeemien määräämien suljettujen tavujen havaitsemiseen näkyy ohimenevänä epävarmuutena tavurajojen havaitsemisessa.

Tulokset osoittivat myös, että oikeinkirjoituskäytänteiden monimutkaisuus vaikuttaa lukemaan oppimiseen alusta lähtien. Lisäksi havaittiin, että venäjänkieliset ensiluokkalaiset kohtaavat vaikeuksia yrittäessään lukea sujuvasti kahden tai useamman tavun mittaisia sanoja tai epäsanoja, vaikka näiden rakenne olisi yksinkertainenkin. Siirtyminen yksitavuisista kaksitavuisiin sanoihin näyttää täten muodostavan kynnyksen, joka on tavurakenteesta riippumaton.

Kun venäjänkielisten ensiluokkalaisten tuloksia verrataan muunkielisten lasten tuloksiin, oli heidän suoriutumisensa samalla tasolla kuin äänteenmukaisesti kirjoitettavaa kieltä puhuvien lasten lukeminen sellaisissa sanoissa, joissa kirjain – äänne käännös on selkeä. Toisaalta venäjänkielisten lasten lukeminen muistutti epäsäännöllisesti kirjoitettavien kielten alkavien lukijoiden suoritusta sellaisissa sanoissa, joissa kirjain – äänne vastaavuus on epätäydellinen. Toisin sanoen, tuloksissa näkyi sanan lukemisen keskinkertainen tarkkuus yhdistyneenä nopeuteen. Myös tämä havainto tukee tulkintaa, että alkavat lukijat luottavat ensisijaisesti äänteenmukaiseen strategiaan ja ovat vasta aloittamassa joustavien strategioiden käytön, mitä tarvitaan kirjoitusasultaan monimutkaisissa sanoissa. Tämä siirtymävaihe jatkuu vielä toisella luokalla.

CONTENTS

ACKNOWLEDGEMENTS

I want to thank Professor Pekka Niemi for his patience and competent advice, Professor Maarit Silvén for her thoughtful and highly instructive guidance during our collaboration, and the whole staff of University of Turku Psychology Department for their friendly helpfulness. I thank my reviewers Elinor Saiegh-Haddad and Eve Kikas for their valuable comments on the final draft of my dissertation. I also thank Galina and Kalevi Rantanen and Taija and Andy Swanström for their warmth and support during my years in Turku. I thank my husband Daniel and his daughter Hanna for their understanding of the limitations on my free time connected to writing this thesis. A special "thank you" goes to Daniel for solving my computer-related problems. I also thank my mother Zinaida for her unconditional love and constant support.

I gratefully acknowledge the following financial support to my work: CIMO Mobility Grant for Doctoral Students; Grant from the University of Turku Foundation to Pekka Niemi; Grant No. 53432 from the Research Council for Culture and Society, Academy of Finland, to Pekka Niemi; Academy of Finland grant 2004–2006 to Maarit Silvén, and NorFA Mobility Grant from the Nordic Council of Ministers.

Danderyd, Sweden, October 2015

Evgenia Rubinov

LIST OF ORIGINAL PUBLICATIONS

Article 1 – Kerek, E., & Niemi, P. (2009). Russian orthography and learning to read. *Reading in Foreign Language*, 21, 1–21.

Article 2 – Kerek, E., & Niemi, P. (2009). Learning to read in Russian: effects of orthographic complexity. *Journal of Research in Reading*, 32, 157–179.

Article 3 – Kerek, E., & Niemi, P. (2012). Grain-size units of phonological awareness among Russian first graders. *Written Language & Literacy*, 15, 80-113.

Article 4 – Silvén, M., & Rubinov, E. (2010). Language and preliteracy skills in bilinguals and monolinguals at preschool age. *Reading and Writing. An Interdisciplinary Journal*, 23, 385–414.

1. INTRODUCTION

1.1. The Role of Orthographic Consistency in Skilled Reading

Orthographies often are "noisy systems" with a great degree of spelling–sound ambiguity and the process of prelexical computation can take different forms in different orthographies. In alphabetic orthographies the degree to which the orthography of a language builds on one-to-one correspondences between sounds (phonemes) and letters (graphemes) representing them is the indication of the orthography's complexity. Finnish is the proverbial example of the so-called shallow (transparent, regular) orthographies with almost ideal one-to-one phoneme-grapheme correspondences. The category of deep (opaque) orthographies is often exemplified by English language with its well-known irregularities in phoneme-grapheme relationships. Any orthography can be placed in the continuum from very deep to very shallow, many of them occupying the middle ground.

The Orthographic depth hypothesis (Frost, Katz, & Bentin, 1987; Katz & Frost, 1992) suggests that the degree of orthographic complexity may influence reading strategies. In its weaker version the Orthographic depth hypothesis (Frost, 1998; 2005) holds that word reading in all orthographies starts with prelexical phonological computation. Lexical access is achieved fast due to reliance on underspecified phonological representations, which are then supplemented by top-down lexical information in order to achieve correct word pronunciation. Skilled readers are therefore those who are able to quickly convert letters and letter clusters into preliminary phonological representation allowing fast lexical access. However, orthographic complexity imposes constraints on the readers' ability to generate phonological representations. In deep orthographies the ambiguity of relations between spelling and phonology makes the initial prelexical assembly more difficult and it results in less accurate phonological representations, therefore generation of detailed phonological representations requires greater involvement of lexical information. This means that while both prelexical and lexical phonology are involved in generating detailed phonological representations in all orthographies, the amount of reliance of one or the other depends on orthographic depth. In order to overcome the inconsistency of the grapheme-phoneme relationships readers of deep orthographies have to find and rely on the letter patterns which are more consistent and can more reliably be converted into speech units.

One aspect of orthographic depth is the consistency of some irregular grapheme-phoneme correspondences. Such irregular correspondences may turn out to be quite regular at other levels than grapheme-to-phoneme. If separate

graphemes have multiple pronunciations while grapheme combinations display higher consistency, it is logical to suppose that phonological recoding at phoneme-grapheme level will be augmented by reliance on units of larger sizes. In English, for example, rimes have been shown to be more consistent spelling units than single letters (Goswami, 1986, Kessler & Treiman, 2001, Treiman, Mullennix, Bijeljac-Babic, & Richmond-Welty, 1995).

The Orthographic depth hypothesis in its present form therefore asserts that while the initial phase of word recognition in all orthographies demands phonological computation, orthographic depth affects the size of processing units. The difference in reading strategies between readers in different orthographies is seen as quantitative rather than qualitative. Shallow orthographies allow the reader to process printed words by linearily converting graphemes into phonemes which results in relatively well-specified phonological representations requiring minimal involvement of top-down lexical phonology. In deep orthographies generation of complete phonological representations based on incomplete phonological information is more laborious and time-consuming. Skilled readers in such orthographies have developed the ability to rely on larger sublexical written units, which can help them to recover words from print with the help of reasonably reliable conversion rules.

1.2. The Influence of Orthographic Depth on Reading Acquisition

According to Frost (1998; 2005) what characterizes skilled readers is the ability to quickly generate an underspecified prelexical phonological code of the word and with its help achieve lexical access. While experienced readers can rely on such impoverished codes, beginning readers have to start with detailed phonological analysis of printed words and train in increasing the speed of the assembly process and lexical access. After sufficient reading exposure beginning readers develop the ability to access the lexicon without relying on detailed phonological codes. Whereas skilled readers in shallow orthographies rely on relatively detailed phonological codes, in deep orthographies phonological codes are more impoverished. As a result, orthographic and phonological complexity has more influence on beginning readers' performance than on that of skilled readers. Beginning readers must cope with the complexities of the orthography in which they are learning to read by discovering and fine-tuning such sublexical units in the printed words which can reliably be connected to speech units with the help of conversion rules. This phonological recoding is, in fact, also a self-teaching activity helping the reader to achieve lexical access even for words that they have heard but never seen before (Share, 1995).

Psycholinguistic Grain Size Theory put forward by Ziegler and Goswami (2005; 2006) attempts to incorporate the accumulating cross-linguistic

information into a parsimonious theory explaining stability and variability of the process of reading acquisition in different orthographies. Ziegler and Goswami propose that readers in shallow orthographies can afford to rely only on units of small grain size (phonemes), while readers in deeper orthographies are forced to use multiple grain size recoding strategies. Beginning readers of orthographies where grapheme-phoneme correspondences are not straightforward have to become more flexible and dynamic in their decoding strategies in line with previously proposed flexible unit size model (Brown & Deavers, 1999). Parallel development of multiple grain-size units, however, exerts a "switching cost" (Goswami, Ziegler, Dalton, & Schneider, 2003). One might say that flexibility in the size of reading units is a forced choice for beginning readers of complex orthographies.

Psycholinguistic Grain Size Theory has been criticized for not accounting for the rapid attainment of reading fluency in consistent orthographies. Wimmer (2006) noted that in consistent orthographies children typically achieve high levels of accuracy after a few months of teaching, after which the main goal of further reading development is to become a fast and fluent reader. Wimmer also suggested the existence of the general developmental trend from small to large grapho-phonological grain sizes. Similarly, De Jong (2006) questioned the assertion that readers of a consistent orthography remain forever reliant on serial phonological recoding and suggested that differences in orthographic consistency affect the grain size of the sublexical units on which the initial serial reading strategy operates. As lexical influences on the reading process increase, the development of reading in different orthographies will converge, although some footprints of different developmental trajectories might remain since the build-up of orthographic knowledge will be slower in less consistent orthographies.

Ziegler and Goswami (2006) responded to criticism by noting that fluency is mentioned implicitly in the grain size framework. There is a pressure in all languages to develop orthography, phonology and semantics connections at the whole word level. However, unlike the dual route theory, Psycholinguistic Grain Size Theory suggests that such a direct access is always mediated by orthography-phonology couplings at various grain sizes. Ziegler and Goswami agree that as reading acquisition continues, large grain size connections between orthography, phonology and semantics emerge in all orthographies, ensuring fast access to meaning. Psycholinguistic Grain Size Theory describes the way in which the beginning readers build up the connections between print and speech at the very start of reading acquisition. At this stage the regularity of such connections is decisive for the grain size units used in word reading. However, initial reliance on small grain sizes does not mean that it is impossible for readers in more transparent orthographies to develop ability to use larger grain sizes. Orthographic

transparency is almost never absolute, languages often encode specific phonological or morphological information in their orthographies, and such information is helpful in decoding.

Since fluent readers in all types of orthographies seem to be able to rely on units of different grain sizes, the difference for orthographies of different degree of transparency might be in the timing of the appearance of such larger units. Some authors suggest that children begin using larger grain size units after they have consolidated their knowledge of grapheme–conversion rules (Ehri, 1999; Frith, 1985). Others propose that beginning readers can acquire orthographic representations before fully mastering the grapheme-phoneme correspondences of their orthography. According to Share's (1995) self-teaching hypothesis, children start learning to read with the help of grapheme–phoneme relationships, and this phonological recoding serves as self-teaching device through which the beginning reader acquires orthographic representations. Therefore, it might be suggested that at some stage of reading development beginning readers of all orthographies would go through a period of manipulating grain size units of different sizes. The difference might be only on the quantity and sizes of these units depending on the inherent features of the orthography in question.

There is evidence of flexibility in applying different grain-size units in orthographies which cannot be considered completely transparent. In Portuguese, classified by Seymour, Aro, and Erskine (2003) as an orthography of intermediate complexity, Defior, Cary, and Martos (2002) showed that subtle differences in the degree of transparency of Spanish compared to Portuguese influenced the relative use that children make of the direct and the phonological routes in different phases of reading acquisition. Defior et al. suggest that in first stages of reading acquisition both Portuguese and Spanish children predominantly use the phonological route, but Portuguese children seem to be more reliant on direct strategies than Spanish children. There is also empirical evidence of task-dependent flexible use of different recoding units in Portuguese skilled reading (Lima & Castro, 2010). It is suggested that skilled reading in intermediate orthographies is responsive to tasks conditions and readers may switch from smaller segment-by-segment decoding to larger unit or lexicon-related processing.

Davies, Cuetos, and Glez-Seijas (2007) motivate the necessity of larger grain size units mappings in transparent orthographies by the frequent occurrence of multisyllabic words reading of which with the help of sequential grapheme-phoneme recoding strategy would result in substantial time penalties. The advantage of relying on knowledge of larger grain size mappings involving morphological or lexical units is that they provide preassembled units for orthography-to-phonology coding. While not denying that children reading in less transparent orthographies are more affected by larger grain size analogies,

Davies et al. suggest that the gain of relying on larger grain size mappings in transparent orthographies improves reading speed. Slowed reading typical for dyslexics in transparent orthographies (Landerl, Wimmer, & Frith, 1997) might be seen as the result of failure to develop a more parallel mode of grapheme-to-phoneme coding.

Georgiou, Parrila, and Papadopoulos (2008) found that the importance of phonological and orthographic processing in English and Greek (a more consistent orthography) was different. The authors suggest that in word decoding, Greek-speaking children relied on small grain size units as indicated by the significant effect of phonological awareness. In reading fluency tasks they relied on large grain size units as indicated by the significant effect of orthographic processing. These findings are interpreted as showing that even in consistent orthographies children demonstrate flexibility in using different grain size units. In timed conditions when a response must be generated quickly, large grain-size units are employed, whereas in untimed conditions when maximum accuracy is desirable, phonological recoding is relied upon.

Seymour (2006) suggests that establishing morphographic skills is appropriate in complex orthographies where spellings signal both lexical identity and morphological structure, and are often in conflict with phonological principles. It is, however, time-consuming and requires forming metarepresentations of syllables and morphemes. The time required for establishing literacy skills at morphographic level depends on the number of possible combinations and on permissible word length. Seymour also considers stress assignment to be part of the morphographic skills system since stress is often not marked orthographically and its disambiguation requires lexical or morpheme-based approaches.

1.3. Review of Large-Scale Studies Relating Orthographic Complexity to Reading Acquisition

As has been discussed above, beginning readers in all orthographies start out with attempting to perform detailed phonological analysis of the written words. However, learning to read in irregular orthographies where grapheme-phoneme relationships do not follow only one set of rules requires more time and effort than is needed in more shallow orthographies.

Numerous studies (Caravolas, Lervåg, Defior, Malkova, & Hulme, 2013; Goswami, Gombert, & De Barrera, 1998; Goswami, Porpodas, & Wheelwright, 1997; Landerl, Wimmer, & Frith, 1997; Öney & Durgunoglu, 1997; Thorstad, 1991; Zaretsky, Kraljevic, Core, & Lencek, 2009) have demonstrated that development of word-decoding skills in a transparent orthography is less time-consuming than in opaque orthographies.

One of the most comprehensive studies has been conducted in thirteen European languages by Seymour et al. (2003), who found that children learning to read in languages using more transparent orthographies become accurate and fluent readers before the end of the first school year, while children learning to read in deeper orthographies such as French, Portuguese, Danish, and, especially, English develop reading skills much slower. The authors suggest that deeper orthographies promote the emergence of dual (logographic + alphabetic) reading strategies which demands twice as much time as establishing single foundation needed for learning to read in a shallow orthography. The effect of orthographic depth is supposed to be abrupt rather than graded. If the orthography exceeds a certain threshold of orthographic complexity which can be satisfied by the development of single reading strategy, the cognitive architecture of the reading process becomes more complex due to the development of dual process strategies. It is suggested that delays in reading acquisition shown by learners in deeper orthographies may be explained by the fact that their attention and processing resources are divided between two types of reading processes, alphabetic and logographic.

Ellis et al. (2004) found evidence of different reading strategies induced by differences in orthographic transparency in reaction times and error patterns of beginning readers in five different orthographies: Hiragana, Kanji, Greek, English, and Albanian. There was a much more linear relation between word-naming time and word length in more transparent orthographies. Moreover, the nature of reading errors in these five orthographies was different. Readers of opaque orthographies tended to make whole-word substitution errors and produced a greater proportion of no-response errors which, according to Ellis et al., indicates that children reading these scripts could not successfully decode the target words and tried to recognize them on the basis of partial visual analysis. However, the pattern of transparent orthographies promoting more nonword errors in contrast to opaque orthographies producing more real-word substitution errors was not absolute as readers in the transparent orthographies of Hiragana and Greek produced more real-word substitution errors than originally expected.

In a recent large-scale study encompassing six different languages with varying degrees of orthographic complexity (Finnish, Hungarian, German, Dutch, French and English) Landerl et al. (2013) discovered that phoneme deletion and RAN were strong concurrent predictors of developmental dyslexia in all orthographies. At the same time the predictive power of phoneme deletion and RAN-digits was stronger in complex than in less complex orthographies. The study did not confirm the popular claim that RAN may be a stronger predictor in orthographies with low compared to high complexity since in such orthographies the variance in reading skills is often determined by reading fluency rather than accuracy.

1.4. Russian Orthography and Reading Acquisition

Russian orthography has been extensively analyzed by linguists (Ivanova, 1966; 1971, 1977; Kuzmina, 1981; Moiseev, 1987; Osipov, 1970; Scherba, 1983; Selezniova, 1981; 1997, 2004; Skoblikova, 1974; Sproat, 2000; Zinder, 1987) but rarely in relation to reading acquisition. Recently some notable descriptions of language-specific qualities of Russian orthography from the point of view of possible weaknesses in mastering reading have been provided by Grigorenko (2003; 2006). Grigorenko points out the elements of transparency and opacity in Russian orthography and names the placement of stress and the morphological complexity of Russian as possible sources of variation in reading development.

Russian orthography may be classified as relatively "deep" in that there are phoneme alternations which are quite predictable, but are never reflected in the orthography. There are two conflicting views concerning this level of representation: one is that Russian orthography is morpheme-based due to its attempts to represent morphologically related forms consistently. Another view suggests that Russian orthography is phoneme-based, but on a more abstract level than surface phonemes: it consistently represents phonemes of the second level of abstraction which in oral speech may be represented by their different variants. Traditionally reading and writing instruction in Russia has been relying on the former view, even though the latter approach has been used in several experimental programs.

Traditionally Russian was considered easy to read and difficult to write, therefore researchers preferred to focus on writing acquisition. Indeed, writing in Russian is governed by numerous orthographic rules on syllabic and morphological level mastering which requires extensive efforts. The impact of this complex system of encoding on the decoding strategies of beginning readers in Russian is currently not sufficiently well explored in empirical studies. Difficulties in reading acquisition remained for a long time the domain for speech pathologists and special education professionals (for a review, see Kornev, Rakhlin, & Grigorenko, 2010).

Presently reading acquisition in Russian is beginning to attract the attention of researchers. The most prominent work so far has been done by Elena Grigorenko who has devoted her recent doctoral dissertation (Grigorenko, 2012) to various aspects of literacy (reading and writing) development in Russian. Grigorenko's work is broad in scope: it includes experimental studies of cognitive precursors of successful reading acquisition, the influence of letter frequency on alphabet learning by preschoolers, discrepancies in (self) assessment of literacy skills, new psychometric approaches applied to reading comprehension measurements as well as the influence of family environment on literacy development and the genetic substrates of individual differences in literacy acquisition.

Most relevant for our work are those parts of Grigorenko's dissertation where she discusses the universal literacy predictors in the context of their applicability to reading acquisition in Russian. Grigorenko places Russian in the context of world reading research and presents the results of her experimental study with Russian primary school children using single word and nonword reading, phonological awareness measured by TAAS (Test of Auditory Analysis Skills) and RAN (Rapid Automatized Naming) tasks. Regression analysis showed high variability of results except for single word and nonword reading tasks. Both RAN and TAAS were significant contributors to variance in the summative word and nonword reading time representing fluency. RAN explained 2% more of its dispersion. At the same time, the reading accuracy outcomes for nonwords had a much closer relationship with TAAS which contributed 17% more than RAN to explained variance. According to Grigorenko, these results suggest that in similarity with the results from other orthographies TAAS predicts accuracy to a greater degree than fluency of reading single words and nonwords in Russian. She notes that while accuracy is achieved by most Russian children in primary school, fluency results are much more variable and can be better measured by RAN tasks.

Grigorenko also devoted a separate longitudinal study to the development of phonological awareness and RAN skills in prereaders and their role as predictors of progress in reading acquisition. Russian boys and girls of preschooler age were tested 11 times during one and the same year. The same children were retested after they had started school. Grigorenko analyzed the group growth curves constructed on the basis of children's outcomes and noted that it was not possible to find a direct correspondence between the variability in TAAS and RAN and the variability in single word reading accuracy and fluency at school where the spread was much smaller. However, there were significant correlations between reading accuracy and RAN digits, TAAS and the number of reading errors as well as between reading speed and the time it took to do TAAS. Despite the fact that TAAS was a significant predictor, it accounted for less of single word reading variance than RAN did. Grigorenko relates this pattern of results to similar results in other relatively transparent orthographies.

Katerina Petchko's dissertation "Predicting Reading Achievement in a Transparent Orthography: Russian Children Learn to Read " (2009) is another experimental study of reading acquisition in Russian. The study investigated predictors of decoding and reading comprehension of Russian-speaking beginning readers. The results support the findings from other relatively transparent alphabetic languages showing that phonological awareness and RAN are reliable predictors of progress in reading acquisition. The role of phonological awareness in the reading progress of Russian children after one year of reading instruction was shown to be smaller than in English, it contributed only 5 % of unique variance in decoding

accuracy, while RAN correlated with phonological awareness, but made no independent contribution to variance. At the same time, the unique contribution of RAN was significant for decoding rate (14%), while phonological awareness explained 9 % of the variance. Phonological awareness accounted for almost twice as much variance in decoding rate as in decoding accuracy. According to Petchko, this corresponds to findings where decoding accuracy in transparent orthographies was shown to develop quickly after the onset of reading instruction while reading speed continues to develop approximately until the end of elementary school. The fact that RAN accounted for more variance in decoding rate than phonological awareness is explained with reference to the special importance of RAN as predictor of reading achievement in transparent orthographies (Holopainen, Ahonen, & Lyytinen, 2001). Short term verbal memory, on the other hand, was found to be unrelated to either decoding accuracy or decoding rate, which is, among other possibilities, again explained by the effect of the relative transparency of Russian orthography allowing sequential grapheme-phoneme assembly.

Petchko used a battery of phonological awareness tasks, which included rhyme and phoneme detection, as well as phoneme segmentation and phoneme deletion. All the tasks were easy for the participants since they were first and second graders, but Petchko notes the relative difficulty of performing phonological awareness tasks with items containing consonant clusters, which was particularly evident in phoneme segmentation task. The position of the target unit and word length seemed to influence performance on phonological awareness tasks, in particular, items with target word or sound in the final position seemed to be easier to process than those in the initial position, which in its turn was easier than processing those in the middle position. At the same time neither the size of units used nor the type of cognitive operation required seemed to have any importance for the ease of coping with the tasks.

Petchko also discusses the possible reasons for reading failure in Russian and suggests that, like in German, the relative transparency of the orthography allows even dyslexic readers to achieve relatively high accuracy in word reading, while their decoding remains laborious and slow. Petchko suggests therefore than RAN can be a more sensitive measure for dyslexia screening in Russia and that reading speed is a more appropriate measure for reading development than accuracy. Petchko measured the reading rate by counting the number of words read within a minute. This is exactly the way Russian primary school teachers control their students' progress in reading. However, as an experimental measure it might not be sufficiently sensitive. For example, Petchko does not seem to take notice of how well the children had mastered blending of phonemes into syllables and of syllables into words, indicating that fluency at single word level has not been assessed in her work. Russian vocabulary contains many multisyllabic words

which are highly frequent even for children in primary school and therefore this aspect of reading development has great importance.

Pechko's study is valuable as the first all-encompassing and methodologically rigorous investigation of reading acquisition in Russian. However, its correlational and concurrent design as well as its general nature - combining measures of both decoding and reading comprehension - point to the need of similar studies focusing on more detailed investigation of language-specific aspects of reading investigation in Russian. The main component missing in Petchko's study is a more detailed description of the strategies used by beginning readers in Russian at the intermediate stage of reading acquisition when basic decoding mechanisms are already in place, but complete decoding automaticity has not yet been reached. In particular, Petchko overlooks the existence of such a language-specific phenomenon of Russian orthography as the syllabic principle and does not investigate its influence on the decoding strategies of beginning readers of Russian who have moved beyond the application of the basic grapheme-phoneme correspondences. In this sense, the present thesis picks up the topic of reading acquisition in Russian exactly where Petchko stopped. My results (see Study II) indicate that irregularities of Russian orthography cause delay in the acquisition of reading skills from the very start of reading development, which was shown by consistently lower accuracy scores and longer reaction times for reading words containing orthographic complexities.

1.5. Phonological Complexity and Phonological Awareness before and after Literacy Onset

One of the most basic tenets of today's reading research is the causal connection between the prereaders' awareness of the phonological structure of their language and their success in subsequent reading acquisition (Alegria, Pignot, & Morais, 1982; Bradley & Bryant, 1983; Goswami & Bryant, 1990; Høien, Lundberg, Stanovich, & Bjaalid, 1995; Lundberg, Frost, & Petersen, 1988; Muter, Hulme, Snowling, & Stevenson, 2004).

Phonological awareness has been conceptualized in many different ways (for a review, see Anthony & Lonigan, 2004). All descriptions mention the type of task and the size of linguistic unit as decisive factors differentiating between levels of phonological awareness. In order to acquire phonological awareness the child has to have well-developed phonological representations of the lexical entries in his native language (Metsala, 1999). However, children grow in different linguistic environments and their receptive and productive language skills are shaped from early on by the phonology of a particular language. Complexity of vowel system, the presence of consonant clusters, the number of available syllable types,

morphophonemic alternations, stress patterns or tone variations are some of the differences in phonological structure that exist among different languages. It is logical to suppose that language-specific characteristics of oral language manifest themself also in the development of phonological awareness.

It has been demonstrated by several recent cross-linguistic studies that phonological awareness in different languages possesses some language-specific traits (Caravolas & Bruck, 1993; Cossu, Shankweiler, Liberman, Katz, & Tola, 1988; Durgunoglu & Öney, 1999; Widjaja & Winskel, 2004). However, there are conflicting opinions concerning the impact of phonological complexity on the development of phonological awareness. Some researchers suggest that phonological complexity exerts a negative influence on the speed and ease of phoneme awareness development (Cossu et al, 1988, Seymour et al, 2003; Ziegler & Goswami, 2006). Others (Caravolas & Bruck, 1993; Durgunoglu & Öney, 2002; Zaretsky, 1994; 2002) suggest that the presence of complex onsets or morphonologically motivated phonemic alternations promote phoneme awareness by forcing the speakers of phonological complex languages to focus on distinctions between phonemes.

Ziegler and Goswami (2006) propose that the discovery of phoneme-size units is more difficult in languages with a more complex phonological structure, like English and German, which allow multi-consonant onset clusters and/or single or multi-consonant codas, and where onsets and rimes does not typically correspond to phonemes. Children speaking these languages organize their phonological lexicon in terms of onsets and rimes and are less well equipped to acquire alphabetic literacy. In contrast, languages like Italian or Finnish have many simple (CV) syllables, where onsets and rimes are equivalent to phonemes and therefore should be easy to discover**.** This thesis is supported by evidence from Cossu et al. (1988) who found that Italian children outperformed their English-speaking counterparts on syllable and phoneme counting tasks. The effect was most pronounced with the reading children, but it was also present in pre-readers. While the effect in the reading children was explained by the difference in orthographic depth between the transparent Italian and the opaque English orthography, for pre-reading children the effect was attributed to differences in syllable structure between two languages. The authors suggest that the open-syllable structure of Italian and smaller number of vowel sounds than in English helped children to develop better phonological segmentation skills.

However, Caravolas and Bruck (1993) criticized the methodological shortcomings in Cossu et al. (1988) study. They pointed out that test items used with the Italian children were not checked for frequency, and they were longer than English items. Therefore results based on two-, three- and four-unit Italian items were compared to results based on one-, two- and three-unit English items. Besides,

the results of the English-speaking children were taken from another study. In their own study Caravolas and Bruck (1993) hypothesized that high prominence, variety, and complexity of consonant clusters in Czech syllables together with the orthographic transparency in written Czech should result in a high level of phoneme awareness in Czech-speaking children compared to English-speaking/reading children. They found that significantly more Czech than English-speaking Canadian children were able to isolate and delete single consonants embedded in consonant clusters of nonwords (86% versus 39%). The effect was of similar size in reading and pre-reading children, therefore it was presumed to reflect the impact of spoken language rather than that of orthography. However, English-speaking children were better at tasks involving simple onsets. Caravolas and Bruck (1993) conclude that it is not necessarily the simplicity or complexity of particular structures, but rather their phonological status in the language that may heighten children's awareness of them.

Durgunoglu and Öney (2002) showed that Turkish children develop phoneme awareness relatively early. The authors suggest that morphological properties of the Turkish language, such as vowel harmony, promote phoneme representation. In order to choose the appropriate form of a suffix a speaker of Turkish has to have an understanding of the phonological properties of the word form to which the suffix is going to be attached as well as being able to distinguish between different forms of the same suffix. This ability is supposed to be closely related to phonological awareness. In particular, Turkish children are supposed to have especially well-developed phonemic awareness of final phonemes as prompted by the agglutinative character of Turkish morphology. Oktay and Aktan (2002) obtained similar results showing that Turkish preschool and first grade students scored higher than American students in both grade levels on phonological awareness tasks. This is explained by such features of Turkish phonology as well-defined syllable structure promoting syllabic awareness and vowel harmony promoting phoneme awareness.

Cheung, Chen, Chun Yip Lai, On Chi Wong, and Hills (2001) also found that language-specific features of early spoken language, namely, its syllable structure had a critical impact on the development of phonological awareness. In their study English-speaking children outperformed Cantonese-speaking children on phonological tasks, which was explained by the fact that English syllables have consonant clusters, while Cantonese syllables do not and by the high proportion of open syllables in Cantonese. Cheung et al. (2001) suggest therefore that a simple phonological structure discourages subsyllabic analyses while speaking a language with a variety of clusters promotes sensitivity to sound positioning.

Zaretsky (1994) found evidence that Russian-speaking children in the United States develop phonological awareness in a different way from native

speakers. Zaretsky demonstrated how the structure of the oral language influences the children's explicit access to syllable-internal constituents. It was proposed that Russian-speaking preschool children possess a higher level of awareness of phonemes in complex onsets than the English speakers of the same age, due to the difference in phonotactic constraints imposed on consonants in complex onsets in these two languages. Russian-speaking pre-readers have also been shown to have an early advantage in their phoneme segmentation skills, supposedly due to the phonological complexity of Russian (Eviatar & Ibrahim, 2000; Leikin, Schwartz, & Share, 2010; Zaretsky, 2002).

Contradictory results obtained in the reviewed studies may be explained by the fact that they relied on phonological tasks involving different types of underlying processes. For example, phoneme deletion/isolation tasks demand the ability to identify or isolate a sound in a given position, while it is not required in the phoneme counting task. On the other hand, phoneme counting requires exact delimiting of phonemes whereas an oddity task simply requires the recognition of shared units and can be solved on the basis of more global similarities (Morais, Alegria, & Content, 1987). However, the relationship between the complexity of phonological structure and the development of phonological and especially phonemic awareness in a particular language is far from clear. Eventually, both viewpoints might be compatible and not as mutually exclusive as it might initially seem. Phonological complexity of a given language might function both as a stumbling block in the development of phonological awareness, but also as a training ground promoting earlier emergence of phonemic awareness.

Phonological awareness has been shown to develop sequentially in overlapping phases (Anthony & Lonigan, 2004; Anthony, Lonigan, Driscoll, Phillips, & Burgess, 2003). The most important landmark in this development is the onset of literacy. Relationship between learning to read and phonological awareness has been the topic of numerous investigations (Morais, 2003; Perfetti, 2003; Stanovich, 2000). Reading acquisition is often said to have a reciprocal relationship with phonological and especially with phonemic awareness since it might be not only the prerequisite, but also the consequence of learning to read (Bentin & Leshem, 1993; Ehri & Wilce, 1980; Goswami & Bryant, 1990; Perfetti, Beck, Bell, & Hughes, 1987; Treiman, 1983). Ziegler and Goswami (2005) note the initial discrepancy between the larger grain sizes favored by phonology and small grain sizes (letters) favored by alphabet-based orthographies. They suggest that discovering phoneme-size units is more difficult in languages with a more complex phonological structure. The relationship between reading ability and phoneme awareness seems therefore to depend on the simplicity of the phonological structure of a given language, consistency of grapheme-phoneme relations in its orthography, and the amount of training in phoneme awareness.

Seymour et al. (2003) found evidence that languages with complex syllable structure, defined in terms of a predominance of closed CVC syllables, and the presence of consonant clusters, create greater difficulties for beginning readers than do languages with a simple syllabic structure. Exaggerated lexicality effect and reduced efficiency of nonword reading were observed in the outcomes of beginning readers in complex syllable languages, but these readers were more accurate and faster in letter knowledge tasks than readers in languages with simple syllable structure. The two groups were equivalent in accuracy and speed of familiar word reading. It was only in nonword reading that a significant disadvantage for the complex syllable group emerged, even though the target nonwords did not contain any syllabic clusters or multi-letter graphemes. The authors interpreted these results as proof that letter-sound decoding is more difficult to acquire in a language with a complex phonology than in a language with a simple phonology because embedding of grapheme-phoneme correspondences in consonant clusters impedes their acquisition. Seymour (2006) also suggested that the rate of development of orthographic literacy, which he defines as constructing an internal model of conventions and variations in the way syllables can be written, will depend on the syllabic structure of the language in question: if the set of possible syllables is small and the syllabic boundaries are not ambiguous, this process will require less time.

In languages with transparent orthographies phonemic awareness seems to develop quite rapidly (Aro, 2004; Caravolas & Bruck, 1993; Cossu et al., 1988; Durgunoglu & Öney, 1999; 2002; Harris & Giannouli, 1999). Ben-Dror, Frost and Bentin (1995) proposed that the ability of beginning readers to manipulate phonemic segments may be influenced by the way phonological information is encoded in the orthography in which they learn to read. Moreover, their study showed that this effect is not restricted to the phase of reading acquisition, but exerts a long-lasting influence on skilled readers' performance in phonological awareness tasks. One reason may be that children learning to read in a shallow orthography obtain visual support in form of graphemes which facilitates the development of phonemic awareness.

Goswami, Ziegler, and Richardson (2005) compared phonological awareness at rime and phoneme levels in prereaders and beginning readers in English and German. Prereaders in both languages displayed similar levels of phonological awareness, while during the first year of reading instruction differential effects attributed to differences in the orthographic transparency between the two languages were observed. For the German children after one year of reading instruction, phoneme awareness improved dramatically due to the consistency of grapheme-phoneme correspondences in German.

A recent study by Ziegler et al. (2010) investigated the role of phonological awareness as well as memory, vocabulary, rapid naming, and nonverbal

intelligence in reading performance in five orthographies varying in complexity (Finnish, Hungarian, Dutch, Portuguese, and French). The results of the study showed that while phonological awareness was the main factor associated with reading performance in all languages, its influence was stronger in less transparent orthographies. The authors relate this modulation of phonological awareness by transparency to the reciprocal influence of phonological awareness and reading.

Vaessen et al. (2010) investigated reading fluency in Grades 1–4 in three orthographies differing in degree of transparency (Hungarian, Dutch, and Portuguese). The study produced similar patterns of results in all three orthographies: a gradual shift in the relative importance of phonological awareness and rapid naming on reading fluency which suggests that cognitive contributions to reading development are relatively independent of orthographic depth. It was shown, however, that the time course of the cognitive developmental pattern and the strength of the cognitive contributions to fluent reading were systematically influenced by the degree of orthographic transparency. The conclusion is that differences in orthographic depth do not recruit different cognitive processes but are mainly expressed in rate of reading development.

Caravolas et al. (2012) conducted a longitudinal study in four languages (English, Spanish, Slovak, and Czech) which showed that phoneme awareness, letter-sound knowledge, and RAN measured at the onset of literacy instruction were reliable predictors, with similar relative importance, of later reading and spelling skills across the four languages. The study found no differences in the relative importance of these three measures as longitudinal predictors of literacy development in English compared with more consistent orthographies.

Caravolas et al. (2013) compared patterns of growth during the early phases of reading development in consistent versus inconsistent orthographies in three languages (English, Czech, and Spanish). Phoneme awareness, letter knowledge, and RAN all predicted individual differences in initial levels of reading ability and the impact of phoneme awareness and RAN did not differ across the three languages. However, letter knowledge was a weaker predictor of initial reading levels in English than in the two consistent orthographies. Variations in early growth were predicted by phoneme awareness and letter knowledge to similar degrees across all three languages, whereas RAN predicted the rate of acceleration of growth. This shows that while phoneme awareness and letter knowledge were associated with the very early growth of reading skills, RAN was associated with how quickly this growth rate accelerated. The authors suggest that similar patterns of prediction from these three measures across languages indicate that the same mechanisms are involved in learning to read in any alphabetic orthography.

1.6. Sequence and Units of Phonological Awareness Development

Language-specific influence may manifest itself not only in the size of units prominent in the phonology of a given language, but also in the sequence and rate of development of awareness of phonological units of different grain size. It is generally suggested that children first develop awareness of larger subsyllabic units, e.g. syllables and rimes, and that phonemic awareness appears concurrently with the onset of literacy (Anthony & Francis, 2005; Ziegler & Goswami, 2005). The "large-to-small progression" in the development of phonological awareness is supposed to be universal across languages even though the speed at which it appears may vary. However, Duncan et al. (2006) argue that while being relatively poor at syllabic awareness, English readers may develop phonemic awareness without developing explicit awareness of larger units.

Saiegh-Haddad (2007a) found proof for her initial proposal that epilinguistic phonological awareness obeys language-universal perceptual constraints while metalinguistic phonological awareness is sensitive to language-specific phonological and orthographic factors. In Hebrew, a language with high orthographic density and a relatively simple CV-syllable based phonology, both preliterate and literacy-acquiring children were found to rely on body–coda (CV + C) rather than onset–rime subsyllabic division. Saiegh-Haddad (2007b) also found evidence of the prominence of the CV unit in the phonological awareness of Arabic-speaking children which is explained by the special cohesion of this unit both in the phonological structure and the orthography of Arabic language.

Geudens and Sandra (2003) found that Dutch-speaking kindergarteners and first-graders did not treat onsets and rimes as cohesive units in tasks tapping explicit awareness and that their performance was influenced by perceptual-phonetic factors. Geudens, Sandra and Martensen (2005) obtained a rime effect in a task highlighting phonological similarity between items sharing rimes, but the effect disappeared in tasks where rime unit was not repeated. The authors suggest that the predominance of a statistical pattern in a certain language does not necessarily lead to the establishment of a corresponding fixed representational unit. Contextual conditions or task demands may play a role in preference for a particular unit. The choice of the unit might therefore depend on the cognitive flexibility of an individual beginning reader.

1.7. Precursors of Reading Acquisition and the Possibility of Cross-Linguistic Transfer

Reading acquisition by bilinguals is a research field rapidly gaining popularity due to wide-spread migration and the problems it poses both on the microlevel to the migrating individuals and on the macrolevel to the educational systems of the host

countries. Certain aspects of language development might be delayed in bilingual children and many of them have lower proficiency in each of their language than expected by norms for their monolingual peers (Leseman & van den Boom, 1999; Oller & Eilers, 2002; Patterson & Pearson, 2004).

The age of initial bilingual exposure seems to be a major predictor of success in reading (Kovelman, Baker, & Petitto, 2008). However, literacy acquisition may proceed differently for bilinguals due to differential development of the prerequisite skills (Bialystok, Luk, & Kwan, 2005). Bilingual preschoolers usually have smaller vocabularies in each language than comparable monolingual speakers and may lag behind in depth of vocabulary knowledge (August, Carlo, Dressler, & Snow, 2005; Umbel, Pearson, Fernández, & Oller, 1992). Beginning L2 learners in early grades might have poorer verbal working memory compared to their L1-speaking peers (Chiappe, Siegel, & Wade-Woolley, 2002; Droop & Verhoeven, 2003), even though this difference can decrease with time (Lesaux & Siegel, 2003). Nonnative literacy students also face a double task of acquiring new phonological features while developing phonological awareness and their morpho-syntactic development might be different from the monolingual order of acquisition as it is influenced by language-specific factors (Bialystok, Luk, & Kwan, 2005; Bland-Stewart & Fitzgerald, 2001; Saiegh-Haddad, Kogan, & Walters, 2010).

Exposure to two different phonological repertoires, two sets of vocabulary and grammatical systems, and, in some cases, to two different orthographies, is supposed to lead bilinguals to insights about the symbolic nature of grapheme-phoneme relationships and greater flexibility in solving complex cognitive tasks (Bruck & Genesee, 1995; Durgonoglu & Öney, 1999). However, the benefits of bilingualism are not very stable: bilingual advantage often disappears in the first grade, where the onset of formal literacy instruction provides an equalizing experience (Campbell & Sais, 1995). Individual differences connected to bilingualism might reemerge in the second grade, when children progress towards fluent reading. On the other hand, reading precursors in L1 and subsequent reading success in L2 might be connected indirectly. Hammer, Lawrence, and Miccio (2007) found that cross-language relationships between preschool L1 and later reading outcomes in L2 were weak when children's language abilities were measured at one point in time, but they became significant when the children's language growth was considered. Saiegh-Haddad and Geva (2008) came to the conclusion that morphological processing can be considered language-specific if one studies the influence of L1 on the learners' performance in morphological awareness tasks, but it is also language-universal in terms of predictive relationship with word reading, vocabulary and reading comprehension. Bialystok (2007) suggests that the influence of bilingualism on the development of literacy is positive when it concerns the symbolic function of print and negative when it concerns the

development of oral proficiency. For phonological awareness it is neutral since it depends on the children's age, availability of formal instruction, the task and the pair of languages the bilingual child speaks.

The idea behind the possibility of cross-linguistic transfer is that general cognitive and linguistic skills such as verbal ability, phonological memory or processing speed can predict success in development of decoding skills in both L1 and L2 of the bilingual child (Geva & Wade-Woolley, 1998). The natural conclusion is that strengthening literacy-related skills in L1 can benefit L2 literacy development. However, there is evidence that L2 phonological awareness is at least to some extent language-specific. Saiegh-Haddad, Kogan and Walters (2010) have demonstrated language-specific effects on phonemic awareness reflecting onset-rime versus body-coda differences in syllable structure. Russak and Saiegh-Haddad (2011) tested the effect of the phoneme's linguistic affiliation on phonological awareness in L2 and found that outcomes in phoneme segmentation tasks were smaller on novel phonemes than on non-novel ones. These findings confirm the authors' suggestion that phonological awareness is affected by the degree of familiarity with the phonological structure of the target language.

Another intriguing question is the direction of the transfer of literacy-related skills. Matthews & Yip (2003) suggested that transfer occurs due to asynchronous development of two languages with respect to specific features. It was found to occur from bilingual children's stronger language to their weaker language (Schiff & Calif, 2007; Yip & Matthews, 2000), but also from a weaker language to a stronger language (Saiegh-Haddad & Geva, 2008). Another suggestion is that bidirectional transfer requires similar proficiency levels in the two languages (Comeau, Cornier, Grandmaison, & Lacroix, 1999, Deacon et al., 2007). Some aspects of linguistic proficiency might transfer from the language where this feature is more developed to the language where it is less prominent. Derivational morphological awareness is transferred from a language with more complex morphology to the one with a simpler morphological system (Saiegh-Haddad & Geva, 2008). Loizou and Stuart (2003) and Leikin, Schwartz and Share (2010) found that the so-called *bilingual enhancement effect,* that is facilitation of skill acquisition in L2 via similar skill in L1 occurs only when bilingual children are exposed to a second language that is phonologically or orthographically simpler than their first language.

Cross-linguistic transfer often occurs in the domain of decoding while the oral language skills contributing to reading comprehension are more language-specific (Lindsey, Manis, & Bailey, 2003; Oller, Pearson, & Cobo-Lewis, 2007). Limbird (2006) found that vocabulary knowledge played a more central role for bilingual German-Turkish beginning readers while phonological awareness was more important for monolingual children. Measures of German vocabulary correlated with all measures of reading related skills, while Turkish vocabulary

skills correlated with none of them. No significant differences were found between monolingual and bilingual participants in decoding at any point in time. Limbird concludes that the relatively transparent German orthography facilitates acquisition of decoding skills even when the bilinguals' German vocabulary skills are still developing. These results correspond to the ones reported by Eviatar and Ibrahim (2000) for Russian-Hebrew bilinguals who compensated for their smaller vocabularies with high levels of phonological abilities.

Some researchers (Geva & Siegel, 2000; Melby-Lervåg & Lervåg, 2011; Saiegh-Haddad & Geva, 2008) suggest that transferability interacts with specific features of the linguistic and orthographic structure as well as with amount of exposure, explicit teaching and the degree of the learner's linguistic proficiency. The universal central processing hypothesis and the script dependency perspectives on L2 reading development are therefore best viewed as complementary.

2. AIMS OF THE THESIS

Traditionally Russian is considered to be a language easy to read and difficult to write (Grigorenko, 2012). Petchko (2009) suggests that Russian orthography is so transparent that the only strategy necessary for reading in it is linear sequential grapheme-phoneme assembly and that it does not promote other types of reading strategies. My analysis of Russian orthography with its orthographic complexities related to phoneme distinguishing consonant palatalization, its syllabic principle as well as its deeply grounded morphological foundations (see the discussion in Study I) points to the possible existence of multiple strategies used by skilled readers of Russian. The present thesis focuses on looking for evidence of building up such strategies by beginning readers. I view Russian orthography as a multilayered complex system with its own internal logic, and just like writing in Russian requires integrating information from different linguistic levels (Selezniova, 1981), I believe that reading in Russian cannot avoid being influenced by this complexity.

The purpose of the present thesis was to explore how the language-specific features of Russian phonology and writing system influence the acquisition of reading skills in this system. My hypothesis was that complexities of Russian orthography influence reading acquisition in reading already during early stages of reading acquisition. I am less interested in the cognitive determinants of reading failure or success in learning to read in Russian orthography, but rather in discovering which structural complexities of the writing system itself may turn out to be difficult for beginning readers at different stages of reading acquisition. I am in no way proposing that Russian orthography is so complex that it leads to developing permanent multiple strategies of equivalent importance or that there exist stage/level phases in the reading of Russian primary school students. It is probably true that the initial stage of reading acquisition starts with the sequential online assembly of grapheme-phoneme correspondences. However, I suggest that like other orthographies of medium complexity Russian orthography probably demands the development of supportive, auxiliary strategies in case linear assembly does not work and that beginning readers in Russian often rely on a combination of different grain size units.

My first objective in this thesis was to explore whether and to what extent irregularities of the writing system determine the choice of strategies beginning readers of Russian use. My second objective was to determine the impact of specific features of Russian phonological system on the structure of beginning readers' phonological awareness. Another currently pertinent topic is the influence of growing up with two highly flective languages on Russian-Finnish bilingual

children's future reading development. Therefore the third objective was studying the development of reading precursors in the situation of bilingualism involving two morphologically rich languages and determining risk factors for bilinguals' future reading development.

The specific research questions were:

1. How do the irregularities of the Russian writing system influence reading acquisition?
2. How are reading accuracy and fluency in Russian related to the complexities of Russian orthography?
3. What is the developmental progression in terms of grain-size units in reading aloud?
4. How does the high variability in the phonological structure of Russian lexical items influence learning to read in this language?
5. How do Finnish-Russian bilinguals develop literacy-related skills?

3. METHOD

3.1. Participants

The sample size in Study II and Study III was coordinated with research teams from other countries taking part in the project. Initially there were 50 participants, but seven of them were excluded from the final statistical analysis due to school change or missing at least one test point, therefore the final number of participants was 43. The participants came from three first-grade classes in the same school. Classes in the school are ability-grouped based on informal screening upon school entrance, therefore while selecting the participants we tried to counterbalance the number of children coming from different classes. Minority children who speak a language other than Russian at home and children receiving speech therapy were excluded from the sample. The average age of the participants in the beginning of the study was 88.8 months, the youngest participant being 73 months old, the oldest 96 months old. Girls and boys were equally represented – 21 boys and 22 girls took part in the study.

In Study IV the participants were 4 years old monolingual and bilingual children born in Finland. Participating families were recruited via the Population Register Centre in Helsinki. To attain a large enough sample of bilinguals, the sampling of bilingual families was expanded to all communities in Finland. Twenty-five monolingual and 25 bilingual children participated in the study. The children were individually tested for language skills and the parents were interviewed for socio-demographic information on the family, and their child's language exposure at home and outside home. There were no group differences between monolingual and bilingual families in mothers' or fathers' years of education and mothers' age, while the fathers in the bilingual sample tended to be a few years older than in the monolingual sample. In the bilingual families, the native language of the mother was Russian and that of the father was Finnish.

3.2. Measures

In Study II the participants were tested four times during Grade 1.The main tasks were letter knowledge, reading familiar words and nonwords. Russian items were developed according to the guidelines for item construction used in other countries taking part in the cross-linguistic project. The word/nonword item pool contained 72 targets chosen from popular children's books for early age. The words were selected to represent two types: simple (the relationship between all

phonemes and letters is 1:1) and complex (the number of phonemes is not equal to the number of letters in the word). The choice of items reflected the variety of possible syllabic structures and took into account the mobile nature of stress in Russian. Additional tests in the study included Raven's Progressive Coloured Matrices, WISC-R digit span forward and backward subtest and spelling tasks in the form of group dictations using test items from the reading tests in randomized order.

In Study III implicit phonological awareness was assessed with the same/different matching task. It contained six conditions: phoneme, rime and syllable in the initial syllable of two types of items: targets (matching pairs) and foils (non-matching pairs). Non-matching pairs had no sounds in common. Matching pairs shared only the target sound and no other sounds. Explicit phonological awareness was tested with a common unit task. The task included three conditions: initial phoneme, initial rime, and initial syllable. For each condition, there were eight items which shared only the common unit and no other sounds. There were no foils. Other tasks used in the study were developed by the respondent. They included syllabic and phonemic segmentation tasks using real high frequency words of varying syllabic structure containing consonant clusters.

In Study IV two sets of parallel tasks with identical testing procedures and coding systems were used. The Russian tasks were constructed from the original Finnish tasks by two native Russian speakers and a native speaker of Finnish. They tested semantic skills in the form of word definition task (WISC—III), morphological skills based on Finnish Morphology Test, phonological skills comprising five tasks on recognizing rhyme and alliteration, syllabic and phonemic awareness and phonological working memory task (WISC—III). Parents were also interviewed on language exposure and interaction patterns both inside and outside the family environment. The order of testing the bilinguals was counterbalanced so that every second child was tested first in Finnish and then in Russian.

4. OVERVIEW OF STUDIES

The studies included in this dissertation have been conducted within the framework of two research projects: "Literacy Acquisition in European Orthographies" coordinated by School of Psychology at the University of Dundee, U.K., and the long-term research project on Russian-Finnish bilinguals conducted by Prof. Maarit Silvén at the University of Turku.

The aim of the first project was to investigate the hypothesis that syllabic complexity and orthographic depth cause significant delays for beginning readers in deeper orthographies. Our results confirmed the general hypothesis tested by the project: deeper orthographies promote the emergence of multiple reading strategies which in its turn delays reading acquisition in these orthographies. My contribution to the project consisted in performing analysis of the language-specific features of Russian orthography relevant for literacy acquisition, creating all the experimental tasks in Russian and adapting the target items' selection process to the demands of Russian phonotactics. I also personally conducted all data collection in Russian school as well as the manual processing and coding of the raw data and most of the statistical analyses and interpreting its results.

The aim of the project on Russian-Finnish bilinguals was to compare language development of bilingual and monolingual children speaking highly flective languages. The part of the project in which I participated concerned the development of preliteracy skills of mono- and bilinguals. For this study I took part in creating the experimental tasks in Russian and adapting them to the Russian cultural context and the phonotactical and grammatical restrictions of Russian. I was responsible for data collection in Russian as well as for its coding. I also took part in interpreting the results of the statistical analyses together with the first author.

STUDY I

Kerek, E., Niemi, P. (2009). Russian orthography and learning to read. *Reading in Foreign Language* 21, 1–21.

The article analyses the structure of Russian orthography and makes predictions concerning the possible trajectories in acquisition of reading skills in Russian. Despite the widespread notion of the relative transparency of Russian orthography and the ease of its decoding rules the article aims to classify the typical irregularities of phonemic-graphemic correspondences in Russian orthography, to determine its basic grain-size units and to discuss possible

difficulties this particular writing system presents for beginning readers. The following classification of grapheme-phoneme correspondences inherent for Russian orthography is proposed:

Regular phoneme-grapheme correspondences where a vowel or a consonant phoneme has a single representational alternative in writing.

Predictable Irregularities (I): Alphabetic Rules and Graphics include cases where the 1.1 phoneme-grapheme correspondences are not observed due to the influence of the positional rules of Russian orthography such as the unique syllabic principle reflecting the softness of consonants.

Predictable Irregularities (II): Orthography describes cases where morphemes are spelled in a uniform way even though they are pronounced differently in different contexts. Such irregularities are verifiable due to a set of verification rules every Russian child learns at school. In case these verification rules are not properly internalized the child will experience problems with writing correctly.

Unpredictable Irregularities: The Traditional Principle where phoneme-grapheme correspondences function in unpredictable or in an unverifiable ways and need to be memorized.

The article also reviews the opinions of prominent Russian linguists on what linguistic units Russian orthography represents, and it evaluates and analyses their relevance for contemporary reading research. Varying definitions of the underlying principles of Russian orthography, even though these definitions are not always stated explicitly, determine to a large extent the structure and the choice of reading instruction materials in Russian schools. Reading instruction in Russian schools focuses mainly on introducing children to basic phoneme-grapheme correspondences and to blending sounds inside CV syllables, whereby special attention is paid to vowels as the main actors in contextual effects inside CV syllables (Kostromina & Nagayeva, 1999; Omorokova, 1997; Starzhinskaya, 1988). Beginning readers in Russian schools are expected to reach the stage of accurate syllabic reading by the end of the first grade. After a child has achieved the stage of syllabic reading, he or she gets little help from the teacher in reaching complete fluency. At the same time, the demands placed on the beginning readers' fluency at school are quite high, often prompting parents to prepare for the pressures of the school program by teaching children to read prior to school entry.

Conclusion. In the present review, the Russian writing system has been described as a complex yet sufficiently consistent system that presents a beginning reader with several levels of complexity and consistency to cope with. The article ends with a discussion of the implications of the special features of Russian orthography for defining the dominant strategies used by beginning and skilled readers in Russian.

STUDY II

Kerek, E., Niemi, P. (2009). Learning to read in Russian: effects of orthographic complexity. *Journal of Research in Reading,* 32, 157–179.

Much attention has been paid to the delay in writing acquisition caused by irregularities of Russian orthography, but little is known about their effect on reading acquisition. The objective of the present study was to find out whether the irregularities of Russian orthography affect the speed of reading acquisition in the first grade of Russian primary school. The study was based on comparing accuracy and reaction times for different types of items. Differences in the efficiency of reading word and nonword items of varying orthographic complexity were supposed to give insight into the strategies relied on by beginning readers in Russian. Because all target words in our study are sufficiently frequent, the primary focus was on lexicality and regularity effects visible in reading words and nonwords of varying orthographic structure and syllabic length. We hypothesized that, in line with the results by Seymour et al. (2003), the gain against educational time for the acquisition of letter knowledge will not be affected by orthographic depth. On the other hand, because we assumed that the irregularities of Russian orthography would have an impact on reading acquisition, accuracy was expected to be lower and reaction times longer for orthographically complex types of lexical items (regularity effect). Control measures (nonverbal intelligence, digit span backward and digit span forward) were included in order to ensure the equivalence of the participants' general processing ability.

Our results showed that irregularities of Russian orthography not only are purely linguistic constructs, but they also have psychological reality both in writing, where difficulties can be easily identified through spelling errors, and in reading, where delays in acquisition are indicated by longer reaction times and lower accuracy scores. The hypothesis in our study was that irregularities of Russian orthography will cause significant differences in the accuracy and speed of reading various types of words and nonwords. Such differences are indicative of difficulties the beginning learners face in reading acquisition as well as of strategies that work best for them at this particular stage of their reading development. Results indicate that the unique complexities of Russian orthography indeed not only constitute a stumbling block in the acquisition of writing, as has been previously shown by Russian researchers, but they also delay the acquisition of reading skills. It appears that orthographic complexity exerts an influence on reading in Russian from the very start of reading acquisition, which is reflected in consistently lower accuracy scores and longer reaction times for reading words containing orthographic complexities. In

fact, the impact of orthographic complexity on reading acquisition in Russian is so strong that it causes reversed lexicality effects when accuracy of reading nonwords containing no complexities is compared with accuracy of reading complex words, controlling for word length. Strong regularity effects both for monosyllabic and bisyllabic complex and simple words, as well as the presence of reversed lexicality effect when reading complex words and nonwords is compared, indicate that at the end of grade 1 Russian children predominantly rely on phonological recoding as the main reading strategy. They also attempt to apply phonological recoding to reading complex words, but it is an ineffective strategy for dealing with orthographic complexities. Irregularity of Russian orthography exerts an influence on the developmental trajectory of reading acquisition because it apparently surpasses the complexity threshold, which necessitates the development of multiple reading strategies. At the same time, there is a movement towards a wider choice of reading strategies.

The results presented in the article are in line with Share's (1995) idea of phonological recoding functioning as a motor for expanding the orthographic lexicon. Progressive lexicalization of the recoding process means that the child's mastery of simple grapheme–phoneme correspondences is supplemented in frequently encountered lexical items by the growing amount of orthographic knowledge, such as context-sensitive, positional and morphemic constraints, acquired through the self-teaching mechanism of phonological recoding. However, Russian first graders seem to experience certain difficulties also in reading orthographically simple words and nonwords. Significant syllabic length effects have indeed been found for the accuracy of reading monosyllabic and bisyllabic simple words, complex words and nonwords. The differences in reading accuracy between monosyllabic and bisyllabic words are constant, and the increase in accuracy across measurement points occurs in parallel for monosyllabic and bisyllabic items. It seems that transition from monosyllabic to bisyllabic nonwords constitutes a certain threshold, for which the exact syllabic structure of the bisyllabic nonword is of no difference. It is the blending of two syllables together that remains difficult for Russian first grade students at the end of the first school year and lowers their accuracy scores for reading bisyllabic nonwords. We may conclude that Russian readers encounter difficulties in reading orthographically complex words, which challenge them to develop dual or multiple word recognition strategies. However, the development of these strategies is not completed during grade 1. The shift towards diversification of strategies will probably continue in grade 2 or for some students even later.

STUDY III

Kerek, E & Niemi, P. (2012). Grain-size units of phonological awareness among Russian first graders. *Written Language & Literacy,* 15 , 80-113

The article presents the outcomes of the study of phonological awareness development in grade 1 of Russian primary school. The goal of the study was to explore the phonological awareness development in Russian after the onset of reading instruction. It is generally agreed that the onset of literacy affects the development of phonological awareness. However, there is disagreement about the nature of this influence. It is often suggested that after reading acquisition phonemic awareness in relatively transparent languages develops quickly. One of the main questions is whether the sequence of phonological awareness development is universal (e.g. large-to-small) or to a certain degree language-specific and dependent on the salience of particular units in a given orthography. Taking into consideration the specific features of Russian phonology, orthography, and methods of reading instruction we tried to determine what linguistic units are prominent in Russian beginning readers' phonological awareness. We were especially interested in how explicit and implicit phonological awareness of large and small grain size units are balanced during the first year of formal reading acquisition, and in what way this balance changes in the course of time in connection to progress in reading acquisition. We also wanted to find out if the instability of syllable boundaries influences the type of subsyllabic units represented in the phonological awareness of Russian-speaking children.

The results of the study are discussed in terms of phonological units prominent at different levels of explicitness in connection with the qualitative shift in phonological awareness of Russian first graders caused by the onset of literacy acquisition. As a group the Russian-speaking first graders showed quite well-developed phonemic segmentation ability which in its turn indicates well-developed explicit phonemic awareness. This can be seen as evidence that external demand in the form of reading instruction promotes phonemic awareness and that phoneme as a unit is dominant in the explicit phonological awareness of Russian first graders. At the same time, implicit epilinguistic awareness retains traces of the dominance of larger units, e.g. syllables, typical for the preliterate stage, when phonemes are usually unavailable. The results of the present study point to a reversal in the phonological awareness of the Russian first graders after the onset of literacy: explicit phonemic awareness promoted by the external demand in the form of reading instruction develops more rapidly than explicit awareness of larger units, especially during the initial stages of reading instruction. Still, the shift from implicit to explicit phonemic awareness seems to be more abrupt than a more gradual transition towards explicit syllabic awareness.

Compared to almost equivalent levels of syllabic and phonemic awareness all the more striking was the difference with the level of rime awareness demonstrated by the Russian first grade students. This result was, however, not very surprising since it was suggested by the preliminary analysis of the phonological structure of Russian and its orthography. The relatively low scores in rime awareness both in same/different and common unit tasks demonstrated that onset-rime subsyllabic units are not salient in the phonological awareness of Russian first graders. In our experiment rimes were represented by vowels following singleton onsets. In other words, the children were required to segment CV segments, which turned out to be a difficult task. Obviously, there is no external demand created by the reading tuition for segmenting CV syllables into subsyllabic parts. Indeed, the awareness of CV segments seems to be particularly important for reading acquisition in Russian. The results of Experiment 2 demonstrate that students in grade 1 rely to a large extent on the CV unit in their oral segmentation strategies. In the outcomes of both the syllabic segmentation and in the phonemic segmentation task there was a pronounced tendency to preserve CV segments. The universality of onset-rime subsyllabic division is therefore further questioned.

At the same time as the Russian children seemed to display exceptional ability to locate CV segments, they were less sure about defining the exact position of syllable onsets, and particularly of syllable offsets (codas), in other words, they seem to be somewhat unsure about where a syllable starts and, especially, where it ends. Looking closer, one might notice that uncertainty about onsets was mainly displayed in initial or medial syllables which were unstressed in our target words. In the stressed final syllables there was no uncertainty about the place of onset. However, even in these syllables the Russian children displayed a wide pattern of coda segmentations pointing to their uncertainty about where the syllabic units end. Our findings support Content, Kearns and Frauenfelder's (2001) hypothesis about the primacy of onsets and variability of offset decisions in syllable detection, as well as the salience of onset points in stressed syllables. Variability of syllable onset and offset decisions made by participants in Experiment 2 suggests that syllabic awareness of Russian first graders has not evolved far beyond the implicit state. These results give support to the idea that sequence of phonological awareness development is influenced by language-specific factors.

An interesting question is the relationship between this instability of syllable boundaries and the type of subsyllabic units represented in the phonological awareness of Russian-speaking first grade children. Uncertainty of where a syllable starts and ends causes a situation where initial consonants in complex onsets and whole or parts of codas can become less relevant. It is possible that the abundance of multisyllabic words in Russian coupled with unclear syllable boundaries creates the need for one central component in the syllable's internal structure, and finding

it is more important than the exact shape of its peripheral elements, which can be quite flexible depending on the phonological context. Another way to look at this uncertainty about the outer limits of syllable is to relate it to the lack of congruence between the syllabic and morphemic word division often encountered in Russian, and to view the fuzziness of syllable offset decisions as a sign of progress towards morpheme-based word segmentation resulting in higher occurrence of closed syllables.

Our study supports suggestions made by Ziegler and Goswami (2005; 2006) about beginning readers' selective reliance on the most salient units of phonology and orthography of the language used in literacy instruction. Our results show that Russian-speaking first grade students rely primarily on phonemes and CV syllables as grain-size units in their explicit phonological awareness. Special cohesion of CV segments in Russian orthography as well as appropriate teaching methods promote rapid development of explicit awareness of CV units in Russian beginning readers. However, the instability of syllabic boundaries slows down the process of developing explicit syllabic awareness more adequately reflecting the morphemic structure of Russian words. At the same type, the suggestion of Duncan et al. (2006) that the sequence of phonological awareness development does not necessarily follow the path from larger to smaller units also found support in our study. Phonemic awareness of Russian first grade students after the onset of reading instruction seems to have reached the metalinguistic level faster than their syllabic awareness, which can be explained by the inherent instability of syllabic boundaries in Russian. The sequence of phonological awareness development in Russian is thus influenced by language-specific features of its phonology and orthography as well as by the choice of reading instruction methods.

STUDY IV

Silvén, M. & Rubinov, E. (2010). Language and preliteracy skills in bilinguals and monolinguals at preschool age: Effects of exposure to richly inflected speech from birth. *Reading and Writing. An Interdisciplinary Journal*, 23, 385–414.

Importance of phonological processing should not overshadow the influence of semantic and morphological processing as precursors of literacy acquisition. Oral language proficiency before school entry has proven to be a powerful predictor of literacy development. This longitudinal study examined how simultaneous exposure to two richly inflected languages, Finnish and Russian, from birth contributes to the development of language and preliteracy skills at four years of age compared to peers exposed to one language.

The results of the study show that same initial "one-language-one parent" exposure condition resulted over the years in different proficiency profiles based on semantic and morphological skills in both languages. One profile can be regarded as emergent bilingualism (20%) and two as at risk bilingualism (80%). The bilinguals who were able to perform relatively well in both home languages had not only experienced balanced exposure to both (49% and 51%, respectively), but had also been more exposed to the minority language during daily activities compared to their peers: the parents read almost every day to the child and the children played every week with peers speaking that language. The bilinguals who had made the greatest gains in the community language had experienced two times more out of home care as well as higher amounts of engagements in that language during triadic interactions at home compared to their peers. Amount of day care and frequency of daily activities was not related to language proficiency among the monolinguals.

The community language was to a great extent age-appropriate compared to monolingual peers, but we found no evidence for a bilingual advantage (or disadvantage) in phonological awareness at preschool age. Although the positive correlations between phonological awareness tasks suggest cross-language transfer at the phonological level, performance on minority language tasks was below or close to chance level for most bilingually reared children. Only among the balanced bilinguals the children showed some skill in phonological awareness both Finnish and Russian. This evidence suggests that phonological awareness is specific for each language rather than universal in nature. We also found language-specific relations between children's phonological, semantic, and morphological skills at preschool age. This was true for the monolinguals as well as the bilinguals in their both languages. Although almost all word types in Finnish and Russian can be inflected, there was no evidence for transfer from one language to the other for semantic and morphological skills.

Phonological working memory span proved to be highly relevant for children's performance on most language tasks at preschool age. A larger memory span was related to more proficient morphological as well as alliteration and rhyme skills among Finnish monolinguals. This language-specific finding expands over prior evidence on working memory span and vocabulary size. Moreover, the balanced bilinguals possessed better phonological awareness skills and a larger working memory span in Russian than their peers with low proficiency in Russian and better phonological awareness skills and a larger span in Finnish than their pears with low proficiency in Finnish. The pattern of findings might be taken as evidence that children can keep active a sequence of words and manipulate their phonological structures, only after having achieved a basic level in mastery of lexemes as well as morphemes in that language. Working memory span was

related to recognizing syllables and sound patterns in words among the balanced bilinguals but for the monolinguals it was only involved in recognizing sound patterns.

Our findings have practical implications for bilingually reared children, especially those learning a highly inflected language. While minority children can easily learn to decode words in Finnish, their comprehension skills seem to lag behind that of monolinguals. Even though bilingualism by itself is not a hinder for academic performance in the community language, some of the children in our study with low proficiency in both home languages might be at high risk for not only for attrition of their minority language, but also for literacy acquisition in the community language and, consequently, for future academic progress.

5. DISCUSSION

The present trend in reading acquisition research is to explore the generalizability of reading skills-related theories, mostly formulated by English-speaking researchers, to languages which are grammatically, phonologically and/or orthographically different from English. This dissertation is a modest contribution to the growing body of knowledge concerning reading acquisition in a cross-linguistic perspective. From the theoretical point of view this investigation was undertaken with the intent to clarify the role of language-specific factors in the process of reading acquisition. It explores the influence of language-specific traits of Russian phonology and orthography on the development of phonological awareness and decoding skills by Russian first graders.

Russian is one of the most wide-spread languages spoken by millions of people both inside Russia and in the diaspora Russian-speaking communities around the world. Russian is also learned as a second language by children belonging to numerous ethnic minorities living on the territory of the multiethnic Russian Federation. What is more, Russian is studied worldwide by many people interested in Russian language and culture, either professionally or as extracurricular activity. This investigation contributed to understanding the mechanisms of reading acquisition in Russian with regard to the specificity of its phonology and orthography as well as to clarifying the components of oral language proficiency in Russian which are transferable to reading acquisition in another morphologically rich language (Finnish).

In this dissertation I tried to answer the following research questions concerning reading acquisition by Russian first graders: how do properties of oral and written language influence reading acquisition in Russian? What are the grain-size units the beginning reader in Russian has to pay attention to? How does the complexity of Russian phonological system influence the development of phonological awareness?

The research question concerning Finnish-Russian bilinguals was: to what extent is cross-linguistic transfer of pre-reading skills possible between the weaker and the stronger language of a bilingual child speaking two morphologically rich, typologically different languages? Does bilingualism in morphologically rich languages provide any specific advantage in morphological awareness? Are there any benefits or, more precisely, enhancement effects on phonological awareness when one of the bilinguals' languages is more complex phonologically than the other, and does language dominance influence the direction of phonological awareness skills transfer?

The results of our longitudinal study of Russian first graders' reading acquisition suggest that phonological recoding is the dominant strategy in the initial phase of reading development in Russian, while there is evidence of gradual shift towards orthographic processing in reading high-frequency regular words. The study confirms that Russian readers encounter difficulties in reading orthographically complex words, where phonological recoding does not completely succeed. These findings are compared with results of reading acquisition studies in other orthographies, and their relevance for models of reading acquisition in different types of orthographies is discussed.

Juxtaposition of our data with the results of the international comparative study of 13 European orthographies (Seymour, Aro, & Erskine, 2003) shows that Russian children at the end of grade 1 have one of the highest levels of letter knowledge in Europe, which is manifested in high accuracy and fast reaction time. In monosyllabic nonword reading the results of the Russian children also compare well both in terms of accuracy and reaction times, suggesting that they have mastered the strategy of syllabic reading, which is actively promoted by teaching methods used in many Russian schools. At the same time, the results for accuracy in bisyllabic nonword reading are more modest and comparable to those shown by beginning readers in deeper orthographies, while reaction time scores for bisyllabic nonword reading are exceptionally fast. The scores for word reading indicate a similar pattern: in accuracy Russian children had rather poor results comparable to those in deeper orthographies. At the same time, reaction times in these tasks are on par with the level of performance in relatively shallow orthographies. Accuracy figures for word and nonword reading demonstrated reversed lexicality effect comparable only to results in deeper orthographies.

How are we to interpret this consistent pattern of modest results in accuracy and excellent performance in terms of reaction times? We see in it an indication that children are applying their dominant strategy to various reading tasks and are only beginning to develop suitable multiple strategies in dealing with orthographically complex material. Therefore in tasks which can be performed with the help of alphabetic recoding, Russian children's accuracy is on the level of children learning to read in relatively shallow orthographies such as German. In tasks where this approach works only partially for deeper orthographies, Russian children demonstrated accuracy results similar to those in French or Portuguese.

Our study of phonological awareness in grade 1 of Russian primary school demonstrated that the sequence of phonological awareness development in Russian is influenced by language-specific features of its phonology and orthography as well as by the choice of reading instruction methods, which, of course, also take into account the specific traits of spoken and written Russian. Our results suggest that language-specific factors, such as the complexity of syllabic structure, as well

as the salience of CV segments in Russian orthography, influence the course of phonological awareness development of Russian schoolchildren.

We also suggest that Russian orthography is definitely not completely transparent, in our judgment it is closer to intermediate/deep orthographies, such as French or Portuguese. Goswami and Ziegler (2006) suggest that children learning to read in deeper orthographies rely on multiple strategies while children learning to read in shallow orthographies can restrict their choice of reading strategies to straightforward grapheme-phoneme recoding. We believe, however, that the item-based build-up of grain size units proposed by Share (1995) occurs in all orthographies since it leads to more economical, faster reading. Readers in shallow orthographies initially get a head start, but their later progress might depend on the regularity of larger grain sizes and the possibility of deriving clear conversion rules on this level of orthographic regularity. At this point general cognitive ability, flexibility in the use of strategies, rapid naming and morphological skills might be better predictors than phonological awareness.

Preservation of morphological stability in violation of 1:1 grapheme correspondences is one of the main reasons of why Russian orthography cannot be considered shallow. Forming a set of morphographic skills is thus crucial for becoming a skilled reader in this language (Grigorenko, 2012), but it is also a challenging task. All of the linguistic features described by Seymour (2006) as factors complicating the formation of morphographic skills such as large number and variability of morphological elements, widespread morphological fusion, ambiguity of syllabic boundaries and mobile stress are present in Russian.

Recommendations for educational practices. Increasing heterogeneity of classrooms in many European countries demands both new directions in educational research and new approaches to educational practices. The results of our research point to the necessity of creating programs geared toward second-language learners at sufficiently early developmental stage, in particular, for developing their preliteracy skills. Delay in vocabulary skills in the community language demonstrated by some children in the bilingual group in our study demonstrates the need for focused interventions aimed at vocabulary development for bilingual children. After the initial period of reading acquisition in the Finnish school, with decoding skills in place, the texts they will read in later grades will certainly become more demanding, and their deficits in vocabulary knowledge might have detrimental effects on their academic progress across a range of academic subjects. Phonological awareness training would be similarly effective for both bilingual and monolingual children.

For reading instruction of monolingual children in Russia the advice is to take into account the complexities of Russian orthography while following the tight schedule of teaching grapheme-phoneme correspondences in the first

grade. These complexities are extensively trained in writing instruction, however, reading has traditionally been considered an easier process in Russian than writing, and the teachers do not always have sufficient patience for the students' reading difficulties caused by the complexities of Russian orthography. Besides, it is important to remember that achieving decoding fluency does not end with ability to read monosyllabic words without visible effort. Russian words are as a rule multisyllabic, and the ability not only to blend phonemes inside a syllable, but also syllables inside a word should be given sufficient space in the reading instruction programs. The instability of syllabic boundaries characteristic for Russian is potentially a source of variability in syllabic segmentation, which in the initial stages of reading acquisition might delay the development of appropriate grain size units.

6. LIMITATIONS

As a whole this study is "unfinished business": in the investigation of reading acquisition by monolingual Russian children a longitudinal or at least cross-sectional investigation of preliteracy skills would be appropriate, while in the investigation on the bilinguals' literacy precursors we still have no data on the reading outcomes of the children with Russian-Finnish linguistic background learning to read in Finnish. In an ideal world with unlimited financial and human resources we would definitely pursue wider-scale research in order to obtain more complete longitudinal data. Lack of time and resources also prevented us from carrying out an even more ambitious project of studying the reading comprehension of Russian children in the lower grades of elementary school. However, even in its current shape the results of research provide an idea of the degree of language-specificity inherent in learning to read in Russian or growing up with Russian as part of the bilinguals' linguistic background. Another notable limitation in our study is the sample size. It is also explained by practical considerations: despite being part of larger projects everything connected to the studies in Russian has been done by a one-woman team consisting of the respondent. However, the relatively small number of participants in both studies is partly compensated by the longitudinal nature of both research projects.

The biggest methodological challenge in conducting the study devoted to reading acquisition in Russian was the almost complete absence of testing materials. All the materials used have been developed specially for this study. The same is true for the study devoted to Finnish-Russian bilinguals' preliteracy skills: the materials used for testing bilingual children in Russian have been created to parallel the existing Finnish-language materials, but were adjusted to reflect the language-specific traits of Russian vocabulary, phonology and grammar. Another methodological difficulty was the ambiguity of the term "orthography" due to its different meaning in the Russian and the Western research tradition.

Linguistic analysis of Russian orthography was carried out in order to identify the sources of complexity that may influence reading development. However, the complexities this study focused on were only the ones relating to the so-called "graphics" level of Russian orthography or the ones following the so-called "traditional" principle of the Russian orthography. We suppose that the complexities relating to the level which is called "orthographic" in the Russian sense of the word would be the topic of further research.

Linguistic material used in the study on reading acquisition of Russian first grade children was somewhat limited with regard to syllabic length due to the

intended comparisons with results from studies in other European languages in which child vocabulary typically does not contain many multisyllabic words. Only mono- and bisyllabic words were used in the study, therefore the difference in the place of stress was reduced to two possible stress patterns: with stress on the first/second syllable. The study on Finnish-Russian bilinguals used multisyllabic words since comparisons planned to be were conducted between two morphologically rich languages. However, even though the Russian-language target materials were representative of different stress patterns common in Russian phonology, the influence of stress patterns on phonological awareness of Finnish-Russian bilinguals was not studied systematically. Altogether the need for an encompassing longitudinal detailed study of Russian children's reading development has been evident for quite a long time, it is a question of resources and proper training.

Another comment we might get from possible critics is that we use somewhat different phonological awareness tasks in Study III and Study IV. The reason for this discrepancy is that the aforementioned studies have been conducted within two different research projects pursuing different research goals.

Yopp (1988) proposed a classification of phonological awareness tasks suggesting that the easiest tasks are rhyming, auditory discrimination and phoneme blending, while phoneme segmentation and phoneme deletion are the hardest. Yopp also suggested the existence of two types of phonemic awareness, "simple", required for phoneme segmentation, isolation or counting and "compound" needed in phoneme isolation tasks which require more advanced cognitive operations. However, Yopps' study, even though influential, has been performed on a relatively small sample of 96 preschool children.

There have been studies suggesting that phonological awareness is a multifactor construct consisting of factors such as syllable, rhyme and phoneme, each of them contributing independently to general phonological ability (Høien, Lundberg, Stanovich, & Bjaalid, 1995; Lundberg, Frost, & Petersen, 1998; Muter, Hulme, Snowling, & Taylor, 1997; Yopp, 1988). The number and the structure of the factors were often different in different studies. This difference might be, of course, explained by age and of participants as well as their print experiences. Differences in statistical approaches are, of course, also important in this respect (Anthony et al., 2002, Smith & Miao, 1994). One might also ask if phonological awareness is exactly the same construct in different languages before and after literacy onset given the differences in phonology and orthography of different languages (Geudens, 2006).

The dominant developmental view of phonological awareness, however, presently is that it is a single underlying ability that develops from sensitivity to words to sensitivity to phonemes (Adams, 1990; Anthony et al., 2003, Goswami & Bryant, 1990; Stanovich, 1992) in a progression which is quasi-parallel rather

than sequential and temporally discrete. Different phonological skills are viewed as representing either same or highly correlated abilities and children's general sensitivity to sound structure of language such as words, syllables, rhymes, onset/rimes, and phonemes can be indexed by a variety of measures if they are administered at the appropriate point in a child's development.

Predictive power of phonological awareness tasks may depend on the type of orthography in which the child is learning to read. In orthographically transparent orthographies the predictive power of phoneme awareness has been shown to be much higher than that of onset/rime awareness (González, González, Monzo, & Hernandez-Valle, 2000; Høien et al., 1995; Wimmer, Landerl, & Schneider, 1994). It has also been shown that certain task characteristics such as the position of the item in the task may influence performance on the task (Schatschneider, Francis, Foorman, Fletcher, & Mehta, 1999). Høien et al. (1995) found three factors in the domain of phonological awareness independently predicting reading ability: phoneme, rhyme and syllable.

In the study on preschool bilinguals not all the tasks were epilinguistic according to Gombert's (1992) characterization involving general similarity judgements on phonological segments ("epilinguistic" processing) and the identification and production of shared phonological segments (metalinguistic processing). As Gombert proposes that children can use overall sound sensitivity to complete epilinguistic tasks, it might be predicted that the easiest task would be the one with the word pairs that sound similar. In this study, that would be the rime task. Although the segments to be matched in the syllable task are larger (full syllables rather than just rimes), the syllable task uses two-syllable words, and therefore larger segments of each pair of words sound different. The initial phoneme matching task was probably the hardest because the word pairs share only one phoneme and differ on two phonemes. Still, all the matching tasks could be solved using implicit strategies and awareness of the segments involved was not necessary. Syllable deletion and producing the first phoneme of a word were, as predicted, the most demanding tasks assessing metalinguistic awareness. Even though the children in our study found these tasks too difficult, in choosing to use them we related to Anthony et al. (2002) suggestion that children's phonological sensitivity should be indexed by their performance on multiple measures of phonological sensitivity that span the task demands and levels of linguistic complexity that have not yet been completely mastered to those that have recently emerged.

7. SUGGESTIONS FOR FUTURE RESEARCH

Our research has touched on several directions which might be developed further and produce both promising and unexpected answers. For example, further research is definitely needed on the impact of phonological complexity on the development of phonological awareness. The notorious mobility of Russian word stress in combination with abundance of multisyllabic words in Russian makes it a very interesting language for investigation the effects of word prosody on the development of word reading and phonological awareness. Another interesting question is what type of word reading strategies Russian children revert to at later stages of reading development and how large are the grain-size units they use for non-lexical computations. A promising way to go is the current attempt to continue research on the role grain size units in different orthographies with the help of creating databases with frequencies of sublexical units (Hofmann, Stenneken, Conrad, & Jacobs, 2007).

Our present findings should be validated in a larger scale longitudinal study involving both beginning readers and preschool non-readers. This type of comparison might further clarify the origin of the preference for CV segments as the Russian first graders' units of explicit phonological awareness and determine the contribution of the specific features of Russian orthography to the salience of these units. Another question of interest is whether CV units retain their special status during subsequent reading development when syllabification strategies are supposed to become predominantly morpheme-based. In the long term perspective one topic of interest is transition to skilled reading by Russian beginning readers. According to Ziegler and Goswami (2006), developmental prints of reading acquisition are discernible even in skilled reading. Frost's (1998; 2005) suggestion that skilled readers can rely on impoverished phonological representations would require explaining what type of skeletal phonological information a Russian reader could extract from written words.

8. REFERENCES

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Aichert, I., & Ziegler, W. (2005). Is there a need to control for sublexical frequencies? *Brain & Language*, 95, 170–171.

Alegria, J., Pignot, E., & Morais, J. (1982). Phonetic analysis of speech and memory codes in beginning readers. *Memory and Cognition*, 10, 451–456.

Anthony, J.L., Lonigan, C.J., Burgess, S.R., Driscoll Bacon, K., Phillips, B.M., & Cantor, B.G. (2002). Structure of preschool phonological sensitivity: Overlapping sensitivity to rhyme, words, syllables, and phonemes. *Journal of Experimental Child Psychology*, 82, 65–92.

Anthony, J.L., Lonigan, C.J., Driscoll, K., Phillips, B.M., & Burgess, S.R. (2003). Phonological sensitivity: A quasi-parallel progression of word structure units and cognitive operations. *Reading Research Quarterly*, 38, 470–487.

Anthony, J.L., & Lonigan, C.J. (2004). Nature of phonological sensitivity: Converging evidence from four studies of preschool and early grade-school children. *Journal of Educational Psychology*, 96, 43–55.

Anthony, J.L., & Francis, D.J. (2005). Development of phonological awareness. *Current Directions in Psychological Science, 14, 255–259.*.

Aro, M. (2004). *Learning to read: The effect of orthography*. Jyväskylä: University of Jyväskylä.

August, D., Carlo, M., Dressler, C., & Snow, C. (2005). The critical role of vocabulary development for English language learners. *Learning Disabilities Research and Practice*, 20, 50–57.

Ben-Dror, I., Frost, R., & Bentin, S. (1995). Orthographic representation and phonemic segmentation in skilled readers: A cross-language comparison. *Psychological Science*, 6, 176–181.

Bentin, S. (1992). Phonological awareness, reading, and reading acquisition: A survey and appraisal of current knowledge. In R. Frost & L. Katz (Eds.) *Phonology, morphology, orthography and meaning* (pp. 193–210). Elsevier, North Holland.

Bentin, S., & Leshem, H. (1993). On the interaction between phonological awareness and reading acquisition: It's a two-way street. *Annals of Dyslexia*, 43, 125–148.

Bialystok, E., Luk, G., & Kwan, E. (2005). Bilingualism, biliteracy, and learning to read: Interactions among languages and writing systems. *Scientific Studies of Reading*, 9, 43–61.

Bialystok, E. (2007). Acquisition of literacy in bilingual children: A framework for research. *Language Learning*, 57, 45–77.

Bland-Stewart, L., & Fitzgerald, S. (2001). Use of Brown's 14 grammatical morphemes by bilingual Hispanic preschoolers: A pilot study. *Communication Disorders Quarterly*, 22, 171–186.

Bradley, L., & Bryant, P. E. (1983). Categorizing sounds and learning to read: A causal connection. *Nature*, 301, 419–421.

Brown, G. D. A. & Deavers, R. P. (1999). Units of analysis in non-word reading: evidence from children and adults. *Journal of Experimental Child Psychology*, 73, 208–242.

Bruck, M., & Genesee, F. (1995). Phonological awareness in young second language learners. *Journal of Child Language.* 22, 307–324.

Campbell, R., & Sais, E. (1995). Accelerated metalinguistic (phonological) awareness in bilingual children. *British Journal of Developmental Psychology*, 13, 61–68.

Caravolas, M., & Bruck M. (1993). The effect of oral and written language input on children's phonological awareness: A cross-linguistic study. *Journal of Experimental Child Psychology*, 55, 1–30.

Caravolas, M; Lervag, A; Mousikou, P; Efrim, C; Litavsky, M; Onochie-Quintanilla, E; ... Hulme, C. (2012). Common patterns of prediction of literacy development in different alphabetic orthographies. *Psychological Science*, 23, 678 - 686.

Caravolas, M., Lervåg, A., Defior, S., Malkova, G. S., & Hulme, C. (2013). Different patterns, but equivalent predictors, of growth in reading in consistent and inconsistent orthographies. *Psychological Science*, 24, 1398–1407.

Cheung, H., Chen, H.-C., Lai, C.Y., Wong, O. C., & Hills, M. (2001). The development of phonological awareness: effects of spoken language experience and orthography. *Cognition*, 81, 227–241.

Chiappe, P., Siegel, L.S., & Wade-Woolley, L. (2002). Linguistic diversity and the development of reading skills: A longitudinal study. *Scientific Studies of Reading*, 6, 369–400.

Comeau, L., Cormier, P., Grandmaison, É., & Lacroix, D. (1999). A longitudinal study of phonological processing skills in children learning to read in a second language. *Journal of Educational Psychology*, 91, 29–43.

Content, A., Kearns, R. K., & Frauenfelder, U. K. (2001). Boundaries versus onsets in syllabic segmentation. *Journal of Memory and Language*, 45, 177–199.

Cossu, G., Shankweiler, D., Liberman, I. Y., Katz, L., & Tola, G. (1998). Awareness of phonological segments and reading ability in Italian children. *Applied Psycholinguistics*, 9, 1–16.

Davies, R., Cuetos, F., & Glez-Seijas, R. M. (2007). Reading development and dyslexia in a transparent orthography: a survey of Spanish children. *Annals of Dyslexia*, 57, 179–198.

De Jong, P. F. (2006). Units and routes of reading in Dutch. *Developmental Science*, 9, 441–442.

Deacon, S. H., Wade-Woolley, L., & Kirby, J. R. (2007). Cross-over: The role of morphological awareness in French immersion children's reading. *Developmental Psychology,* 43, 732–746.

Defior, S., Cary, L., & Martos, F. (2002). Differences in reading acquisition development in two shallow orthographies: Portuguese and Spanish. *Applied Psycholinguistics*, 23, 135–148.

Droop, M., & Verhoeven, L. (2003). Language proficiency and reading ability in first- and second-language learners. *Reading Research Quarterly*, 38, 78–103.

Duncan, L. G., Cole, P., Seymour, P. H. K., & Magnan, A. (2006). Differing sequences of metaphonological development in French and English. *Journal of Child Language*, 33, 369–399.

Durgunoglu, A. Y., & Öney, B. (1999). A cross-linguistic comparison of phonological awareness and word recognition. *Reading & Writing*, 11, 281–299.

Durgunoglu, A. Y., & Öney, B. (2002). Phonological awareness in literacy development: It's not only for children. *Scientific Studies of Reading*, 6, 245–266.

Ehri, L. C., & Wilce, L. S. (1980). The influence of orthography on readers' conceptualization of the phonemic structure of words. *Applied Psycholinguistics,* 1, 371–385.

Ehri, L. (1999). Phases of development in learning to read words. In J. Oakhill & R. Beard (Eds.), *Reading Development and the Teaching of Reading: A Psychological Perspective* (pp. 79–108). Oxford, UK: Blackwell Publishers.

Ellis, N. C., Natsume, M., Stavropoulou, K., Hoxhallari, L., Van Daal, V. H. P., Polyzoe, N., Tsipa, M.-L., & Petalas, M. (2004). The effects of orthographic depth on learning to read alphabetic, syllabic, and logographic scripts. *Reading Research Quarterly*, 39, 438–468.

Eviatar, Z., & Ibrahim, R. (2000). Bilingual is as bilingual does: Metalinguistic abilities of Arabic-speaking children. *Applied Psycholinguistics,* 21, 451–471.

Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. Patterson, J. Marshall, & M. Colthart (Eds.), Surface Dyslexia (pp. 301–330). Hillsdale, NJ: Erlbaum.

Frost, R., Katz, L., & Bentin, S. (1987). Strategies for visual word recognition and orthographic depth: a multilingual comparison. *Journal of Experimental Psychology: Human Perception and Performance*, 13, 104–115.

Frost, R. (1998). Toward a phonological theory of visual word recognition: True issues and false trails. *Psychological Bulletin*, 123, 71–99.

Frost, R. (2005). Orthographic systems and skilled word recognition processes in reading. In M. J. Snowling & C. Hulme (Eds.) *The science of reading: A handbook. Blackwell handbooks of developmental psychology* (pp. 272–295). Malden, MA: Blackwell.

Frost, R. (2012). Towards a universal model of reading. *Behavioral and Brain Sciences*, 35, 263–329.

Genesee, F. (2009). Early childhood bilingualism: Perils and possibilities. *Journal of Applied Research on Learning*, 2, 1–21.

Georgiou, G. K., Parrila, R., & Papadopoulos, T. C. (2008). Predictors of word decoding and reading fluency across languages varying in orthographic consistency. *Journal of Educational Psychology*, 100, 566–580.

Geudens, A., & Sandra, D. (2003). Beyond children's implicit phonological knowledge: No support for an onset-rime structure in children's explicit phonological awareness. *Journal of Memory and Language*, 49, 157–182.

Geudens, A., Sandra, D., & Martensen, H. (2005). Rhyming words and onset-rime constituents: An inquiry into structural breaking points and emergent boundaries in the syllable. *Journal of Experimental Child Psychology*, 92, 366–387.

Geudens, A. (2006). Phonological awareness and learning to read a first language: controversies and new perspectives. In: I. van de Craats, J. Kurvers & M. Young-Scholten (Eds.) *Low-Educated Second Language and Literacy Acquisition. Proceedings of the Inaugural Symposium*.Tilburg University August 2005, Utrecht, The Netherlands: LOT.

Geva, E., & Wade-Woolley, L. (1998). Component processes in becoming English-Hebrew biliterate. In A. Durgunoglu, & L. Verhoeven (Eds.), *Acquisition of literacy in a multilingual context: a cross-cultural perspective. Literacy development in a multilingual context.* (pp. 85–110). Hillsdale, NJ: Lawrence Erlbaum.

Geva, E., & Siegel, L.S. (2000). Orthographic and cognitive factors in the concurrent development of

basic reading skills in two languages. *Reading and Writing,* 12, 1–30.

Gombert, J. E. (1992). *Metalinguistic development*. Hemel Hempstead: Harvester Wheatsheaf.

González, J. E., González, C. J., Monzó, A. E., & Hernández-Valle, I. (2000). Onset-rime units in visual word recognition in Spanish normal readers and children with reading disabilities. *Learning Disabilities: Research & Practice*, 15, 135–141.

Goswami, U. (1986). Children's use of analogy in learning to read: A developmental study. *Journal of Experimental Child Psychology*, 42, 73–83.

Goswami, U., & Bryant, P.E. (1990). *Phonological skills and learning to read*. Hillsdale, NJ: Lawrence Erlbaum.

Goswami, U., Gombert, J. E., & de Barrera, L. F. (1998). Children's orthographic representations and linguistic transparency: Nonsense word reading in English, French, and Spanish. *Applied Psycholinguistics*, 19, 19–52.

Goswami U., Porpodas C., & Wheelwright S. (1997). Children's orthographic representations in English and Greek. *European Journal of Psychology of Education*, 12, 273–292.

Goswami, U., Ziegler, J. C., Dalton, L., & Schneider, W. (2003). Nonword reading across orthographies: How flexible is the choice of reading units? *Applied Psycholinguistics*, 24, 235–247.

Goswami, U., Ziegler, J. C., & Richardson, U. (2005). The effects of spelling consistency on phonological awareness: A comparison of English and German. *Journal of Experimental Child Psychology*, 92, 345–365.

Grigorenko, E. L. (2003). Matryoshka, Matryozhka or Motryoshka? The difficulty of mastering reading and spelling in Russian. In N. Goulandris & M. J. Snowling (Eds.), *Dyslexia in different languages: cross-linguistic comparisons*. Whurr Publishers, London.

Grigorenko, E. L. (2006). If John were Ivan: Would he fail in reading? In R. M. Joshi and P. G. Aaron (Eds.), *Handbook of orthography and literacy* (pp. 303–320). Mahwah, NJ: Lawrence Erlbaum Associates.

Hammer C. S., Lawrence F.R., & Miccio A.W. (2007). Bilingual children's language abilities and early reading outcomes in Head Start and kindergarten. *Language, Speech, and Hearing Services in Schools*, 38, 237–48.

Harris, M., & Giannouli, V. (1999). Learning to read and spell Greek: the importance of letter knowledge and morphological awareness. In M. Harris & G. Hatano (Eds.), *Learning to read and write: a cross-linguistic perspective* (pp 51–70). Cambridge: Cambridge University Press.

Hofmann, M. J., Stenneken, P., Conrad, M., & Jacobs, A. M. (2007). Sublexical frequency measures for orthographic and phonological units in German. *Behavior Research Methods*, 39, 620–629.

Høien, T., Lundberg, I., Stanovich, K. E., & Bjaalid, I-K. (1995). Components of phonological awareness. *Reading and Writing*, 7, 171–188.

Holopainen, L., Ahonen, T., & Lyytinen, H. (2001). Predicting delay in reading achievement in a highly transparent language. *Journal of Learning Disabilities*, 34, 401–413.

Häikiö, T., Bertram, R., & Hyönä, J. (2011). The development of whole-word representations in compound word processing: Evidence from eye fixation patterns of elementary school children. *Applied Psycholinguistics*, 32, 533–551.

Ivanova, V. F. (1966). *Sovremennyj russkij jazyk. Grafika i orfografija [Modern Russian language. Graphics and orthography]*. Moscow, Russia: Prosveshchenije.

Ivanova, V. F. (1971). *Teoreticheskije osnovy russkoj orfografii. ADD [Theoretical basics of Russian orthography. Summary of doctoral dissertation]*. Leningrad, Russia: Leningrad University.

Ivanova, V. F. (1977). *Printsypy russkoj orfografii [Principles of Russian orthography]*. Leningrad, Russia: Leningrad University.

Katz, L. & Frost, R. (1992). The reading process is different for different orthographies: The orthographic depth hypothesis. In R. Frost & L. Katz (Eds.), *Orthography, phonology, morphology, and meaning* (pp. 67–84). Amsterdam: Elsevier North Holland Press.

Kessler, B., & Treiman, R. (2001). Relations between sounds and letters in English monosyllables. *Journal of Memory and Language*, 44, 592–617.

Kornev, A. N., Rakhlin, N., & Grigorenko, E. L. (2010). Dyslexia from a cross-linguistic and cross-cultural perspective: The case of Russian and Russia. *Learning Disabilities: A Contemporary Journal*, 8, 41–69.

Kovelman, I., Baker, S.A., & Petitto, L.A. (2008). Age of first bilingual language exposure as a new window into bilingual reading development. *Bilingualism: Language and Cognition*, 11, 203–223.

Kuzmina, S. M. (1981). *Teorija russkoj orfografii [Theory of Russian orthography]*. Moscow, Russia: Nauka.

Landerl, K., Ramus, F., Ziegler, J. C....& Schulte-Körne, G. (2013). Predictors of developmental dyslexia in European orthographies with varying complexity. *Journal of Child Psychology and Psychiatry*, 54, 686-694.

Landerl, K., Wimmer, H., & Frith, U. (1997). The impact of orthographic consistency on dyslexia: A German–English comparison. *Cognition*, 63, 315–334.

Leikin, M., Schwartz, M., & Share, D. (2010). General and specific benefits of bi-literate bilingualism: a Russian–Hebrew study of beginning literacy. *Reading and Writing*, 23, 269–292.

Lesaux, N., & Siegel, L. (2003). The development of reading in children who speak English as a second language (ESL). *Developmental Psychology*, 39, 1005–1019.

Leseman, P. P. M., & van den Boom, D. C. (1999). Effects of quantity and quality of home proximal processes on Dutch, Surinamese-Dutch, and Turkish-Dutch preschoolers' cognitive development. *Infant and Child Development*, 8, 19–38.

Lima, C. F., & Castro, S. L. (2010). Reading strategies in orthographies of intermediate depth are flexible: Modulation of length effects in Portuguese. *The European Journal of Cognitive Psychology*, 22, 190–215.

Limbird, C. (2006). *Phonological processing, verbal abilities, and second language literacy development among bilingual Turkish children in Germany. Unpublished PhD thesis.* Free University of Berlin, Institute for Empirical Educational Science.

Lindsey, K. A., Manis, F. R., & Bailey, C. E. (2003). Prediction of first-grade reading in Spanish-speaking English-language learners. *Journal of Educational Psychology*, 95, 482–494.

Loizou, M., & Stuart, M. (2003). Phonological awareness in monolingual and bilingual English and Greek five-year-olds. *Journal of Research in Reading*, 26, 3–18.

Lundberg, I., Frost, J., & Petersen, O-P. (1988). Effects of an extensive program for stimulating phonological awareness in preschool children. *Reading Research Quarterly*, 33, 263–284.

Matthews, S., & Yip, V. (2003). Relative clauses in early bilingual development: transfer and universals. In A. Giacalone (Ed.), *Typology and second language acquisition* (pp. 39–81). Berlin: Mouton de Gruyter.

Melby-Lervåg, M., & Lervåg, A. (2011). Cross-linguistic transfer of oral language, decoding, phonological awareness and reading comprehension. *Journal of Research in Reading*, 34, 114–135.

Metsala, J. L. (1999). Young children`s phonological awareness and nonword repetitions as a function of vocabulary development. *Journal of Educational Psychology*, 91, 3–19.

Moiseev, A. I. (1987). *Zvuki i bukvy, bukvy i cyfry [Sounds and letters, letters and numbers].* Moscow, Russia: Prosveshchenije.

Morais J., Alegria J., & Content, A. (1987). The relation between segmental analysis and alphabetic literacy: An interactive view. *Cahiers de Psychologie Cognitive*, 7, 415–438.

Morais, J. (2003). Levels of phonological representation in skilled reading and in learning to read. *Reading and Writing*, 16, 123–151.

Muter, V., Hulme, C., Snowling, M., & Taylor, S. (1997). Segmentation, not rhyming, predicts early progress in learning to read. *Journal of Experimental Child Psychology*, 65, 370–396.

Muter, V, Hulme, C, Snowling, M.J., & Stevenson, J. (2004). Phonemes, rimes, vocabulary, and grammatical skills as foundations of early reading development: evidence from a longitudinal study. *Developmental Psychology*, 40, 665–81.

Müller, N., & Hulk, A. (2001). Crosslinguistic influence in bilingual language acquisition: Italian and French as recipient languages. *Bilingualism: Language and Cognition*, 4, 1–21.

Oktay, A., & Aktan, E. (2002). A cross-linguistic comparison of phonological awareness and word recognition in Turkish and English. *International Journal of Early Years Education,* 10, 37–48.

Oller, D. K., & Eilers, R. E. (2002). *Language and Literacy in Bilingual Children.* Clevedon, UK: Multilingual Matters.

Oller, D. K., Pearson, B. Z., & Cobo-Lewis, A. B. (2007). Profile effects in early bilingual language and literacy. *Applied Psycholinguistics*, 28, 191–230.

Omorokova, M.I. (1997). *Sovershenstvovanie chtenia mladshih shkol 'nikov [Improvement of younger school age children's reading]*. Moscow, Russia: ARCTI.

Osipov, B. I. (1970). *Grafiko-orfograficheskij analiz teksta [Graphic-orthographic text analysis]*. Barnaul, Russia: Barnaul University.

Pearson, B. Z. Fernández, S. C., Lewedag, V., & Oller, D. K. (1997). The relation of input factors to lexical learning by bilingual infants (ages 10 to 30 months). *Applied Psycholinguistics*, 18, 41–58.

Patterson, J. L., & Pearson, B. Z. (2004). Bilingual lexical development: Influences, contexts, and processes. In B. A. Goldstein (Ed.), *Bilingual language development and disorders in Spanish-English speakers* (pp. 77–104). Baltimore, MD: Paul H. Brookes.

Perfetti, C., Beck, I., Bell, L.C., & Hughes, C. (1987). Phonemic knowledge and learning to read are reciprocal: A longitudinal study of first grade children. *Merrill-Palmer Quarterly*, 33, 283–319.

Perfetti, C. (2003). The Universal Grammar of reading. *Scientific Studies of Reading*, 7, 3–24.

Petchko, K. (2009). *Predicting reading achievement in a transparent orthography: Russian children learn to read. Unpublished PhD thesis*. Temple University, Tokyo, Japan.

Russak, S., & Saiegh-Haddad, E. (2011). Phonological awareness in Hebrew (L1) and English L2) in normal and disabled readers. *Reading and Writing*, 24, 427-442.

Saiegh-Haddad, E. (2007a). Linguistic constraints on children's ability to isolate phonemes in Arabic. *Applied Psycholinguistics*, 28, 607–625.

Saiegh-Haddad, E. (2007b). Epilinguistic and metalinguistic phonological awareness may be subject to different constraints: Evidence from Hebrew. *First Language*, 27, 385– 405.

Saiegh-Haddad, E., & Geva, E. (2008). Morphological awareness, phonological awareness, and reading in English-Arabic bilingual children. *Reading and Writing*, 21, 481–504.

Saiegh-Haddad, E., Kogan, N. & Walters, J. (2010). Universal and language-specific constraints on phonemic awareness: Evidence from Russian-Hebrew bilingual children. *Reading and Writing* 23, 359–384.

Schatschneider, C., Francis, D. J., Foorman, B. R., Fletcher, J. M., & Mehta, P. (1999). The dimensionality of phonological awareness: An application of item response theory. *Journal of Educational Psychology*, 91, 439–449.

Scherba, L. V. (1983). *Teorija russkogo pi'sma [Theory of Russian writing system]*. Leningrad, Russia: Nauka.

Schiff, R., & Calif, S. (2007).The role of phonological and morphological awareness in L2 oral word reading. *Language Learning*, 57, 271–298.

Selezniova, L. B. (1981). *Sovremennoje russkoje pis'mo. Sistemnyj analiz [Modern Russian writing system. System analysis]*. Tomsk, Russia: Tomsk University.

Selezniova, L. B. (1997*). Russkaja orfografija. Algoritmizirovannoje obuchenije [Russian orthography. Teaching through algorithms]*. St. Petersburg, Russia: Special'naja literatura.

Selezniova, L. B. (2004). *Kategorii i jedinicy russkogo pis'ma [Categories and units of writing in Russian]*. Moscow, Russia: Vysshaja Shkola.

Seymour, P. H. K, Aro, M., & Erskine, J. M. (2003). Foundation literacy acquisition in European orthographies. *British Journal of Psychology*, 94, 143–174.

Seymour, P. H. K. (2006). Theoretical framework for beginning reading in different orthographies. In M. Joshi & P. G. Aaron (Eds.), *Handbook of orthography and literacy (pp. 219-230).* Mahwah, NJ: Erlbaum Associates.

Share, D. (1995). Phonological recoding and self-teaching: Sine qua non of reading acquisition. *Cognition*, 55, 151–218.

Share, D. (2008). On the anglocentricities of current reading research and practice: the perils of overreliance on an "outlier" orthography. *Psychological Bulletin*, 134, 584–615.

Skoblikova, E. S. (1974). *Russkaja grafika. Cykl lekcij [Russian graphics. A collection of lectures]*. Kujbyshev, Russia: Kujbyshev University

Smith, R. M, & Miao, C. Y. (1994). Assessing unidimensionality for Rasch measurement. In M. Wilson (Ed.): *Objective measurement: Theory into practice. V.* 2. Greenwich: Ablex.

Sproat, R. (2000). *A Computational Theory of Writing Systems.* Cambridge: Cambridge University Press.

Stanovich, K. E. (1992). Speculation on the causes and consequences of individual differences in early reading acquisition. In P. Gough, L. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 307–342). Hillsdale, NJ: Laurence Erlbaum.

Stanovich, K. E. (2000). *Progress in understanding reading: Scientific foundations and new frontiers.* New York: Guilford Press.

Thorstad, G. (1991).The effect of orthography on the acquisition of literacy skills. *British Journal of Psychology*, 82, 527–537.

Treiman, R. (1983). The structure of spoken syllables: Evidence from novel word games. *Cognition*, 15, 49–74.

Treiman, R., Mullennix, J., Bijeljac-Babic, R., & Richmond-Welty, E. D. (1995). The special role of rimes in the description use and acquisition of English orthography. *Journal of Experimental Psychology: General*, 124, 107–136.

Umbel, V. M., Pearson, B. Z., Fernández, M. C., & Oller, D. K. (1992). Measuring bilingual children's receptive vocabularies. *Child Development*, 63, 1012–1020.

Vaessen, A., Bertrand, D., Tóth, D., Csépe, V., Faísca, L., Reis, A., & Blomert, L. (2010). Cognitive development of fluent word reading does not qualitatively differ between transparent and opaque orthographies. *Journal of Educational Psychology*, 102, 827–842.

Widjaja, V., & Winskel. H. (2004). Phonological awareness and word reading in a transparent orthography: preliminary findings on Indonesian. In *Proceedings of the 10th Australian International Conference on Speech Science and Technology, Macquarie University, Sydney, NSW, 8-10 December* (pp. 370-375).

Wimmer, H., Landerl, K., & Schneider, W. (1994). The role of rhyme awareness in learning to read a regular

orthography. *British Journal of Developmental Psychology*, 12, 469–484.

Wimmer (2006). Do not neglect reading fluency! *Developmental Science*, 9, 447–448.

Yip, V., & Matthews, S. (2000). Syntactic transfer in a cantonese-english bilingual child. *Bilingualism: Language and Cognition*, 3, 193–208.

Yopp, H. (1988). The validity and reliability of phonemic awareness tests. *Reading Research Quarterly*, 23, 160–177.

Zaretsky, E. (1994) *Phonological Awareness of Russian- and English-speaking Prereaders. The Influence of Oral Language on the Development of Sound Segmentation Skills. MSc Thesis,* MGH Institute of Health Professions

Zaretsky, E., Kraljevic J.. Core, C., & Lencek, M. (2009). Literacy predictors and early reading and spelling skills as a factor of orthography: Cross-linguistic evidence. *Written Language and Literacy*, 12, 52–81.

Ziegler, J. C., Bertrand, D., Tóth, D., Csépe, V., Reis, A., Faísca, L., et al. (2010). Orthographic depth and its impact on universal predictors of reading: A cross-language investigation. *Psychological Science*, 21, 551–559.

Zinder, L. R. (1987). *Ocherk obshej teorii pis'ma [A sketch of the general theory of the writing system]*. Leningrad, Russia: Nauka.

Ziegler, J.C. & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A Psycholinguistic Grain Size Theory. *Psychological Bulletin*, 131, 3–29.

Ziegler, J.C. & Goswami, U. (2006). Becoming literate in different languages: Similar problems, different solutions. *Developmental Science*, 9, 429–453.

Öney, B. & Durgunoglu, A.Y. (1997). Beginning to read in Turkish: A phonologically transparent orthography. *Applied Psycholinguistics*, 18, 1–15.