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Early predictors of reading acquisition  
in Ukrainian-Polish bilingual novice readers:  
A longitudinal study

Wczesne predyktory nabywania umiejętności czytania u  
początkujących ukraińsko-polskich dwujęzycznych  
czytelników: Badanie podłużne

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Uniwersytetu im. Adama Mickiewicza w Poznaniu

pod kierunkiem prof. UAM dr hab. Anny Ewert

i dr. Marcina Szczerbińskiego

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## OŚWIADCZENIE

**Ja, niżej podpisana**

Viktoriia Kishchak

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**przedkładam rozprawę doktorską**

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(Wczesne predyktory nabywania umiejętności czytania u początkujących ukraińsko-polskich dwujęzycznych czytelników: Badanie podłużne)

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**na Uniwersytecie im. Adama Mickiewicza w Poznaniu  
i oświadczam,  
że napisałam ją samodzielnie.**

Oznacza to, że przy pisaniu pracy, poza niezbędnymi konsultacjami, nie korzystałam z pomocy innych osób, a w szczególności nie zlecałam opracowania rozprawy lub jej istotnych części innym osobom, ani nie odpisywałam tej rozprawy lub jej istotnych części od innych osób.

Jednocześnie przyjmuję do wiadomości, że gdyby powyższe oświadczenie okazało się nieprawdziwe, decyzja o wydaniu mi dyplomu zostanie cofnięta.

Poznań, 18.06.2023  
(miejscowość, data)

*Viktoriia Kishchak*

.....  
(czytelny podpis)

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## **List of abbreviations and symbol**

|      |                                    |
|------|------------------------------------|
| CAH  | Contrastive Analysis Hypothesis    |
| CLI  | crosslinguistic influence          |
| D    | decoding                           |
| ITF  | Interactive Transfer Framework     |
| L1   | first/native language              |
| L2   | second/foreign language            |
| LC   | language comprehension             |
| LK   | letter knowledge                   |
| ODH  | Orthographic Depth Hypothesis      |
| PA   | phonological awareness             |
| PD   | pseudoword decoding                |
| PGST | Psycholinguistic Grain Size Theory |
| RAN  | rapid automatized naming           |
| RC   | reading comprehension              |
| S    | speed of processing                |
| SLA  | second language acquisition        |
| SLI  | specific language impairment       |
| SVR  | Simple View of Reading             |
| T1   | testing session 1                  |
| T2   | testing session 2                  |
| WR   | word reading                       |
| WM   | working memory                     |

## **Introduction**

Bi- and multilingualism has become a norm rather than an exception in the present-day world. According to different estimates, more than 44% of the population in the world is bilingual. Not surprisingly, this phenomenon has drawn a lot of scientific attention. Though research on bilingualism has revealed numerous benefits, cognitive (Bialystok 2009; Kroll and Bialystok 2013), educational (Bialystok 2018), as well as linguistic (Akhtar and Menjivar 2012); parents of bi- and multilingual children often express concerns about the costs and benefits of early bilingualism. Negative attitudes against early bilingualism may arise from misinterpretations and existing myths, not from research findings. Not only parents but also educators have little knowledge about how to teach bilingual children, accommodate their educational needs, and assess their knowledge.

In the Polish context, the topic of bilingual children has arisen relatively recently. Poland had been a remarkably monolingual country until the beginning of the 2010s when an increase in labour migration from Ukraine occurred. According to statistics provided by the Polish governmental statistical office (GUS) in 2021, 457 000 foreigners officially held residence permits. Of them, 85 000 were children enrolled in Polish schools (Statistics Poland 2021). Over the last decade, Poland has experienced a significant increase of labour immigration from Ukraine. According to available estimates, the population of immigrants in Poland has increased from approximately 100 000 in 2011 to a number exceeding 2 million in 2019 (GUS 2020). The war outbreak in Ukraine in February 2022 has led to the largest refugee migration in Europe after World War II with a roughly estimated number of 4.2 million as of June 2022, half of them were children (Duszczyk and Kaczmarczyk 2022). The number of Ukrainians who fled the war into Poland reached 2 490 447 in April 2022, more than a

half of them were children (UNESCO 2022). Apparently, in the coming years the Polish educational system will have to face numerous challenges caused by the influx of Ukrainian students. Data provided by the Ministry of Education and Science in Poland in June 2023 indicates that a number of Ukrainian students enrolled into the educational system in Poland equals 179 868, with 110 004 of them being primary school children (Statistics Poland 2023).

The above-mentioned circumstances raise numerous questions and pose challenges both in short- and long-term perspectives for the educators and parents, among which evaluation of language and literacy (reading) skills of bilingual children emerges as the most crucial. One primary obstacle arises from the limited availability of screening tools in Ukrainian. Moreover, lack of research focused on reading development in the context of Ukrainian-Polish bilingualism posits an additional challenge. Given the above, the significance of research investigating literacy acquisition in the Ukrainian-Polish context becomes evident.

This dissertation aims to explore reading development in Ukrainian-Polish bilingual novice readers. The current study has two main goals to achieve. The first one is to advance understanding of bilingual reading acquisition. Specifically, the study focuses on exploring the developmental trajectories of reading in novice bilingual (Ukrainian-Polish) readers, and compares them with their monolingual counterparts. Additionally, this study investigates how reading skills in the two languages of bilinguals develop over the first year of their schooling. Specifically, it explores early cognitive predictors of decoding skills and reading comprehension in bilinguals' first language (Ukrainian or Russian, L1) and their second language (Polish, L2) and compares them with those in monolinguals.

The second aim is more applied: to develop tools for assessment of early literacy acquisition in Ukrainian and Russian (as the immigrant children speak either Ukrainian or Russian as their L1) as part of the MABEL test battery. MABEL (*Multilanguage Assessment Battery of Early Literacy*, Caravolas et al. 2018) is a tool for early assessment of reading acquisition available online for registered language and speech practitioners (<https://www.eldel-mabel.net/>). In the context of Ukrainian-Polish bilingualism and educational needs in Poland, Polish (its adaptation commenced earlier), Ukrainian and Russian versions of MABEL will be an asset for educators, parents, speech and language practitioners.

Given the aims of the study, a longitudinal design was adopted, as it allows to evaluate predictive validity of various measures. Children were assessed at two time points: at the onset of formal reading instruction (T1) and at the end of the first grade (T2). To the best of my knowledge, this PhD thesis is the first research study to investigate reading acquisition in Ukrainian-Polish bilingual children concurrently and longitudinally.

The current thesis is divided into 9 chapters. Chapters 1-3 provide a review of previous research. Chapter 1 reviews theoretical models of reading development, focusing on the influential Simple View of Reading (henceforth SVR) framework (Gough and Tunmer 1986; Hoover and Gough 1990). Chapter 2 explores early cognitive precursors of reading and their roles in development. Chapter 3 discusses crosslinguistic influence in second language acquisition and presents empirical findings. It also examines moderator variables that impact L2 reading development. Furthermore, Chapter 3 examines the validity of the Simple View of Reading in bilingual contexts.

Chapters 4-5 present an overview of theoretical accounts and empirical evidence of the effect of orthography on reading acquisition. Chapter 4 focuses on specificities of reading acquisition in transparent orthographies, discussing the role of orthographic consistency, transparency as well as morphological and syllabic complexity on reading development. Chapter 5 compares linguistic features of the three transparent languages under study (Ukrainian, Russian and Polish). It also presents an overview of empirical evidence on literacy acquisition in the three languages.

Chapters 6-8 present the results of the current study. Chapter 6 describes the overall study design, its methodology and formulates the specific research questions. Chapter 7 presents the results of the concurrent study (T1) conducted at the beginning of the first grade. Chapter 8 reports the findings of testing session 2 (T2) conducted at the end of the first grade.

The last chapter summarizes the findings from the two testing sessions, highlighting similarities and differences between patterns of cognitive predictors of reading in the three groups as well as across the two languages of the bilinguals. The chapter concludes with practical implications for future research.

Finally, since this thesis is interdisciplinary, drawing on research from linguistics and psychology, in numerous instances it has turned out that these two disciplines sometimes use identical or very similar terms while referring to different



things. To avoid terminological confusion, certain decisions had to be made on word choice. One of these terms is *transfer*. In second language acquisition (SLA) research the term transfer refers to an integration of elements from one language to another (see section 3.2.1), while in psychology of bilingual reading, the notion of transfer embraces a wider scope of different processes in the two languages of the bilinguals. In my own research on bilingual reading, I decided to use the term transfer throughout the thesis to encompass the totality of interactions between processes taking place in bilingual readers, both in L1 and L2. The other troublesome word is *competence*. In linguistics, especially influenced by Chomsky's model, competence is roughly equivalent to proficiency, while in psychology, the term *competence* or *competency* usually refers to a cognitive skill. Therefore, in the thesis I will be using the term competence in both senses while referring to language knowledge or cognitive skill, as specified by the context.

# **Chapter 1: Reading development**

## **1.1. Introduction**

One of the core skills acquired during the first stage of formal education is reading, which greatly contributes to a child's future academic success. In literate societies, reading is considered to be an essential skill that opens unlimited perspectives in the future. While most master this skill smoothly and effortlessly, some may struggle learning to read, despite adequate educational input and exposure to print. Failure to read leads to frustration, demotivation to pursue further education, low self-esteem, and even behavioural problems. Not surprisingly, there has been a vast public and scientific interest in how children acquire reading.

Being a complex multifaceted process, reading is acquired gradually as the cognitive and neurobiological maturation develops. Therefore, it is crucial for researchers, educators, and parents to understand what skills should be acquired by novice readers at a particular developmental stage, what factors might alter reading development, and how to help struggling readers.

The present chapter starts with a brief overview of different aspects of reading addressed by researchers so far in skilled readers (adults) with a further detailed discussion of theoretical accounts of reading development in children. First, prominent stage and phase theories of word reading development in children are reviewed. Further sections give an overview of theoretical accounts of reading comprehension development in children. The final section provides a comprehensive description of the SVR, one of the most influential frameworks of reading comprehension, with a detailed discussion of each component of reading comprehension (decoding and listening comprehension) and its respective sub-skills (e.g. phonological awareness, letter knowledge, etc.). The SVR is of special importance for this study as empirical findings

demonstrate it applies not only to monolinguals but also to bilinguals (e.g. Edele and Stanat 2015; Papastefanou et al. 2021; Tobia and Bonifacci 2015).

## **1.2. Learning to read: Theoretical accounts**

We were never born to read. Human beings invented reading only a few thousand years ago. And with this invention, we rearranged the very organization of our brain (Wolf 2007:3).

Being one of the most remarkable human inventions, reading is a highly complex skill that is often taken for granted by most who mastered it (Rayner 2011). Indeed, learning to read changes lives. A core skill in all literate societies, reading requires rewiring of our brain system as many cognitive processes engage in it.

Over the last century, reading has been researched extensively by cognitive psychologists from different perspectives. However, as the nature of reading is highly complex, it is unlikely to consider one insight sufficient to answer all the questions posed by this multifaceted phenomenon. As an information-processing activity, skilled reading as a complex process relying on a number of sub-processes, such as eye movement control, word-recognition, sentence parsing, and discourse processing (Rayner 2011). Thus, one theory of reading would not embrace its multifaceted nature. Therefore, there are theories of word reading, theories of learning to read, theories of reading disabilities (e.g. dyslexia), and theories of comprehension at different levels (sentence comprehension, text comprehension) (Perfetti and Stafura 2014). Cognitive theorists put forward a range of theoretical models to explain working mechanisms of each sub-process.

A great attention was directed to skilled reading aloud (e.g. single word reading) which has been of a particular focus of cognitive research in reading. Theories of skilled reading are the most specified and sophisticated. At the time of this PhD writing, there have been proposed three main computational theoretical models accounting for skilled reading processes: the Triangle model (connectionist) (Seidenberg and McClelland 1989; Plaut et al. 1996; Harm and Seidenberg 2004), the Dual Route Cascaded (henceforth DRC) model of reading (e.g. Coltheart et al. 2001), and the Connectionist Dual Process (henceforth CDP+ ) model (Perry et al. 2007, 2010, 2013). The Triangle model is considered to be a simulation of the process of learning to

read in children as well as the adult system of skilled reading. The DRC model is claimed as a static model of the skilled adult reading system. An attempt to synthesize these two models is presented in the form of CDP+, which builds on the strengths of the connectionists and dual route models while eliminating their weaknesses (Perry et al. 2007), and is claimed by proponents to be a leading computational model of skilled reading aloud (Ziegler et al. 2020). In general, there is an agreement that a skilled reading process involves two key cognitive processes: the first one translates the word's spelling into sounds via phonology (alphabetic decoding), the second one enables to access lexical representation of the words via direct route from the spelling. The models state that reading involves stored knowledge of learned words (orthographic lexicon) as well as knowledge of the relationship between graphemes and phoneme (Castles et al. 2018). These models simulating typical skilled reading in adults are presented here to illustrate how complex word reading is, not to mention high order skill – reading comprehension. However, the models will not be discussed in depth in this chapter as the primary attention of the work is on reading development in young readers. Thus, an outline of literature on reading development in children will be presented further in next sections.

### **1.2.1. Reading development: Stage and phase theories**

To understand the written text, one undergoes a transition from a novice reader to a skilled reader. This transformation does not happen implicitly from an exposure to print environment itself; it is a result of explicit instructions and practice. At the very initial stage of reading, children have to learn how to crack the orthographic code (Ziegler et al. 2020). How does it happen?

As a developmental process, learning to read occurs over developmental stages or phases. Although stage and phase theories describe the developmental changes in reading acquisition and both terms might be used interchangeably, there are differences between them. In stage theories each stage is a prerequisite for the next one (i.e. Piaget's stage theory of cognitive development (1983) is a well-known example, where stages are considered universal and obligatory). Whereas in phase theories, criteria are not so strict as phases are cultural and context-dependent (i.e. stage A precedes stage B

but it does not rely on it). Some of stage and phase theories focused on the description of early stages of reading (e.g. word reading), others extend their scope to reading comprehension. To understand the development of reading acquisition on a broad scale, one should start with child's development of word reading skills. Automatic recognition of words is mastered through different qualitatively distinct stages. Therefore, this section starts with an overview of some influential stage and phase theories of early reading development focusing on word reading (Marsh et al.'s (1981) Stage Model, Frith's (1985) Stage Model, Ehri's (1995) Phase Theory, Duncan and Seymour's (2000) Dual-Foundation Model).

Despite differences in a scope and attention paid to word reading, stage and phase theories share a lot of similarities. Table 1 presents some of the most prominent stage and phase models. Though stages' names vary across models and their boundaries do not necessarily coincide, they share a lot of core similarities related to developmental transition from one stage to another.

In all models the very initial point of early reading acquisition is *a pre-reading stage*, when children rely on visual and contextual cues to identify words (e.g. storefront sign, a food label). Children can memorize the word salient features (e.g. shape, size, colour), but they are not able to recognize the word without the context or when it is presented in a different case. At this stage there is no proper decoding as children have not learnt the alphabetical principle. Pre-readers are able to build grapheme-semantic correspondences but not the grapheme-phoneme ones (Ehri 2005).

The second stage is *a transitional stage* at which children start using not only visual and contextual cues but also graphemic cues (e.g. initial letters of the words). However, not all researchers distinguish them separately, e.g. in Frith's model these two stages fit within one logographic phase.

The third stage emerges when letter knowledge is acquired, and grapheme-phoneme mapping is taught. This is when children start to decode print to sound. Consequently, through an exposure to print and explicit instructions, a self-teaching mechanism develops, e.g. knowledge about grapheme-phoneme correspondence enables reading of new words, creating their phonological representation and through that accessing its meaning. This is *a breakthrough stage* as at this point children have cracked the alphabetic code (Castles et al. 2018). In Duncan and Seymour's model, this stage slightly overlaps with partial alphabetic stage in Ehri's model and involves two foundational processes: logographic (i.e. storing sight words in memory) and alphabetic

process (i.e. grapheme-phoneme mapping). Reading at this stage can be characterized as slow, elaborate, inaccurate, and sequential (one grapheme at a time left to right). As a child gets more experience with reading, and all or most of grapheme-phoneme correspondences are established there is a transition to the last stage.

The common feature of the last stage in all models is sensitivity to letter sequences that a child develops (e.g. sequence of *-ing* or *-ed* letter strings in English). According to Ehri (2005), at this stage there is a shift in connections from primarily phonetic to morphographic ones. Children read new words by analogy to previously learnt grapheme-phoneme correspondences, boost their proficiency, and get ready for developing the higher-order reading skill – reading comprehension, which will be discussed later in this chapter.

Table 1. Summary of stage and phase theories of word reading.

|   | Marsh et al.<br>(1981)         | Frith (1985) | Ehri (1995)             | Duncan and<br>Seymour (2000)                    |
|---|--------------------------------|--------------|-------------------------|-------------------------------------------------|
| 1 | Linguistic<br>guessing         | Logographic  | Pre-alphabetic          | Pre-literacy                                    |
| 2 | Discrimination<br>not guessing |              | Partial alphabetic      | Dual Foundation<br>(logographic,<br>alphabetic) |
| 3 | Sequential<br>decoding         | Alphabetic   | Full alphabetic         |                                                 |
| 4 | Hierarchical<br>decoding       | Orthographic | Consolidated alphabetic | Orthographic<br>Morphographic                   |

Despite some differences between stage and phase models, common patterns exist in a way how typically developing children acquire basic reading skills. These insights allow researchers and educators to observe and monitor children's development of reading and their progress. However, they are not without criticism.

First, one common criticism refers to an assumption that each stage must be a prerequisite for the next. This assumption fails to take into account the influence of cultural and instructional factors on reading development. For instance, students who are taught using the *whole word approach* may go through a stage that emphasizes visual recognition of words without attending to phonetic connections between letters and sounds (this is the case in opaque orthographies like English). However, this may not be true for children who learn to read through phonics (in more transparent orthographies like Ukrainian or Polish). Thus, the notion that stages are universally applicable is open to debate.

Second, duration of a specific phase for each child acquiring skills may greatly vary. Sometimes, the rapid development of phases may lead to their overlap, which makes its strict distinction impossible.

Third, stage and phase models have received criticism for being overly descriptive and lacking in explanations of the cognitive mechanisms that lead to the transition from one stage/phase to the next.

Fourth, an oversimplification of the process of reading development was another point of criticism. According to Share (1995), children have various processing strategies available to them when reading, and the strategy they use can depend on the properties of the text they are reading. Thus, the particular strategy that a child uses may not be the only one available to them, but rather the one mostly used because of the nature of stimuli.

As children progress from novice readers towards more skilled readers, word reading becomes more automatized and fluent. Thus, readers' strategies gradually change from phonological decoding strategy to the direct orthographic processing one, when the meaning of the printed word is directly accessed via semantic lexicon. This shift is a vital step towards reading comprehension. Some theoretical accounts such as Chall's (1996) Stage Model, Wolf's (2007) Phase Model, the Simple View of Reading Framework (Gough and Tunmer 1986; Hoover and Gough 1990) are discussed in this section.

Chall's (1983, 1996) Stage Model presents six stages which mark reader's progress and highlight a particular aspect of reading development.

The *pre-reading stage* (from birth to age 6) embraces a period when a child accumulates and stores knowledge about sounds and words, developing basis of phonological awareness (e.g. some words have similar sounds at the beginnings and at the ends; words can be divided into parts and then the parts can be put together). This stage precedes the formal reading instructions.

The initial or *decoding stage* (age 6-7) is marked by child's acquisition of letter-sound knowledge (grapheme-phoneme correspondence) and beginning of formal reading instruction. The qualitative change at this stage is child's gaining insight about the nature of the spelling system of the alphabetic language.

The *confirmation, fluency, or ungluing from print stage* (age 7-8;6) is a consolidation of previously learnt information. At this stage a novice reader can focus

on developing automaticity of high-frequency words and enhance decoding skills acquired at stage 1. By gaining experience, the reader gains courage and skills using context, resulting into fluency and speed development.

The next stage, called by Chall as *reading for learning the new* (8;6-10), implies gaining new knowledge through extensive exposure to print. That is when a novice reader can read more complex texts but within one viewpoint, e.g. clear and unambiguous interpretation of the information.

The *multiple viewpoint stage* (10-14) occurs when a reader is exposed to texts requiring analysis and synthesis of more than one point of view. At this stage a critical evaluation of read information is essential.

The last stage, coined by Chall as *construction and reconstruction* (14-18), is the hallmark of reading acquisition. At this stage a reader is able to use selectively the printed material in those areas of knowledge that are in the scope of one's interest. In other words, this is the stage when a critical thinking is developing.

Chall's Stage Model provides a comprehensive model of developmental reading stages, going beyond single word reading and embracing reading comprehension. It is still one of the most acknowledged models in the field of developmental and educational psychology. Not only is its theoretical contribution essential, but also its practical implications for educators are worth noting. This model allows teachers to track a developmental path of reading as well as to identify challenges a reader might experience at a particular stage.

A more recent model, proposed by Maryanne Wolf (2007), identifies five phases of reading development. Wolf's Phase Model of reading development, which is presented in her book *Proust and The Squid: The Story and Science of The Reading Brain* (2007), incorporates not only cognitive neuroscientific explanations of the reading process, but also accounts for the impact of environmental factors on reading development.

The first phase of the development is called an *emerging pre-reader phase* (6 month to 6 years old). This is when a child builds understanding of symbolic references (akin to logographic stage in Frith's model or pre-reading stage in Chall's model). Two important factors boosting the pre-reading development are (a) child's exposure to language, stories/books read to a child, and (b) a role of joint or shared attention (e.g.,



emotional connection). In other words, to build a solid background for the reading skills, a child needs to be well-read-to.

The second phase is named a *novice reader phase* (age 6-7). At this stage children build a visual inventory of the alphabet's arbitrary letter forms and consolidate them in memory. There is a qualitative change in the visual attentional systems at this stage (right-left orientation and top-down orientations of letters). For example, a child learns to differentiate visually quite similar graphemes (e.g. <b> and <d> or <t> and <f> letters in English). At this stage, the awareness of grapheme-phoneme correspondence begins, which, in turn, boosts the development of phonological, orthographic, and semantic awareness. In addition, Wolf emphasizes an importance of explicit teaching of multiple meanings of some words (they build a so-called semantic web) for further boost of vocabulary acquisition and enhancement of reading comprehension.

The third phase is called a *decoding reader phase* (age 7-9). In this phase of semi-fluency, there is a great shift from painstaking and elaborate reading to smoother, more confident reading including prosodic elements. It is a stage of consolidating phonological, orthographic and semantics skills acquired during the novice reader phase. Basic skills of morphological awareness, which should be taught explicitly, are essential for later fluent comprehension. In this phase, as fluency develops, attention can be directed to inference and to prediction of information in the text. This is when a reader gets time to think.

The fourth phase is a *fluent, comprehending reader's phase* (ages 9-15). It is characterized by almost automatic decoding processes developed, which frees up brain capacities for learning to intergrade metaphorical, inferential, analogical information:

For the first time in reading development, the brain becomes fast enough to think and feel differently. This gift of time is more important for our capacity to think endless thoughts most wonderful (Wolf 2007: 143).

The final fifth phase is an *expert reader's phase* (16 and older), when a reader can integrate his life experience, read and lived, to allow a full comprehension to encompass the whole range of complexity in any text. Words are processed automatically, so there is almost instantaneous fusion of cognitive, linguistic, and affective processes.

Wolf's model builds on Chall's model by adding the importance of child's rich literacy environment and cognitive changes in the *re-wired* brain. She elicits a great role of explicit teaching methods of phonics, semantics, constant exposure to print to develop further comprehension skills. In Wolf's model, *the expert reader's phase* is never ending through reader's life. This model shows that the development of each next phase is not possible without properly established preceding one. However, time to acquire skills at each phase may differ among readers due to many factors, e.g. literacy environment, individual cognitive precursors, teaching methods, socio-economic status, and specifics of the language system (e.g. orthographic depth, writing system). Albeit phases of this model to some extent overlap with previously introduced models of reading development, an interesting aspect of this model is author's' explicit suggestions about areas of specific educational focus at each phase (e.g. teaching multi-meaning words at the second phase). In addition, Wolf draws on recent scientific findings from neuroscience of developmental changes of the reading brain, explaining how the reading brain changes with exposure to print (albeit it is beyond the scope of the thesis).

### **1.2.2. The Simple View of Reading (SVR)**

One of the most widely acknowledged theoretical frameworks for understanding core cognitive skills that determines reading comprehension is the SVR (Gough and Tunmer 1986; Hoover and Gough 1990). The SVR appeared as an attempt “[t]o clarify the role of decoding in reading and reading disability” (Hough and Tunmer 1986: 6). This framework enables to explain individual differences in reading comprehension by differentiating two distinct but interconnected skills essential – decoding and linguistic comprehension.

It postulates that reading comprehension (henceforth RC) is the product of two sets of competences, decoding (henceforth D) and linguistic comprehension (henceforth LC). The original conceptualization of the SVR was presented in a form of a simple multiplication formula:  $RC = D \times LC$ . It posits that both skills are essential for achieving success in reading comprehension; neither is sufficient alone. A child may master decoding but without oral language comprehension skills will never

comprehend the text; similarly, regardless of the linguistic comprehension level, reading comprehension will never occur.

Reading comprehension is defined as an ability to derive the meaning (at the sentence or text level) by getting an access to lexical information via print.

Within the SVR, decoding is defined as “[a]n efficient word recognition, described as an ability to quickly derive a phonological representation from print to access semantic information at the word level” (Hoover and Gough 1990: 130). The beginner reader should build connections between already accessible phonological representations of words in mental lexicon and its grapheme input by incorporating grapheme-phoneme correspondence rules. Once these connections are built, a beginner reader gets a direct access system to the semantic lexicon of words through orthographic representations. The definition of decoding given by Hoover and Gough is quite broad (as it includes both word reading, which implies lexical access, and decoding, which refers to print-to-sound conversion). In other words, decoding builds a path to further word recognition as decoding skills develop.

Linguistic comprehension is described as an ability to obtain lexical information (i.e. semantic information at the word level) from oral speech, which enables interpretation of information at sentence and discourse levels. In other words, understanding the meaning of spoken words (listening comprehension) is core for comprehending the whole sentence or a story.

Since its first introduction, the validity of the SVR has been widely supported by a large body of research evidence. According to the meta-analysis conducted by García and Cain (2014), there is a strong correlation between decoding and reading comprehension ( $r = .74$ ) at the early stages of reading acquisition. As its strength decreases in older age groups ( $r = .41$ ), the correlation between listening comprehension and reading becomes stronger. It is suggested that the reason for this shift is related to a change in decoding ability. As word reading becomes more fluent and efficient, the variance in reading comprehension explained by word reading diminishes. Hence, in more competent readers individual differences in reading comprehension correlate most strongly with individual differences in listening comprehension (García and Cain 2014). A comprehensive overview of empirical evidence of the SVR validity is presented in Chapter 3.

Both decoding and linguistic comprehension rely on a number of underlying cognitive skills as described by Hoover and Gough (2001) (Fig. 1). Detailed description of each component is given below.

*Concept about print* refers to general understanding about the printed text. For example, a child has to be aware of basic principles such as a text is read from left to right and from top to bottom on a page (e.g. in alphabetic writing systems).

*Letter knowledge*, an ability to recognize and manipulate the units of the alphabetic writing system, is crucial for successful development of reading.

*Knowledge of the alphabetical principle* is conscious understanding that there is a systematic internal relationship between letters (graphemes) and sounds (phonemes). In other words, knowing that words consist of sounds, and sounds represent the letters' set in specific order in words is crucial for reading development. This competence is related to phoneme awareness and letter knowledge.

*Cipher knowledge* refers to familiarity of regular grapheme-phoneme correspondences (e.g. letters of the alphabet correspond to speech sounds).

*Lexical knowledge* embraces reading of irregular words (e.g. in the English language) that do not follow regular patterns and are pronounced differently. To read them, a child has to access her mental lexicon, in which spelling, pronunciation, and meaning are stored. However, this can be applied not only to sight words reading (irregular words in English) but also to reading of familiar (previously learnt) words through orthographic processing.

*Phoneme awareness* refers to the knowledge about words being built from separate sets of units (phonemes) and an ability to recognise and manipulate them.

*Language (linguistic) comprehension.* To understand spoken language, two domains of knowledge are required: linguistic knowledge (formal structure of a language) and background knowledge (how the everyday world works). Linguistic knowledge includes three large domains: phonology, syntax, and semantics. Phonology is knowledge of the sound structures of a language (e.g. differences in meaning of its basic elements, their relationship with each other). A child's ability to hear and produce sounds as well as an ability to distinguish one word from another builds a cognitive foundation for effective communication. *Semantics* embraces understanding of meaningful components of language at different levels: at the morphology level of word (e.g. morphemes form words), at the word level (vocabulary) and at the higher

level (e.g. words form sentences, sentences form discourse). *Syntax* deals with the structural relationships of different classes of words (e.g. nouns, verbs, adverbs, etc.). In other words, it is knowledge about the sentence structure.

Background knowledge is knowledge acquired from daily interaction with the surrounding environment. Hoover and Gough (2001) present it as specific schemas learnt by a child which are based on experience. Some of them are very basic (e.g. birthday party schema includes giving gifts, eating cakes, playing games), whereas others might be more sophisticated (e.g. knowledge about planets). Having rich background knowledge allows a child to infer meanings during communication by referring to previous experience.

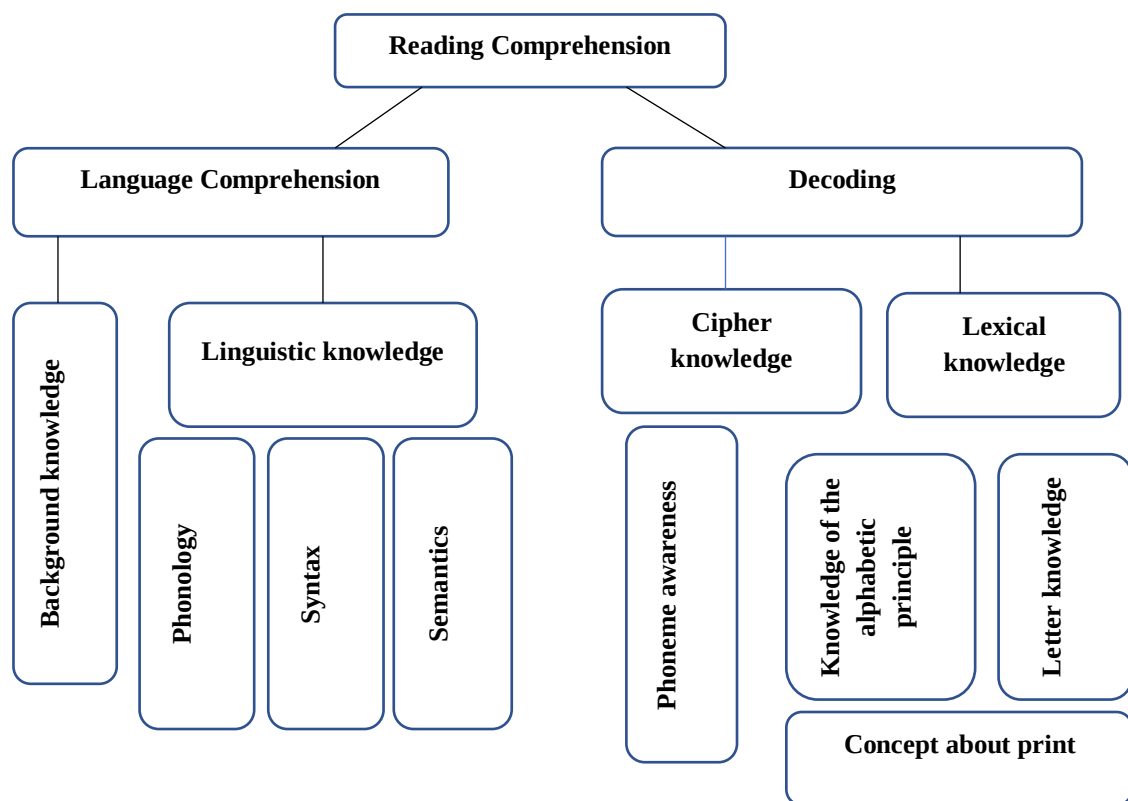


Fig. 1 Primary cognitive foundations of the SVR.

*Decoding.* As mentioned before, within the SRV the notion of decoding includes not only grapheme-phoneme conversion (traditionally referred to as decoding in a narrower context) but also word recognition (lexical access and retrieval of semantic information of the word based on its orthographic representation). In later elaboration of the SVR, Hoover and Gough (2001) define two core competences

underlying decoding – cipher and lexical knowledge. Both are complex abilities based on interrelated sub-competence.

This more detailed (relative to its first version) description of RC components and their underlying cognitive skills enabled researchers to address different aspects of reading comprehension development. Not only has it proved to be valid in alphabetic languages (e.g. Bonifacci and Tobia 2017; see Florit and Cain 2011 for a review; Joshi et al. 2015; Protopapas et al. 2012), but it was also found to be applicable in non-alphabetic languages (Ho et al. 2012). Moreover, it has been validated in studies with second language learners (Verhoeven and van Leeuwe 2012) and bilingual learners (Bonifacci and Tobia 2017).

Although the SVR has greatly contributed to understanding of reading comprehension, there are some issues in the literature to be discussed. First, there is an unresolved issue as to the nature of the interaction between the components – multiplicative or additive. Hoover and Gough (1990) proposed the multiplicative model  $RC = D \times LC$ , whereas Dreyer and Katz (1992) suggested additive relationship of two variables ( $RC = D + LC$ ), arguing that total lack of decoding and/or linguistic comprehension skills (when equal 0) are extremes. Later, some researchers supported this assumption, finding an additive model to be a valid support in their studies (Savage 2006; Kirby and Savage 2008).

Second, the SVR does not explain how two core components develop and how their interaction with reading changes (Castles et al. 2018). Further research findings indicate that relationship between two components and RC is dependent on the grade (or age). Thus, decoding accounts more for RC variability in early grades, whereas language comprehension tends to predict RC better in later grades (Catts 2018). This shift may occur differently through developmental changes, depending on the orthographic consistency, in which reading is acquired. Research findings indicate that decoding skills automaticity is developed earlier in transparent orthographies rather than in opaque (Catts et al. 2005; Joshi et al. 2015). Therefore, development of these components is not in parallel, which alters their predictive strength of the reading comprehension.

Third, some researchers claim that two components do not fully explain RC and addressed a question of adding other components to the framework. A speed of processing (henceforth S) was suggested as an additional element in the Component Model of Reading (Joshi and Aaron 2000). Their findings revealed that a speed of

processing added 10% to the model along with 48 % of RC variance explained by decoding and language comprehension. The proposed formula was presented as  $RC = R \times RC + S$ .

Last, it has been claimed that the simplicity of the representation of reading comprehension constructs “[h]as contributed to some false impressions about comprehension” (Catts 2018: 319). Catts argues that representing decoding and comprehension in similar graphical ways (e.g. similar sized fonts) gives the impression of unidimensional nature of two constructs, which is not, in fact, true. Being a multidimensional by nature, RC cannot be measured only by one single task (e.g. multiple-choice questions). In fact, what one reads (a type of text) and for what purposes greatly impacts reading outcomes measures (Pearson et al. 2014).

Overall, despite ongoing debates about the reductionist nature of the SRV and other criticism, it should be noted that the SVR has contributed greatly to the understanding of reading comprehension. Its title explicitly describes it as *simple view of reading*, which perfectly justifies its *simplicity*. There is no doubt that it is a clear conceptualisation of core processes involved in the reading comprehension. What is more, it explicitly classifies types of poor readers, which advanced the reading assessment and intervention programs around the world. Practical application of the SRV framework for educational purposes should not be forgotten – it is the core basis of the Primary National Strategy’s of literacy learning in the UK (Rose 2006).

### **1.3. Summary**

The primary focus of this chapter is to present a description and an evaluation of some prominent theoretical accounts of reading acquisition. Marsh (1981), Frith (1985), Ehri (1995), Duncan and Seymour (2000) described reading development as a sequence of developmental stages/phases. Despite rather superficial terminological differences, stage and phase models are all very similar: they posit that the strategies that beginning readers adopt to decode and recognize printed words change systematically over time in the direction of greater flexibility and efficiency (which entails growing mastery of the alphabetic principle). These models have greatly contributed to the understanding of the developmental trajectories of core reading skills. They are of great value for

researchers and teachers, providing a clear conceptualization of reading development paths, and enabling educators to monitor the development of word reading skills in children from the early stages of reading acquisition.

The second set of stage/phase models and theories (Chall 1996; Hoover and Gough 1986, 1990; Wolf 2007) goes beyond single word reading and attempts to explain acquisition of reading comprehension, which is an ultimate goal of reading. All of those models have greatly contributed to our present understanding of reading development, positing new questions, and leading to new findings.



## **Chapter 2: Predicting individual differences in learning to read: The role of early cognitive skills**

### **2.1. Introduction**

This chapter provides an overview of cognitive and language skills identified as early predictors of reading in previous research. This task is difficult because the list of skills that have been shown to correlate with reading is very long. Consequently, some selection is necessary. The choice of variables to review here is motivated both theoretically and empirically. Theoretically, as noted in Chapter 1, within the SVR framework, reading comprehension is a product of decoding and language comprehension (Gough and Tunmer 1986; Hoover and Gough 1990). From this perspective, decoding skills are underpinned by phonological awareness as well as letter-sound knowledge. RAN has also been widely acknowledged to relate to decoding skills. These three constructs are vital for mastering decoding skills at the onset of reading. However, understanding of the written text is not attainable without adequately developed oral language skills. This broad construct embraces a range of language (vocabulary, grammatical/semantic awareness) and cognitive (working memory, inferencing, text structure knowledge) skills. Empirically, all the variables listed above have also been shown to correlate with reading outcomes fairly strongly and consistently.

This chapter not only identifies significant and robust correlates of reading, but also seeks to clarify the causal mechanisms of these correlations. Four possible scenarios of relationships between cognitive skills and reading outcomes have been identified by previous research. First, some skills acquired before (formal) literacy

acquisition enable (or at least facilitate) learning to read (i.e. true prerequisites or facilitators). Second, leaning to read (even informal preschool exposure to print) develops certain cognitive skills. Thus, these skills might be considered as consequences of learning to read. Third, reciprocal causation exists between early forms of certain skills and reading. In other words, early/rudimentary forms of cognitive predictors might enable or facilitate reading, which, in turn, enhances the development of this skill. Fourth, a particular skill may correlate with reading, yet, by itself, be irrelevant to successful reading. The nature of its relationship with reading lies in the fact, that an ability that underpins that skill is important for reading, not the skill itself. Hence, apart from identification of the early cognitive correlates of reading, this chapter attempts to identify which of the above-mentioned scenarios applies to each particular skill discussed below.

## **2.2. Phonological awareness**

It is widely acknowledged that phonological awareness (henceforth PA) plays a fundamental role in the acquisition of reading skills, namely decoding. PA is an ability to consciously identify sublexical units of words (i.e. syllables, syllable onsets and codas, rimes, and phonemes) and to manipulate them (e.g. blend or remove phonemes, identify rhymes, count syllables). PA has attracted a great research interest as it has consistently been found to be directly linked to children's success in reading acquisition, explaining unique variance in reading skills above and beyond general factors like age and nonverbal IQ (Melby-Lervåg et al. 2012). PA skills have been proved to correlate with literacy outcomes both concurrently (e.g. Melby-Lervåg et al. 2012; Swanson et al. 2003) and longitudinally (e.g. Hjetland et al. 2017; Powell and Atkinson 2020). This appears to be the case across all writing systems and all languages studied so far (see Landerl et al. 2022 for a review). Therefore, it is crucial to understand mechanisms that underly the relationship between this fundamental literacy skill and reading.

Historically, PA has been widely researched as a subcategory of the phonological processing (also referred to as the phonological skills), which implies the mastery of the sound structure of a language and its usage while listening, writing,

speaking, and reading. Wagner and Torgesen (1987) regarded phonological awareness as one of the three components of the phonological processing (along with phonological coding in working memory and retrieval of phonological codes from long-term memory (known as rapid automatized naming (henceforth RAN)). Yet, more recent empirical studies tend to explore each of the phonological skills' components (PA, RAN and phonological working memory) as a distinct skill (beyond the umbrella term of the phonological skills). That is because they seem to tap into distinct (though interrelated) cognitive skills (Wolf et al. 2000). Thus, the phonological retrieval (known as RAN) has been found an independent and robust predictor of reading difficulties, even when PA skills were intact (Wolf et al. 2000). Phonological working memory (henceforth PWM) seems to be more intuitively related to the phonological skills as its main function is to simultaneously store and process sounds, while other operations are performed. Yet, its relationship with reading has also been researched as a separate cognitive skill yet interrelated with phonological awareness (Bellocchi 2017).

Some researchers differentiate the phonological skills and phonological representations as two sources of variation in reading. Thus, Ramus et al. (2013) in their study examined phonological deficits in four groups of readers (specific language impairment (henceforth SLI) group, dyslexia group, a group with both SLI and dyslexia, and a group of typically developing children). In all groups findings indicated that apart from non-phonological skills (syntactic, morphological), two distinct sets of phonological abilities explained the variance in reading – the phonological skills (PA, verbal working memory and the rapid naming) and the phonological representation. Phonological representation is the mental representation of the sounds and combinations of sounds. It can be described and measured at different levels: acoustic (pitch, loudness, duration of a word), linguistic (quality of speech sound production), and cognitive level (a word is understood as a set of constituent elements - consonants and vowels) (Goswami 2012). By distinguishing these two sets of phonological abilities, Ramus et al. (2013) suggested that the phonological skills are more relevant for written languages, whilst the phonological representation is relevant for oral language skills. This claim seems to be justifiable considering that the quality of phonological representations impacts vocabulary acquisition (especially in very young children when they learn to detect word boundaries within speech, segment words, sentences, etc.).

So, what is the nature of the phonological awareness and reading relationship? Phonological awareness (along with morphological, syntactic, and semantic-pragmatic awareness) is the subset of linguistic awareness skills, which involves explicit access to linguistic structures as well as the possibility of conscious control over them (Szczerbiński 2001). It is broadly agreed that the relationship between PA and reading reveals reciprocal causality: while some PA skills facilitate literacy acquisition and are found to be developed in pre-literate children (e.g. syllabic and intrasyllabic awareness), others emerge or get strengthened (e.g. phonemic awareness) as the result of explicit engagement with phonology and orthography that is integral in learning to read and spell (Hulme et al. 2005; Powell and Atkinson 2020) for a somewhat different view see Castles and Coltheart 2004). Thus, it should be noted that the developmental course of PA changes with the size of phonological elements involved (syllables, intrasyllabic units, phonemes).

Larger phonological units are acquired first. Research findings show that the awareness of syllables occurs spontaneously without any instructions in pre-literate children. Indeed, even young children (4-5-year-olds) are able to tap the syllables in a word (Anthony and Francis 2005; Bradly and Shankweiler 2013; Liberman et al. 1974). The intrasyllabic awareness also develops early. Syllables are hierarchical structures that groups phonemes into two intrasyllabic units. Syllables can be divided between the initial consonant (or consonant clusters), called *onset*, and the vowel with the following consonants – *rime* (e.g. *b-ird*); or between initial consonants with the vowel, called *body*, and the remaining consonants – *coda* (e.g. *bi-rd*). Empirical findings show that pre-school children demonstrate intrasyllabic awareness prior to the commence of literacy instruction (e.g. Goswami 1991; Treiman 1992). Contrary to two previous skills, phonemic awareness, an ability to manipulate phoneme strings, develops later and is thought to be linked to literacy instructions. Empirical research has confirmed results of seminal work by Liberman et al. (1974), finding that young children (not exposed to printed text) experience difficulties while manipulating specific phonemes of a word (e.g. Duncan et al. 2006; Goswami 2000).

Apart from the developmental aspect of the phonological growth, other factors that might affect PA and reading relationship should be considered. Empirical findings demonstrate that the PA-reading relationship can be moderated by several factors such as writing system (alphabetic vs. non-alphabetic), orthographic consistency (transparent

vs. opaque), type of reading outcomes (accuracy vs. fluency), reading domain (word reading, pseudoword decoding, reading comprehension), type of PA tasks (e.g. by unit measured: phonemic, intrasyllabic, syllabic, and prosodic awareness; by type of manipulation: blending, isolation, deletion), and age. As these moderators have been well-researched, a brief description of each is presented further.

First, writing system has been found to impact the PA-reading relationship as the magnitude of the relationship tends to be stronger in alphabetic than in non-alphabetic writing systems (for Chinese: Song et al. 2016; for Japanese Kanji: Inoue et al. 2017). Intuitively, it can be inferred that PA skills may play a less important role in word recognition in writing systems where phonology is presented very opaquely. Then non-phonological cues (e.g. morphological awareness) would be more essential in learning to reading single words in non-alphabetical writing systems (see Landerl et al. 2022 for a review). Indeed, while phoneme is the smallest linguistic unit that is mapped to a grapheme in alphabetic orthographies, a syllable is more important in morpho-syllabic orthographies.

Second, orthographic consistency in alphabetic orthographies, a regularity of phoneme and grapheme mapping, has been found to influence PA-reading correlations. Languages with regular (or mostly regular) phoneme-grapheme mapping are considered to be transparent (e.g. Italian, Ukrainian), whereas languages where one phoneme can be presented in a few different graphemes are labelled as opaque (or non-transparent) (Seymour et al. 2003). Thus, it appears to be stronger in more opaque languages (e.g. English) than in more transparent (e.g. Moll et al. 2014; Ziegler et al. 2010). A larger number of inconsistencies and irregularities in opaque orthographies pose higher demand on phonological awareness skills, which then expectedly would make it a more significant precursor of reading in those orthographies. However, longitudinally this pattern of relationships looks quite similar across orthographic systems (see Landerl et al. 2022 for a review).

Third, a type of reading outcomes measured may alter the PA-reading relationship. The correlations have been found to be stronger for reading accuracy than for reading fluency (Powell and Atkinson 2021). As PA is assumed to enable children to understand sublexical units, it should be more relevant for the development of reading accuracy, which is based on precise decoding of sublexical units (e.g. phonemes).

In addition, reading domain (word reading, pseudoword decoding, reading comprehension) has been identified to be another moderator. Thus, PA appears to have somewhat stronger correlations with pseudoword decoding than with real word reading (Swanson et al. 2003). Taken that word recognition involves activation of its lexical representation, so called lexical route (Coltheart 1985; Coltheart et al. 2001), then word decoding and PA relationships might be slightly weaker than those for pseudoword reading, which purely rely on direct decoding. When it comes to reading comprehension, PA has been found to play indirect contribution (via word reading) to explaining its variance (Furnes et al. 2009).

Finally, the PA-reading relationship might be modified by a type of PA unit measured. Types of PA tasks might be differentiated according to (1) the size of the phonological unit measured and (2) type of manipulation task. As to the size of the phonological unit, four different types of PA tasks are distinguished: (a) phonemic awareness (an ability to identify and manipulate the phonemes that form the word) (Boyer and Ehri 2011); (b) syllabic awareness (an ability to consciously segment, identify, blend or manipulate the syllables in a word (Ziegler and Goswami 2005); (c) intrasyllabic awareness (an ability to compare rhymes and onsets between the words (Treiman 1992); (d) prosodic awareness (an ability to perceive the length, pattern, tone of the statement in order to focus on their most important parts (Wade-Woolley 2016). While phoneme awareness is considered to be the most relevant in some alphabetic languages (e.g. Latin- or Cyrillic-based), this is not the case in other orthographies (e.g. Nakamura et al. 2017 for akshara languages), where syllable awareness is of greater importance. As to the type of manipulation tasks, they are three types: (1) blending (an ability to combine phonemes together in order to create a word); (2) isolation (an ability to identify, extract and name the initial or final phoneme of the word); (3) deletion (an ability to identify and extract the initial or final phoneme of a word, pronouncing the remaining part of the word). These tasks differ in terms of the difficulty level, starting with PA blending, followed by PA isolation and PA deletion as the most difficult out of three.

Considering all the above-mentioned aspects of the multifaceted PA-reading relationship, an overall conclusion is that conscious identification and manipulation of phonological units is linked to reading success to different extent in all orthographies. This interaction is reciprocal and has been found to be modified by various factors. Despite differences in study designs, measures used and tasks' difficulty levels,

empirical findings unequivocally show PA as a foundation skill for reading acquisition across languages.

### **2.3. Letter knowledge**

Written words in alphabetic languages are composed of letters. Unsurprisingly, letter-name and letter-sound knowledge has been found to be one of the key foundation skills of the development of word reading (e.g. Byrne and Fielding-Barnsley 1989, 1990; Byrne 1998). The ability to name letters and letter sounds has been widely documented to correlate with later decoding ability across different alphabetic languages (e.g. Caravolas et al. 2001; Clayton et al. 2020; Muter et al. 2004; Wagner et al. 1994). It is intuitive to assume that the knowledge of letter names and/or their sounds (which is particularly important in less transparent orthographies where letter names and sounds might differ) is essential for mastering letter-sound correspondence in print. The nature of this relationship between letter-name knowledge and letter-sound mapping can be simply explained by the fact that many letter names carry information about the sound of the letter within them. Letter-name knowledge has been claimed to be a precursor of letter sounds knowledge. In line with the so-called alphabetic theory (Ehri 1983; Adams 1990), it is thought that when letter names contain letter sounds, letter name knowledge serves as background knowledge for a child to rely on while acquiring letter-sound correspondence. Empirical research findings lend support to this claim. For example, Treiman and colleagues (1998) found that English novice readers were better at identifying the sounds of acrophonic letters (when the initial phoneme of letter's name contain its sound, such as /b/ or /p/) than nonacrophonic letters, such as <r> or <q>. Thus, knowledge of letter names serves as a bridge to literacy in alphabetic languages that have been explored so far (see Foulon 2005 for a review). Moreover, acquaintance with letters is not limited only to letter names and letter sounds, novice readers have to get familiar with several graphic shapes for each letter, namely upper case and lowercase forms.

Though the general agreement exists as to an undisputable predictive role of early letter-name and letter-sound knowledge, there are differences across studies as to how letter knowledge is measured (letter names and letter sounds as separate variables

or as a composite score of two measures). The predictive strength of letter naming skills was established in studies with a combined single measure of letter-name and letter-sound knowledge (e.g. Duncan and Seymour 2000; Gallagher et al. 2000). However, there is a different view which suggests that pooling letter naming and sounding scores can provide more insight into children's knowledge about letters as each has a specific predictiveness of reading achievement along literacy development (e.g. Caravolas et al. 2001; Wagner et al. 1994). It might be assumed that a combined score of letter knowledge (letter names and letter sounds) might be more relevant before the formal instruction begins as at this stage most children can recognize a letter either only by its name or by sound. When letter-name knowledge level reaches a ceiling effect in all children (after the formal instruction starts), letter-sound development becomes a better predictor of reading achievement (see Foulin 2005 for a review). However, there are a few factors that should be considered: 1) letter-sound correspondence (how different letter names and letter sounds are); 2) government-mandatory literacy programs (whether letter sounds or letter names are taught in a particular order or both letter skills are taught simultaneously). In more transparent orthographies (with close letter-sound correspondence) letter names and sounds are taught simultaneously as it does not impede reading. In this case, children would benefit from knowing letter names as it gives them cues to build stronger grapheme-phoneme associations. In fact, studies show that this simultaneous approach facilitates letter-sound acquisition in different orthographies.

It should be mentioned that development of alphabetic knowledge is dependent on a number of letter properties and child characteristics. There are several letter properties that are sought to modify letter skills growth. They are (1) a letter category (consonant vs. vowel), (2) a letter-name structure, (3) a letter's position within the alphabet, (4) its manner of articulation, (5) letter-sound correspondence (single like <p> and /p/ or multiple like <c> with /k/ and /s/ correspondences), (6) the age at which the sound is typically produced, the complexity of the letter's shape, and (7) frequency in print materials (Piasta and Wager 2010). All these factors to some extent account for individual differences in children's development of alphabetic knowledge. For example, research findings indicated faster acquisition of letter-sound correspondence in which the first sound of the letter name correctly corresponds to its sound (i.e. CV letters - *consonant* + /i/ such as /di/ in <d>). VC letter patterns (i.e. /ε/ + *consonant*,



such as /*ɛm*/ in <*m*>) have been found more challenging to master for novice readers (Justice et al. 2006; McBride-Chang 1999). However, the detailed examination of each factor is beyond the scope of the thesis.

It is of importance to mention that empirical research findings have shown strong correlations between phonemic awareness and letter-sound knowledge during the very early stages of learning to read (Burgess and Lanning 1998; Caravolas et al. 2001). A recent longitudinal study by Powell and Atkinson (2021) with preliterate children (3;11) demonstrated a significant correlation ( $r = .53$ ) between phonological awareness at 3;11 years and letter knowledge assessed 18 months later, demonstrating close association between these constructs. Moreover, research findings indicate that these relationships are bidirectional – letter-sound knowledge influences phonemic awareness and phonological skills influence letter-sound learning (Piasta and Wagner 2010; Torppa et al. 2006). Children may use their phonological abilities, notably phonemic isolation skills, to extract the letter sound from letter name, isolating the corresponding sound from the full syllable of the letter name. On the other hand, letter name knowledge enhances their experience and awareness with different sounds and sound combinations (representing letter names), which allows children to draw on this knowledge while building phonological representations of graphemes.

Overall, it can be drawn that letter name and letter sound knowledge are key foundation skills for literacy acquisition in all alphabetic orthographies. Though its development might be influenced by a number of letter properties and educational practices, it has been deemed to predict variance in literacy skills both concurrently and longitudinally.

## **2.4. Rapid automatized naming**

Rapid automatized naming is the speed of naming highly familiar stimuli, such as colour patches, line drawings of common objects, letters or digits. It has been widely considered as an important predictor of reading abilities in children since Denckla and Rudel (1974, 1976). RAN has drawn a great deal of research and clinical interest, as this apparently simple task correlates with ecologically valid outcomes, such as ADHD diagnoses (Ryan et al. 2017), arithmetic performance (Hornung et al. 2017) and literacy

skills across languages in monolingual children (e.g. Caravolas et al. 2013; Georgiou et al. 2008; Landerl et al. 2019) as well as in bilingual children (see Kishchak et al. 2023 for a review). Numerous studies have found slow RAN performance to be a core deficit in developmental dyslexia (Fernandes et al. 2017; Kirby et al. 2008; Wolf et al. 2002). It is widely acknowledged that RAN-reading relationships are unidirectional (enhanced RAN skills can boost reading outcomes but not in reverse).

While there is broad agreement that RAN is predictive of reading skills (both concurrently and longitudinally), mechanisms underlying their relationship are still a matter of debate. The major accounts are described below.

Advocates of the phonological processing account suggest that RAN tasks are an assessment of how quickly phonological codes are accessed and retrieved from long-term memory (Torgesen et al. 1994, 1997). As discussed before, in this view, naming speed is one of three distinct yet interconnected phonological processing skills, alongside phonological awareness and phonological coding in working memory. The argument is that RAN performance and reading performance are related insofar as they both depend on efficient phonological access and retrieval processes, which ultimately are determined by the quality of underlying phonological representations.

Another account proposed by Wolf and colleagues (2000), often referred to as the orthographic processing account, argues that the complexity of cognitive structure of RAN tasks goes beyond the phonological processes. RAN tasks require precise temporal coordination of several subprocesses (attentional, visual, phonological, semantic) that resemble to some extent fine temporal integration of different processes involved in reading (Wolf et al. 2000).

Kail and colleagues (1994, 1999) suggest that the speed of processing account explains the relationship between skilled reading performance and rapid naming. This account proposes that both reading and rapid naming rely on the quick execution of underlying processes.

The working memory account, proposed by Amtmann et al. (2007), suggests that the RAN-reading relationship reflects a shared requirement for the maintenance of a set of names in working memory (specifically, its phonological loop component) that allows to integrate phonological and orthographic representations of words in a timely fashion.

The attentional processes account of the RAN-reading relationship (Semrud-Clikeman et al. 2000; Shao et al. 2013) emphasises response competition inherent in rapid naming, and so the role of effective response inhibition processes in fast production of correct responses.

The cascaded processing hypothesis introduced by Protopapas, Altani and Georgiou (2013) claims that the mechanisms of the RAN-reading relationship change over the course of development, but in advanced readers RAN is related uniquely to reading fluency (of connected text or of lists of words). This is because RAN and fluent reading both rely on cascaded processing, specifically one where “[m]ultiple items are processed simultaneously, so that one item may be processed phonologically while the preceding one is articulated and the next one is recognized visually” (Protopapas, Altani and Georgiou 2013: 924).

The theoretical explanations mentioned earlier may not necessarily exclude each other, as RAN tasks involve various cognitive subprocesses such as sustained attention, response inhibition, feature analysis, pattern recognition, phonological and semantic processing, and motor articulation. A failure in any of these processes could hinder both naming and reading fluency (McWeeny et al. 2022; Wolf et al. 2000).

Even though RAN has been found to be one of the most universal and robust predictors of reading, there is a considerable variation in the literature on the strength of this relationship. While some studies report strong to moderate correlations (e.g. Chung et al. 2021; Vataja et al. 2021), others reveal weak (e.g. Fleury and Avila 2015) correlations. These inconsistencies in findings can be explained by differences between studies, including the methods used to assess RAN and reading performance, characteristics of the populations (e.g. age, reading level, etc). Therefore, it is essential to draw attention to moderators that are thought to modify the RAN-reading relationship. There is a number of moderators that have been well-reported in the literature both concurrently and longitudinally.

First, a type of RAN tasks has been found to be one of the sources of variation across studies. There are two RAN tasks categories: alphanumeric (letters and digits) and non-alphanumeric (colours and objects). Non-alphanumeric tasks are typically used with pre-literate children as a predictor of later reading development (e.g. Kirby et al. 2003; Landerl and Wimmer 2008). Whereas RAN letters and RAN digits tasks are commonly used once children have learnt (or partially learnt) letters and digits.

Empirical findings suggest stronger correlations for RAN alphanumeric than RAN non-alphanumeric tasks (see Araújo et al. 2015 for a review; Lervåg and Hulme 2009). One of the explanations might be that alphanumeric tasks better capture the nature of RAN-reading relationships as fast retrieval and repetition of a string of letters seem to be more relevant for word reading than retrieval of colours and objects. In other words, children need to know letters (and digits) to read words and texts to comprehend. Bowey et al. (2005) argued that stronger associations between RAN alphanumeric tests with reading might be a mere effect of letter knowledge (weak letter knowledge would slow RAN performance and word reading). However, Araújo et al. 2015 questions that claim, arguing that if this is the case, then non-alphanumeric tasks would not show any correlations with reading at all. Therefore, both alphanumeric and non-alphanumeric RAN tasks are predictive of reading development, though alphanumeric ones are more relevant and predictive of reading success for children after the commencement of literacy acquisition.

Second, measure of reading outcomes (accuracy vs. fluency) is considered to be another important moderator. RAN-reading correlations have been found to be stronger for fluency than for accuracy in different orthographies (see Araújo et al. 2015; Song et al. 2016 for reviews). This finding is not surprising considering that both RAN and reading fluency share a time component. In other words, the speed with which RAN task items are retrieved and the speed for retrieving phonological representations of words from long-term memory during reading tap the same construct – a global speed of processing (Kail and Hall 1994; Kail et al. 1999). Another explanation was suggested by Protopapas, Altani and Georgiou (2013) and later supported by Altani et al (2020), claiming that RAN and reading fluency may relate to a shared ability to simultaneously process multiple items in serial fashion. Thus, in both cases (while performing RAN task or reading words) an individual has to visually identify an item, retrieve it from the long-term memory (while identifying another item in parallel), then articulate it (while phonologically retrieving the preceding one).

In addition to reading measure, type of reading tasks (also called reading domain) has been shown to modify RAN and reading relationship. Most empirical studies use word reading, pseudoword decoding, text (passage) reading, and reading comprehension tasks as a measure of reading. Word reading and pseudoword reading are typically assessed by tasks of single word or pseudoword reading (timed or

untimed). That is when a participant is asked to read accurately a list of words or pseudowords within a given time limit. As reading develops, tasks get more complex and include those measuring sentence or passage accuracy (number of correctly read words in a sentence or a passage) or efficiency (number of correctly read words per given time unit). Reading comprehension has also been measured in various ways across studies, among which the most common tasks comprise text reading with a follow-up set of multiple choice, open-ended or closed-ended questions. Naturally, such a variety of reading tasks has led to mixed empirical findings across languages. Nevertheless, recent meta-analyses of RAN-reading relationship have provided reliable evidence that RAN-reading relationships tend to be stronger for word and pseudoword reading as well as for text reading than for reading comprehension (see Araújo et al. 2015; McWeeney et al. 2022 for reviews). Moreover, some findings indicate correlations to be somewhat stronger for word reading than for pseudoword decoding, suggesting that orthographic processing that underlies both RAN and word reading might explain this difference. Whereas PA might be more predictive of pseudoword reading performance as readers can just rely on phoneme-grapheme correspondence then, without any orthographic or semantic cues as in word reading tasks. However, such findings have not been replicated in a meta-analysis in Chinese, a non-alphabetic orthography (Song et al. 2016). The strength of correlations was similar for both word and pseudoword reading.

The role of writing system as a moderator has also been examined. General findings of meta-analyses in different orthographies demonstrate rather similar strength of the RAN-reading relationship across different orthographies. Though Araújo et al. (2015) found stronger relationship for reading fluency measures in non-alphabetic orthographies, this finding was not replicated in Song et al. (2016) study in Chinese. Therefore, it can be assumed that RAN's predictive strength is universal across different orthographies.

Not only writing system but also orthographic consistency (in alphabetic orthographies) might moderate the RAN-reading correlations. As previously mentioned, alphabetic languages vary with regard to the consistency of phoneme-grapheme mapping (Ziegler and Goswami 2005). Up to date, only two meta-analyses addressed this issue, revealing mixed results. Whereas Chen et al. (2021) were not able to identify any differences between transparent and opaque orthographies, Araújo et al.

(2015) reported stronger RAN-reading correlations for opaque orthographies than for transparent ones, both for accuracy and fluency measures.

Age of participants (or grade) is another essential moderator across studies. Findings are mixed as some identified no difference across grades (Chen et al. 2021) and others reported an increase of the strength in the RAN-reading relationship with grade (see Araújo et al. 2015 for a review). However, it should be noted that in Araújo et al. (2015) only fluency measures remained quite stable across grades (from kindergarten to 5+ grade). In contrary, correlations between measures of reading accuracy and RAN diminished with grade. Landerl et al. (2022) attempt to explain such findings suggesting that as reading accuracy achieves close to ceiling effect with more exposure to print (at least in more transparent orthographies), its correlations with RAN fades.

Last, as RAN is considered to be a robust predictor of developmental dyslexia (Wolf and Bower 1999), reading status of participants (typical or atypical reader) has been explored as an essential moderator of the RAN-reading relationship. Results of meta-analyses of correlational studies did not demonstrate difference between typical and impaired readers (see Swanson et al. 2003; Araújo et al. 2015; McWeeney et al. 2022 for reviews).

Overall, RAN strength in predicting reading outcomes has been proved to be robust in various writing systems and orthographies with varying degree of consistency. It appears to be a universal and unidirectional precursor of reading. Its robustness and validity has been proved to stay throughout the development of reading.

## **2.5. Working memory**

Working memory (henceforth WM) refers to capacity to store and process information for short periods of time while engaging in ongoing cognitive tasks simultaneously (Baddeley 1986). Its relationship with reading has been widely researched. Theoretically and empirically, there are at least two reasons why WM is deemed to play an essential role in reading acquisition. First, its relationship with decoding skills (an ability to translate written language into speech by converting letters into sounds) can be explained by a required simultaneous processing and storage of letters and sounds.

At the early stage of reading when this process is elaborate and not yet fully automatic, first, a novice reader converts letters sequentially and then blends them sequentially (not in parallel as a proficient reader does). These temporal conversions have to be stored in short-term memory (henceforth STM) while the semantic/lexical information of the word is activated. Second, WM is known to correlate with a higher order literacy skill – reading comprehension. Comprehension is considered the most complex literacy task that involves the coordination of different reading and cognitive skills. This process requires maintaining of the words being decoded (for new words) or recognized (for learnt words) in memory while other higher-order semantic and syntactic processing are being performed.

Theoretical validation of WM-reading relationship can be explained within the multi-componential model of working memory introduced by Baddeley and colleagues (Baddeley and Hitch 1974; Baddeley 1986, 1996, 2017). There are four key conceptual parts of the model: (1) the central executive (CEO) of working memory, which performs main functions (i.e. inhibition, shifting and updating), (2) the phonological loop (inferior to CEO), which stores and rehearses auditory/phonological information; (3) the visual-spatial sketchpad (subordinate to CEO), that stores information in the form of images and shapes, (4) the episodic buffer (a transitional storage device between the CEO and the two subordinate systems), which holds bound and integrates information from different sources (Li 2022). Within this model, it can be inferred that processes involved in reading require active engagement of the central executive (of working memory), the phonological loop (short-term phonological working memory) and the episodic buffer (to integrate the information between phonological working memory and central executive). While reading, a novice reader might need to simultaneously store sublexical (phonemes, syllables) and lexical units (words) and to arrange them for higher order processing (blending, syntactic analysis etc.) That would engage the central executive of working memory for coordinating read information (e.g. comprehension monitoring, making inferences, etc.) Then, phonological loop (STM) would be required to store and rehearse phonological units (phonemes) of words as reading input is coded phonologically (Szczerbiński 2001). The episodic buffer would be needed to integrate the information between the phonological working memory (stored items) and the central executive.

Empirical research findings have provided ample support to the theoretical assumptions of the relationship between working memory and reading. Yet, findings

are inconsistent across studies. While some find negligible contribution of WM to reading (e.g. O'Shaughnessy and Swanson 2000), others found WM ability to almost fully explain variation in reading abilities (e.g. McIntyre 2015; Weissinger 2013). Methodological differences across studies and usage of different measures are likely to be the cause of such discrepancies. Given that WM is a multi-componential system, measures used to assess different components of WM vary across studies. WM measures can be broadly divided into two categories: simple and complex tasks. While simple tasks measure the storage capacity of the components, complex tasks tap into both, storage and processing.

The phonological short-term memory is usually measured by tasks that require recalling of items in oral or written form (nonword or pseudoword span, word span, digit and letter span). They were found to moderately correlate with word reading and pseudoword decoding (e.g. Bellocchi 2017; Gathercole et al. 1994, 2005) as well as with reading comprehension (e.g. Cain et al. 2004; Christopher et al. 2012; see Peng et al. 2018 for a review).

Measures of the episodic buffer usually require integration of information. A sentence repetition task (where a participant is asked to repeat sentences presented aurally with an increasing level of difficulty) is often used to assess the capacity of the episodic buffer. This task involves an integration of received information from short-term phonological working memory with long-term memory, which is then combined with the outcome of semantic and syntactic analyses (Li 2022). Despite its simplicity at first sight, repeating a sentence is not just a memorization task. In order to accurately recall a sentence, one must parse the sentence, analyse the thematic relations (order of events), identify and interpret the underlying syntactic representation, elaborate an articulation plan, and produce it (Levelt 2001). Evidence that sentence repetition measures the capacity of the episodic buffer can be found in developmental research. Alloway et al. (2004) in a study of 4-6-year-old children found that sentence repetition ability formed a separate construct from the central executive and the phonological loop.

Finally, the central executive measures can be distinguished between two types: those measuring performance on integrated and independent activities. Integrated tasks are complex tasks, which require both processing (e.g. such as decision tasks where a participant is asked to decide whether a sentence is meaningful or unmeaningful) and then storage tasks (e.g. tasks where a participant is asked to memorize and later recall



the final word in a sentence). Independent measurements of the central executive can measure its different functions, namely inhibition, shifting and updating. Among the three, inhibition has gained most attention in the field. Inhibition is thought to be involved in the process of reading as it allows to control for guessing errors (De Rom et al. 2023). While reading, novice readers quite often try to replace a word by its orthographic neighbour. In this case an inhibition is important to suppress the irrelevant word articulation. As reading becomes more automatic, the development of inhibition increases as well. Altemeier et al. (2008) discovered that inhibition increases steadily from Grade 1 to 6. The most frequent verbal inhibition task used in the literature is a Stroop task, which requires to read colour words in congruent and incongruent conditions (a participant should read the word *red* written in green colour). The faster an incongruent word is read; the better inhibition control is. Inhibition has been mostly investigated in relation to reading comprehension (Keiffer and Christodoulou 2020; Meixner et al. 2019). Meixner et al. (2019) in a longitudinal study with primary school children found that inhibition and reading comprehension show bidirectional relations. Moreover, some research findings indicate that measures of working memory capacity tapping the central executive function revealed even greater correlations with reading than tests of phonological working memory (e.g. Oakhill and Kyle 2000; Perfetti 2007).

However, a type of WM measures is not the only factor mediating the WM and reading relationship. Although Peng al. (2018) in their meta-analysis reported that WM-reading relationship was not affected by types of reading domain (word reading, pseudoword decoding or reading comprehension), the type of reading tasks *per se* has been shown to posit different load on WM. Thus, reading comprehension tasks (timed or untimed), type of text (expository or narrative), and grade level are potential moderators of the WM-reading relationship. Time-limited tasks may impose more load on working memory than untimed tasks as timed reading may imply more pressure involving a greater cognitive load. Expository texts may require more intensive engagement of WM than narrative texts as they are more informationally dense with less familiar and subject-related words (e.g. McNamara et al. 2012). In addition, reading experience (typically related to grade level) should be considered. As reading is a developmental process, readers' exposure to print enables them to switch from learning-to-read stage to reading-to-learn stage (Chall 1996). Therefore, at the initial stage of reading comprehension development novice readers may rely on WM for both

decoding and comprehension in reading comprehension tasks. Whereas more experienced readers need only to allocate WM for comprehension not decoding, which frees some WM capacity for reading comprehension tasks (see Peng 2018 for a review).

Apart from WM component- and WM measure-related moderators, WM and reading relationship should also be considered through its correlations with other cognitive precursors, namely phonological awareness and vocabulary. Not surprisingly, WM has demonstrated small to moderate relations with PA, one of the core skills for literacy acquisition (e.g. Hester and Hodson 2004; Li 2022; Swanson and Alexander 1997). Such a relationship can be intuitively expected as phonological working memory's main function is to simultaneously store and process sounds, while other phonological operations are performed. The size of the correlations might be moderated by the level of difficulty of PA awareness tasks. Manipulation of smaller units' tasks (phonemes) is considered to be more difficult than bigger units' manipulation (syllable) tasks (Li 2022). Thus, phoneme manipulation tasks might impose more cognitive load on working memory than syllable manipulation tasks. Moreover, some findings show that WM cannot predict variance in decoding skills over and above that explained by PA (Wagner et al. 1994; Torgesen et al. 1997). Therefore, its relationship with reading might be assumed as indirect through PA. An indirect causal path, proposed by Tunmer and Hoover (1992), claims that working memory might exert an indirect causal influence on reading as it constrains the development of PA skills. In this view, limited WM capacity would lead to lower performance on PA tasks, which consequently influences reading skills development.

Vocabulary (one of the oral language skills subcategories) is also thought to closely relate to working memory performance (e.g. Baddeley 2003; Babayigit 2015). That is because memorization of new words requires engagement of the phonological working memory (the phonological loop) for word recognition, the central executive (for storage and processing of new words, building semantic representations, etc.) and the episodic buffer (for integration of information). For example, a measure of phonological memory capacity (nonword repetition) was found to be closely linked with vocabulary acquisition (Gathercole and Baddeley 1989). An explanation of this relationship might be that the storage and manipulation of phonological information are critical in supporting the phonological structure of new words. Its relationship might also be moderated by age of participants and the type of vocabulary measures. Some

research findings indicate that phonological working memory is crucial for vocabulary learning, namely for beginners, but as proficiency level in reading increases, its predictive role weakens (Li 2022). Gathercole et al. (1992) found that phonological short-term memory was a stronger predictor for children aged four to five, but when they reached the age of eight, its significance faded. This shift related to developmental processes might be directly related to the type of vocabulary measures. They can be receptive (understanding of spoken, written or a signed word) and expressive (production of words). Considering that expressive vocabulary appears to develop after receptive vocabulary over the course of early language development, it can be assumed that receptive vocabulary would show stronger correlations with WM than performance on receptive vocabulary tasks (Peng 2018). Moreover, vocabulary knowledge has been claimed to have direct influence not only on reading comprehension (Kim 2015; Protopapas, Mousaki, Sideridis, Kotsolakou and Panagio 2013), but also supports decoding. Vocabulary knowledge is not only a strong correlate of discourse-level reading comprehension (Carroll 1993) but also will support decoding (Protopapas, Mousaki, Sideridis, Kotsolakou and Panagio 2013; Tunmer and Chapman 2012), influencing the relationship between our target variables.

Therefore, WM indirectly (through vocabulary knowledge) exerts its influence on listening comprehension skills, which consequently contributes to reading comprehension (Lervåg et al 2018). Thus, the relationship between WM and other cognitive skills is interactive, demonstrating both direct and mediated influence.

Taken all into account, research on working memory clearly indicates its importance for reading acquisition. The relationship between working memory and reading depends on working memory components being assessed. In addition, it can be moderated by the types of tasks measuring reading domains. Finally, its role should be considered within a developmental context and though its relationship with other cognitive predictors.

## **2.6. Oral language skills**

The importance of oral language in literacy development is undisputable. Its significance has been corroborated both theoretically and empirically. Oral language

skills are a broad theoretical concept often used as an umbrella term to denote a number of language skills (e.g. vocabulary, syntax, semantics, discourse skills, etc.). Therefore, it has been often considered multidimensional (i.e. consisting of different but related components). Some recent empirical findings add to the multidimensionality debate by demonstrating developmental changes of the dimensionality across grades. Thus, in the Language and Reading Research Consortium report (LARRC 2015), a study with 4-8-year-old children ( $n = 915$ ), oral language skills were found to be unidimensional at the kindergarten level as they all loaded on one construct, but later were “best represented as two- or even three-related dimensions” (LARRC 2017: 1961). The findings show that by the third grade vocabulary, grammar, and discourse skills appear to be distinct skills predicting reading success separately, while this difference is not blurred at the initial stage of literacy development. Further research findings also provided empirical support by showing that discourse-level languages skills (e.g. narrative proficiency and listening comprehension) and core language skills (e.g. vocabulary and grammar) become separate variables across grades (though they are inseparable at the early developmental stage) (Karlsen et al. 2021).

A great research attention to oral language skills is warranted, considering its role in the development of reading comprehension. Within the SVR (Gough and Tunmer 1986; Hoover and Gough 1990), language comprehension (operationalized as linguistic comprehension and later referred to as listening comprehension) is one of the two fundamental components of reading comprehension. Indeed, an ability to understand the text (when it is heard instead of read) plays an unquestionable role in comprehending the written text (Hogan et al. 2014). Moreover, its developmental nature should be considered as its role increases across grades as the role of decoding skills fades (see Garcia and Cain 2013 for a review). Therefore, capturing its nature is essential for predicting further reading success or identifying underlying causes of failures in literacy acquisition. For ease of reading, the term listening comprehension (as in the SVR) will be used throughout the text while discussing oral language skills.

As stated before, listening comprehension (as a multidimensional higher-order skill) requires engagement of multiple language (vocabulary, grammar and syntax) and cognitive skills (Florit et al. 2014; Gottardo et al. 2018; Kim and Pilcher 2016). The importance of cognitive skills, such as memory (working memory and long-term memory), inference-making, comprehension monitoring, has been validated in reading

comprehension research in languages with varying depth of orthography (Catts et al. 2006; Joshi and Aaron 2000; Lervåg et al. 2018). Their relevance for listening comprehension has also been acknowledged. As to the range of linguistic skills, vocabulary, morphology, syntax and background knowledge have been identified to constitute listening comprehension (Kieffer et al. 2016; Kim 2016; van den Broek et al. 2005; Tompkins et al. 2013). Considering a versatile range of its underlying skills, it is not surprising that listening comprehension is not always clearly defined across studies. For pragmatic reasons one or two linguistic skill are usually chosen as a proxy for listening comprehension. However, understanding the components of language comprehension is important as its role in explaining variation in reading comprehension increases through the development of reading as readers gain more experience. For example, a study in English-speaking population by Catts et al. (2005) revealed that decoding explained the majority of unique (27%) and shared (40%) variance in reading comprehension in the second grade. While listening comprehension appeared to play more crucial role in explaining reading comprehension uniquely (36%) and when shared with other predictors (36%) by the eighth grade.

Hogan and colleagues (2011) in their review of underpinning skills that constitute reading comprehension have broadly divided linguistic skills (comprising listening comprehension) into lower level (vocabulary and grammar) and higher-level (inferencing, comprehension monitoring, and text structure knowledge). They state that lower-level skills emerge relatively easy and quickly in the majority of typically developing children in the course of early childhood. Later they function as the “[f]oundation that supports (...) higher level language skills” (Hogan et al. 2011: 3). Higher level skills emerge as lower-level skills achieve age-appropriate level. Yet, the relationship of lower and higher level skills might also be reciprocal as creation of accurate mental models of spoken language can enhance vocabulary and grammar. It is worth noting that higher level skills should not be considered restricted to reading as the onset of their development commences prior to formal reading instruction. Thus, these skills are core aspects of listening comprehension as children use them to inference information from narratives, to follow cartoons, or a set of instructions in everyday situations. A somewhat similar yet more detailed description of listening comprehension’s subcomponents was proposed by Kim (2015). In this view, foundational lower-level skills comprise not only language skills (vocabulary and

grammar) but also cognitive skills (working memory and attention). Higher-level skills include comprehension monitoring, inferencing and the theory of mind. Though, empirical and theoretical studies clearly differentiate between lower- and higher-level skills, subskills included in each group slightly vary across studies. Detailed discussion of each component is beyond the scope of this thesis as a number of higher-level cognitive subcomponents develops later across grades. Therefore, several lower- and higher-level components are discussed in more details below that are more relevant for reading development in novice readers.

Close vocabulary relationship with listening comprehension seems to be obvious. Vocabulary breadth (a number of known words) and depth (quality of lexical representations, i.e. how well the words are known) are crucial for comprehending oral (and written) texts. Vocabulary has been studied extensively in relation to reading comprehension across languages as a separate construct or as a proxy of listening comprehension. Research findings indicate receptive and expressive vocabulary knowledge reliably predict individual differences in listening comprehension (Braze et al. 2007; Florit et al. 2014; Kim 2015; Lervåg et al. 2018). Likewise, vocabulary deficit in children has been found to be predictive of further poor listening comprehension (Vandewalle et al. 2012). The relationship between listening comprehension and vocabulary has been shown to have a reciprocal relationship in children (Cain and Oakhill 2011; Verhoeven and Leeuwe 2008). Better listening comprehension provides greater opportunity to learn new vocabulary, and, in turn, an increased vocabulary size would lead to enhanced listening comprehension skills.

Grammar (often referred to as grammatical knowledge or syntactic knowledge across studies) has also been identified to be a foundational component of listening comprehension. Such knowledge embraces understanding of the rules regulating how words are combined in a sentence in order to convey the meaning. Research evidence claims that grammatical knowledge allows readers to determine the topic or the general idea of the sentence by identifying the subject-verb-object elements of the sentence. It also allows readers to relate ideas within a sentence or across sentences. Some cross-sectional studies found its direct influence on listening comprehension in addition to verbal working memory (Kim 2015, 2016), while others failed to find its direct contribution to listening comprehension (Florit et al. 2014).

The role of working memory in literacy skills development has been discussed earlier in this chapter. As listening comprehension requires the ability to process, store and make inferences of orally presented texts, it is reasonable to assume that verbal working memory is actively involved in the process. However, the nature of this relationship (direct or mediated path) is still a matter of debate. Some empirical research findings suggested that limitations in verbal working memory capacity may restrain listening comprehension after controlling for the vocabulary effect (e.g. Florit et al. 2011; Kim 2016). An alternative view suggesting its indirect influence (via vocabulary) on listening comprehension has also been proposed by some researchers (Lervåg et al. 2018; MacDonald and Christiansen 2002; Melby-Lervåg et al. 2012).

One of the higher-level cognitive skills noted-above – an inference-making skill – was found to be related to listening comprehension both directly (Kim 2016) and indirectly (Florit et al. 2014). This skill includes a number of abilities such as comprehension of difficult vocabulary as well as structuring and synthesizing background knowledge to create meaning. This ability is usually evaluated through tasks requiring definition of the main topic, cause-effect relations, and making conclusions. It has been suggested that these skills are critical for the development of listening comprehension and have been found to be a unique predictor of later listening comprehension beyond vocabulary and prior listening comprehension skills (Lepola et al. 2012). It is of note, drawing inferences requires applying background knowledge (i.e. prior knowledge about specific things, general concepts). Building a rich mental model of the narrative (heard or read) requires an integration of new information with previous knowledge. According to Hogan et al. (2014), inferencing skills are moderated by background knowledge, indirectly contributes to listening comprehension development.

To conclude, listening comprehension (i.e. oral language skills) is a multifaceted construct dependent on several lower- and higher-level cognitive and linguistic skills. Their role may change across developmental stages, affecting listening comprehension skills growth to different extent. Not only are these relationships causal for reading skills but this is also the case for different components of listening comprehension (Florit et al. 2014). Thus, disentangling shared and unique contribution to the development of listening comprehension sometimes poses a challenge.

## 2.7. Summary

In this chapter there has been presented a literature review of several cognitive and language skills underlying reading acquisition at the initial stage of literacy development.

There seems to be a general consensus that PA, letter knowledge and RAN are concurrently and longitudinally related to later reading performance, specifically decoding skills. The relationship between phonological awareness and reading is best explained in terms of reciprocal causality, while RAN and letter knowledge appear to be unidirectional prerequisites of early literacy skills. It seems that development of early literacy is mainly constrained by phonological awareness and rapid automatized naming. A deficit in one of the skills will inevitably lead to reading difficulties (as postulated within the Double Deficit Hypotheses (henceforth DDH) by Wolf and Bower (1999)). Whereas their relationship with decoding is direct, their influence on reading comprehension may be deemed as indirect through decoding, as achieving adequate level of decoding skills frees working memory capacity for making inferencing and constructing the meaning of the text. What is more, the role of decoding skills in explaining reading comprehension variance fades as decoding skills become more automatic, whereas oral language comprehension skills increase their predictive strength.

As the reviewed literature suggests, listening comprehension (another component of reading comprehension) is a multicomponential construct, embracing lower- and higher-level skills. At early stages of literacy development, the lower-level skills (i.e. vocabulary, grammatical/syntactic and morphological awareness are most predictive of further reading comprehension as they constitute bases for the development of higher-level skills, such as inference-making, comprehension monitoring, etc. It appears that these higher-level cognitive and linguistic abilities show some signs of reciprocal relationship with literacy.

Finally, WM construct is undeniably crucial for the development of reading skills, both decoding and comprehension. It appears to be related to different extent to all cognitive and language skills as storage and effective processing of different input constitutes its main functions.



## **Chapter 3: Crosslinguistic influence in bilingual reading development**

### **3.1. Introduction**

Learning to read in one language is a complex multifaceted process (as discussed in previous chapters). Yet, many people around the world learn to read in more than one language. There are various reasons for that, including educational requirements (e.g. English as an obligatory subject at school), advanced education opportunities, better career prospects, migration, travelling, interaction within multilingual countries, and many more. Circumstances under which people learn to read in a second and/or third language vary.

With an increased number of bilinguals across the world, bilingualism has become an extensively researched topic over the last few decades. Luk and Bialystok argue that “[b]ilingualism is best described as a multidimensional construct rather than a categorical variable” (2013: 606). Bilingual experience will vary across populations, depending on language proficiency and exposure related factors (e.g. amount and quality of language input, daily rates of language use, length of exposure).

Historically, different criteria have been suggested to categorize people as bilingual or not (e.g. Bloomfield 1933; Haugen 1953; Diebold 1964; Grosjean 1989). As research on bilingualism evolved, different classifications of bilinguals were identified: (1) balanced or dominant (by proficiency level); (2) compound, coordinate, subordinate (by mapping between linguistic and conceptual domains); (3) early (simultaneous or sequential), late (by age of acquisition); (4) incipient, receptive, productive (by functional ability); (5) additive or subtractive (by effect of L2 on

retention of L1); (6) elite, folk (by language status and learning environment); (7) circumstantial and elective (by literacy support of L1); (8) bicultural, L1 monocultural, L2 acculturated, deculturated (by cultural identity) (Butler and Hakuta 2004). This multifaceted classification depicts a complexity of bilingualism *per se*. While this list is by no means exhaustive, bilingualism research has made significant progress over the past century by exploring various linguistic, socio-cultural, and educational factors that influence second language acquisition and literacy development in bilingual individuals. Among these factors, transfer has been extensively researched. Thus, understanding of the nature of multifaceted interactions between languages has evolved greatly over decades.

This chapter provides an overview of theoretical developments in research on crosslinguistic influence as well as its empirical evidence in bilingual reading development. The sections below present major theoretical perspectives on crosslinguistic influence from different field of study. First, the applied linguistics perspective on crosslinguistic influence is discussed, starting with the contrastive analysis approach (Lado 1957) and interlanguage (Selinker 1972). The next section presents insights from bilingual education studies, with Cummins' interdependence (1979) and threshold hypotheses (1976). Then theoretical models of transfer in reading are discussed: the common underlying cognitive processes (Geva and Ryan 1993), the transfer facilitation model (Koda 2008), and the interactive transfer framework (Chung et al. 2019). This section is followed by a discussion of interactions of linguistic and cognitive skills in the first L1 and second L2 languages as well as moderator variables that might alter L2 reading acquisition are discussed. The last part of the chapter presents a review of empirical findings in bilingual reading within the SVR.

### **3.2. Theoretical accounts of crosslinguistic influence**

Second language acquisition is a complex and multifaceted process influenced by a number of internal and external factors. Bilinguals use two language systems simultaneously. Interaction between L1 and L2 competences has been broadly researched to explore its facilitative or, in some cases, interfering nature. Theoretical accounts of this crosslinguistic relationship have traditionally relied on the notion of

transfer. Theoretical developments in research on transfer that attempted to explain processes and mechanisms of dual language interactions are discussed below.

### **3.2.1. Applied linguistics approaches**

First introduced by Robert Lado in 1957, the contrastive analysis hypothesis (henceforth CAH) states that the structures of the first language impact the acquisition of the second language. In this view, the linguistic transfer is seen as transfer of forms and meanings (i.e. structures) from the native language to a foreign language (Lado 1957). The more similar the two languages are typologically (for example, in grammatical structure or phonology), the less *interference* should be expected in L2 acquisition. On the other hand, it has been acknowledged that transfer can also be positive and, in fact, can enhance L2 learning.

By the 1970s various shortcomings of the contrastive analysis hypothesis became evident. The so-called weak version of the CAH, which claimed that observable errors could explain difficulties in second language learning, has later morphed into error analysis (henceforth EA). In this view, not all errors are caused by first language interference. Developmental errors are common to learners with different L1 backgrounds, as they are a product of rules in the learner system and language learning strategies (Corder 1967). In this view, second language learners possessed a “built-in syllabus” that determined the order of acquisition of structures. Learners’ errors were considered crucial for the learning process, as they were seen as evidence of the learner actively testing hypotheses about the structure of the language. Moreover, they were considered a source of data for studying the learning process.

An important theoretical concept that emerged from the error analysis research was interlanguage (Selinker 1972). In this view, the learner’s linguistic system is different from both the learner’s L1 system and the target L2, i.e. the system of monolingual speakers of the language that is the learner’s L2. This system is believed to be independent of either L1 or L2 yet being influenced by both. Selinker defines it as “a separate linguistic system based on the observable output which results from a learner’s attempted production of a target norm” (Selinker 1972: 35). Within this view,

the system is dynamic in the sense that it changes as the learner progresses from their L1 towards the L2.

The central concept of the interlanguage hypothesis is called *fossilisation* by Selinker (1972). This notion refers to L2 learners' persisting usage of some phonological, morphological, and syntactic features of the L2 that are not normative for that language. According to the hypothesis, L2 learners (referring to adults in the original paper) will never master some aspects of the L2 (e.g. phonology, some grammar rules) due to fossilisation of structures. Fossilization effect has been reported in some studies with adult learners (Lardiere 2007), with L2 learners acquiring the language in naturalistic settings and with instructed learners (Klein and Perdue 1997). According to Selinker (1972), there are five central processes that influence the development of interlanguage and are likely to lead to fossilisation: (a) language transfer (L1 to L2); (b) transfer-of-training; (c) strategies of L2 learning; (d) strategies of L2 communication, and (e) overgeneralisation of L2 rules.

Later, Gass and Selinker (2008), under the influence of Sharwood Smith and Kellerman (1986), expanded on the influence of the native language on L2 by adding such aspects as differential learning rates (faster in typologically similar languages), different paths of language acquisition (different order of acquisition of grammatical structures), overproduction (tendency to use frequently specific structures), avoidance (avoid more complex structures that are more typical in L1). Although the above-mentioned hypothesis extends the scope of language transfer beyond the notion of a mere incorporation of language structures (as in the CAH), its focus is still limited to the impact of L1 on L2.

Sharwood Smith and Kellerman (1986) introduced the term *crosslinguistic influence* (henceforth CLI). They propose to limit the use of the term transfer to "[i]ncorporation of elements from one language into another" (Sharwood Smith and Kellerman 1986: 1), while they define crosslinguistic influence as a broader term, which includes transfer and a number of transfer-related phenomena, such as avoidance or borrowings. In other words, the term crosslinguistic influence encompasses all the interactions between two or more languages in the same mind, emphasizing bidirectionality of these processes (Ewert 2009).

Apart from linguistic factors, such as structural similarities and differences between languages, transfer was found to be influenced by a number of other factors.

According to Odlin (1989), there are nonstructural factors that can interact with transfer. He refers to these as nonlinguistic influences and divides them into three groups: (1) individual variables, which include personality factors, aptitude, proficiency, and literacy, (2) age of acquisition, and (3) linguistic awareness and social contexts.

This section has presented historical approaches to transfer in second language acquisition research to highlight that interactions between the two languages of a bilingual person have been studied for over a half century, providing a conceptual apparatus for discussing these phenomena.

### **3.2.2. Early bilingualism research**

In early 1960s, the seminal study by Peal and Lambert (1962) demonstrated the cognitive advantage of bilingual children over their monolingual peers on verbal and nonverbal intelligence tasks. These findings led to a shift in the perception of bilingualism from a deficit to an advantage. The study also paved the way for future research on the cognitive and social benefits of bilingualism. Another important source of inspiration for future research from about the same time was the powerful theoretical framework developed by Cummins (1976, 1979) for the field of bilingual education.

In late 1970s, James Cummins introduced his prominent theoretical framework attempting to explain the mechanisms of crosslinguistic transfer. The key concept of Cummins's framework is the concept of the common underlying proficiency (CUP), which postulates that there is a shared cognitive and linguistic foundation that underlies bilinguals' language proficiency in both languages. The two languages of a bilingual function within the same cognitive system. Information processing abilities and educational accomplishment can be fostered through one or both languages of a bilingual.

Cummins formulates two hypotheses regarding the relationships between the two languages of a bilingual: the threshold hypothesis (1976) and the interdependence hypothesis (1979). Cummins claims there are underlying common cognitive skills shared by both L1 and L2, which is the basis for the cross-language transfer. The

transfer of L1 competence to L2 can occur when proficiency in both languages reaches a certain threshold:

The "developmental interdependence" hypothesis proposes that the development of competence in a second language (L2) is partially a function of the type of competence already developed in L1 at the time when intensive exposure to L2 begins. The "threshold" hypothesis proposes that there may be threshold levels of linguistic competence which a bilingual child must attain both in order to avoid cognitive disadvantages and allow the potentially beneficial aspects of bilingualism to influence his cognitive and academic functioning (Cummins 1979: 222).

Cummins (1979) argues that studies conducted with minority language children, for whom L2 is societal and instructional language, i.e. *subtractive bilingualism*, introduced by Lambert (1974), and the majority language children, who learn L2 in the classroom as an additional language, i.e. *additive bilingualism* (Lambert 1974), demonstrated different findings. He pointed out that negative effects found in studies with minority language children is a result of the children's lower proficiency in L1 at the expense of L2 learning, but not a negative effect of bilingualism itself. Whereas studies with additive bilinguals reported positive effects as competences in L1 are adequately developed. Cummins claims that the "lower threshold" of L2 proficiency in the context of subtractive bilingualism in early grades may, in fact, have a negative impact, but only on L2 listening comprehension and L2 expressive vocabulary skills. However, further cognitive and academic development in L2 will be impeded unless a sufficient level of L2 proficiency is achieved, as at later stages more advanced language competences are required to understand the subject matter content.

Recent research findings continuously provide support for the hypothesis. For example, Daller and Ongun (2018) found that Turkish-English sequential bilinguals, whose parents used primarily L1 at home, outperformed at non-verbal cognitive abilities tasks English-speaking monolinguals and bilinguals with more exposure to L2 (English) at home. Another study by Ardasheva et al. (2012) compared reading and mathematics in three groups differing in L2 proficiency (current English language learners, henceforth ELLs), former ELLs who achieved a sufficiently high level of English proficiency, and native English speakers (NES)). Their findings showed that former ELLs significantly outperformed both ELLs and NES groups in both tests. This suggests that achieving a sufficiently high proficiency in the language of instruction (L2), bilinguals will not experience academic disadvantages. However, it is not

distinctly clear what these thresholds are, and how they can be measured. This issue has been pointed out as a major criticism of the hypothesis. Yet, the introduction of the threshold hypothesis led to some important insights into bilingualism at the initial stages of bilingual research, emphasising its beneficial impact on further cognitive development, emphasizing the importance of development of both languages in bilingual children, drawing attention to different contexts in which L2 is acquired, as well as pointing out that L1-L2 proficiency is essential for the transfer of language skills to occur.

The linguistic interdependence hypothesis, proposed by Cummins in 1979, postulated that L2 competences are partly built on the competences attained in L1. Later Cummins expanded the initial version of the interdependence hypothesis (Cummins 1980a, 1980b, 2000), suggesting a two-way interaction of L1 and L2, depending on sociolinguistic and educational contexts. Cummins (2021) suggests six possible types of crosslinguistic transfer:

- (1) transfer of conceptual elements (e.g. concept of democracy),
- (2) transfer of specific linguistic elements (e.g. knowledge of the meaning of {*demo-*} in *democracy*),
- (3) transfer of more general morphological awareness (e.g. awareness of the function of {-*ture*} in *signature* English and *signature* French),
- (4) transfer of phonological awareness (e.g. knowledge that words consist of sounds),
- (5) transfer of metacognitive and metalinguistic learning strategies (e.g. how to learn new words),
- (6) transfer of pragmatic aspects of the language (e.g. use of gestures, intonation, etc.).

As Cummins claims, there are similar underlying skills shared by L1 and L2, enabling the above-mentioned crosslinguistic transfer:

The interdependence hypothesis incorporates both “transfer” and “underlying cognitive processes” as sources of relationship between L1 and L2 literacy-related abilities (...) the presences of underlying attributes (e.g. verbal cognitive abilities) and conceptual knowledge develop through experience, in other words, they are learnt. Regardless of which language mediated their acquisition, when skills and knowledge exist in the individual language apparatus, or central processing system, they are available for two-way transfer across languages (Cummins 2021: 93).

Cummins also states that this positive transfer can occur if the sociolinguistic and educational environment provides adequate support. Since its first introduction, ample research has provided empirical support for the interdependence hypothesis, demonstrating cross linguistic transfer of different skills in similar and quite distinct languages (e.g. Cobo-Lewis et al. 2002; Dressler and Kamil 2006; Edele and Stanat 2016; Geva 2014; Lindsey et al. 2003; Prevoo et al. 2015; Releya and Amendum 2020; Riches and Genesee 2006; Sparks et al. 2008).

Cummins's framework has had a significant impact on both further research and educational practices. However, some scholars have criticized it for being vague in defining interdependence and not providing a clear explanation of what is being transferred between languages (Genesee et al. 2006).

### **3.2.3. Models of crosslinguistic influence**

Cummins's framework found direct application in theoretical models of bilingual reading, with numerous authors attempting to specify what exactly gets transferred in the common underlying proficiency. Unlike in SLA research, these authors usually use the term transfer to include a number of different cognitive processes involved in reading acquisition in bilingual children.

Drawing on Cummins's linguistic interdependence hypothesis, Geva and Ryan (1993) developed the common underlying cognitive processes model. It posits that the correlation between lower-level parallel tasks in L1 and L2 (e.g. decoding accuracy and fluency) does not necessarily entail that skills learned in L1 will transfer to L2. It is believed that cognitive skills, e.g. WM, PA, and RAN, are inherent to an individual's cognitive ability and are not easily influenced by intentional manipulation (Chung et al. 2018). This model suggests that these cognitive components do not merely transfer from L1 to L2 but they underlie processing in both languages.

Koda (2008) developed the transfer facilitation model (henceforth TFM) to explain how metalinguistic skills (e.g. phonemic and morphological awareness, orthographic processing) acquired in one language can aid in the development of reading skills in another language. According to TFM, when individuals are exposed to the second language input, their well-established competences in the first language are



automatically activated and transferred to the second language. In this view, transfer is considered as a dynamic process, as it is constantly influenced by the interplay between established competences in L1 and exposure to print input in L2. There are three conditions for the transfer to occur: “(1) [t]he competencies to be transferred must be well rehearsed – to the point of automaticity – in the first language; (2) transfer is not likely to cease at any given point in second-language development; (3) transferred competencies will continuously mature through processing experience with second-language input” (Koda 2007: 17–18). Moreover, this transfer is also viewed as cross-modal (from L1 spoken language to L2 reading). This claim found support in empirical studies with both similar (Comeau et al. 1999; D’Angelo et al. 2020) and different languages (Wade-Woolley and Geva 2000; Wang et al. 2005). One of the shortcomings of this model is its restriction of the scope of the transfer of metalinguistic skills (only automatized skills from L1 can be easily transferred to L2). Yet, recent research found evidence that automaticity of metalinguistic skills in L1 might not be necessary. Moreover, recent empirical findings have also revealed crosslinguistic transfer from L2 to L1 (e.g. Chung et al. 2017; Pasquarella et al. 2014).

The interactive transfer framework (henceforth ITF), proposed by Chung et al. (2019), acknowledges that bilingual reading outcomes are influenced by language-specific factors (orthographic processing, L1-L2 distance, and L2 complexity), domain-general factors (e.g. working memory, processing speed, executive function), sociolinguistic and socio-cultural factors (age of acquisition, educational settings, immigration experience, extent of exposure to L1 and L2) that interact with each other. In this view, cross-language transfer is a multifaceted and interactive process, involving units of analysis varying in complexity. For instance, L1-L2 distance (a language-specific factor) facilitates morphological awareness transfer in typologically close languages. Yet, it appears that it does not restrict phonological awareness or advanced reading comprehension strategies (Chung et al. 2018). As to L1-L2 proficiency and its impact on transfer, findings are mixed. Some suggest that transfer tends to happen from a more proficient language to a less proficient one (L1 to L2: Wang et al. 2006; Zhang et al. 2014; L2 to L1: Chung et al. 2017; Pasquarella et al. 2011). Others have shown bidirectional transfer in studies with early bilingual learners with similar exposure to their two languages (e.g. Deacon et al. 2007, 2009), which is of particular interest for the current study. These instances of interactions are merely a few among a wide variety of intricate language interaction processes. As Chung et al. (2019) state, the

process of transfer is determined by multiple factors that interact with each other, but the exact nature of this interaction remains unknown.

Overall, there are several conclusions regarding *transfer* that can be drawn from the literature. First, transfer was an essential concept in early SLA research. Second, the notion of transfer itself has evolved greatly in the field, transitioning from a unidirectional view of L1 to L2 transfer (Selinker 1972; Koda 2008) to an acknowledgment of bidirectional interactions of two languages (Cummins' 1979; Sharwood Smith and Kellerman 1986; Geva and Ryan 1993; Chung et al. 2019). Third, recent models of cross linguistic transfer acknowledge a complexity of transfer that is moderated by multiple language-related, socio-cultural and educational factors.

### **3.3. Interactions of L1 skills and L2 reading outcomes**

L1 and L2 literacy experiences both play a definitive, but distinct, role in L2 reading development. Because L2 reading skills are presumed to evolve through their interactions, it is important to examine their impacts in tandem (Koda 2007: 25).

Given that two languages contribute to L2 reading development, it is vital to understand what the relationships of the two languages are. Working memory, phonological short-term (working) memory and phonological awareness are commonly acknowledged in the research literature as general, language independent skills (Genesee et al. 2006). They are described below.

*Phonological awareness (PA).* Phonological awareness, an ability to identify and manipulate sounds of spoken language, attracted great interest of researchers as its development is linked with success in learning to read. The nature and the role of this construct in literacy development was previously discussed in Chapter 2. According to Koda (2007), once developed in one language, it is believed to be available in learning to read in other languages. Thus, all aspects of PA in bilinguals are highly correlated between their two languages and L2 decoding development closely relates to PA in both languages. There are several possible scenarios of such interactions. First, PA in L1 correlations with PA in L2 might indicate either skill transfer from L1 to L2 or some general underlying shared PA competence. Empirical support for such an interaction was found in studies with similar orthographies (Melby-Lervåg et al. 2012) and

different orthographies (Chung et al. 2021; McBride-Chang et al. 2006; Saiegh-Haddad and Geva 2008). Second, PA in L1 might predict literacy skills in L2, which may have several interpretations (i.e. PA as a shared cognitive skill is equally predictive of literacy in both languages; PA in L1 might predict reading outcome indirectly via PA in L2). Third, PA in L1 might also predict literacy skills in L2 even after L2 PA is controlled for, in which case it strongly suggests crosslinguistic transfer (Abu-Rabia 2001; Cheung et al. 2010). Of note, transfer of PA is influenced by phonological features of the language (Chung et al. 2019). PA transfer is likely to occur from that language, whose phonological system is more complex (e.g. Bialystok, McBride and Luk 2005).

*Working memory* (WM) refers to the mental processes involving active manipulation of information while engaging in ongoing cognitive tasks simultaneously (Baddeley and Logie 1999). It has been found to significantly correlate with RC. In brief, WM keeps necessary information currently being read and simultaneously makes it available for integration with upcoming information as well as previously gained knowledge. Numerous studies found it to be a predictor of RC in monolinguals (McVay and Kane 2012; Swanson et al. 2001) and bilinguals (see Linck et al. 2014 for a review). However, empirical evidence of its crosslinguistic transfer is not that unequivocal. In a meta-analysis, Shin (2020) found that while performance on L2 WM tasks correlated with and contributed to L2 reading comprehension, research results were inconsistent as to the L1 WM contribution to L2 reading. Geva and Ryan (1993) reported L2 WM correlation with L1 reading comprehension, whereas such an effect was not found from L1 WM to L2 reading measures. They concluded that being seemingly parallel, L1 and L2 memory measures are not entirely interchangeable.

*Phonological working memory* (henceforth PWM). Phonological loop introduced by Baddeley and Hitch (1974) involves cognitive processes that underly short-term maintenance of speech sounds. It has been widely associated with word learning (e.g. Farnia and Geva 2011) and grammar development (Kehoe et al. 2021), which, in turn, indirectly moderates reading comprehension. PWM memory measures (e.g. digit span, syllable span or pseudoword repetition tasks) have been found to correlate strongly with vocabulary measures in monolinguals (e.g. Engel de Abreu et al. 2011; Gathercole 2006) as well as in bilinguals (Gathercole and Masoura 2005; Szewczyk et al. 2018). As to crosslinguistic effect, studies' reports are inconsistent. In

some studies, only within-language correlations have been found as significant (e.g. Girbau and Schwartz 2008; Thordardottir and Brandeker 2013; Windsor et al. 2010). Others reported evidence of PWM crosslinguistic transfer (e.g. Core et al. 2017; Kehoe et al. 2021; Parra et al. 2011). According to Kehoe and colleagues (2021), the positive influence of PWM on second language learning tends to diminish over time, indicating that any cross-language effects that may exist are temporary in nature.

In addition to above-mentioned underlying cognitive skills, cross-language transfer of other reading competences has been also been examined in the literature. For example, in a meta-analysis Melby-Lervåg and Lervåg (2011) identified strong correlations between L1 and L2 decoding skills ( $r = .54$ ). This finding suggests that assessing bilinguals' decoding skills in a native language can partly predict similar skills in L2.

While some skills are transferrable across languages, others are likely to be more language specific. In their overview of studies examining contributions of L1 proficiency to L2 reading, Geva and Genesee (2006) found that measures in such domains as syntax, morphology, and semantics do not correlate with L2 (English) reading fluency. These findings were consistent across different L1 (e.g. Cantonese, Urdu, Hebrew, etc.). As to L1 oral language skills and L2 reading comprehension, Melby-Lervåg and Lervåg (2011) found the correlation to be very small ( $r = .04$ ), indicating that not all skills transfer.

### **3.4. Interactions of L2 skills and L2 reading outcomes**

Relationship between cognitive and linguistic skills in L2 and L2 reading outcomes have been researched widely. Though it is assumed that their correlations might be quite similar to patterns within one language, this interaction might be moderated by different bilingualism-related aspects (educational context, age of acquisition, exposure to L2).

*Decoding skills in L2.* Decoding skills are closely related to phonological awareness. This is the case for monolingual and bilingual reading development. In a narrative review Lesaux et al. (2006) reported that the process of learning to decode in L2, similarly to that in L1, relies greatly on phonological awareness (in alphabetical

orthographies). An assumption of superior PA skills in bilinguals over monolinguals is based on that fact that exposure to two phonological systems may refine those skills. However, empirical evidence has demonstrated mixed results. While some find enhanced PA skills in bilinguals (e.g. PA measured in both languages: Bialystok et al. 2003, 2005), others reported similar level of PA in monolinguals and bilinguals (PA measured in L2: Jongejan et al. 2007; Verhoeven 2000). As to L2 PA contribution to L2 decoding skills, its role has been validated in many studies. For example, Gottardo et al. (2001, 2006) reported L2 phonological skills to be related to L2 word and pseudowords reading. Luk and Bialystok (2008) supported the previous findings, identifying L2 PA strongly correlated with L2 word reading. In the same vein, Koda et al. (2014) reported L2 PA contribution to L2 reading decoding skills in English as a second language. L2 RAN measures were found to moderately correlated with L2 word reading (e.g. Chung and Lam 2020; Lee and Chen 2019) and pseudoword reading (e.g. Grant et al. 2011).

*Reading comprehension in L2.* Empirical findings are somewhat inconsistent in regard to what language skills play more crucial role in L2 reading comprehension development. However, oral language skills/language comprehension in bilinguals (e.g. vocabulary) has attracted a great attention in the field, suggesting its primary role in RC in bilinguals. A meta-analysis conducted by Jeon and Yamashita (2014) reported RC correlations with grammar knowledge ( $r = .85$ ), vocabulary ( $r = .79$ ), listening comprehension ( $r = .77$ ), morphological skills ( $r = .61$ ), and decoding ( $r = .56$ ) in participants with an age range from kindergarten to postgraduates. Participants' L2 in this meta-analysis was predominantly English (with a few studies in Spanish, German, Arabic, and Japanese), whereas L1 included a number of alphabetic languages (Spanish, Hebrew, German, Dutch, Russian and Farsi) as well as non-alphabetic (Chinese, Japanese, Korean, Arabic). In a similar vein, Melby-Lervåg and Lervåg (2011) found a moderate to strong within L2 intercorrelation between decoding skills and oral language with reading comprehension ( $r = .54$  and  $r = .46$ , respectively). In their analysis an age range was 3;5-14;00, whereas detailed information about languages included was not reported. Instead, two language categories were created: (1) Indo-European L1 and L2; (2) non-Indo-European L1 and Indo-European L2. In a longitudinal large-scale study (L1 ( $n = 198$ ), L2 ( $n = 90$ ), age – 7;6) by Lervåg and Aukrust (2010) language comprehension (measured by vocabulary breadth and vocabulary definition tasks) was also found to be a significant predictor of growth in

reading comprehension in bilinguals whose L1 was Urdu and L2 – Dutch. Another longitudinal study by Droop and Verhoeven (2003) with three groups of participants (monolingual Dutch ( $n = 163$ ), bilingual Turkish-Dutch ( $n = 72$ ) and Moroccan-Dutch ( $n = 67$ )) reported somewhat different findings, acknowledging both decoding and oral skills to explain variations in reading comprehension. In a study by Babayiğit (2015), comparing predictive patterns of language skills between bilinguals ( $n = 81$ , different L1 (Somali, Urdu, Bengali and others), L2 (English)) and monolinguals ( $n = 102$ , English), oral proficiency was found to predict similarly reading comprehension in both groups, suggesting that vocabulary knowledge is equally important for reading comprehension in monolinguals and bilinguals. The same findings were reported in a recent study by Gunnerud et al. (2022) in Norwegian early bilinguals ( $n = 91$ ) with different L1 background (English, German, French, Kurdish, Dutch, Turkish, Arabic, Polish) indicating predictive patterns from language skills to reading comprehension are similar for monolinguals and bilinguals. This incongruency in research findings may be attributed to differences in reading comprehension and vocabulary assessment measures, sample differences (e.g. age of acquisition, socioeconomic status (henceforth SES), language exposure related factors, and study design (concurrent vs. longitudinal).

By and large, research findings convincingly prove that language skills in both languages interact, contributing to L2 reading success. Though some of them can be readily transferred from L1 to L2 (e.g. PA, RAN), other skills' transferability (e.g. WM, PWM) is quite ambiguous, whereas others have to undergo development in L2 (e.g. oral language skills) to enhance further L2 reading growth.

### **3.5. Moderator variables**

In previous sections, cognitive and linguistic skills impacting L2 reading development were discussed. Yet, research findings demonstrate that the development of L2 literacy is also sought to be influenced by a number of various internal and external factors. According to Genesee et al. (2006), these factors include (1) level of L1 and L2 proficiency, (2) an amount and quality of L1 input at home, (3) socioeconomic status (SES), (4) generational status (e.g. first- or second-generation immigrant), (5) instruction received (6) personality (e.g. motivation).

Contribution of language proficiency level to second language reading draws on Cummins' threshold hypothesis, discussed earlier. Lee and Schallert (1997) provided support for the hypothesis in a large-scale study with Korean-English bilinguals with different L2 proficiency level, establishing that L2 reading progress can be drawn on L1 reading abilities, given that some level of L2 language proficiency per se is established. Research on Chinese-English bilinguals has demonstrated that L2 language proficiency accounts for 27%-39% of variance in L2 reading comprehension (Jiang 2011).

SES is known as a factor that elevates risks for early reading difficulties. Differences in SES are linked to different access to sources supporting reading development (see Sirin 2005 for a review). Kieffer (2010) reported that students with lower SES were significantly higher at risk for developing L2 reading difficulties than those with higher SES.

Motivation is also an important factor and a multifaceted construct extensively researched in the context of L2 reading. In brief, depending on the source, motivation can be intrinsic (e.g. curiosity, self-efficacy, intrinsic value of reading) and extrinsic (e.g. recognition from others, higher institution entrance-exam related factors). Thus, relationships between intrinsic (e.g. Dhanapala 2006; Takase 2007) and extrinsic (e.g. Lin et al. 2012) motivation was found to have a moderator effect on L2 reading. In addition, attitudes related to L2 in the community has a strong influence on learning as a language of a low-status community is unlikely to be successfully mastered by learners (Dörnyei and Skehan 2008). Therefore, L2 reading is affected by more varied factors than L1 reading acquisition, some of which are challenging to measure in consistent way across bilingual populations (e.g. quality of L1 input at home, instruction received at school).

### **3.6. The Simple View of Reading in L2: Empirical evidence**

The SVR was described in Chapter 1 as initially most studies applied this framework in the monolingual context. However, studies in bilingual populations have validated its relevance as well. Although their number is relatively scant compared to studies in monolinguals, they provided support for the SVR validity in the bilingual context. As

this work relates to cognitive predictors in monolinguals and bilinguals, an overview of empirical findings in the bilingual context will be presented below. Four studies exploring contribution of decoding and oral language comprehension skills to L2 reading comprehension in bilingual children, will be discussed here. Their choice was justified by the fact that they adapted different study designs, addressed to some extent distinct research questions, included different bilingual samples (e.g. age/grade level, L1-L2 language pairs), two of them compared directly bilinguals and monolinguals.

Verhoeven and van Leeuwe (2012) tested the validity of the SVR in a large-scale longitudinal study comparing Dutch monolinguals ( $n = 1293$ ) and L2 learners of Dutch ( $n = 394$ ) with different L1 background (two thirds were Turkish and Moroccan), in the primary grades. Participants were followed from the first through sixth grade, comprising three groups: the early grades (i.e. grade 1 and 2), the intermediate grades (i.e. 3 and 4), and the upper grades (i.e. grade 5 and 6). Word decoding speed and listening comprehension were collected in 1, 3, and 5 grades, whereas reading comprehension skills were assessed half-way through in grades 2, 4, and 6. The assessment was conducted in L2 Dutch. In reading development studies, the longitudinal design is crucial as research findings in monolinguals and bilinguals have revealed a developmental shift of decoding and oral comprehension skills role in reading comprehension growth. While decoding skills' contribution to reading comprehension decreases over time, oral language skills tend to increase its predictive power.

A few valuable findings can be drawn from this study. First, at the initial stage of reading development L2 learners lagged behind their monolingual peers in all skills. However, over time decoding skills differences disappeared, whereas gaps in listening and reading comprehension remained significant (albeit smaller) even in the upper grades. Second, in both groups variance of reading comprehension of L1 and L2 learners could be explained by decoding and oral language skills (61% of variance in the early grades, 70% - in the intermediate and upper grades). Their findings showed that starting from the intermediate grades, decoding role fades while listening comprehension becomes more important. Third, their results provided strong support for the SVR validity in L1 and L2. In both groups reading comprehension was dependent on decoding and oral language skills. However, one difference was identified – reciprocity of listening and reading comprehension relationship was found stronger in higher grades in bilinguals than in monolinguals. It is suggested that reading



comprehension in bilinguals is more constrained by oral language proficiency than in monolinguals.

A recent longitudinal study by Papastefanou et al. (2021) in early Greek-English bilinguals compared bilinguals and monolinguals' performance on language and literacy tasks, and effects of heritage (L1 Greek) and instruction language (L2 English) exposure on literacy development in L1 and L2. The study followed 40 bilingual and 40 monolingual children for over one year. There was a one-year gap between the assessment of decoding and oral comprehension skills and the assessment of reading comprehension. A few conclusions on bilingual reading development can be drawn from this study. First, findings revealed superior decoding skills in bilinguals L2 (English) compared to English-speaking monolinguals. The authors suggested two possible reasons accounting for it: (1) literacy acquisition in a transparent L1 (Greek) might boost decoding skills in an opaque L2 (English), or (2) an exposure to another language itself (irrespective of orthographic consistency) could be a potential explanation. Yet, they did not find such an effect in oral comprehension skills or reading comprehension, where bilinguals lagged behind their monolingual peers. The *second* finding directly answers the question of the SVR validity for L2: both oral language comprehension and decoding skills contributed to reading comprehension in monolingual and bilingual groups, with a relatively stronger effect of oral skills in the bilingual group. Third, use and exposure to the heritage language (Greek) contributed to L1 reading comprehension, whereas such an effect was not observed for L2. Yet, authors elicited that there was no negative effect of exposure to Greek (L1) on L2 reading and oral comprehension.

Bonifacci and Tobia (2017) conducted a cross-sectional study with a group of bilingual children ( $n = 260$ , grades 1-5) with different L1 background and Italian as L2. They investigated the role of reading speed, reading accuracy, and listening comprehension in predicting reading comprehension development. An interesting aspect of this study is that decoding skills were measured separately for accuracy and for speed, arguing that in a transparent orthography (when phoneme-grapheme mapping is consistent), decoding accuracy may, in fact, play a more significant role than reading speed. Participants were assigned to two groups (1) the first stage (1-2 grades) and the second stage (3-5 grade). Their findings demonstrated listening comprehension to be the strongest predictor in both groups. Reading accuracy made a smaller but significant contribution to reading comprehension only in the first group of younger learners. Even

though reading fluency is related to reading accuracy, it was not found as a significant predictor in both groups. Their findings suggest including reading accuracy as a distinct predictor to the SVR model, namely in the transparent orthographies. Their argument is that since reading is oriented to comprehension, fluency is less important than accuracy in this case. In addition, accuracy is determined by lexical access and vocabulary, therefore decoding accuracy and vocabulary plausibly are more important factors of reading comprehension in early bilinguals.

A large-scale study by Edele and Stanat (2016) included Russian-German ( $n = 502$ ) and Turkish-German ( $n = 662$ ) bilingual ninth graders. Decoding and listening comprehension skills were measured in both languages. Along with the SVR validation in bilinguals, this study aimed at testing the assumption of cross-language transfer of skills from L1 to L2, and the notion of this transfer to occur at higher level of L1 proficiency. Their findings indicated a strong predictive contribution of L1 listening comprehension on L2 reading comprehension, even after controlling for L2 receptive vocabulary, reading fluency and contextual factors (e.g. family background, home language use, attended school track). Thus, there was a strong support for cross-linguistic transfer of L1 linguistic skills to L2 reading. However, the effect was different in two groups. In the Turkish bilingual group, only higher-level listening comprehension skills were related to L2 comprehension. Authors suggested that in more typologically distant languages (Turkish is more typologically distant from German than Russian), transfer can occur only for more advanced language-independent skills (e.g. when meta-cognitive strategies, higher-order semantic knowledge can be used). However, in languages with a higher degree of similarities the transfer can occur at lower levels of L1 listening comprehension. In addition, they claim that oral language skills in L1 are sufficient for the transfer to occur as not all bilinguals are necessarily biliterate (i.e. read and write in both languages). The study found support for earlier discussed theoretical accounts of reading: the SVR (Gough and Tunmer 1990) and the threshold and interdependence hypotheses (Cummins 1976, 1979).

The above-mentioned studies have provided a strong support for the SVR legitimacy in the bilingual context. Some general conclusions can be drawn. First, both components of the SVR (decoding and oral language comprehension) contribute (albeit to different extent) to L2 reading comprehension development in bilinguals. While decoding skills (speed and/or accuracy) may be more prominent at the very initial

stages of reading acquisition, oral language skills tend to play more dominant role at later stages (e.g. 3-4 grades in Verhoeven and van Leeuwe (2012)). However, this pattern can vary depending on the L2 orthographic consistency with longer development of decoding skills in more opaque orthographies than in relatively shallow ones (see Florit and Cain 2011 for a review). Second, biliteracy has a positive effect on decoding skills development, while this effect was not found in oral language and reading comprehension skills (at the early stages). It might be the case that enhancement of those skills occurs at later stages. In addition, it can be greatly influenced by typological similarities between languages. Third, cross-linguistic transfer of the SVR components from L1 to L2 or vice versa can be observed not only for lower-level (i.e. decoding) but also for higher-level (i.e., reading comprehension) skills. This indicates that more complex, integrated processes have a potential for transfer to occur once significant level of proficiency in L1 and L2 is achieved.

### **3.7. Summary**

Over the last few decades, research in L2 reading development has made great advances. Learning to read in L2 in many aspects follows patterns of monolingual reading development. One of the most demanding skills - reading comprehension - relies on two distinct competences: decoding and oral comprehension skills. In bilingual contexts, these relationships are more complex as dual-language interaction is involved.

Numerous factors can affect L2 reading as there is a greater diversity of linguistic experiences encountered by bilinguals relative to monolinguals. Broadly speaking, cognitive (e.g. working memory), cross-language (e.g. orthographic transparency), individual (e.g. motivation) as well as contextual and environmental differences (e.g. L1 exposure, parental level of education) can mediate reading development in bilinguals. Considering the multifaceted nature of bilingual reading, research has explored some aspects of the process in greater depth (e.g. cognitive skills), whereas other aspects have attracted less attention (e.g. language exposure).

For transfer to occur in some more complex competences (e.g. reading comprehension), there should be a certain level of L2 proficiency achieved. Whereas

other early cognitive-linguistic skills (e.g. phonological awareness, rapid automatized naming) seem not to depend on the level of proficiency as they are considered to be language-independent. Once acquired in L1, they are ready to be used in L2, irrespective of structural similarity between the two languages. Yet, other aspects of linguistic knowledge are specific to the language system (e.g. morphological awareness, orthographic processing). Transfer of these skills is dependent on typological similarity between languages.

## **Chapter 4: Reading acquisition: The impact of orthography**

### **4.1. Introduction**

The mapping of linguistic units onto visual symbols varies across languages, and this variability can impact the learnability of a particular written language, making it either easier or more challenging to master. This chapter explores this issue.

The present chapter starts with a linguistic analysis of the key structural parameters that set orthographies apart, namely: orthographic consistency, regularity, transparency, depth, and grain size. This is followed by a discussion of the Orthographic Depth Hypothesis (henceforth ODH) and the Psycholinguistic Grain Size Theory (henceforth PGST) – two influential theoretical accounts of how those crosslinguistic differences in orthographies affect reading strategies and rates of reading development. Then, crosslinguistic differences in the *spoken* language, namely phonology, syllabic and morphological complexity of languages, are discussed as well as their impact on reading acquisition. Finally, an overview of studies exploring development of decoding and reading comprehension in transparent orthographies is provided.

### **4.2. Alphabetic orthographies**

#### **4.2.1. Orthographic characteristics of languages**

While acquiring reading can be easier and faster in some languages, in others it takes longer. Over the past decades, much progress has been achieved in understanding reading processes. Theoretical accounts such as the orthographic depth hypothesis and the grain size theory attempted to account for differences in reading strategies used by readers in different orthographies. Both claim that the complexity of a given orthography affects reading processes, namely the rate of reading acquisition and reading strategies used by learners.

A written language is a coded sound system of a spoken language. Writing systems use different linguistic units (syllables, phonemes, morphemes, semantic units as in Chinese) to be represented by visual (or, in exceptional cases, tactile) symbols called graphemes. In alphabetic orthographies a grapheme represents a phoneme. This representation is achieved through a set of rules known as correspondence rules, which establish a connection between specific phonemes and their corresponding graphemes. Yet, the degree of systematicity of mapping between the units of language and their graphemic representations varies across languages.

Alphabetic orthographies differ with respect to the consistency of grapheme-phoneme mapping, regularity, transparency, which constitute the notion of orthographic depth (Katz and Frost 1992). These essential orthographic parameters are addressed below.

Orthographic transparency refers to sound-symbol mappings. In languages with a transparent mapping system surface phonology is presented in spelling with a high level of consistency. In a fully transparent system, each phoneme is always represented by one grapheme, irrespectively of its position in a word (e.g. see Borleff et al. 2019 for a review; Ziegler et al. 2010). Orthographies vary greatly with respect to their transparency. If the pronunciation of the word can be figured from its spelling by applying most typical grapheme-phoneme correspondences, or by letter sounds, this word can be considered transparent. For example, Polish words *sen*, *woda* can be considered as transparent. Languages with a transparent grapheme-phoneme mapping are called transparent. Languages where this correspondence is ambiguous are called opaque (Frost 2012; Seymour et al. 2003). English is considered to be the least transparent language among Indo-European languages (Seymour et al. 2003). A given letter might have multiple pronunciations, like <o> in *on*, *hope*, *work*, *woman*, *root*.

The same sound can be spelled in multiple ways (e.g. /k/ in *cat*, *kid*, *back*, *mosque*). Some letters do not have corresponding sounds in a word (e.g. <h> in *hour*).

Regularity implies a systematic repetition of a set of particular rules (in this case grapheme-phoneme mapping). Such rules allow to predict a spelling or pronunciation of a new word. In most cases, words follow general rules and called regular. However, irregular cases also occur (e.g. *blood* or *flood* in English). Some rules are position-dependent (e.g. three different pronunciation for the letter <y>: in the initial position as *yoga*, in the middle position as *gym*, the final position as in *cry*) and context-sensitive (e.g. pronunciation depends on the neighbouring letter) (Coltheart et al. 1993). In addition, in most alphabetic orthographies rules are heavily based on morphology, which does not fully represent their surface phonological realisation (e.g. *open* – *opened* (inflectional morphemes), *heal* – *health* (lexical ones)).

While the concepts of transparency and regularity apply primarily to describe individual grapheme-phoneme correspondences beyond the context and position-related effects, orthographic consistency deals with these correspondences in a specific *grapheme environment* (certain preceding and following neighbouring letters, position within a letter string). What is more, orthographic consistency can be applied not only to individual phoneme-grapheme correspondences but also to bigger sublexical units (e.g. onsets, codas, rimes, etc.) If a grapheme or a string of graphemes is pronounced the same in a given position (e.g. word finally), then it is consistent. For instance, the letter sequence <ght> is always pronounced as /t/ when occurs word finally (non-transparent mapping but consistent).

The orthographic consistency manifests itself in a feedforward (grapheme-to-phoneme) fashion for reading and in a backward (phoneme-to-grapheme) fashion for spelling (Lété et al. 2008). These mappings are not always reversible. Generally, orthographies show higher degree of transparency, regularity and consistency for reading than for spelling. Some orthographic systems are regarded as symmetrical (e.g. English – irregular in both directions, Finnish – regular in both directions) and asymmetrical (e.g. German – relatively regular from the reading point of view and less regular for spelling) (see Borleffs et al. 2019 for a review). Moreover, consistency may vary with the size of the unit. In some languages smaller units' consistency might be low (e.g. as in English for a phoneme size), while for bigger units (as for rimes) it is significantly higher.

All orthographic characteristics presented above (transparency, regularity, consistency) constitute the concept called orthographic depth. The notion of orthographic depth refers to reliability of print-to-speech correspondences. Since Katz and Frost (1992), orthographic depth has been studied widely as one of the sources of cross-linguistic variability in reading. The relationship between orthography and phonology can be seen as a continuum. It means that a given orthography can be categorised along a single scale with shallow orthographies (purely phonological) at the one end (e.g. Italian, Greek) and deep orthographies (e.g. English, Dutch), reflecting mostly morphological principle in spelling, where phonology can be derived indirectly, at the other end (e.g. Frost et al. 1987; Seymour et al. 2003). Orthographic depth is relevant for reading development as acquisition of different reading skills is closely related to the characteristics of the orthography. Moreover, different learning strategies of reading are adopted by novice readers with respect to the complexity of grapheme-phoneme correspondence.

Granularity of orthographic representations should also be considered when talking about reading acquisition strategies across different orthographies. A grain size refers to a size of a sublexical unit of a word. Depending on the size, sublexical units can be categorized into small (phonemes) and large units (e.g. onsets, rimes, syllables). Orthographic inconsistency does not affect all psycholinguistic units to a similar extent (Ziegler and Goswami 2005). In opaque orthographies larger grain sizes demonstrate more consistent mapping onto orthography than smaller ones. Whereas in shallow orthographies there is a relatively consistent mapping of grapheme-phoneme correspondence of small grain sizes.

Considering the above-mentioned orthographic characteristics, two theoretical accounts – the ODH (for skilled reading) and the PGST (for reading acquisition) – attempted to explain variability in reading across languages.

#### **4.2.2. Theoretical accounts of crosslinguistic differences in reading acquisition**

The ODH introduced by Katz and Frost (1992), posits that the degree of grapheme-phoneme mapping consistency affects reading. In other words, reading process is adjusted to the orthography being learnt. In transparent orthographies (with regular



grapheme-phoneme correspondences) a single word reading relies on sublexical phonological processing, while in opaque orthographies (multiple grapheme-phoneme correspondences) readers are encouraged to process words via orthographic processing. Katz and Frost (1992) list three concepts underlying orthographic depth: in an opaque orthography the grapheme-to-phoneme correspondences are complex, inconsistent, and incomplete. Complexity refers to the presence of complex multiletter rules (e.g. <ch>, <th>), which are shown to slow down reading aloud words and nonwords (Rastle and Coltheart 1998). When a grapheme-phoneme correspondence is inconsistent, it is difficult to predict its pronunciation only by sublexical information. Then, orthographic lexicon should be checked. For example, a letter string <ough>, which can be pronounced in several different ways in English (e.g. *tough*, *though*, *through*). The third concept – incompleteness of the sublexical correspondences – refers to words, whose orthographic representation is not sufficient to derive its pronunciation without a sentence context. Heterophonic homographs (e.g. the word *wind* in English) can be an example. Two different pronunciations link to different meaning (/wind/ – a movement of air, /wand/ - to move in a twisting course). As Szmaltz et al. (2015) suggest the three components (complexity, inconsistency, incompleteness) listed above may affect reading processes in different ways. Namely, complexity may lead to a quantitative change by impeding the sublexical route relative to the lexical one. Inconsistency and incompleteness may strengthen reliance on lexical strategies.

Further research built on ODH suggesting that both routes (phonological/sub-lexical and orthographic/lexical) are used by readers in all orthographies, both shallow and opaque (Share 2008). In all orthographies a reader uses lexical route for familiar words (and irregular words in English) to access them faster, the sub-lexical route serves for decoding new words that have not been stored in the mental lexicon. A novice reader in alphabetical orthographies needs to learn to associate letters with sounds to access a whole-word phonological representation. As this basic skill is mastered, a reader builds lexical representations of connections between phonological (oral form) and orthographic representations (visual form) of the words. Once this connection is established and becomes automatized, a reader uses a direct-retrieval mechanism via lexical route (see Borleffs et al. 2019 for a review; Grainger and Ziegler 2011; Ziegler et al. 2010). In shallow orthographies automatization of the word retrieval process is built faster as there are less combinations between grapheme-

phoneme to memorize. Such cross-orthographic differences are thought to lead to difference of the rate of reading acquisition.

In a seminal work Seymour et al. (2003) evaluated an impact of orthographic complexity on reading development in 13 European orthographies. Their findings confirmed that differences at the rate of development of foundational reading skills (word reading accuracy and fluency) differed depending on the orthographic consistency of the languages. Thus, in shallow orthographies (e.g. Finnish, Greek, Italian, Spanish) children achieve higher level of word reading accuracy and fluency by the end of the first grade, whereas in deep orthographies (e.g. English, French, Danish) these skills are developed over longer period of time (almost twice longer). These findings are in line with other studies in monolingual reading in transparent orthographies, where accuracy scores for word and pseudoword decoding towards the end of the first grade reached almost a ceiling effect. For example, Cossu et al. (1995) showed that word reading accuracy rate reached 94% and 82% for pseudowords decoding for Italian novice readers. In contrast, Seymour et al. (2003) reported that English-speaking children from Scotland performed rather poorly on word (34%) pseudoword (29%) reading accuracy tasks.

The PGST proposed by Ziegler and Goswami (2005) highlights the role of complex grapheme-phoneme correspondences in driving cross-linguistic differences. In more transparent orthographies novice readers rely on a grapheme-phoneme decoding strategy as smaller grain sizes are highly consistent. In opaque orthographies correspondences between small units are less consistent, therefore children may adapt reading strategies by relying on bigger units (i.e. rhymes) while learning to read. The reduced reliability of small grain sizes in opaque orthographies makes children develop decoding reading strategies at more than one level. To develop complete (fully specific) orthographic representations of words in opaque orthographies, all possible grain sizes in phonology and orthography should be mastered (see Borleffs et al. 2019 for a review). Hence, developing multiple strategies will inevitably take longer than the development of a single strategy. This might explain cross linguistic differences at the rate of reading acquisition.

The PGST was supported by empirical findings. In English, for example, young children tend to use orthographic chunks corresponding to rhymes (as they are more consistent) to read new words (e.g. using *ball* as a basis to read *small*). To investigate

whether this strategy is specific to opaque orthographies or applies in shallow orthographies as well, Goswami et al. (1997) assessed nonword reading in English and Greek children (ages 7–9). Two types of nonwords were given: those based on real words (rhymes; e.g. *ticket–bicket*) and those with unfamiliar orthographic patterns but similar phonological representation (*bikket*). While Greek children achieved close to ceiling results on both tasks, English children were better at nonwords with rhyme analogies. Indeed, English-speaking novice readers make more progress in word and sight-word reading while focusing on larger units such as rimes as part of their instruction (Kyle et al. 2013).

Researchers have also addressed a question whether orthographic depth might alter the degree to which cognitive mechanisms contribute to reading acquisition. Findings are somewhat mixed. Some empirical evidence from concurrent studies suggests that phonological awareness appears to be a stronger predictor of reading in deep orthographies (e.g. Landerl et al. 2013; Vaessen et al. 2010), RAN seems to be more predictive of reading success in shallow languages (e.g. Fricke et al. 2015; Moll et al. 2014; Powell and Atkinson 2021). While in some longitudinal studies (e.g. Caravolas et al. 2012, 2013, 2019) no differences were found between cognitive mechanisms underlying reading across languages with different orthographic transparency (in English, Czech and Spanish). It was the rate of reading development that varied across languages (slower in English). An overview of empirical evidence of reading predictors across languages is presented in the section 4.4 of this chapter.

Overall, both the ODH and the PGST provide clear theoretical accounts of how the degree of orthographic consistency may enhance (in shallow orthographies) and impede (in opaque orthographies) the rate of reading development. Moreover, depending on the complexity of grapheme-phoneme correspondences novice learners use different reading strategies by mastering different grain units in a descending order of its complexity. These findings are of great importance for researchers and educators as it provides useful insights into why reading skills develop at different rates as well as what reading instruction methods to apply.

#### 4.2.3. Syllabic and morphological complexity

Syllables have been claimed to play a great role in visual word recognition as via lexical route words are processed by syllables as a sub-lexical unit rather than a whole word (Prinzmetal et al. 1986). Along with orthographic consistency, syllabic complexity plays an important role in the rate of reading growth. Definitions of syllabic complexity vary in the literature. In a narrow context, syllabic complexity has been defined as the number of phonemes per syllables (see Borleffs et al. 2017 for a review). More elaborated definition was given by Adsett and Marchand (2010), who described it as a measure of determining syllable boundaries in words of specific languages. In other words, the more difficult it is to determine the boundaries, the more complex syllabic structure is. In the previously discussed study by Seymour et al. (2003), syllabic complexity was suggested as a factor affecting reading. In addition to orthographic depth, in their study syllabic complexity was found to influence pseudoword decoding. Seymour et al. (2003) proposed to classify syllabic complexity between two groups of languages included in their study (1) Germanic (e.g. German, English and Danish) and (2) Romance (e.g. Italian, Spanish, French) languages. Germanic languages predominantly included closed CVC syllables, whereas Romance languages open CV syllables, which are easier to process. Fewer decoding errors were found in languages with less complex syllable structures. Therefore, they suggested that syllabic complexity can explain some variability in reading attainment in different orthographies.

Furthermore, depending on the rhythmic properties, the world's languages can be classified into three rhythm groups: stress-timed, syllable-timed and mora-timed languages (Ramus et al. 1999). Stress-timed languages have roughly equal foot (a rhythm unit of a word consisting of one or two syllables) as in English, Dutch, Russian. In such languages the stressed syllable is given more duration, which, in turn, leads to vowel reduction in unstressed syllables (as in /bə'na:nə/, vowel <a> is pronounced as schwa /ə/ sound in an unstressed syllable). Generally, languages using stress-timed rhythm tend to have different in length, more complex syllable structures. In syllable-timed languages, all syllables in a word take about the same amount of time to pronounce. The languages using syllable-timed rhythm have less complex syllable structure (mostly CV combinations, such as in French, Italian, Catalan) (Nespor et al.

2011). Some researchers also proposed the third type called mora-timed languages. A mora is a time unit, which is represented best in Japanese and is similar to some extent to a syllable (Liu and Kaye 2021). Considering the above mentioned, syllabic structure and rhythmic properties of a given language are those linguistic characteristics that are also claimed to moderate reading acquisition. While reading in syllable-timed languages with predominantly CV syllable structure might facilitate development of decoding skills, it may be slower in some stress-timed languages (with more complex syllable structures CVC, CVCC) (Nespor et al. 2011). Yet, these potential moderators should be considered within the orthographic depth concept. For example, some languages might be time-stressed with complex syllable structures (Russian) but also with relatively transparent orthography (at least in a feedforward direction), which allows children to achieve an adequate level of decoding accuracy relatively quickly.

It is of note, syllabic complexity of the language is also believed to affect phonological awareness in children (Duncan et al. 2006). In their study, phonological awareness in young French-speaking and English-speaking children was compared before formal reading instructions began. Children who spoke French (a language with a relatively simple syllable structure) outperformed their English-speaking counterparts (a language with a more complex syllable structure). As reviewed in Chapter 2, phonological awareness skills' relevance in reading acquisition is undisputable for decoding skills. Therefore, presented above findings suggest that syllable complexity is a factor to consider in the development of early literacy acquisition.

Another factor thought to impact the reading development is morphological structure of a language. Morphemes are smallest meaning-bearing units. Thus, meaning of more complex words can be inferred from word's morphological constituents (Koda 2007). Morphological awareness has been found to be considerably correlated with word reading (e.g. De Freitas et al. 2018) and reading comprehension (e.g. James et al. 2021). Though this skill is developed later (starting at around the second grade) than other skills (e.g. phonological awareness), its role increases throughout the development of reading (Carlisle 2000; Mahony et al. 2000; Nagy et al. 2013).

Languages vary in a degree of morphological complexity, which can be seen as a range of morphological forms in a language. At a word level, morphemes can be divided into two categories – inflectional and derivational. Inflectional morphemes are suffixes added to a word to assign a particular grammatical property, such as tense,

number, possession, and comparison. Some of them might denote several grammatical features. For example, in English an inflectional morpheme {-s} can signify a plural form of a noun (e.g. a *boy* – *boys*), can indicate a grammatical form of the third-person singular tense (e.g. *I speak* – *he speaks*), and can mark the possession (in conjunction with an apostrophe as in *boys' toys*). Derivational morphemes are bound morphemes (prefixes and suffixes) added to a word that change the grammatical category of a word (e.g. *beauty* – *beautiful*). To simplify, they create new word forms. Depending on linguistic properties, some languages have richer inflectional morphology (e.g. Slavic languages) than others (e.g. English). In language systems with a more developed inflectional morphology, morphological inventories are more robust (e.g. there are numbers and cases on nouns, suffixes that denote past, present and future tenses, affixes for adjectives). For instance, a rich inflectional morphology inventory in Slavic languages (e.g. Polish, Ukrainian, Russian) include seven cases, different types of verb conjugations that reflect gender and number. Their nouns, adjectives, and numerals are marked for gender, number, and case. In addition, the length of the morphemes as well as their number added to one stem of the word contributes to morphological complexity of such languages. The Finnish orthography can be an interesting example of a highly transparent orthography with a complicated morphology (words are mostly polysyllabic and tend to be long). Hence, languages may be transparent in its grapheme-phoneme mapping (which facilitates reading acquisition), but quite complex in their morphological structure. Contrary, in opaque orthographies (e.g. English, French), the morphological structure of words may serve like an anchor to the reader. As discussed earlier (section 4.2.2), orthographies in these languages are not only governed by phonology but also by morphology. Readers might use morphological cues to learn to read new words (e.g. in English the prefix {un-} is always pronounced as /ʌn/ like in *happy* – *unhappy*). Moreover, in Ehri's (2005) stage model of reading, it is suggested that more proficient readers read multisyllabic words via chunking, reducing the demand on working memory (Nagy et al. 2013). For example, the word *uselessness* can be read in three chunks via morphemes {use}+{less}+{ness}. Indeed, for long and morphologically complex words a letter-by-letter decoding would be inefficient. Therefore, morphological knowledge might enhance reading acquisition in all languages. Yet, its role may vary depending on the orthographic properties of languages.

Overall, development of decoding skills may be affected by orthographic, syllabic and morphological complexity of the language. Specific properties of different languages affect the strategies readers apply as well as language units they first acquire (e.g. phonemes – in more transparent, rimes – in opaque). In turn, that leads to different rates at which literacy skills are acquired across languages.

#### **4.3. The impact of orthography and spoken language structure on reading acquisition: Empirical evidence**

In this section, research literature review of studies exploring the moderating role of orthographic consistency on the development of decoding and reading comprehension is provided. Specifically, the focus is on studies that investigated reading development in transparent orthographies across alphabetic languages as it is of relevance for the current thesis.

It is suggested that orthographic consistency might alter the role of decoding and oral language skills on reading comprehension development (Ziegler and Goswami 2005). Considering consistent grapheme-phoneme mapping, decoding is acquired more quickly in transparent orthographies than in opaque (e.g. Caravolas et al. 2013; Georgiou et al. 2008; Tobia and Bonifacci 2015). In such orthographies, children achieve high reading accuracy rate quite quickly after the formal instruction is introduced. Therefore, its role in predicting reading comprehension might diminish with time. In fact, research evidence shows it might be time-restricted up till the end of the first grade (e.g. Lepola et al. 2016; Tobia and Bonifacci 2015). As to oral language skills, they were found to predict reading comprehension effectively both at the onset of reading acquisition as well as later in transparent orthographies (Caravolas et al. 2019). It has been claimed that decoding role in explaining variability in reading comprehension is stronger and lasts longer in opaque languages rather than in transparent ones (at least at the initial stage of reading development) (Furnes and Samuelsson 2009; see Florit and Cain 2011 for a review).

Over the last two decades, there has been a significant increase in cross-linguistic studies investigating predictive patterns of cognitive precursors underpinning literacy development concurrently and longitudinally. However, differences in study

designs, measures of construct and participants characteristics result in some inconsistencies across studies. It has been suggested that the way how skills are measured may determine the difference of predictive strength of both constructs across studies (Caravolas et al. 2019). Decoding can be assessed in different ways (e.g. word reading vs. pseudoword decoding in timed and/or untimed manner). In transparent orthographies timed measures (fluency-based) might be more sensitive in predicting reading comprehension than untimed (accuracy-based), as accuracy measures achieve almost ceiling level in this group of languages. A study in the Italian language by Florit et al. (2022) revealed that listening comprehension (i.e. oral language skills) accounted for reading comprehension better than decoding skills. However, they measured accuracy and fluency separately in word and non-word reading tasks. It was found that when measured separately, decoding fluency correlated stronger with reading comprehension than accuracy measures, pointing out that fluency is a more relevant measure in transparent orthographies. However, findings of Roch and Levorato (2009) in Italian were to some extent similar to those in opaque orthographies: decoding was a better predictor of reading comprehension in the first grade than oral language skills. These mixed findings across studies Florit et al. (2022) explain by inclusion of different reading accuracy and fluency measures (e.g. latent vs. observed). Similarly, measures of oral language comprehension must be considered. In different studies this construct was measured in various ways (e.g. receptive and/or expressive vocabulary, morphosyntactic skills). Recent studies suggest using latent variables (a combination of different indicators) as a better measure of oral skills (e.g. Hulme et al. 2015; Lervåg et al. 2018). Finally, reading comprehension itself can be measured as multiple-choice and cloze tasks as well as open-ended or retelling tasks. Then, decoding might be a stronger indicator of reading comprehension, while language comprehension can play a more crucial role when inferential (open-ended) tasks are included as a measure of reading comprehension (Caravolas et al. 2019).

Bearing in mind early reading development, cognitive skills underlying development of decoding and oral comprehension should be considered. As discussed before, PA, letter-sound knowledge, RAN, WM and oral language skills have been found reliable correlates of learning to read in different languages (see Chapter 2). However, to what extent their predictive patterns are universal or language specific, research findings are mixed.



A number of crosslinguistic studies have explored reading development patterns in alphabetic orthographies with varying degree of consistency. Table 2 presents a summary of findings of crosslinguistic studies conducted over the last two decades. The main criteria for selecting studies were direct comparison (using directly comparable tests) of cognitive and literacy skills in two or more alphabetic orthographies over 2000-2022. Most of the selected studies investigated the relationship between early cognitive and literacy predictors with decoding skills (word reading and pseudoword/nonword decoding) concurrently and longitudinally. Only a few studies (from selected) analysed reading comprehension and its underpinning cognitive/literacy skills in their studies (Caravolas et al. 2005; Caravolas et al. 2019; Furnes and Samuelsson 2009). Broadly, research findings demonstrate two rather different viewpoints: some claim a universality of predictive patterns of cognitive skills across languages, others find the role of cognitive predictors to be language specific (Table 2). Findings of some empirical research support the claim of PA, RAN and letter knowledge being universal predictors of decoding skills across languages (Caravolas et al. 2012, 2013, 2019; Moll et al. 2014). According to their findings, cognitive predictors are similar across languages, both concurrently and longitudinally. It is the rate of literacy acquisition, that differs across languages (slower in opaque, faster in transparent). Others argues that cognitive predictors may have different predictive strength developmentally in explaining individual differences in reading skills. While RAN has proved to remain a robust predictor through grades in all orthographies, the predictive strength of PA diminishes in transparent orthographies (Furnes and Samuelsson 2009, 2011; Vaessen et al. 2010). Moreover, PA has been found to be more vital in less transparent orthographies, while RAN's role seem to be essential in more transparent ones (Ziegler et al. 2010). In a recent cross-linguistic study in five languages, RAN was identified as a universal predictor, while PA-reading relationship was transient and interactive across orthographies (Landerl et al. 2019). Other predictors (e.g. vocabulary, phonological/verbal working memory, IQ, grammatical and morphological skills) were also selectively assessed across studies, yet generalizability of those findings is challenging, considering their random inclusion in studies (Table 2).

Three crosslinguistic studies also explored the role of decoding and oral language skills in reading comprehension. Oral language skills (vocabulary), phonological awareness (PA and PWM) and decoding (reading speed) were found to be

similarly predictive of reading comprehension in two orthographies Czech (transparent) and English (opaque) (Caravolas et al. 2005). In a large-scale longitudinal study by Furnes and Samuelson (2009) with Swedish/Norwegian and English novice readers, reading comprehension was predicted by kindergarten decoding and spelling skills (oral language skills were not measured). A recent longitudinal study conducted by Caravolas et al. (2019) investigated reading in four languages (English, Spanish, Czech, and Slovak) with different degrees of orthographic depth. Their findings revealed some interesting insights. First, children's core foundations of decoding skills (PA, letter knowledge, RAN) and word reading (initial decoding skills might be acquired at this age) measured before the formal reading instructions were introduced predicted decoding variations at the end of the first year in all languages. In relatively transparent orthographies (Spanish, Czech and Slovak) oral language skills (vocabulary and morphosyntactic knowledge in orally administered tasks) predicted reading comprehension in the second year. That was not the case in English, where decoding still accounted more for reading comprehension variability. Both decoding and oral language skills were found to be moderately predictive of reading comprehension in transparent orthographies. However, within this group of languages there was a variation of the degree of predictive strength between two constructs. While in the Czech language decoding was an equally strong predictor along with oral skills, it was slightly weaker in Spanish and Slovak. Authors attributed this difference to random sampling effect. Overall, children in transparent orthographies demonstrated faster word and pseudoword reading rates that positively affected their reading comprehension skills. Thus, it can be inferred that in transparent orthographies while oral skills exerted stronger direct effect on reading comprehension, the role of decoding is still essential (albeit somewhat weaker). By and large, empirical findings presented above suggest that reading acquisition is influenced to some extent by the orthographic depth (at least in alphabetic orthographies). PA, RAN, and letter-sound knowledge have been identified common predictors of decoding skills. Yet, the unresolved debate in the literature remains as to whether their predictive patterns are similar across orthographies or different. In addition, it is widely acknowledged that the rate of reading acquisition is modulated by orthography: decoding skills are acquired faster in shallow languages, which, in turn, enhances the development of reading comprehension skills. However, as word reading often reaches a ceiling effect in such orthographies, oral language proficiency may capture better variability in reading comprehension.

Table 2. Summary of findings: Studies on reading development in transparent orthographies.

| № | Study                   | Languages                                         | Age group                          | Study design                                                | Scope                                                                                                                        | Main Findings                                                                                                                                                                              |
|---|-------------------------|---------------------------------------------------|------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Mann and Wimmer (2002)  | English: opaque<br>German: relatively transparent | Kindergarten<br>Grade 1<br>Grade 2 | Concurrent                                                  | Decoding skills:<br>word reading<br>pseudoword decoding<br>RAN<br>PA<br>LK<br>STM                                            | <i>Different patterns:</i><br><i>English:</i> PA - unique predictor in both grades; PA, RAN and STM<br><i>German:</i> PA decreased in grade 2, RAN – unique predictor                      |
| 2 | Patel et al. (2004)     | English: opaque<br>Dutch: relatively transparent  | Age (6;0-11;00)                    | Concurrent                                                  | Decoding skills:<br>word reading<br>nonword reading<br>PA<br>RAN<br>Vocabulary                                               | <i>Similar patterns:</i><br>PA - unique predictor, but not RAN                                                                                                                             |
| 3 | Caravolas et al. (2005) | English: opaque<br>Czech: relatively transparent  | Grade 2-7                          | Concurrent<br>Study 1: typical readers<br>Study 2: dyslexia | Word reading (speed)<br>Reading comprehension<br>Spelling<br>PA<br>Vocabulary<br>PWM<br>Processing speed<br>Raven's matrices | <i>Similar patterns in both studies:</i><br>Reading speed: PA and coding<br>Spelling: vocabulary, PA, reading speed.<br>Reading comprehension:<br>Raven, vocabulary, PA, and reading speed |
| 4 | Georgiou et al. (2008)  | English: opaque<br>Greek: transparent             | Grade 1 -2                         | Longitudinal                                                | Word reading<br>Nonword reading;<br>PA<br>RAN<br>PWM<br>Orthographic choice (OC)                                             | <i>Different patterns:</i><br>Nonword decoding:<br><i>English:</i> RAN, PA; <i>Greek:</i> nonword decoding at T1.<br>Word reading (fluency):<br><i>Greek:</i> RAN, PA; <i>English:</i> OC  |

| № | Study                                    | Languages                                                        | Age group                       | Study design | Scope                                                                                                                                                                                   | Main Findings                                                                                                                                                                                                                                                                                                          |
|---|------------------------------------------|------------------------------------------------------------------|---------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Furnes and Samuelsson (2009, 2010, 2011) | Swedish/Norwegian: relatively transparent<br><br>English: opaque | Kindergarten Grade 1            | Longitudinal | Decoding skills:<br>word reading<br>pseudoword decoding<br>Reading comprehension<br>Spelling<br>Phonological awareness<br>RAN<br>Verbal WM<br>Print knowledge<br>Grammar and morphology | (2009) <i>Similar patterns:</i><br><i>Decoding (concurrent):</i> PA and print knowledge;<br><i>spelling:</i> print knowledge in Scandinavian languages; PWM in English.<br><i>Decoding (longitudinal):</i> PA, print knowledge and RAN.<br><i>Reading comprehension:</i> decoding skills and spelling in kindergarten. |
|   |                                          |                                                                  | Kindergarten Grade 1<br>Grade 2 |              | Decoding skills:<br>word reading<br>nonword reading<br>Spelling<br>Phonological awareness<br>RAN, verbal WM,<br>Letter knowledge<br>Syntactic and semantic skills                       | (2010) <i>Similar patterns:</i> RAN and PA. PA role is time-restricted (by Grade 1). RAN strength increases across grades, a robust predictor of reading difficulties.                                                                                                                                                 |
|   |                                          |                                                                  |                                 |              | Decoding skills:<br>word reading<br>pseudoword decoding<br>Spelling<br>Phonological awareness<br>RAN<br>Vocabulary                                                                      | (2011) <i>Similar patterns:</i> PA and RAN<br>PA is a time-limited predictor in transparent orthographies (till 1 grade), but not in opaque languages.<br>RAN is a significant longitudinal predictor across languages;<br>PA is more important for predicting spelling in all orthographies.                          |

| № | Study                              | Languages                                                                                                                                               | Age group                  | Study design             | Scope                                                                                                    | Main Findings                                                                                                                                     |
|---|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Vaessen et al. (2010)              | Hungarian: transparent<br>Dutch: relatively transparent<br>Portuguese: relatively transparent                                                           | Grade 1-4                  | Concurrent               | Word reading (fluency)<br>PA<br>RAN<br>Letter knowledge<br>Verbal working memory                         | <i>Similar patterns:</i><br>PA<br>RAN<br>letter knowledge:                                                                                        |
| 7 | Ziegler et al. (2010)              | Finnish: transparent<br>Hungarian: transparent<br>Dutch: relatively transparent<br>Portuguese: relatively transparent<br>French: relatively transparent | Grade 2                    | Concurrent               | Decoding skills:<br>word reading<br>phonological decoding<br>PA<br>RAN<br>PSTM<br>Vocabulary<br>IQ       | <i>Different patterns:</i><br>PA: stronger role in less transparent orthographies, speed.<br>RAN: speed, vocabulary (only in Finnish)             |
| 8 | Caravolas et al. (2012 2013, 2019) | English, Spanish, Slovak, Czech                                                                                                                         | Kindergarten-1 grade       | Longitudinal (10 months) | Word reading<br>Picture-word matching<br>Word spelling<br>Letter knowledge<br>PA, RAN, verbal memory, IQ | <i>Similar patterns</i><br>Reading (unique predictors):<br>prior reading skills, PA, LK, RAN,<br><br>Spelling: prior spelling skills, PA, LK, RAN |
|   |                                    |                                                                                                                                                         | Kindergarten-Grade 2       | Longitudinal (28 months) | Picture-word matching<br>LK<br>PA, RAN                                                                   |                                                                                                                                                   |
|   |                                    |                                                                                                                                                         | Kindergarten – mid Grade 2 | Longitudinal             | Word reading (T1,T2)<br>Pseudoword reading (T2)<br>LK, PA, RAN, vocabulary,                              | <i>T2 similar patterns:</i><br>decoding efficiency (unique predictor),<br>RAN                                                                     |

|    |                       |                                                                                                               |           |              |                                                                                    |                                                                                                                                |
|----|-----------------------|---------------------------------------------------------------------------------------------------------------|-----------|--------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|    |                       |                                                                                                               |           |              | morphological knowledge,<br>syntactic knowledge<br>Reading comprehension (T3)      | <i>T3 similar patterns RC:</i><br>decoding skills T2 +language skills T1<br>decoding T2 (English)                              |
| 9  | Moll et al. (2014)    | English, French:<br>opaque German,<br>Hungarian:<br>relatively<br>transparent<br>Finnish: less<br>transparent | Grade 2-7 | Concurrent   | Word and nonword reading<br>(accuracy and fluency)<br>Spelling<br>RAN<br>PA<br>PWM | <i>Similar patterns:</i><br>PA (word accuracy)<br>RAN (word fluency)<br>RAN (spelling)                                         |
| 10 | Landerl et al. (2019) | English, French,<br>German, Dutch,<br>Greek                                                                   | Grade 1-2 | Longitudinal | Reading fluency<br>PA<br>RAN                                                       | <i>Different patterns:</i><br>RAN: unique predictor across languages<br>PA: patterns of interaction differ across<br>languages |

#### **4.4. Summary**

Reading development depends on many factors related to linguistic features of languages. Whilst consistent grapheme-phoneme mapping in transparent orthographies speeds up development of automatized decoding skills, in opaque orthographies this process takes longer (almost twice longer) to achieve similar level of automaticity. Depending on the orthographic consistency, novice learners apply different strategies in learning to read. Those acquiring reading in a transparent language start with the smallest units (phonemes). Thus, explicit teaching of phonemes at the early age is beneficial. Whereas such approach is less effective in more opaque languages, where bigger units (rimes) have to be a priority at the beginning of reading acquisition as they are more consistent with their visual forms. In addition to orthographic consistency, syllable and morphological complexity of languages are also thought to impact reading. Thus, in languages with simple CV syllable structures, reading is acquired easier, while CVC, CCVC, CVCC combinations are harder to process and potentially can impede the rate of reading development. Morphological complexity affects the length of the words (words tend to be longer as they consist of multiple morphemes). Not surprisingly, reading longer words is more challenging for the beginners. However, with growing reading proficiency and explicit morphological teaching, morphological awareness enhances word reading fluency and, in turn, reading comprehension.

Considering inconsistent findings within the group of transparent orthographies as to the contribution of decoding and oral language comprehension skills to reading comprehension development, studies which directly compare reading acquisition across several languages using fully equivalent measures are particularly informative. Such studies typically found that both decoding skills and oral language skills accounted for variance in reading comprehension at the later stage of acquisition. While oral language skills showed greater contribution to reading comprehension in more transparent languages (compared to less transparent ones) this difference was not large.

## **Chapter 5: Ukrainian, Russian and Polish: Linguistic comparison**

### **5.1. Introduction**

As reading development in Ukrainian-Polish bilinguals is a key focus of this work, the present chapter provides an overview of the major characteristics of these languages to highlight their similarities and differences.

The language situation in Ukraine has been a matter of debate for decades. Historically, Southern and Eastern Ukraine has been predominantly Russian speaking. Ukrainian immigrants in Poland who come from those regions tend to use Russian as the main language of communication in the family. Thus, Ukrainian immigrant children from those regions are predominantly Russian speaking. Presence of two languages within a migrant Ukrainian community is inevitable, which should be acknowledged. Thus, Russian is included in this chapter along with Ukrainian and Polish.

The three languages in this research belong to the Indo-European family. Russian and Ukrainian are Eastern Slavic languages using the Cyrillic script, while Polish is a Western Slavic language using the Latin script. Although these languages share some linguistic features, Russian and Ukrainian have more similarities in phonology, orthography, and morphology compared to Polish.

As the chapter aims to describe the main linguistic characteristics of the three languages, the first section discusses key features of the three Slavic languages, such as phonology, orthography and morphology. Then, an overview of empirical evidence on reading development in the three languages is presented.



## 5.2. Key features of the three languages

### 5.2.1. Polish

Polish is a West Slavic inflectional, consonantal language that uses a Latin alphabet of 32 letters (23 basic and 9 additional letters <ą, ę, ć, ń, ś, ź, ó, ż, ł>) to transcribe its 35 (Świdziński 1997) to 42 phonemes (see Pietras and Łockiewicz 2020 for a review). In addition, there are 13 digraphs (e.g. <sz, rz, dż, ch>) and one trigraph (<dzi>). All Polish letters names contain letter sounds. Considering vowels, letter names and sounds are identical (Szczerbiński 2003).

*Orthography.* The Polish orthography is considered to be relatively transparent in the grapheme-phoneme relationship for reading. In most words, letters can be read in only one way. 14 characters of the Polish alphabet are fully transparent (<a>, <ć>, <e>, <f>, <h>, <j>, <ł>, <ł>, <m>, <ń>, <o>, <ó>, <p>, <t>) (Awramiuk 2006). The remaining letters are less transparent as they may be pronounced in more than one way (e.g. <b> = /p/ or /b/). Yet, their pronunciation is always disambiguated by their position (initial or final: <b> *brat* /**brat**/ ‘brother’ or *chleb* /xl**ɛp**/ ‘bread’) as well as by context (preceding or following letter) (see Pietras and Łockiewicz 2020 for a review). A significant proportion of Polish words are considered “transparent” in a limited sense, meaning that their pronunciation can be determined by sounding out the individual letters or letter combinations. If feedforward correspondences are not fully transparent, there are still regularities that can be applied. They usually reflect the morphological principle, where the spelling of lexical roots, inflectional and derivational affixes remain constant, regardless of their surface phonological realization. Sometimes, different pronunciations may also reflect the historical principle, where loan words retain their original spelling, despite phonological changes in Polish.

With respect to spelling, the consistency of phoneme-grapheme mapping is less regular, which means some phonemes can be spelled in two ways. For example, phoneme /ż/ can be spelled as a single grapheme <ż> *żona* /ʐɔna/ ‘wife’ or a digraph <rz> *rzeka* /ʐɛka/ ‘river’. Another aspect of the Polish orthography which adds to inconsistency is its graphic presentation of soft sounds. Specifically, soft sounds, such

as palatal / $\widehat{t\epsilon}$ ,  $\epsilon$ ,  $\widehat{z}$ ,  $\widehat{d\epsilon}$ ,  $\widehat{j}$ / can be represented in several ways in writing. For instance, the phoneme / $\epsilon$ / appears in both *siano* / $\epsilon an\sigma$ / ‘hay’ and *świat* / $\epsilon fiat$ / ‘world’, but in different graphic forms (see Pietras and Łockiewicz 2020 for a review). Consonantal palatalization of letters <s, z, c, n> may be expressed by their diacritic forms <ś, ź, ć, ń> (e.g. *koń* / $k\sigma n$ / ‘horse’, *państwo* / $p\tilde{a}\tilde{n}\tilde{s}t\tilde{f}\sigma$ / ‘country’, *święto* / $\epsilon f\tilde{e}nt\sigma$ / ‘holiday’) or by plain graphemes directly preceding <i> (e.g. *siwy* / $\epsilon ivi$ / ‘grey’, *zimno* / $zimn\sigma$ / ‘cold’). Other Polish consonants can be palatalized only when they are directly followed by <i> (e.g. *lis* / $lis$ / ‘fox’, *wielki* / $v\epsilon lkji$ / ‘big, great’). Though the rules are quite complex, they are perfectly regular, which does not require rote memorization of words.

*Phonology.* Polish phonology is notable for the contrast between a relatively simple system of vowels and a more intricate system of consonants. While there are various accounts as to the vowel phonology of Polish, none of them posits more than eight distinct vowels: 6 oral vowels (/i, i,  $\epsilon$ , a,  $\sigma$ , u/) and 2 nasal vowels (/ĩ/ and /ẽ/). Some scholars argue that nasal vowels in Polish have a complex structure that can be analyzed as diphthongs (Wagner and Przedlacka 2012). Table 3 contains a list of vowel sounds in Polish, Ukrainian, and Russian. In Polish, 8 phonemes are used to represent 9 vowel letters. Two graphemes <ó, u> are represented one phoneme by /u/.

Table 3. Vowel sounds and letters in the three languages.

| Language  | Total N sounds | N vowels       | Phonemes                                                   | Letters                            |
|-----------|----------------|----------------|------------------------------------------------------------|------------------------------------|
| Polish    | 35 (42)        | 8              | /a/, /ĩ/, / $\epsilon$ /, /ẽ/, /i/, / $\sigma$ /, /u/, /i/ | a, ą, e, ę, i, o, ó, u, y (9)      |
| Ukrainian | 38             | 6              | /a/, /i/, / $\epsilon$ /, /i/, / $\sigma$ /, /u/           | a, e, e, и, i, i, o, y, ю, я (10)  |
| Russian   | 39             | 6 <sup>1</sup> | /a/, /i/, /i/, / $\epsilon$ /, /u/, /o/                    | a, э, и, ы, y, o, e, ё, ю, я, (10) |

Source: Ukrainian (Buk et al. 2008; Pompino-Marshall et al. 2017), Polish (Debski et al. 2022), Russian (Rakhlin et al. 2017)

Polish consonant inventory is large (Ian Maddieson 2013a) and comprises 32 consonant phonemes. Comparison of consonant phonemes in the three languages can be found in Appendix I. In the Polish language, the ratio of consonants to vowels is 3.5:1 (Szczerbiński 2001). The syllable structure of Polish can be described as relatively complex. Syllables in Polish can be classified as either open (ending in a vowel: CV *woda* / $v\sigma da$ / ‘water’) or closed (ending in a consonant: CVC *kot* / $k\sigma t$ / ‘cat’,

<sup>1</sup> Treatment of /i/ and /i/ as separate phonemes in Russian is not universally accepted (Rakhlin et al. 2017).

CCV *trzeci* /tʃɛtʃi/ ‘third’, CCCVC *skrzyp* /skʒɪp/ ‘space’, CCVC *szczotka* /ʃtʃɔtkə/ ‘brush’, and the first group is more frequent in the language (Bethin 2011).

Lexical stress in Polish falls on the penultimate syllable and is relatively fixed (e.g. *ka-’me-ra* ‘camera’, *’ma-larz* ‘painter’, *dra-’bi-na* ‘ladder’, with only a few predictable exceptions (e.g. *uni-’wer-sy-tet* ‘university’). Polish can be considered a syllable-stressed language as there is no vowel reduction in an unstressed syllable.

*Morphology.* The Polish language has a complex inflectional and derivational morphology. Inflectional suffixes often carry syntactic information. Nouns, pronouns, adjectives and numerals undergo declension which involves adding a suffix that indicates the case, number, and grammatical gender of a word. The rules for choosing of a declensional morpheme for a word depend on its lexical category (nouns, pronouns, etc.), gender, and phonological properties of its stem. The declension system is quite complex as it is demonstrated below.

Case

|              |                                   |                                     |
|--------------|-----------------------------------|-------------------------------------|
| Nominative   | <i>jedna wesoła dziewczynka</i>   | <i>dwie wesołe dziewczynki</i>      |
| Genitive     | <i>jednej wesołej dziewczynki</i> | <i>dwóch wesołych dziewczynek</i>   |
| Dative       | <i>jednej wesołej dziewczynce</i> | <i>dwóm wesołym dziewczynkom</i>    |
| Accusative   | <i>jedną wesołą dziewczynkę</i>   | <i>dwie wesołe dziewczynki</i>      |
| Instrumental | <i>jedną wesołą dziewczynką</i>   | <i>dwoma wesołymi dziewczynkami</i> |
| Locative     | <i>jednej wesołej dziewczynce</i> | <i>dwóch wesołych dziewczynkach</i> |
| Vocative     | <i>wesoła dziewczynko!</i>        | <i>wesołe dziewczynki!</i>          |
|              | ‘One happy girl’                  | ‘Two happy girls’                   |

Typically, when a word stem takes on an inflectional suffix, it may undergo some phonological changes. For example, *boli ząb* /’zɔmp/ ‘my tooth aches’ in nominative, but *nie ma zęba* /’zɛmba/ ‘there is no tooth’ in genitive.

In Polish, verbs are modified through conjugation. A verb can have multiple suffixes attached to it, indicating various grammatical information such as the number, person, gender, tense, and sometimes aspect of the sentence. Phonological changes may occur in the stems of inflected verbs, similar to how changes may occur in the stems of inflected nouns (*ona nies-ie* /ɔna ’nɛ.ɛɛ/ ‘she is carrying’ – *ona przy-nios-ła* /ɔna pʃɪ ’nɔswa/ ‘she brought’).

Due to its complex inflectional morphology, an entire sentence (or clause) in Polish can be expressed by a single word form, which is not possible in positional languages (e.g. as in English where the word order identifies the syntax). For instance, an English clause *I have been living* is presented by one Polish word *mieszkam*. Such tendency of Polish syntax to express meaning through inflectional word forms is reflected in the length of utterances, which tend to be longer compared to languages that rely more heavily on syntax to convey meaning.

New words can be formed by adding prefixes and suffixes to existing words, which may also lead to phonological changes. There are certain rules in Polish for deriving new verbs by adding prefixes like {*od-*, *do-*, *pod-*, *nad-*, *prze-*, *za*, *w-*}. These prefixes can indicate differences in aspect (e.g. perfective or imperfective verb). This process of word formation is common in Polish and other Slavic languages:

|               |                             |                              |
|---------------|-----------------------------|------------------------------|
| Perfective:   | <i>z-robić</i> ‘to do/make’ | <i>prze-czytać</i> ‘to read’ |
| Imperfective: | <i>robić</i> ‘to do/make’   | <i>czytać</i> ‘to read’      |

Another notable feature of the Polish language (as well as other Slavic languages) is the derivation of words through the process of forming diminutives and augmentatives, which is highly productive. It involves creating two or more diminutive forms of a noun, indicating different degrees of smallness (e.g. *mały*, *maleńki*, *malutki*, *maluteńki*, *malusieńki*, *malusi* ‘a small one’ (see Pietras and Łockiewicz 2020 for a review). Diminutives are not only used to indicate a difference in size, but they can also express emotional attitude or even convey a different meaning altogether.

The linguistic features of the Polish language may influence how children learn to read. In Polish, words have multiple forms that vary in appearance. Yet, its relatively transparent feedforward correspondence of graphemes-phonemes can moderate morphologically caused assimilations in words. In its turn, morphological and syntactic skills may also play a significant role in early decoding in Polish, as the ability to use morpho-syntactic context may be more important for recognizing inflectional suffixes than word stems.

### 5.2.2. Ukrainian

Ukrainian is an Eastern Slavic inflectional, consonantal language that uses a writing system based on the Cyrillic script, which has 33 letters used to represent 38 distinct sounds. Three letters <г> /g/, <ї> /ji/ and <є> /je/ are not used in other Cyrillic-based languages and are unique in the Ukrainian alphabet (Danylenko 2020). One letter <ь> (soft sign) does not represent any sounds but indicates the palatalization of a preceding consonant. The apostrophe <'> is not included in the alphabet, but it has an essential role in the orthography, similar to the hard sign <ь> in Russian. It is used between consonants and iotated vowels (<я>, <ю>, <є>, <ї>) to indicate their split pronunciation (Danylenko and Vakulenko 1995).

*Phonology.* Ukrainian is characterized by a relatively high number of consonant sounds, compared to its vowel sounds (Buk et al. 2008). Consonants play a crucial role in the pronunciation, morphology, and orthography of Ukrainian. The phonological system consists of 6 vowels /i, ɪ, ɛ, a, ɔ, u/ and 32 consonants (Table 3), some of which have different pronunciations depending on the word's position or surrounding sounds. In addition, 13 consonant sounds (i.e. /b, p, k, g, f, v, h, ʒ, m, x, ʃ, tʃ, dʒ/, have semi-palatalised (semi-soft) variants, which are specific to the Ukrainian language (Pompino-Marshall et al. 2017).

*Orthography.* The orthography of Ukrainian is primarily phonemic. There are several exceptions to the one-letter-to-one-sound rule, but these sound changes resulting from assimilation are predictable and justified on a morphological level. Ukrainian's shallow orthography makes it relatively easy to learn to read and write, compared to languages with more complex spelling systems (Buk et al. 2008). In most words, letters can be pronounced in only one way. 16 letters have one corresponding sound <a>, <e>, <г>, <ї>, <o>, <y>, <б>, <п>, <т>, <л>, <м>, <н>, <ш>, <р>, <к>, <ц>) (Buk et al. 2008). The remaining letters in the Ukrainian language have several corresponding phonemes, but their pronunciation is often clarified by the context (preceding or following letters). For example, the letter <г> is mostly pronounced as /h/ as in *гора* /hɔ'ra/ 'mountain' or *лу́г* /luh/ 'meadow', but when followed by <т> or <к>, it is pronounced as /x/ in *кізми* /'kihtʃi/ 'claws', *нізми* /'nihtʃi/ 'nails'. In most cases, phonological pronunciation is justified by morphological patterns (e.g. in a word

*вирісший* /'wiriʃʃi/ 'grown' a letter <c> is assimilated to /ʃ/ as it is followed by a perfective suffix {-ши}).

In terms of spelling, the phoneme-grapheme correspondence is less transparent. Only 9 sounds (/k/, /l/, /m/, /p/, /r/, /t/, /f/, /i/, /ɔ/) have straightforward correspondences with letters. Other phonemes have more than one graphemic representation. For example, the sound /ʃ/ can be represented by four different letters, such as <ш> *шум* /ʃum/ 'noise', <щ> in *щока* /ʃiʃka/ 'cheek', <c> in *вирісший* /'wiriʃʃi/ 'grown', <з> *зшити* /ʃʃiti/ 'sewn'). Another source of spelling inconsistency is assimilations caused by voicing and devoicing of consonants. Unlike Russian and Polish, Ukrainian does not have final devoicing (e.g. Polish: *chleb* /xlɛp/ 'bread', Russian: *хлеб* /xlɛp/ 'bread', Ukrainian: *хліб* /xlib/ 'bread'. Voicing and devoicing of consonants is mostly consistent and governed by rules. There are several regressive assimilation rules (when a voiceless consonant is followed by a voiced obstruent, it undergoes voicing). For example, *боротьба* /bɔrɔdʲba/ 'fight' – voiceless /t/ followed by voiced /b/ is pronounced as /dʲ/, *якби* /jagbi/ 'if' – /k/ followed by /b/ is pronounced as /g/). For Ukrainian vowels, the difference between stressed and unstressed positions is not essential (e.g. unstressed /a/ has an allophone /ɐ/, /ɔ/ has an allophone /o/), which makes spelling of vowels unambiguous. In addition, some nouns contain geminate consonants (double consonants), which mainly appear within morpheme boundaries (e.g. prefixation: {без-} and a stem with an initial <з> *беззвучно* /bez'vutʃno/ 'inaudibly'; suffixation: {-н} in *законний* /za'kɔn:ij/ 'legal'. Some geminates are historically preserved (e.g. *пан-на* /pan:a/ 'young lady'.

In Ukrainian, a syllable must have a vocalic nucleus (a vowel), while the syllable onset and coda can contain up to four consonants. Open syllables are preferred (e.g. CV *дорога* /dɔ'rɔɦa/ 'road'), as is the case with other Slavic languages (Pompino-Marschall et al. 2017). Closed syllables are presented in a variety of combinations of consonants preceding and/or following (e.g. CVC *кіт* /kit/ 'cat', CCVC *стіл* /stil/ 'table', CCCVC *скрип* /skryp/ 'squeak').

Lexical stress in Ukrainian is free. It can be contrastive as it changes meaning in homographs (e.g. *кури* /'kuri/ 'chickens' and *кури* /ku'ri/ 'to smoke' in imperative mood); *дорога* /dɔ'rɔɦa/ 'road' and *дорога* /dɔrɔ'ɦa/ 'dear'. The Ukrainian language can be considered as syllable-stressed as vowels do not undergo reduction (similar to Polish, but not to Russian, which is time-stressed).

*Morphology.* Ukrainian morphology is characterized by a rich system of inflectional and derivational morphemes. Ukrainian nouns, adjectives, pronouns, and numerals have inflectional categories that include case and number, as well as a non-inflectional category of gender (masculine, feminine, or neuter). Similar to Polish, Ukrainian has a seven-case system. Nouns, pronouns, adjectives, and numerals undergo declension by adding suffixes to indicate their case, number, and gender. The way in which a word is declined depends on its lexical category, gender, and the phonological properties of its stem. This system is complex, and there are specific rules for choosing a declensional morpheme for a word. Below is an example of how a phrase consisting of a numeral, adjective, and noun (feminine) is declined in both the singular and plural forms. The transliteration of phrases is in accordance with ISO 1995 (international standard for transliteration of Cyrillic characters into Latin).

#### Case

|              |                                 |                                 |
|--------------|---------------------------------|---------------------------------|
| Nominative   | <i>odna vesela divčinka</i>     | <i>dvì veselì divčinki</i>      |
| Genitive     | <i>odniêi veseloï divčinki</i>  | <i>dvoh veselih divčिनok</i>    |
| Dative       | <i>odnij veselij divčinci</i>   | <i>dvom veselim divčatam</i>    |
| Accusative   | <i>odnu veselu divčinku</i>     | <i>dvì veselì divčinki</i>      |
| Instrumental | <i>odniêu veseloû divčinkoû</i> | <i>dvoma veselimi divčatami</i> |
| Locative     | <i>odnu veselu divčinku</i>     | <i>dvoh veselih divčिनok</i>    |
|              | ‘One happy girl’                | ‘Two happy girls’               |

In general, when an inflectional suffix is added to a word stem, there may be some changes in the way the word is pronounced (and spelled), such as alterations in its phonological structure (e.g. *kit* ‘cat’ – *kota* ‘cat’ Gen.).

The Ukrainian verbal system follows a pattern that is similar to the verb systems of other Slavic languages. Ukrainian verbs undergo conjugation through the addition of multiple suffixes that indicate grammatical information such as number, person, gender, tense, and aspect. There are three tenses: present, past, and future, and two aspects: imperfective and perfective. Similar to inflected nouns, phonological and orthographical changes may occur in the stem of the verb as shown below:

*pekti* ‘to bake’      *peču* ‘I bake’      <к> – <ч>      /k/ – /tʃ/

*bìgti* ‘to run’                      *bìžu* ‘I run’                      <г> – <ж>      /h/ – /ʒ/

The complexity of Ukrainian inflectional morphology allows for a single word form to express an entire sentence or clause. Suffixes added to a verb stem indicate number, gender, tense, aspect. For example, the English clause ‘I will be reading’ is expressed by a single Ukrainian verb *čitatimu*.

In addition to inflectional morphology, Ukrainian also has a complex system of derivational affixes that can change the lexical meaning and grammatical category of a word. For example, the suffixes {- *n'ka*}, {- *sen'ka*} can be added to a noun to create a diminutive form (e.g. *mala* ‘little’ - *malen'ka* - *malesen'ka* ‘very little’, while the prefixes {*po-*}, {*pri-*} can be added to a verb to indicate differences in aspect of verbs (e.g. *īsti* ‘to eat’ – *poīsti* ‘to finish eating’, *jti* ‘to go’ – *prijti* ‘to arrive’).

### 5.2.3. Russian

Russian is also an Eastern Slavic inflectional, consonantal language using the Cyrillic script, which has 33 letters used to represent 39 sounds. Two letters do not represent any sounds: <ь> (soft sign) and <ъ> (hard sign).

*Phonology.* Russian has 6 vowel phonemes: /a, e, i, o, u, ɪ/, which are represented ten letters. Ten vowel letters arranged in pairs: "hard vowels" <а, о, у, ы, э> and their "soft" counterparts <я, ё, ю, и, е> which appear after palatalized consonants (e.g. *песня* /*piesinʲə*/ ‘song’). When four of the "soft" vowels <я, ё, ю, е> appear at the beginning of a word or syllable, they are pronounced with a preceding glide /j/, resembling the sound of the "hard" vowels (e.g. *яблоко* /*ˈjæbləkə*/ ‘apple’). This phonetic phenomenon is called "jotation" (Rakhlin et al. 2017). Its consonantal inventory is moderately large with approximately 33 consonants phonemes (Ian Maddieson 2013a). The abundance of consonant inventory is largely due to the systematic differentiation between palatalized and non-palatalized consonants (Rakhlin et al 2017).

In Russian, the stress is free (can occur on any syllable of a word) and can move within a word depending on the word of the word (e.g. *лицо* /*liˈtso*/ ‘face’ and *лица* /*ˈlitse*/ ‘faces’). The stress can be used to distinguish semantic meaning of words



(e.g. *мука* /mu'ka/ 'flour' and *мука* /'muka/ 'torment'). The most common syllable structure in Russian is open syllable. However, they often tend to have complex onsets (CCV, CCCV, CCCC) as well as closed syllables contain complex codas (CVCC) (Kornev 2010).) Russian is considered to be a time-stressed language with a longer duration of stressed syllables (Nesport et al. 2011).

*Orthography.* With respect to reading, Russian orthography is considered to be transparent. Although there are a few exceptions, most letters are pronounced the same, which makes reading in Russian a straightforward process. Similarly, to other Slavic languages, when a letter has two alternative corresponding phonemes, its pronunciation is disambiguated by its position (e.g. letter <д>: *да* /da/ 'yes' and *вход* /'fxot/ 'entrance') or by the position of surrounding letters (e.g. <в>: *вы* /vi/ 'you' and *завтра* /'zaftɾə/ 'tomorrow'). Considering spelling, Russian is complicated by several phonological pervasive processes (e.g. vowel reduction) and morphological rules. For example, unstressed vowels /e/ and /i/ are pronounced as a somewhat reduced /i/ as in homophones *леса* /li'sa/ 'fox' and *леса* /'lɛsa/ 'woods'). Another peculiarity of Russian orthography involves the distinction between palatalized and non-palatalized consonants, which is indicated in writing not by the consonantal letter itself, but by the vowel letter following it (e.g. *время* /vr'i'ɛmʲə/ 'time') or by the use of the soft sign <ь> (e.g. *семь* /sʲi'ɛmʲ/ 'seven'). In addition, there is a large number of morphological alternations. For example, a verb conjugation in present tense leads to an alternations of <к>/<ч> (e.g. *неку* /pʲi'ekul/ 'I bake') – *печешь* /pʲi'etʃʲi/ 'you bake' or in nouns declension (e.g. *сон* /son/ 'sleep' – *сна* /sna/ 'sleep' Gen.), *пень* /pʲ'en/ 'stump' – *пня* /pnʲ'a/ 'stump' in Gen.)

*Morphology.* Similar to other Slavic languages, Russian morphology (both inflectional and declinational) is quite complex. Nouns, adjectives, numerals, pronouns are inflected for case (6), number (singular and plural), and gender (masculine, feminine, and neuter). As an example, a declension of phrase consisting of a numeral, adjective, and noun (feminine) is declined in both the singular and plural forms.

#### Case

|            |                              |                             |
|------------|------------------------------|-----------------------------|
| Nominative | <i>odna veselaâ devočka</i>  | <i>dve veselye devočki</i>  |
| Genitive   | <i>odnoj veseloj devočki</i> | <i>dvuh veselyh devoček</i> |

|              |                               |                                 |
|--------------|-------------------------------|---------------------------------|
| Dative       | <i>odnoj veseloj devočke</i>  | <i>dvum veselym devočkam</i>    |
| Accusative   | <i>odnu veseluđu devočku</i>  | <i>dvuh veselyh devoček</i>     |
| Instrumental | <i>odnoj veseloj devočkoj</i> | <i>dvumâ veselymi devočkami</i> |
| Locative     | <i>odnoj veseloj devočke</i>  | <i>dvuh veselyh devočkah</i>    |
|              | ‘One happy girl’              | ‘Two happy girls’               |

In Russian, the syntax is quite flexible as the subject, verb, direct and indirect object can be arranged in various orders. Thus, to determine the relationships between constituents in the sentence, the case morphology plays a significant role as in the example.

*Plany u menâ bol'shie.*

‘Plans in me big’ (literal translation in English; ‘I have big plans’).

Russian verbs are marked as either perfective or imperfective, which is achieved by adding a prefix or a suffix. This leads to a great variety of similar-root verbs denoting subtle changes in actions (e.g. *čitat'* /tʃit'atʲ/ ‘to read’, **pro-***čitat'* /prɔtʃit'atʲ/ ‘to read’-perfective, **pere-***čitat'* /pʲirʲitʃit'atʲ/ ‘to read again’, **do-***čitat'* /dɔtʃit'atʲ/ ‘to read to the end’, **za-***čitat'* /zʲatʃit'atʲ/ ‘to read out loud’, **vy-***čitat'* /vʲy-tʃit'atʲ/ ‘to discover through reading’, **ot-** *čitat'* /ot-tʃit'atʲ/ ‘to reprimand’) (Rakhlin et al. 2017). As in Polish and Ukrainian, indication of grammatical information such as number, person, gender, tense, and aspect is attained by adding affixes to the verb stem (e.g. *pisat'* /pis'atʲ/ ‘to write’: *napisala* /napʲisʌlʌ/ ‘I/she wrote’; *napisal* /napʲisʌ/ ‘I/he wrote’; *pokupat'* /pʌkup'atʲ/ ‘to buy’: *pokupaem* /pʌkup'ajim/ ‘we buy’). Words are formed by adding suffixes (e.g. {-ost'}: *smel-ost'* /smʲeʌstʲ/ ‘bravery’, *nov-ost'* /n'ɔf-ostʲ/ ‘news’; {-ec} /j'etʲs/: *mudr-ec* /m'udr-j'etʲs/ ‘wiseman’), prefixes (e.g. {is/iz-}: *is-hod* /is-x'otʲ/ ‘outcome’; {bez-}: *bez-limit* /bʲes-ʎimʲitʲ/ ‘non-limit’) and by compounding (e.g. *paro-voz* /p'ara-v'os/ ‘locomotive’), *samo-let* /sam'o-ʎetʲ/ ‘plane’) (Rakhlin et al. 2017). Linguistic features of the Russian language make reading acquisition quite easy, whereas spelling is more intricate due to morpho-phonological alternations.

An overview of key features of three languages clearly presents a number of phonological, morphological and syntactic similarities across languages as well as their differences. First, all languages are relatively transparent in a feedforward direction, while spelling is more ambiguous due to its heavy reliance on morphological principles.

Second, their vowel and consonantal inventories are quite similar (with a few exceptions), which may lead to similar rate of reading acquisition as a number of grapheme-phoneme correspondences is comparable. Third, CV syllables are prevailing in all languages, which has been found to enhance reading acquisition (Duncan et al. 2006). Fourth, all languages have quite complex derivational and inflectional morphology. Whereas Polish and Ukrainian do not differentiate between stressed and unstressed vowels (their pronunciation is not altered by the stress), this is a distinguished feature of the Russian orthography. The flexibility of stress within words is common for Ukrainian and Russian, whereas it is fixed in Polish. Considering all mentioned, reading acquisition rate in all three languages might be quite similar in monolingual children. Therefore, an overview of recent studies on early literacy acquisition in three languages will follow.

### **5.3. Reading acquisition in the three languages: Empirical evidence**

In the past 20 years, there has been growing interest in reading acquisition development research across various languages, including Slavic languages. Several studies have explored reading acquisition in monolinguals in the group of Western Slavic languages (Czech and Slovak: Caravolas and Volin 2001; Caravolas et al. 2012, 2013, 2019; Moll et al. 2016; Polish: Bogdanowicz 2000; Krasowicz-Kupis 1999; Łockiewicz and Ciecholewska 2017; Szczerbiński 2001), Southern Slavic Languages (Bosnian: Memisevic et al. 2022), Croatian: Kelić et al. 2021). Among the Eastern Slavic Languages, Russian has been researched the most (Kerek and Niemi 2009; Grigorenko et al. 2011; Rakhlin et al. 2014), whereas empirical studies exploring reading acquisition in Ukrainian have not been identified neither in Ukrainian nor in English through available research databases (Scopus, World of Science, PsycINFO, ResearchGate). A few studies have investigated early language development in Ukrainian children (e.g. phonological skills in Ukrainian-Polish bilinguals: Dębski et al. 2020; syntactic skills: Mykhaylyk 2012; Mykhaylyk and Sopata, 2014). Yet, up to date development of reading acquisition (at least from the developmental psychological perspective) in Ukrainian has not achieved much research attention. Due to Ukraine's past as part of the USSR, not much research on reading could be conducted in

Ukrainian as the dominance of Russian was prevalent in all fields. Although the research on reading in Russian itself has a long history, during the Soviet period it was isolated from western schools of thought. As a result, the field in literacy acquisition and in reading disabilities developed in isolation. Contemporary research on reading in Ukrainian, if any exists, is likely to be heavily influenced by the Russian scientific school, which is mostly conducted in the field of education and related fields (defectology and logopedia). Moreover, such studies are descriptive/qualitative in nature and are not easily accessible to the general public. Thus, the significance of this research project lies in the fact that it is the first to examine the acquisition of early reading skills in Ukrainian-Polish bilingual children as well as in Ukrainian and Polish monolinguals in a cross-sectional manner.

Research on literacy acquisition in Polish has a relatively long history. Yet, the present overview of empirical research on literacy acquisition is limited to recent studies that explored cognitive mechanisms underlying reading development in typically developing children (or this group was included as a control one) and reported their relationship with reading outcomes. Pietras and Łockiewicz (2020) presented a comprehensive review of studies on literacy development in Polish, covering a variety of aspects of literacy, with a particular emphasis on dyslexia. As reading in atypically developing is beyond the scope of the thesis, such studies were not included in an overview. A summary of empirical findings in Polish and Russian languages can be found in Table 4. Though studies vary in terms of scope of cognitive and literacy measures included, still some general conclusions can be inferred.

Among predictors, PA, RAN and phonological and verbal working memory were mostly reported in Polish studies. With regard to reading measures, decoding skills (word reading and/or nonword/pseudoword decoding) have been researched in all studies. Findings of a longitudinal large-scale study by Krasowicz-Kupis (1999), which followed children from kindergarten till Grade 2, showed PA to be a robust predictor of decoding skills (both for fluency and accuracy) at the early stage of literacy acquisition. Yet, its predictive strength seemed to decrease (though remained relevant for accuracy) as reading proficiency increased by the end of Grade 2. At the same time, phonological memory and meta-phonological skills remained predictive across grades. Moreover, reading comprehension measured in Grade 2 was only predicted by phonological memory. Łockiewicz and Ciecholewska (2017) also found PA to be predictive of text

reading accuracy in older primary school children (Grade 4), while RAN was the only predictor of word and pseudoword fluency. In a study by Pawlicka et al. (2018) involving primary school students enrolled in mono- and bilingual programs, it was found that PA was a predictor of decoding skills fluency. Similarly, Wieczorek et al. (2016) found that PA correlated significantly with word reading fluency in a study with older participants (16-17-year-olds). RAN (fluency) and verbal working memory (accuracy) were also found to be predictors of individual variance in pseudoword reading. Overall, the evidence suggests that initially, PA is the strongest predictor of reading achievement as the initial reading strategy is analytical and alphabetic. However, with an increase in reading proficiency, orthographic and lexical processing become more efficient predictors.

The history of reading acquisition research in Russia is marked by significant contributions from prominent educational psychologists and neuropsychologists such as Lev Vygotsky, Daniil Elkonin, and Alexander Luria, who are recognized internationally for their work on child psychological development and reading disabilities. Although contemporary research on reading had waned in Russia in the 1980s-1990s, it has since experienced a resurgence since early 2000s, with researchers like Grigorenko (dyslexia, reading), Kornev (reading disorders), and Rakhlin (reading development) leading the way. Table 4 contains information on three recent studies that investigated the cognitive factors that can predict reading ability in typically developing children. In two large-scale studies, Grigorenko (2012) explored predictors of decoding skills and reading comprehension.

Table 4. Summary of empirical evidence: Reading development in Polish and Russian.

| No | Study                              | Language          | Age group                                                   | Study design | Scope                                                                                                           | Main Findings                                                                                                                                                                                                                           |
|----|------------------------------------|-------------------|-------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Krasowicz-Kupis (1999)             | Polish            | Kindergarten<br>Grade1<br>Grade 2                           | Longitudinal | Word reading<br>Pseudoword decoding<br>RC<br>PA<br>Meta-phonological awareness (MA)<br>Phonological memory (PM) | <i>Reading fluency and accuracy:</i><br>Reception year: PA, PM<br>Grade 1:PA, MA, PM<br>Grade2: MA, PM, PA (remained strong only for decoding accuracy).<br><i>Predictors of reading comprehension:</i><br>Grade 2: phonological memory |
| 2  | Wieczorek et al. (2016)            | Polish            | Age (16-17)                                                 | Concurrent   | Word reading<br>Pseudoword reading<br>PA<br>RAN<br>VWM                                                          | <i>Word reading:</i><br>Fluency: PA and RAN<br>Pseudoword decoding:<br>Fluency: RAN<br>Accuracy: VWM                                                                                                                                    |
| 3  | Łockiewicz and Ciecholewska (2017) | Polish            | Grade 4                                                     | Concurrent   | Short text reading: accuracy<br>Single word reading: fluency<br>PA<br>RAN                                       | <i>Text reading accuracy:</i> PA<br>Word reading accuracy and fluency: RAN                                                                                                                                                              |
| 4  | Pawlicka et al. (2018)             | Polish<br>English | Grade 1-<br>Grade 2                                         | Concurrent   | Word reading (in Polish and English)<br>Pseudoword decoding<br>PA<br>RAN                                        | <i>Word and pseudoword fluency:</i> PA                                                                                                                                                                                                  |
| 5  | Grigorenko (2012)                  | Russian           | Study 1 (S1):<br>Age (7-13)<br>Study 2 (S2):<br>Age: (7-18) | Concurrent   | Word reading<br>PA, RAN<br>Orthographic awareness (OA)<br>Morphological awareness (MO)<br>Spelling              | Predictors (S1):<br><i>Word reading:</i> PA, RAN<br><i>Reading comprehension:</i> PA, age, RAN<br>Predictors (S2):<br><i>Reading comprehension:</i> MA, OA, age                                                                         |

|   |                       |         |           |            |                                                                                                                                                                               |                                                                                                                  |
|---|-----------------------|---------|-----------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 7 | Rakhlin et al. (2014) | Russian | Grade 4-9 | Concurrent | Word reading<br>Pseudoword decoding<br>Spelling<br>PA<br>Rapid Serial naming (RSN)<br>Orthographic Choice (OC)<br>Phonological choice (PC)                                    | <i>Word and pseudoword reading fluency:</i><br>RSN<br>Spelling: PA, orthographic choice,<br>phonological choice. |
| 8 | Rakhlin et al. (2019) | Russian | Grade 2-6 | Concurrent | Word reading (accuracy)<br>Word reading (unitization)<br>Pseudoword decoding (accuracy)<br>Text reading (fluency)<br>PA<br>PWM<br>Orthographic skills (OS)<br>Spelling<br>RAN | Predictors:<br>Text reading fluency: OS, word<br>unitization<br>Word fluency: RAN                                |

---

Findings showed that PA predicted word accuracy and RAN was predictive of word fluency. Reading comprehension in a study with younger participants (7-13) was predicted by PA, age and RAN, whereas in the second study with students of a wider age range (7-18) reading comprehension was predicted by age, morphological awareness (MA) and orthographic awareness (OA). Grigorenko's research demonstrates that basic cognitive abilities such as PA, RAN, OA and MA are not only significant predictors of reading ability in primary school but also continue to be important factors in reading proficiency over time. However, the specific role of these cognitive processes changes as reading skills develop, with PA and RAN being more critical in the early stages and MA and OA becoming more important as reading progresses. Rakhlin and colleagues (2014) focused on decoding skills development in middle school children and their predictors. The findings of the study showed that PA had a stronger correlation with orthographic processing skills such as phonological choice, orthographic choice, and spelling, whereas rapid serial naming (RSN) was found to be associated with reading fluency. According to Rakhlin et al.'s 2014 study, in Russian, which has a semi-transparent writing system, children tend to rely more on well-developed phonological skills to learn spelling. This is because some of the most challenging aspects of Russian spelling stem from phonological processes that can alter the sound structure of words, resulting in a large number of words whose spelling cannot be easily predicted from their pronunciation. Consequently, to master spelling in Russian, children must explicitly learn strategies that allow them to reconstruct the underlying phonemic form of words, a task that demands a high degree of sophistication in phonological awareness. In turn, RSN appears to be more significant in explaining individual differences in word reading fluency, which is consistent with other findings across different languages. In a more recent study Rakhlin and colleagues (2019) investigate predictors of reading and spelling in primary school children. Their findings showed that word unitization (*whole word* reading as opposed to *syllabic* reading) and orthographic skills were significant contributors to text reading fluency. According to Rakhlin et al. (2019), for children in grades 2-6, in transparent orthographies, the importance of PA in predicting reading fluency decreases, at least among typically developing children. Instead, other skills are found to play a more significant role in predicting reading fluency in this age group.



The studies discussed above suggest that in languages with asymmetrical orthographies, word reading accuracy tends to plateau by the end of the first grade and is best predicted by early PA skills and RAN. RAN has also been found to be predictive of reading fluency across different grades, consistent with findings in other alphabetic orthographies. However, there has been less research on reading comprehension in these languages. When measuring literacy skills in more proficient readers, morphological and orthographic processing seem to play a more important role in predicting reading differences. It is important to note that the studies reviewed employed different measures and focused on different research questions, making direct comparisons between findings difficult. As a result, more cross-linguistic research is needed.

#### **5.4. Summary**

Crosslinguistic differences between languages may significantly affect reading development. Therefore, a brief comparison of the three Slavic languages was provided. Similar features across the three languages are (1) their asymmetrical transparency (more transparent for reading, less for spelling); (2) complex inflectional and derivational morphology; (3) syllabic structure (prevailing CV structures with complex consonant onsets and codas). Differences were found at the level of phonology: (1) vowel reduction in Russian, but not in Polish and Ukrainian; (2) final devoicing in Polish and Russian, but not in Ukrainian. Whereas Polish is characterized by fixed word stress, it is free within words in Ukrainian and Russian. In addition, while Ukrainian and Russian languages use the Cyrillic script, Polish is based on the Latin. Finer detailed analysis would definitely reveal more differences between the languages (albeit it is beyond the scope of the thesis).

Empirical research conducted on reading acquisition in Russian and Polish has shown broadly similar predictive patterns. PA and RAN were identified as crucial factors for decoding skills in both languages. Additionally, these skills, along with morphological and orthographic awareness, were found to predict later reading comprehension abilities. However, it is important to note that only two studies, one in Polish and one in Russian, specifically examined predictors of reading comprehension.

Therefore, further research, particularly longitudinal studies, is needed to provide more comprehensive insights into the cognitive predictors of reading in these languages.

## **Chapter 6: The current study**

### **6.1. Introduction**

Within the SVR, reading comprehension is seen as a product of decoding and language comprehension skills. Foundations of decoding skills are built during the first year of formal literacy instruction in transparent orthographies and up to the end of the second year in more opaque writing systems (section 4.3). As fluency develops (e.g. decoding skills are automatized), reader's attention can be directed to inference and to prediction of information in the text. This is when a reader gets time to think and when reading comprehension starts developing (Wolf 2007).

Whereas in monolinguals, assessment of those skills is more straightforward due to availability of well-developed assessment tools, it gets more complicated in the bilingual contexts for various reasons. Not only might cognitive, neurobiological, or societal issues be the core of the problem, but child's bilingual experience may cause misinterpretation of decoding skills' development by parents and educators.

First, child's low proficiency in L2 is an obvious potential cause for the delay of reading development in L2. Insufficient oral languages skills in L2 hinder an understanding of instructions in the classroom, slowing down the development of decoding skills and reading comprehension. However, empirical research findings show that typically developing bilingual children after 1-2 years of schooling in a second language achieve sufficient and monolingual-like decoding skill performance as the oral proficiency increases (August et al. 2009; Bellocchi et al. 2016; Droop and Verhoeven 2003).

Second, a bilingual child might experience difficulties with reading in her first language, which automatically translates into challenges with reading in a second language. However, assessment of literacy in bilingual children might be challenging due to (1) lack of screening and assessment tools in their respective first language (L1); (2) lack of bilingual speech and language specialists speaking the respective minority language to conduct an assessment; (3) child's parents low language proficiency of L2, which minimizes chances of obtaining qualitative descriptions of child's L1 development. Due to above-mentioned challenges, bilingual children are usually neglected in terms of getting a quality assessment at the initial stage of reading acquisition. As a result, teachers and parents lack necessary information as to a child's literacy development, which later may lead to deeper academic problems, lower self-esteem, psychological disturbances, and other negative consequences. Therefore, a question of bilingual children's literacy development assessment is of crucial importance.

Within the Polish context, assessment of Ukrainian children might be a challenge. The primary reason is a lack of screening tools in the Ukrainian language. In addition, there is a shortage of speech and language pathologists who could assess children's skills in L1 (Ukrainian). Up to date, reading development in the Ukrainian-Polish bilingual context has not been researched, which pauses additional difficulties for practitioners and parents as to differentiate between typically and atypically developing bilingual children.

Given the above, two main aims for this project emerge. The first aim is theoretical: to advance our understanding of bilingual reading acquisition by investigating the developmental paths of reading in novice bilingual (Ukrainian-Polish) readers and comparing them with their monolingual peers. The project's goal is to provide more research-based evidence of bilingual reading patterns in children at the early stage of reading acquisition. Specifically, to identify cognitive predictors of decoding skills and reading comprehension in bilingual novice readers. In addition, the project aims to compare early predictors for bilinguals and monolinguals in order to explore their similarities and differences. To do that, two monolingual groups of novice readers – Ukrainian and Polish – have been also assessed to investigate similarities and differences in developmental patterns of monolinguals and bilinguals.

The second aim is applied: to develop tools for the assessment of early literacy acquisition in Ukrainian and Russian. This involved adaptation of some components of the MABEL test battery to those languages. It has parallel versions in English, Welsh, Spanish, Czech and Slovak, with French, Polish and Portuguese versions under way. The existing versions have been validated in a number of studies (Caravolas et al. 2012, 2013, 2019). In the context of the Ukrainian language as well as Ukrainian-Polish bilingualism and educational needs in Poland, Ukrainian, Russian and Polish versions of MABEL will be an asset for educators, parents, speech and language practitioners in different countries. Its practical implication has become more crucial as massive immigration caused by the war in Ukraine led to an influx of migrant Ukrainian children in different countries in Europe.

Given the aims of the study, prospective longitudinal design is optimal (as it allows to evaluate predictive validity of various measures), and it was adopted. Children were assessed at two time points: at the onset of formal reading instruction (T1) and at the end of the first grade (T2). Fig. 2 presents an overall study design.

Across the study, several analyses were conducted for each testing session. First, at T1 bilingual children's performance was assessed by means of parallel versions of Ukrainian/Russian (L1) and Polish (L2) tests to identify their language abilities in both languages (section 7.2.1). Second, Ukrainian and Polish monolingual children were assessed on similar parallel versions of tests in their respective languages in order to compare their performance on a number of cognitive and literacy skills with the Ukrainian-Polish bilingual group (section 7.2.2). Third, to identify potential crosslinguistic influence in relationships between reading abilities and related cognitive skills in L1 and L2 in the bilingual group were explored (section 7.3.3). Lastly, the comparison of cognitive predictors between the bilingual group and two monolingual groups was examined (section 7.3.4).

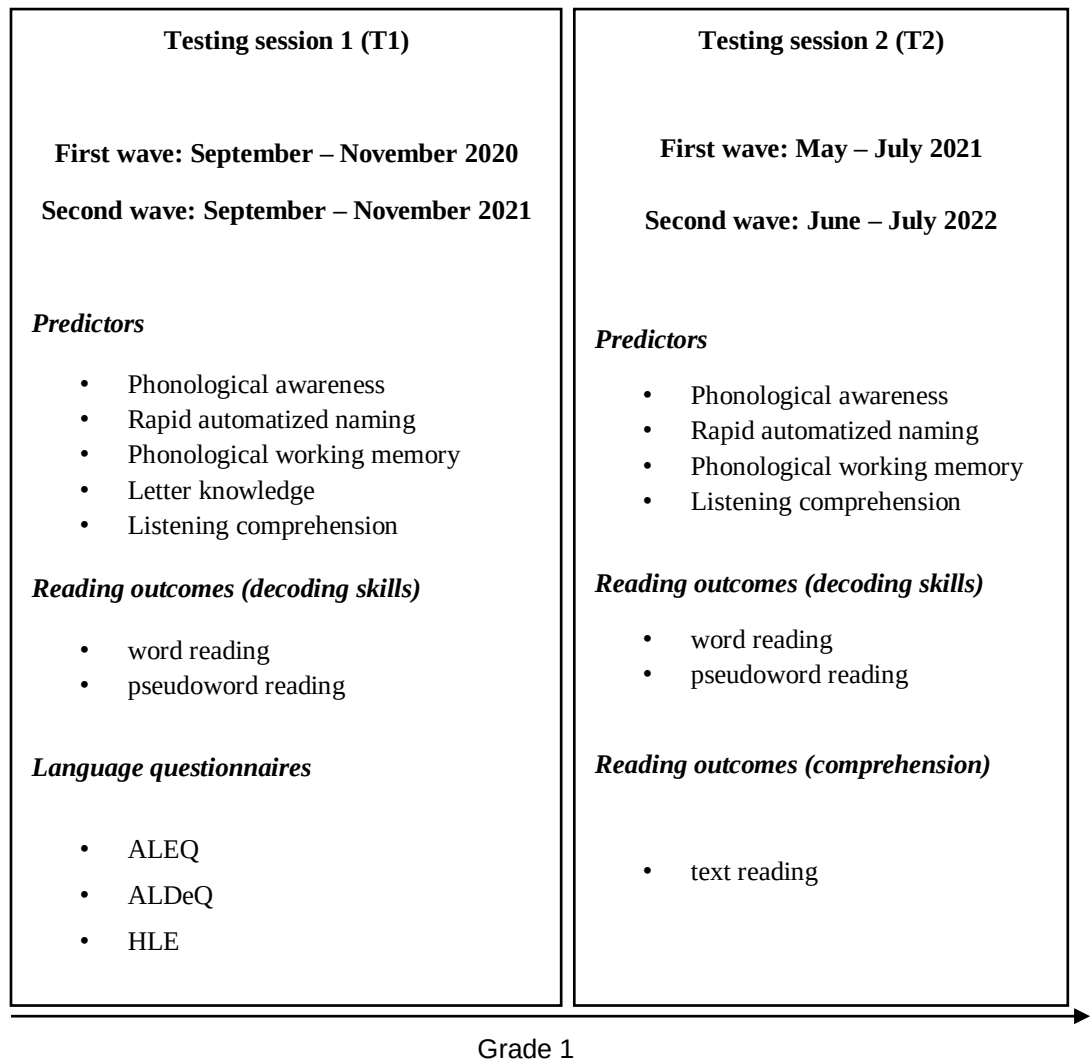


Fig. 2. Overall study design.

At T2, early predictors of decoding skills as well as reading comprehension were explored longitudinally (over a nine-month period) and concurrently at T2. To identify longitudinal predictors of decoding skills development and reading comprehension in bilingual novice readers, several analyses were conducted. First, bilingual children's performance was assessed by means of parallel versions of Ukrainian/Russian (L1) and Polish (L2) tests to examine their cognitive abilities and literacy skills in both languages at the end of the first year of formal schooling (section 8.2.1). Second, Ukrainian and Polish monolingual children were assessed on parallel versions of tests in their respective languages at the end of the first year. Then their performance on a number of cognitive and literacy skills was compared with results of the Ukrainian-Polish bilingual group (section 8.2.2). Third, in the bilingual children the relationships between cognitive skills and reading outcomes (reading words,

pseudoword decoding and reading comprehension) were explored both within and across languages longitudinally and concurrently (T2) (section 8.3.2). Finally, the comparison of cognitive predictors between the bilingual group and two monolingual groups was conducted (section 8.3.4).

## **6.2. Research questions and hypotheses**

To explore the above-mentioned aspects of the reading development in novice readers, several research questions were formulated.

Questions pertaining to T1 data are as follows:

**RQ 1:** In bilingual children, do language and literacy skills measured in L1 and L2 differ at the beginning of their schooling? If so, which set of skills is better developed ?

It was predicted that bilingual children's performance might be better in L1 than in L2, taken their limited exposure to L2 (Polish) at the beginning of formal literacy instruction.

**RQ 2:** In bilingual children, do language and literacy skills measured in L1 (Ukrainian/Russian) differ from those in the Ukrainian monolingual group?

Language and literacy skills in bilinguals' L1 (Ukrainian/Russian) were predicted to be broadly similar to those in Ukrainian monolinguals. Yet, bilinguals were expected to perform somewhat worse on vocabulary and serial naming tasks (RAN) than monolinguals due to lower exposure to L1.

**RQ 3:** In bilingual children, do language and literacy skills measured in L2 (Polish) differ from those in the Polish monolingual group?

At the onset of formal literacy instruction, bilingual children were predicted to perform less successfully on literacy and language tasks in their L2 than the monolingual native speakers.

**RQ 4:** In bilingual children, what are early cognitive predictors of decoding skills in L1 and L2 (i.e. within languages)?

It was predicted that skills from each domain (e.g. phonological awareness, speed of processing, phonological-WM, oral language, letter knowledge) would predict to different extent reading outcomes in either language. Patterns of predictors were expected to be broadly similar irrespective of language.

**RQ 5:** In bilingual children, what is the relationship between predictors in L1 and L2 and decoding skills (i.e. across languages)?

All skills expected to predict decoding within languages (see RQ4) were also expected to predict decoding across languages. This is due to interdependence of L1 and L2 skills (discussed in Chapter 3). Additionally, structural similarity of Polish and Ukrainian languages and orthographies might also strengthen across-language correlations.

**RQ 6:** Do early predictors differ for monolingual and bilingual children?

In this study, predictors of reading are assumed to be broadly similar.

Questions pertaining to T2 data are as follows:

**RQ 7:** In bilingual children, do language and literacy skills at T2 measured in L1 and L2 differ?

Cognitive and literacy skills in both languages were expected to be roughly similar as exposure to L2 (Polish) in school settings should enhance the development of L2 skills (presumably weaker at T1).

**RQ 8:** In bilingual children, do language and literacy skills measured in L1 (Ukrainian/Russian) at T2 (i.e. nine months into Grade 1) differ from those for the Ukrainian monolingual group when measured at the same time point?

It was expected that lack of formal schooling in L1 (combined with limited exposure to spoken L1) may result in bilingual children lagging behind their Ukrainian monolingual peers at T2, at least with regards to literacy skills.

**RQ 9:** In bilingual children, do language and literacy skills measured in L2 (Polish) at nine months into Grade 1 differ from the respective monolingual group measures at the same time point?

It was expected that the bilingual children, having received formal literacy instruction for a year, would make rapid progress in their L2 and literacy skills approaching (or perhaps matching) the performance of their monolingual peers.

**RQ 10:** In bilingual children, what are early (T1) cognitive predictors of decoding skills and reading comprehension in L1 and L2 measured nine months later (T2)? Do they differ from the same relationships measured concurrently (at T2)?

It was predicted that phonological awareness, phonological working memory, RAN, and letter knowledge would have a greater impact on decoding skills, specifically



word reading. Conversely, oral language skills were expected to be more indicative of reading comprehension abilities. However, previous research has shown the relationships and interactions between these L1 and L2 predictors and outcomes to be complex and varied, which calls for cautious predictions.

**RQ 11:** Do early predictors of reading outcomes differ for monolingual and bilingual children in a longitudinal perspective?

Predictors of reading between monolinguals and bilinguals were expected to remain largely similar.

### **6.3. Method**

#### **6.3.1. Participants at T1**

85 participants were recruited to participate in the study. The total number comprised three groups: the Ukrainian monolingual group ( $n = 39$ ), the Polish monolingual group ( $n = 25$ ), and the Ukrainian-Polish bilingual group ( $n = 21$ ).

As the process of data collection coincided with the COVID-19 outbreak, which consequently led to a total lockdown across the world, recruitment of participants was conducted by means of random selection via different online communication means (social media, e-mails).

For the bilingual group ( $n = 21$ ), information about the study recruitment process was posted via social media groups (Facebook and Instagram) for Ukrainian immigrants (*Ladies in Poznań* and *Poznań is my city*). In addition, it was circulated among people from the Ukrainian immigrants' community via e-mails obtained from personal contacts, which helped to recruit participants not only from Poznań and its suburbs but also from Kraków. Recruitment of participants consisted of two waves. The first one lasted from August till November 2020, enabling to collect written consents from 18 bilingual parents (Appendix A). The second recruitment wave was conducted in August 2021 and lasted till September 2021, allowing for additional 3 participants to the bilingual group (Table 5).

Table 5. Recruitment of participants: Two waves.

| Year                    | Bilinguals | Polish monolinguals | Ukrainian monolinguals |
|-------------------------|------------|---------------------|------------------------|
| August - November 2020  | 18         | 20                  | 34                     |
| August - September 2021 | 3          | 5                   | 5                      |
| Total                   | 21         | 25                  | 39                     |

All bilingual participants were first-grade students enrolled in Polish primary schools, acquiring literacy in Polish. All of them were biliterate as they were taught to read in their heritage language, according to the information obtained from parents. Their bilingual experience and language environment was assessed by Alberta Language Environment Questionnaire (ALEQ) (Paradis et al. 2010), adapted into Ukrainian and Russian (Appendix C). The written permission to adapt questionnaires used in this study into Polish, Ukrainian and Russian was obtained from authors of the questionnaires (Appendix F).

All participants were sequential bilinguals as they started learning L2 (Polish) upon their arrival to Poland. According to the parents' responses to ALEQ questionnaire, L1 (Ukrainian or Russian) was spoken at most of the households: 57% ( $n = 12$ ) indicated only L1 and 33% ( $n = 7$ ) indicated L1 as mostly often used at home. As to children's preferences of language usage at home, parents declared L1 as mostly often used (52%,  $n = 11$ ) and L2 (Polish) equally used (43%,  $n = 9$ ). Fig. 3 presents more information on bilingual participants' language environment and language usage at home. Bilingual participants characteristics are specified in Table 6.

Ukrainian monolingual participants ( $n = 39$ ) were recruited in two waves, similarly to the bilingual group. They were selected by random sampling from Staroyarska school (named after Roman Varenytsia) in Sary Yar, Yavoriv region, Lvivski oblast ( $n = 25$ ). Additionally, information about the study was sent via e-mails of personal contacts of the researcher, allowing for 9 participants. Overall, during the first wave in August – November 2020, 34 participants were enrolled. In August – September 2021, the information about the study was circulated again, allowing for 5 additional participants (Table 5). All children were enrolled into the first grade of primary school in Ukraine, where the language of instructions is Ukrainian.

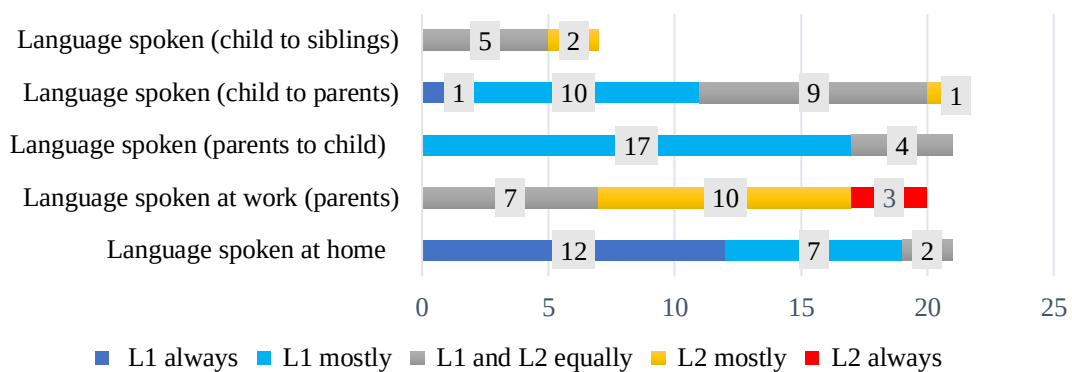


Fig. 3. Bilingual children language environment assessment based on Alberta Language Environment Questionnaire (ALEQ),  $n = 21$ .

Polish monolingual participants ( $n = 25$ ) were also recruited during two waves in 2020 and 2021. Information about the study was sent to two primary schools in Poznan: № 74 (named after Mikolaj Kopernik) and № 69 (named after Jarogniew Drwęski), as well as one primary school in Komorniki, a suburb area of Poznań (№ 1 named after Janusz Korczak). Information was also sent via e-mails obtained through personal contacts. 20 written consents were obtained from participants' parents during the first wave in August – November in 2020 and 5 more in August – September 2021. Polish monolingual participants were first-grade students enrolled in Polish schools, learning to read in Polish.

Both monolingual groups' language development was assessed by Alberta Language and Development Questionnaire (ALDeQ) (Paradis et al. 2010) (Appendix D). In the three groups, home language environment was evaluated by HLE questionnaire by Burgess et al. 2002 (Appendix E). Participants characteristics for all groups are presented in Table 6.

Table 6. Participants characteristics at Time 1 (concurrent analysis).

| Characteristics           | Bilingual (21)<br>N (%) | Polish monolingual (25)<br>N (%) | Ukrainian monolingual (39)<br>N (%) |
|---------------------------|-------------------------|----------------------------------|-------------------------------------|
| Gender                    |                         |                                  |                                     |
| Female                    | 13 (62)                 | 14 (56)                          | 23 (59)                             |
| Male                      | 8 (38)                  | 11 (44)                          | 16 (41)                             |
| Ukrainian-Polish          | 13 (62)                 | -                                | -                                   |
| Russian-Polish            | 8 (38)                  | -                                | -                                   |
| Parental education        |                         |                                  |                                     |
| Secondary school          | -                       | -                                | -                                   |
| College/Bachelor's degree | 4 (19)                  | 4 (16)                           | 21 (54)                             |

|                                 |          |         |         |
|---------------------------------|----------|---------|---------|
| Master's degree                 | 15 (71)  | 19 (76) | 18 (46) |
| PhD                             | 2 (10)   | 2 (8)   | -       |
| Reading to child<br>(frequency) |          |         |         |
| Daily                           | 1 (4.8)  | -       | -       |
| Once in two days                | 11(52.4) | 11 (44) | 12 (31) |
| Weekly                          | 8 (38)   | 13 (52) | 21 (54) |
| Monthly                         | 1(4.8)   | 1 (4)   | 6 (15)  |
| Rarely                          | -        |         | -       |

### 6.3.2. Participants at T2

In total, 65 participants were assessed at T2. The study was also conducted in two waves: the first one in May-July 2021 and the second one in June-July 2022. The total number of 65 participants comprised the three groups: the Ukrainian monolingual group ( $n = 26$ ), the Polish monolingual group ( $n = 22$ ), and the Ukrainian-Polish bilingual group ( $n = 17$ ). The same cohorts of the first-grade participants recruited in 2020 and 2021 were assessed at the end of the first grade of formal schooling. The time interval between the first testing session (T1) and the second testing session (T2) varied from seven to nine months, depending on the schedule of testing sessions agreed with parents.

Exact numbers of participants tested at T2 can be found in Table 8. An overall dropout rate was 23.5%. There are a few reasons why this was the case. First, the first wave of T2 was conducted in May-June 2021. Participants' parents were contacted by e-mails and/or Viber application and invited for the second testing session. 85 invitations were sent out. Parents of 60 participants responded and signed up for the testing session 2. Eight participants' participating in T1 did not respond at all, all of them were Ukrainian monolinguals. Two Polish monolingual participants' and two bilingual participants' parents expressed their unwillingness to participate in the study due to overall tiredness of the participants caused by online studying. Therefore, they considered further online activities to be burdensome for their children. The second wave of T2 in June 2022 was scant due to the war outbreak in Ukraine on 24<sup>th</sup> February 2022. As many Ukrainians fled to other countries escaping the war, five participants, initially tested in August – September 2021 in the second wave of the recruitment process, had to be excluded from the study for the following reasons.

Table 7. Bilingual participants characteristics at Time 1 (concurrent analysis).

|                    | How long<br>has your<br>child lived<br>in Poland?<br>(in months) | Has your child<br>attended a<br>kindergarten in<br>Poland? | What other<br>languages, if any,<br>besides<br>Ukrainian/Russian<br>are spoken at<br>home?* | At what age<br>did you<br>begin to read<br>to your<br>child?<br>(in months) | How often do you<br>read to your child? | Can your<br>child read<br>in his/her<br>native<br>language? | Can your<br>child read<br>in Polish? | Does your<br>child like<br>storytelling? |
|--------------------|------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------|--------------------------------------|------------------------------------------|
| Participant 1 (U)  | 18                                                               | +                                                          | -                                                                                           | 6                                                                           | every week                              | +                                                           | a little                             | yes                                      |
| Participant 2 (U)  | 25                                                               | +                                                          | -                                                                                           | 12                                                                          | twice a month                           | +                                                           | +                                    | yes                                      |
| Participant 3 (U)  | 37                                                               | +                                                          | -                                                                                           | 18                                                                          | daily                                   | +                                                           | +                                    | yes                                      |
| Participant 4 (R)  | 22                                                               | +                                                          | -                                                                                           | 0                                                                           | every week                              | +                                                           | -                                    | no                                       |
| Participant 5 (U)  | 33                                                               | +                                                          | -                                                                                           | 5                                                                           | every week                              | +                                                           | +                                    | yes                                      |
| Participant 6 (U)  | 32                                                               | +                                                          | -                                                                                           | 12                                                                          | every week                              | +                                                           | +                                    | yes                                      |
| Participant 7 (R)  | 23                                                               | +                                                          | -                                                                                           | 6                                                                           | every week                              | +                                                           | a little                             | yes                                      |
| Participant 8 (R)  | 20                                                               | +                                                          | -                                                                                           | 8                                                                           | once in two days                        | +                                                           | a little                             | yes                                      |
| Participant 9 (U)  | 21                                                               | +                                                          | -                                                                                           | 10                                                                          | daily                                   | +                                                           | +                                    | yes                                      |
| Participant 10 (U) | 23                                                               | +                                                          | -                                                                                           | 12                                                                          | every week                              | +                                                           | +                                    | no                                       |
| Participant 11 (U) | 22                                                               | -                                                          | -                                                                                           | 10                                                                          | once in two days                        | -                                                           | +                                    | yes                                      |
| Participant 12 (U) | 24                                                               | +                                                          | -                                                                                           | 12                                                                          | twice a month                           | +                                                           | +                                    | yes                                      |
| Participant 13 (R) | 30                                                               | +                                                          | -                                                                                           | 6                                                                           | every week                              | +                                                           | +                                    | yes                                      |
| Participant 14 (R) | 19                                                               | +                                                          | -                                                                                           | 8                                                                           | every week                              | +                                                           | +                                    | no                                       |
| Participant 15 (R) | 24                                                               | +                                                          | -                                                                                           | 10                                                                          | every week                              | +                                                           | a little                             | yes                                      |
| Participant 16 (R) | 15                                                               | +                                                          | -                                                                                           | 18                                                                          | twice a month                           | +                                                           | +                                    | yes                                      |
| Participant 17 (R) | 22                                                               | +                                                          | -                                                                                           | 12                                                                          | every month                             | +                                                           | +                                    | yes                                      |
| Participant 18 (U) | 23                                                               | +                                                          | -                                                                                           | 10                                                                          | every week                              | +                                                           | +                                    | no                                       |
| Participant 19 (U) | 16                                                               | +                                                          | -                                                                                           | 8                                                                           | every week                              | +                                                           | +                                    | yes                                      |
| Participant 20 (U) | 23                                                               | +                                                          | -                                                                                           | 12                                                                          | twice a month                           | +                                                           | +                                    | yes                                      |
| Participant 21 (U) | 17                                                               | +                                                          | -                                                                                           | 10                                                                          | twice a month                           | +                                                           | +                                    | yes                                      |

\* The language spoken at home is either Ukrainian or Russian as participants are from different parts of Ukraine

First, the current situation did not allow children to continue with their education. Second, their immersion in the foreign language environment did not allow to qualify them as monolinguals. As to the Polish monolingual group and the bilingual group, four Polish monolinguals and one bilingual participant were tested in June 2022. The rest of participants did not participate for different personal reasons.

Table 8. Testing session 2: Two waves.

| Year          | Bilingual  | Polish monolingual | Ukrainian monolingual |
|---------------|------------|--------------------|-----------------------|
| May-June 2021 | 16         | 18                 | 26                    |
| June-July2022 | 1          | 4                  | 0                     |
| Total at T2   | 17         | 22                 | 26                    |
| Total at T1   | 21         | 25                 | 39                    |
| Dropout rate* | 19% (4/21) | 12% (3/25)         | 33% (13/39)           |

\*Dropout rate is a difference between a number of participants at T1 and T2 in each group.

### 6.3.3. Design

To assess the developmental patterns of reading, a longitudinal design was adopted. (Fig. 2). All participants were tested at two time points: at the beginning of the first grade (Time 1) and at the end of the first grade (Time 2).

Monolingual Ukrainian and Polish children were assessed once at each time point (T1 and T2) in their respective languages. Bilingual children were tested twice at each time point (parallel assessments in Ukrainian or Russian and in Polish) on different dates. All children received a comprehensive battery of tests that enabled the assessment of predictor variables and reading outcomes.

All testing sessions were conducted online via Zoom platform. Prior to the study, a researcher sent to parents a schedule with available timeslots for the session. Most testing sessions were conducted at weekends (Sundays or Saturdays), some preferred Friday afternoons. This choice was dictated by parents' availability as they dealt with technical settings related to the online meeting (e.g. setting up the sound, cameras). In addition, weekends were more beneficial as participants were not as tired as during weekdays. Information with technical details (e.g. how to open a Zoom account, download the Zoom app) and links to the online meetings were sent to parents prior to the testing. Each participant was tested individually. All sessions were audio recorded; results were also documented by the researcher on separate answer cards

(Appendix H). Parents' written consents as well as oral assents from children were received prior to the testing sessions. At the beginning a child was shown a pictogram of the testing session, which was accompanied by the researcher's oral explanation (Appendix B). Each testing sessions took between 60 to 80 minutes with two 5-7-minute breaks, depending on participants needs and requests.

Parents were asked to find a quiet room for the period of testing session, where a child would not be disturbed by external sound or other distractors. For the good quality of sound, parents were also asked to provide a child with headphones. Testing sessions were held on laptops or computers as the quality of pictures' resolution and their dimension were much higher. All materials presented visually were prepared in PPT (Microsoft PowerPoint Presentation), shown in a slide show mode via Zoom sharing screen function. In cases when the internet connection was poor, the testing sessions were rescheduled for another date or time. If abruptions/interruptions happened during the testing session, it was terminated and resumed as the connection improved.

#### 6.3.4. Measures

In the study, a number of standardized and experimental language and reading measures in Ukrainian, Russian and Polish languages were administered to all participants. Bilingual children completed assessments in both languages on different days. The order of tasks was counterbalanced to control for the order effect. Existing Polish language standardised tests were used (e.g. Smoczyńska et al. 2015; Szewczyk et al. 2015) as well as adapted MABEL tests (Caravolas et al. 2018) in Ukrainian, Russian and Polish. A list of the tests administered at both testing sessions is presented in Table 9. All tests are presented in full in Appendix J (Ukrainian), Appendix K (Polish), Appendix L (Russian).

Table 9. Tests administered at T1 and T2.

| Number | Test              | Skills measured          | T1 | T2 | Source |
|--------|-------------------|--------------------------|----|----|--------|
| 1      | Phoneme isolation | phonological awareness   | x  | x  | MABEL  |
| 2      | Phoneme blending  | phonological awareness   | x  | x  | MABEL  |
| 3      | Phoneme deletion  | phonological awareness   | x  | x  | MABEL  |
| 4      | RAN objects       | rapid automatized naming | x  | -  | MABEL  |

|    |                         |                                       |   |   |                 |
|----|-------------------------|---------------------------------------|---|---|-----------------|
| 5  | RAN letters             | rapid automatized naming              | x | x | MABEL           |
| 6  | RAN digits              | rapid automatized naming              | x | x | MABEL           |
| 7  | RAN colours             | rapid automatized naming              | x | - | MABEL           |
| 8  | Listening comprehension | oral language skills                  | x | x | TRJ             |
| 9  | Vocabulary knowledge    | oral language skills                  | x | x | TRJ             |
| 10 | Pseudowords repetition  | phonological working memory           | x | - | TPP             |
| 11 | Sentence repetition     | phonological working memory           | x | x | TRJ             |
| 12 | Letter naming           | knowledge of letters and their sounds | x | - | MABEL           |
| 13 | Word reading            | decoding skills                       | x | x | MABEL           |
| 14 | Pseudoword reading      | decoding skills                       | x | x | MABEL           |
| 15 | Text reading            | reading comprehension                 |   | x | www.superkid.pl |

Note: MABEL – *Multilingual Assessment Battery of Early Literacy* (Caravolas et al. 2018), TRJ – *Test Rozwoju Językowego* [Language Development Test] (Smoczyńska et al. 2015), TPP – *Test Powtarzania Pseudosłów* [Pseudoword Repetition Test] (Szewczyk et al. 2015).

#### 6.3.4.1. Phonological awareness

Three phonological awareness tasks were administered to the participants. They were adapted into Ukrainian, Russian and Polish from the MABEL test battery (Caravolas et al. 2018).

*Phoneme blending task* was administered first as it is conceptually less difficult among the three. It consisted of 24 items ranging from two-phoneme to four-phoneme highly familiar words. The outcome variable was the number of correctly synthesized words in an untimed mode. The maximum available score was 24. There was a discontinuation rule after six consecutive errors with no matches at all (no overlap between the phonemes the child pronounces and the target ones). Before the testing, there were two demonstration items to familiarize the child with the task. These were pictures of *a mouse* and *a house* presented on the screen and accompanied by the researcher's explanation of the tasks. Later two practice items without picture support were given to ensure that the participant understands the task. After that the researcher named the phonemes of 24 stimuli and asked a child to blend sounds into words. Considering the typological distance between English and Slavic languages, the items chosen for the adapted Ukrainian, Russian and Polish versions were in line with the Slovak version of the test. In the current study, the T1-T2 test-retest reliability ( $r$ ) was .88 for the Ukrainian language, .81 for the Polish language, and .86 for the Russian language.



*Phoneme isolation task* was administered as the second one out of the three PA tasks. There was an interval between PA blending and PA isolation tasks filled with one different task. The task consisted of four 8-item blocks. The items were non-words differing in levels of phonological complexity. The actual testing was preceded by two demonstration items and four practice items. The researcher named the nonword. Then a child was asked to repeat it and pronounce the isolated phoneme afterwards. The first two blocks comprised 8 CVC and 8 CCVC monosyllabic nonwords where the onset phoneme had to be isolated. The last two blocks also consisted of 8 CVC and 8 CCVC monosyllabic nonwords where the final phoneme had to be isolated. A block was discontinued if a child produced four consecutive mistakes. Each correctly isolated first/last targeted phoneme was awarded 2 points. If a child repeated a nonword incorrectly but isolated first/last phoneme of this repetition correctly, it was awarded 1 point. The maximum score available was 64 points. Similarly, to PA blending, adaptations into Ukrainian, Russian and Polish were heavily based on the Slovak version of the test. In the current study, the T1-T2 test - retest reliability was .77 for the Ukrainian language, .73 for the Polish language, and .76 for the Russian language.

*Phoneme deletion task* was administered the last among the three PA tasks as it is considered to be the most difficult one. The task was administered only if a child achieved ( $\geq 80\%$ , at least 52 points) on the Phoneme isolation task. The tasks included four 5-item blocks, two of them consisted of 5 CVC and two of 5 CCVC nonword items. In the first block, a child had to delete the onset phoneme and pronounce the remaining part of the nonword. In the last block, a child had to delete the final phoneme and pronounce the remaining sounds. There were two demonstration items and four practice items for each block. The outcome variable was the number of correctly deleted phonemes. In addition, time was recorded but not used in subsequent analyses. Each correctly deleted first/last targeted phoneme was awarded 2 points. If a child repeated a nonword incorrectly but correctly isolated first/last phoneme of this repetition, it was awarded 1 point. The maximum score available was 40 points. The T1-T2 test-retest reliability was .41 for Ukrainian, .56 for Polish, and .55 for Russian.

#### 6.3.4.2. Rapid automatized naming

Four measures of rapid automatized naming were included in the study. They were adapted into Ukrainian, Russian and Polish from the MABEL test battery mentioned earlier (Caravolas et al. 2018). All four tasks were administered at T1, whereas at T2 only RAN digits and RAN letters were used. For each task described below, a child had to name the stimuli aloud and as fast as possible.

*RAN colours:* five colours (*brown, blue, black, red, green*) were recurrently presented in a random order in a fixed array of five rows, totalling in 40 items. At Time 1 split-half reliability (based on comparing children's performance of 1st and 2nd card) was .88 for Polish, .91 for Ukrainian and .89 for Russian.

*RAN objects:* five objects (pictures of *dog, eye, key, lion, table*) were recurrently presented in a pseudorandom order in a fixed array of five rows, totalling in 40 items. At Time 1 split-half reliability was .96 for Ukrainian, .90 for Polish and .93 for Russian.

*RAN digits:* five digits (2, 3, 6, 7, 9) were recurrently presented in a random order in a fixed array of five rows, totalling in 40 items. At Time 1 split-half reliability for the Ukrainian language was .98, .97 for Polish, and .97 for Russian. At Time 2, for Polish the half-split reliability was .97, the T1-T2 test-retest was .83. For Ukrainian, the half-split reliability was .98 and the T1-T2 test-retest reliability was .86. For Russian: the half-split reliability was .95, the T1-T2 retest was .80.

*RAN letters:* five letters (*a, s, d, p, o*) are recurrently presented in a random order in a fixed array of five rows, totalling in 40 items. At T1 the split-half reliability was .98 for Ukrainian, it was .97 for Polish and .97 for Russian. At T2, for Ukrainian the half-split reliability was .98. and the T1-T2 test-retest was .60. For Polish, the half-split reliability for was .98. and T1-T2 test-retest was .63. For Russian, the half-split reliability was .96 and the T1-T2 test-retest was .65.

Each task was presented to a child on a screen, using PPT in a slide show mode. The PPT contained three slides: (a) the first one was the training card; (b) the second one was testing card 1; (c) the third card was testing card 2. The non-alphanumeric task RAN colours was administered first, followed by RAN objects with the interval between them filled with three different tasks. The alphanumeric tasks RAN letters and RAN digits were administered after a break in the second part of the testing session, considering the child knew letters and digits. The interval between the

two tasks was also filled with three different tasks. At the beginning, a child was asked to name stimuli. If the child could not recall the name of the stimulus, the researcher named the stimuli and asked the child to repeat. If the child could name all the stimuli correctly, then the task was administered. The outcome variable was an average time (measured in seconds) spent on naming all the stimuli on testing card 1 and 2. Errors were noted down on a score sheet but were not a part of an outcome variable.

#### **6.3.4.3. Letter naming**

*Letter naming task* followed the format of the analogous MABEL task. The children were first presented with their own initials (in lower case) and asked to produce their names as well as sounds. All other lowercase letters of the alphabet then followed, in ascending order of difficulty (most frequent letters, taught early in school were presented first). The procedure was then repeated with upper case letters. Testing with each block (lower- or uppercase) was discontinued if the child could neither name nor produce the sound of 5 consecutive letters.

The Ukrainian letter knowledge task consisted of 33 upper- and lower-case letters. The maximum score was 33 for the letter name-sound category. The Russian test set comprised 33 letters, with the same maximum score of 33 points. The Polish version of the test included 32 letters, which allowed for the maximum score of 32 points. According to the MABEL manual, letter sound and letter names scores are tallied separately. However, in this study instructions were modified. A child was given a point whenever a letter name or a letter sound was named correctly. This blended approach was applied out of necessity to minimize participants' tiredness, considering a number of tasks per participant. The split-half reliability (based on comparing children's performance of lower and upper case letter names and sounds) was .92 for Ukrainian. It was .93 for Polish and .92 for Russian.

All the letters were presented on the screen in the PPT slide show mode. The letters were presented in black colour on the white background, centred, the font chosen was *Calibri*, the font size was 200.

#### 6.3.4.4. Oral language skills

*Polish listening comprehension* (the monolingual and the bilingual group). This task used materials from a subtest called *Dyskurs – Rozumienie Tekstów* [Discourse – Text Comprehension] from *Test Rozwoju Językowego* [Language Development Test] by Smoczyńska et al. (2015). The task consisted of six short texts with an increasing level of difficulty. The number of words increased through the texts from 100 to 179 words. Pre-recorded texts were narrated by a Polish native speaker. Six texts were assigned in three blocks of two and presented consequently, starting from the easiest ones to more complex. First, the child listened to the first block of two audio taped stories. After each story was presented, the child was immediately asked to answer five open questions. One point was awarded for each correct answer. The interval between each block of texts was filled with two different tasks. The maximum score for each text was 5 points. The outcome variable was a total sum of all questions answered correctly. Split-half reliability was .85. The T1-T2 test-retest reliability was .65.

*Ukrainian listening comprehension* (the monolingual group). This task also used the materials from a subtest called *Dyskurs – Rozumienie Tekstów* [Discourse – Text Comprehension], translated into Ukrainian. The procedure used in this task was the same as for Polish listening comprehension. The length of the texts varied from 100 to 180 words, similar to Polish version. Texts were also audio recorded by the researcher (a Ukrainian native speaker) and presented in three blocks of two texts to participants. Split-half reliability was .88. The T1-T2 test-retest reliability was .66.

*Ukrainian/Russian listening comprehension* (the bilingual group). This task was also based on a subtest from *Test Rozwoju Językowego* [Language Development Test] by Smoczyńska et al. (2015). The complexity and length of texts were the same as in the TRJ subtest. However, new content for L1 (Ukrainian) tests was created by the researcher, who is fluent in Ukrainian and Russian, to avoid an effect of texts familiarity in the bilingual group. Otherwise, the assessment procedure was identical to that adopted in the Ukrainian/Polish listening comprehension tasks. The bilingual participants listened to Polish listening comprehension texts when were assessed in L2. To test new text versions in L1, an online pilot study was conducted in May 2020. Three monolingual Ukrainian children participated in the pilot session. The procedure was similar to the one in a real testing session. All texts proved to be clear and

appropriate for children aged 6-8. The length of texts varied from 98 to 178 words, similar to Ukrainian and Polish monolingual versions. Split-half reliability was .83. The T1-T2 test-retest reliability was .71.

*Polish vocabulary.* The subtest *Vocabulary – Word Production* from *Test Rozwoju Językowego* [Language Development Test] by Smoczyńska et al. (2015) was used as an untimed vocabulary task. It consists of 2 practice items and 25 testing items. The first practice item and 6 consecutive items were verbs. The child was shown a picture and immediately asked a question “What is he/she doing?”. The response was scored as correct if it contained the target verb, either on its own or embedded within a sentence. The next block of 13 nouns was preceded by one testing item. The testing items were nouns presenting natural (e.g. *cactus*, *desert*) or man-made objects (e.g. *compass*, *scales*). The child was shown a picture and asked a question “What is this?”. The response was scored as correct if it contained the target noun. A child was asked a question “Who is this?”. The outcome variable was the number of correctly produced words. The maximum possible score was 25. All items were presented in PPT in a slide show mode on the researcher’s screen shared with the participants. T1-T2 test-retest was .93. The reliability of the original test (Cronbach  $\alpha$ ): .77 (children aged 6;6-6;11) and .82 (7;0-7;11).

*Ukrainian vocabulary.* The same subtest *Vocabulary – Word Production* from *Test Rozwoju Językowego* [Language Development Test] by Smoczyńska et al. (2015) was used as a vocabulary task. The procedure was similar to Polish vocabulary task. The maximum score was 25 points. The test-retest reliability was .91 for Ukrainian, .89 for Russian.

#### **6.3.4.5. Phonological working memory**

*Polish pseudoword repetition.* *Test Powtarzania Pseudosłów* [Pseudoword Repetition Test] by Szewczyk et al. 2015 was used as a task. The task consisted of 27 pseudowords with increasing level of difficulty. All the words were audio recorded by a Polish native speaker. After each pseudoword was played once, a child was immediately asked to repeat it. One point was given for each correctly repeated pseudoword. Correct answers were given in the test manual. The outcome variable was

the number of correctly repeated pseudowords. The maximum score was 27 points. The reliability of the original test (Cronbach  $\alpha$ ): .81 (children aged 6;6-6;11) and .84 (7;0-7;11).

*Ukrainian and Russian pseudoword repetition.* The same *Test Powtarzania Pseudosłów* [Pseudoword Repetition Test] by Szewczyk et al. (2015) was adapted into Ukrainian and Russian. The core principle was to keep the syllable complexity the same across the tasks starting with two-syllable and extending to four-syllable items. Another principle was to keep items phonotactically plausible (i.e. pronounceable) in each language. As Polish, Ukrainian and Russian are typologically close, adapted items were quite similar across the languages. The number of items was 27. The procedure was similar to Polish pseudoword repetition.

*Polish sentence repetition.* This task was a subtest *Gramatyka – Powtarzanie Zdań* [Grammar – Sentence Repetition] from *Language Development Test* by Smoczyńska et al. (2015). The test consisted of 4 practice items and 34 testing items. Sentences were presented in an order of increasing difficulty. All items were audio recorded by a Polish native speaker. The child had to listen to each item once and was immediately asked to repeat the sentence. One point was given for each correctly repeated sentence. The outcome variable was the number of correctly repeated sentences. The test consisted of 4 practice items and 34 testing items. Sentences were presented in an order of increasing difficulty. The maximum score was 34 points. The task was untimed. When a child could not repeat or refused to repeat the sentence, the researcher continued the task by presenting the next sentence. T1-T2 test-retest reliability was .67.

*Ukrainian and Russian sentence repetition.* The same subtest of *Language development test* (Smoczyńska et al. 2015) was translated by the researcher into Ukrainian and Russian languages. When needed, minor stylistic or syntactic changes were made in order to keep sentences coherent in the given language. The overall complexity of sentences (e.g. tenses, defining clauses, subordinate clauses) was retained. The procedure was similar to Polish sentence repetition. The maximum score was 34 points. T1-T2 test-retest reliability for Ukrainian was .72 and .71 for Russian.

#### 6.3.4.6. Decoding skills

*One-minute word reading.* This task was adapted into Ukrainian, Russian and Polish from the MABEL test battery (Caravolas et al. 2018). This test assesses word reading efficiency in one-minute reading aloud format. The test consisted of 140 relatively familiar words with an increasing reading difficulty, starting with one- and two-letter words up to three-syllable words. The outcome variable is the number of correctly read and self-corrected words produced in one minute. Words for Polish, Ukrainian and Russian versions were close to the Slovak version of the same test. They were selected by word frequency and syllable complexity. WESLALEX (a database of words in children's school books in the West Slavic languages: Czech, Slovak and Polish; Kessler and Caravolas 2011) was used to select words based on frequency. Children's words frequency database in Ukrainian has not been developed yet. The criteria were similar to those used in other language versions of this MABEL subtest (standard frequency index (SFI) was not lower than 50). As most words in this task were cognates, the frequency in either Slovak and/or Polish was considered. T1-T2 test-retest reliability for Ukrainian was .81, .83 for Russian and .75 for Polish.

In this study, the mode of materials presenting was different from the one described in the MABEL manual. As the testing was held online, all 140 items were presented in PPT on five slides using *Calibri* 36-point font. Each slide contained 28 words presented in a linear order of four items per line. There were seven lines on each slide, totalling into 140 items. A child was asked to read words from left to right moving on to the next line as accurate and fast as possible. When all the words on one slide were read, the researcher moved on to another slide. The task was timed by a stopwatch.

*One-minute pseudoword decoding.* This task was also an adaptation of one-minute pseudoword reading task from MABEL battery into Ukrainian, Polish and Russian. The test measures decoding efficiency in a one-minute reading aloud format. The total number of testing items was 140. The items were derived from the list of words used in the corresponding word reading task. Depending on the word length, one or two letters were changed or transposed in a real word to derive a pseudoword. The method of materials presenting was similar to the one for one-minute word reading task. The outcome variable was the number of correctly decoded pseudowords in one

minute. T1-T2 test-retest reliability for Ukrainian was .88, for Russian .89 and .71 for Polish.

#### **6.3.4.7. Reading comprehension**

*Polish reading comprehension.* This task used materials adapted from SuperKid.pl, an online educational platform for primary school students ([www.superkid.pl](http://www.superkid.pl)). The platform contains versatile reading materials for Polish speaking children aged from 4 to 11. Texts used in the study were matched at the level of difficulty for the first graders. The child was presented one narrative text (79 words) and one expository text (86 words). The child was instructed to read a text aloud and to immediately answer the questions that followed. If a child came to a word that was unknown, they were instructed to skip it and continue with the rest of the text. The child was required to answer four questions after each text. The questions were a mixture of literal and inferential. The outcome variable was the number of questions answered correctly. An average score was created based on results of the two texts. The maximum score available for two texts was 8. Split-half reliability was .73.

*Ukrainian reading comprehension.* For the monolingual Ukrainian group, similar tasks adopted into the Ukrainian language were used. The translation approach made it possible to keep the tests comparable (similar length and context). The procedure was similar to the Polish reading comprehension task. An average score was created based on results of the two texts. The maximum score available for two texts was 8. Split-half reliability was .82.

*Ukrainian and Russian reading comprehension.* For the bilingual group, the same reading comprehension tasks in both languages, Ukrainian and Russian, were completed. They were based on the materials adapted from [www.superkid.pl](http://www.superkid.pl). The content of these texts differed from those presented to the child in the Polish version of the task. There were two texts followed up by sets of questions. An average score was created based on results of the two texts. The maximum score available for two texts was 8. Split-half reliability was .77 for Ukrainian and .75 for Russian versions.



## 6.4. Ethics

The study was granted permission by the Adam Mickiewicz University's Ethics Committee (Appendix G). Consent was provided by participant's parents prior to commencement of the study. The consent form outlined the nature of the study and the voluntary nature of their child's participation. The participants themselves also gave a oral assent which made them aware of the purpose of the study and its voluntary nature.

## 6.5. Statistical analyses conducted at T1 and T2

This section presents an outline of statistical analyses conducted at both testing sessions T1 and T2 (Fig. 4). A detailed description of each analysis is given in Chapter 7 (T1) and Chapter 8 (T2).

*Statistical analyses at T1.* Descriptive statistics analyses for the three groups were run to get insights into the dataset collected. All statistical analyses were grouped in two blocks in accordance with research questions. The first block of analyses was conducted to compare cognitive and literacy skills in L1 and L2 in the bilingual group (RQ 1) as well as cognitive and literacy skills measured between two monolingual groups and the Ukrainian-Polish bilingual group (RQ 2, 3). The second block of analyses aimed to explore cognitive predictors of decoding skills and their relationship in L1 and L2 in bilingual children (RQ 4, 5) as well as to compare those predictors between the three groups (RQ 6).

First, cognitive and literacy skills in both languages (L1 and L2) in bilinguals were compared (RQ 1). To explore that, a one-way repeated measures multivariate analysis of variance (within-subject) MANOVA and a dependent samples t-test were conducted. To address RQ 2 and RQ 3, performance on cognitive and literacy skills between monolingual and bilingual groups was compared by running two between-group t-tests as well as two one-way repeated measures multivariate analyses of covariance (between-subject) MANCOVAs: (1) one between Ukrainian monolinguals and Ukrainian-Polish bilinguals in their L1; (2) another one between Polish monolinguals and Ukrainian-Polish bilinguals in their L2. Level of parental education (mean score of educational level of both parents) was a covariate in MANCOVA

analyses to explore its possible moderator effect on children's performance on cognitive and language skills.

Second, four Pearson correlational analyses between predictors and reading outcomes both within and across languages in the bilingual group were conducted. Pearson coefficients ( $r$ ) in L1 and L2 as well as across languages (L1-L2, L2-L1) were compared by computing Fisher's  $z$  for each pair of correlations (within and across languages). Then, a number of hierarchical regression analyses within and across languages was conducted. Significance of differences between  $R^2$  values have been computed using a script written in R (Appendix N). To address RQ 6, two multiple linear regression analyses with interactions between categorical and continuous variables were conducted: (1) in Ukrainian: between Ukrainian monolinguals and Ukrainian-Polish bilinguals (L1); (2) in Polish: between Polish monolinguals and Ukrainian-Polish bilinguals (L2).

*Statistical analyses at T2.* Similar to T1, all statistical analyses at T2 were grouped in two blocks in accordance with research questions. The first group of analyses was run to compare cognitive and literacy skills in L1 and L2 in the bilingual group (RQ 7) as well as cognitive and literacy skills measured between monolinguals and the Ukrainian-Polish bilinguals longitudinally (RQ 8, 9). The second block of analyses aimed to explore cognitive predictors of decoding skills and reading comprehension as well as their relationship in L1 and L2 in bilingual children (RQ 10) as well as to compare those predictors between the three groups (RQ 11) in a longitudinal perspective. Most analyses conducted at T2 are similar to those at T1 (Fig. 4).

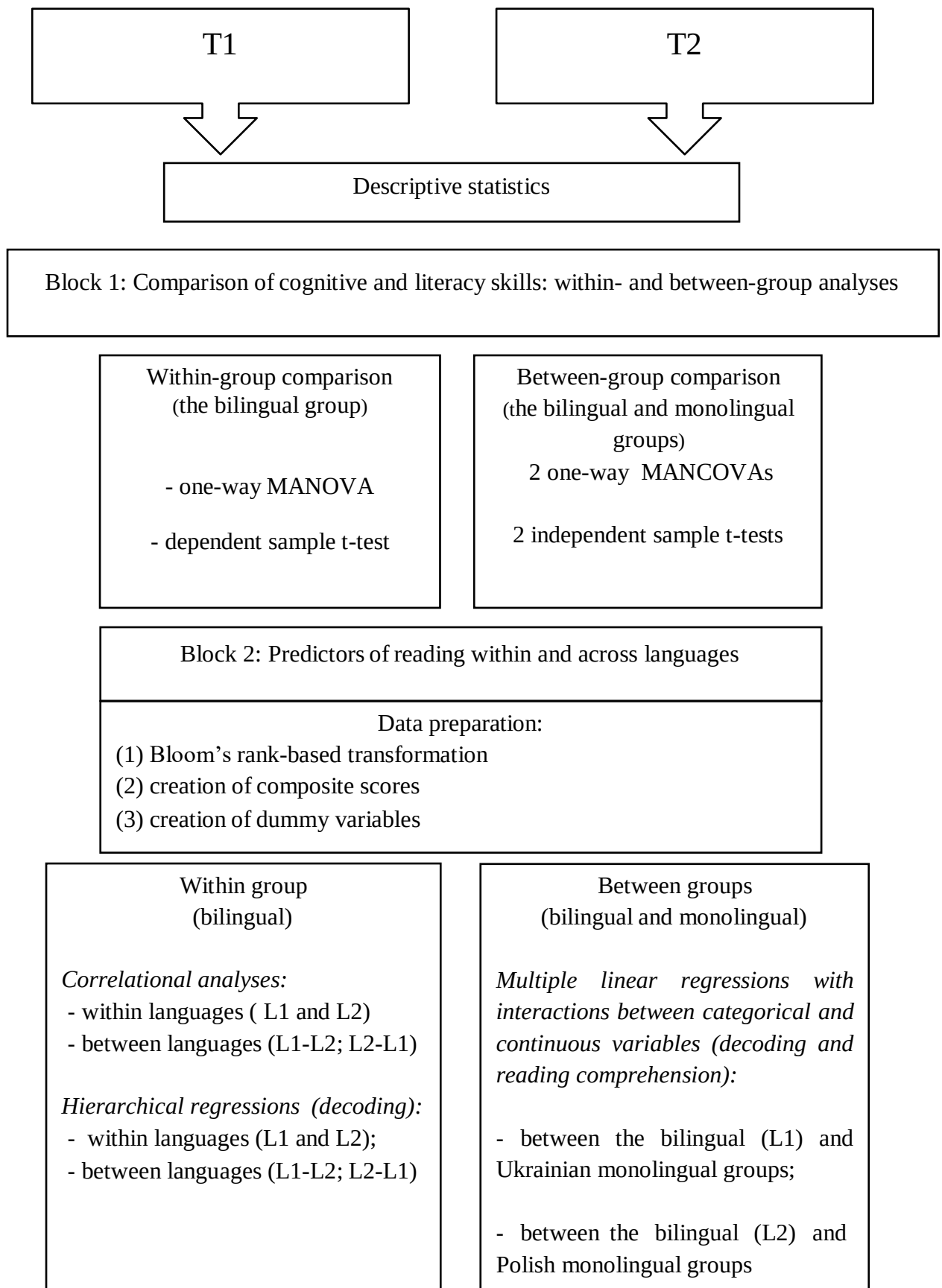


Fig. 4. Outline of statistical analyses at T1 and T2.

## **6.6. Summary**

The current longitudinal study in the Ukrainian-Polish bilinguals is designed to gain more insights into reading development in the bilingual novice readers acquiring literacy in two semi-transparent languages. Its main goal is to identify cognitive predictors of reading in bilinguals and to compare them with monolingual peers. Moreover, its aim is to explore crosslinguistic influence between cognitive predictors in L1/L2 and reading outcomes in L1/L2.

Due to the longitudinal nature of the study, two testing sessions were conducted over a period of seven-nine months, at which participants – first graders – were assessed on several cognitive and language as well as reading measures. Having presented an extensive description of the study design, participants' characteristics and measures included in this study, the two following two chapters report results and present a detailed description of the statistical analyses of conducted at T1 (Chapter 7) and T2 (Chapter 8).

## **Chapter 7: Early predictors of decoding skills in bilingual novice readers: Results of a concurrent study (T1)**

### **7.1. Introduction**

This chapter presents results of the concurrent analyses conducted at T1 in September – November 2020/2021. Results are described in accordance with the research questions (RQs 1-6) formulated in Chapter 6 (section 6.2). They are grouped into two blocks:

- (1) comparison of cognitive and literacy skills in L1 and L2 in the bilingual group (RQ 1); comparison of cognitive and literacy skills measured in two monolingual groups and the Ukrainian-Polish bilingual group (RQ 2, 3),
- (2) cognitive predictors of decoding skills and their relationship in L1 and L2 in the bilingual children (RQ 4, 5) as well as comparison of those predictors between the three groups (RQ 6).

## 7.2. Comparison of cognitive and literacy skills

### 7.2.1. Comparison of cognitive and literacy skills in both languages in the bilingual group

Only the bilingual group ( $n = 21$ , 13 girls) is included in the analysis presented here. Data was collected at the beginning of the first year (September – November 2020/2021) of formal literacy instruction at T1.

As the first step in this analysis, descriptive statistics for all the predictor variables (based on raw scores) are presented in Table 10. Overall, measures in L1 tend to be slightly better than similar measures in L2.

Table 10. Descriptive statistics of all measures at Time 1: Bilingual group.

| L 1 (Ukrainian/Russian)                      |    |       |        |      |     |     |    |       |        |      |     |     | L2 (Polish) |  |  |  |
|----------------------------------------------|----|-------|--------|------|-----|-----|----|-------|--------|------|-----|-----|-------------|--|--|--|
| Variable (maximum possible score)            | N  | Mean  | Median | SD   | Min | Max | N  | Mean  | Median | SD   | Min | Max |             |  |  |  |
| <i>Decoding skills</i>                       |    |       |        |      |     |     |    |       |        |      |     |     |             |  |  |  |
| Word reading                                 | 21 | 22.86 | 22.0   | 8.48 | 12  | 53  | 20 | 21.35 | 19.5   | 7.07 | 14  | 42  |             |  |  |  |
| Pseudoword decoding                          | 21 | 21.90 | 21.0   | 8.07 | 12  | 47  | 20 | 18.90 | 16.5   | 6.49 | 12  | 36  |             |  |  |  |
| <i>Phonological awareness</i>                |    |       |        |      |     |     |    |       |        |      |     |     |             |  |  |  |
| Phoneme deletion (40)                        | 16 | 32.81 | 32.5   | 3.39 | 25  | 38  | 16 | 31.81 | 32.0   | 3.97 | 23  | 38  |             |  |  |  |
| Phoneme isolation (64)                       | 21 | 57.95 | 60.0   | 4.97 | 48  | 64  | 21 | 56.86 | 58.0   | 5.37 | 45  | 64  |             |  |  |  |
| Phoneme blending (24)                        | 21 | 21.71 | 22.0   | 1.98 | 16  | 24  | 21 | 21.67 | 22.0   | 2.42 | 15  | 24  |             |  |  |  |
| <i>Letter knowledge</i>                      |    |       |        |      |     |     |    |       |        |      |     |     |             |  |  |  |
| Letter knowledge: upper case L1(33)/L2 (32)  | 21 | 30.76 | 31.0   | 1.81 | 26  | 33  | 21 | 28.86 | 30.0   | 2.73 | 22  | 32  |             |  |  |  |
| Letter knowledge: lower case L1 (33)/L2 (32) | 21 | 31.10 | 31.0   | 1.70 | 27  | 33  | 21 | 28.62 | 30.0   | 2.73 | 21  | 31  |             |  |  |  |
| <i>Oral skills</i>                           |    |       |        |      |     |     |    |       |        |      |     |     |             |  |  |  |
| Listening comprehension (30)                 | 21 | 23.95 | 24.0   | 2.77 | 18  | 28  | 21 | 20.95 | 22.0   | 3.65 | 12  | 25  |             |  |  |  |
| Vocabulary (25)                              | 21 | 18.19 | 18.0   | 1.54 | 15  | 21  | 21 | 16.90 | 17.0   | 3.08 | 10  | 22  |             |  |  |  |
| <i>Phonological working memory</i>           |    |       |        |      |     |     |    |       |        |      |     |     |             |  |  |  |
| Pseudoword repetition (27)                   | 21 | 25.43 | 26.0   | 1.72 | 22  | 27  | 21 | 24.57 | 24.0   | 1.89 | 21  | 27  |             |  |  |  |
| Sentence repetition (34)                     | 21 | 31.81 | 32.0   | 1.57 | 28  | 34  | 21 | 30.76 | 31.0   | 2.64 | 22  | 34  |             |  |  |  |

*Rapid Automatized**Naming*

|             |    |       |      |      |    |    |    |       |      |       |    |    |
|-------------|----|-------|------|------|----|----|----|-------|------|-------|----|----|
| RAN Objects | 21 | 48.77 | 48.0 | 9.28 | 34 | 69 | 21 | 50.58 | 48.0 | 9.68  | 33 | 68 |
| RAN Numbers | 21 | 33.42 | 31.5 | 7.72 | 18 | 52 | 21 | 36.86 | 31.5 | 11.63 | 21 | 78 |
| RAN Colours | 21 | 55.29 | 54.5 | 9.63 | 40 | 84 | 21 | 54.46 | 54.5 | 9.13  | 38 | 78 |
| RAN Letters | 21 | 31.47 | 31.0 | 8.22 | 17 | 47 | 20 | 38.81 | 31.0 | 7.62  | 17 | 53 |

In order to investigate the differences between performance across languages in the bilingual group, a one-way repeated measures multivariate analysis of variance (within-subject) MANOVA and a dependent samples t-test were conducted. Language was the within-subject variable. Measures in L1 and L2 were entered as dependent variables. All variables included in the analyses are comparable across languages.

There was a statistically significant difference between measures in L1 and L2 on the combined dependent variable (comprised of 15 directly comparable tasks),  $F(14,12) = 10.19$ ,  $p = .005$ , Wilks Lambda = .040, partial eta squared = .960. Within-subject univariate analyses (using Bonferroni correction) indicated that there were significant differences in children's performance on a number of tasks. Table 11 shows the tasks on which significant differences were evident across languages.

Table 11. Measures on which bilingual children demonstrated significant difference between languages ( $n = 21$ ).

| Measure                     | $t$   | $df$ | $p$   | $F$   | $df$ | $p$   | $\eta^2$ |
|-----------------------------|-------|------|-------|-------|------|-------|----------|
| Pseudoword decoding         | 5.19  | 19   | <.001 | 26.91 | 1,19 | <.001 | .586     |
| Word reading                | 2.26  | 19   | .036  | 5.10  | 1,19 | .036  | .212     |
| PA Isolation                | 3.75  | 19   | .001  | 11.99 | 1,19 | .003  | .387     |
| Listening comprehension     | 4.95  | 20   | <.001 | 35.84 | 1,19 | <.001 | .654     |
| Letter Knowledge Upper Case | 6.28  | 20   | <.001 | 20.79 | 1,19 | <.001 | .523     |
| Letter Knowledge Lower Case | 4.95  | 20   | <.001 | 34.85 | 1,19 | <.001 | .647     |
| Vocabulary                  | 2.66  | 20   | .015  | 5.94  | 1,19 | .025  | .238     |
| Pseudowords repetition      | 2.69  | 20   | .014  | 9.24  | 1,19 | .007  | .327     |
| Sentence repetition         | 2.22  | 20   | .038  | 6.05  | 1,19 | .024  | .241     |
| RAN Numbers                 | -2.59 | 20   | .018  | 9.06  | 1,19 | .007  | .323     |

Overall, the bilingual children performed better in their L1 (Ukrainian/Russian, the language spoken at home) on all measures presented in Table 11. There was no significant difference between other measures in L1 and L2.

### **7.2.2. Comparison of cognitive and literacy skills between the bilingual and monolingual groups**

*Participants.* For these analyses concurrent data from the Ukrainian monolingual group ( $n = 39$ , 23 girls), the Polish monolingual group ( $n = 25$ , 11 girls), and the previously described Ukrainian-Polish bilingual group ( $n = 21$ , 13 girls) was included.

As a first step to compare monolingual and bilingual groups, descriptive statistics (based on raw scores) were created for all Ukrainian measures (Table 12.1) and for all Polish measures (Table 12.2) at T1. The descriptive statistics for the bilingual group were presented in the previous section (Table 10). Results are available for both monolingual and bilingual groups.

Overall, the bilingual group performed better on all tasks in Ukrainian (L1) than the Ukrainian monolingual group. However, a different trend was observed while comparing the bilingual group's performance in Polish. In this case, the Polish monolingual group outperformed the bilingual children on most tasks in Polish (L2), although there were some exceptions. Thus, the bilingual group was marginally better at pseudoword decoding task as well as RAN objects and RAN letters. Data on RAN tasks are presented in seconds (less time, better RAN task result). The most notable difference between the two groups was in performance on the oral skills tasks (listening comprehension and vocabulary), where the Polish monolinguals achieved higher scores.

To further investigate the differences between monolingual and bilingual groups, two one-way multivariate analysis of covariance (MANCOVAs) between groups and two independent sample t-tests were performed. Level of parental education was a covariate. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity (Appendix M). Data was found to deviate from the assumption of normality, but MANCOVA is reasonably robust to modest violations of normality (Blanca 2017).



In the Ukrainian monolingual group three cases missed the data, therefore, only data from 36 participants were included in the MANCOVA analyses and 39 in the dependent sample t-test. All variables measured at T1 were entered as dependent variables. The independent variable was a group.

Table 12.1. Descriptive statistics of all Ukrainian/Russian measures at Time 1: bilingual ( $n = 21$ ) and monolingual ( $n = 39$ ) groups.

| Ukrainian/Russian (bilingual)      |    |       |        |      |         | Ukrainian (monolingual) |    |       |        |       |     |     |
|------------------------------------|----|-------|--------|------|---------|-------------------------|----|-------|--------|-------|-----|-----|
| Variable (maximum possible score)  | N  | Mean  | Median | SD   | Min-Max |                         | N  | Mean  | Median | SD    | Min | Max |
| <i>Decoding skills</i>             |    |       |        |      |         |                         |    |       |        |       |     |     |
| Word reading                       | 21 | 22.86 | 22.0   | 8.48 | 12-53   |                         | 36 | 20.61 | 18.5   | 6.01  | 12  | 39  |
| Pseudoword decoding                | 21 | 21.90 | 21.0   | 8.07 | 12-47   |                         | 36 | 17.36 | 15.5   | 5.47  | 11  | 38  |
| <i>Phonological awareness</i>      |    |       |        |      |         |                         |    |       |        |       |     |     |
| Phoneme deletion (40)              | 16 | 32.81 | 32.5   | 3.39 | 25-38   |                         | 14 | 33.14 | 34.0   | 4.28  | 26  | 38  |
| Phoneme isolation (64)             | 21 | 57.95 | 60.0   | 4.97 | 48-64   |                         | 39 | 49.49 | 53.0   | 9.26  | 30  | 60  |
| Phoneme blending (24)              | 21 | 21.71 | 22.0   | 1.98 | 16      | 24                      | 39 | 20.03 | 20.0   | 2.59  | 12  | 24  |
| <i>Letter knowledge</i>            |    |       |        |      |         |                         |    |       |        |       |     |     |
| Letter knowledge: upper case (33)  | 21 | 30.76 | 31.0   | 1.81 | 26      | 33                      | 39 | 29.82 | 31.0   | 2.74  | 22  | 33  |
| Letter knowledge: lower case (33)  | 21 | 31.10 | 31.0   | 1.70 | 27      | 33                      | 39 | 29.54 | 30.0   | 3.00  | 20  | 33  |
| <i>Oral skills</i>                 |    |       |        |      |         |                         |    |       |        |       |     |     |
| Listening comprehension (30)       | 21 | 23.95 | 24.0   | 2.77 | 18      | 28                      | 39 | 19.03 | 21.0   | 5.20  | 8   | 26  |
| Vocabulary (25)                    | 21 | 18.19 | 18.0   | 1.54 | 15      | 21                      | 39 | 18.00 | 18.0   | 4.05  | 9   | 25  |
| <i>Phonological working memory</i> |    |       |        |      |         |                         |    |       |        |       |     |     |
| Pseudoword repetition (27)         | 21 | 25.43 | 26.0   | 1.72 | 22      | 27                      | 39 | 25.26 | 26.0   | 1.57  | 20  | 27  |
| Sentence repetition (34)           | 21 | 31.81 | 32.0   | 1.57 | 28      | 34                      | 39 | 28.36 | 30.0   | 4.46  | 13  | 33  |
| <i>Rapid Automatized Naming</i>    |    |       |        |      |         |                         |    |       |        |       |     |     |
| RAN Objects                        | 21 | 48.77 | 48.0   | 9.28 | 34      | 69                      | 38 | 49.91 | 48.3   | 8.76  | 34  | 76  |
| RAN Numbers                        | 21 | 33.42 | 31.5   | 7.72 | 18      | 52                      | 39 | 41.82 | 41.5   | 11.31 | 26  | 87  |
| RAN Colours                        | 21 | 55.29 | 54.5   | 9.63 | 40      | 84                      | 39 | 52.43 | 53.5   | 12.32 | 38  | 115 |
| RAN Letters                        | 21 | 31.47 | 31.0   | 8.21 | 17      | 47                      | 38 | 41.80 | 41.8   | 10.62 | 23  | 93  |

Table 12.2. Descriptive statistics of all Polish measures at Time 1: bilingual ( $n = 21$ ) and monolingual ( $n = 25$ ) groups.

| Variable (maximum possible score)  | Ukrainian/Russian (bilingual) |       |        |       |     |     | Polish (monolingual) |       |        |      |     |     |
|------------------------------------|-------------------------------|-------|--------|-------|-----|-----|----------------------|-------|--------|------|-----|-----|
|                                    | N                             | Mean  | Median | SD    | Min | Max | N                    | Mean  | Median | SD   | Min | Max |
| <i>Decoding skills</i>             |                               |       |        |       |     |     |                      |       |        |      |     |     |
| Word reading                       | 20                            | 21.35 | 19.5   | 7.07  | 14  | 42  | 25                   | 21.20 | 21.0   | 3.24 | 15  | 27  |
| Pseudoword decoding                | 20                            | 18.90 | 16.5   | 6.49  | 12  | 36  | 25                   | 17.12 | 17.0   | 2.62 | 14  | 24  |
| <i>Phonological awareness</i>      |                               |       |        |       |     |     |                      |       |        |      |     |     |
| Phoneme deletion (40)              | 16                            | 31.81 | 32.0   | 3.97  | 23  | 38  | 19                   | 34.79 | 35.0   | 2.23 | 30  | 38  |
| Phoneme isolation (64)             | 21                            | 56.86 | 58.0   | 5.37  | 45  | 64  | 25                   | 57.32 | 59.0   | 3.98 | 50  | 63  |
| Phoneme blending (24)              | 21                            | 21.67 | 22.0   | 2.42  | 15  | 24  | 25                   | 22.20 | 22.0   | 1.15 | 20  | 24  |
| <i>Letter knowledge</i>            |                               |       |        |       |     |     |                      |       |        |      |     |     |
| Letter knowledge: upper case (32)  | 21                            | 28.86 | 30.0   | 2.73  | 22  | 32  | 25                   | 29.64 | 30.0   | 1.22 | 27  | 32  |
| Letter knowledge: lower case (32)  | 21                            | 28.62 | 30.0   | 2.73  | 21  | 31  | 25                   | 29.36 | 29.0   | 1.25 | 27  | 32  |
| <i>Oral skills</i>                 |                               |       |        |       |     |     |                      |       |        |      |     |     |
| Listening comprehension (30)       | 21                            | 20.95 | 22.0   | 3.65  | 12  | 25  | 25                   | 24.72 | 24.0   | 1.90 | 22  | 28  |
| Vocabulary (25)                    | 21                            | 16.90 | 17.0   | 3.08  | 10  | 22  | 25                   | 20.36 | 20.0   | 2.56 | 16  | 25  |
| <i>Phonological working memory</i> |                               |       |        |       |     |     |                      |       |        |      |     |     |
| Pseudoword repetition (27)         | 21                            | 24.57 | 24.0   | 1.89  | 21  | 27  | 25                   | 25.28 | 26.0   | 1.49 | 22  | 27  |
| Sentence repetition (34)           | 21                            | 30.76 | 31.0   | 2.64  | 22  | 34  | 25                   | 31.72 | 32.0   | 1.24 | 29  | 34  |
| <i>Rapid Automatized naming</i>    |                               |       |        |       |     |     |                      |       |        |      |     |     |
| RAN Objects                        | 21                            | 50.58 | 53.0   | 9.68  | 33  | 68  | 25                   | 55.70 | 55.0   | 5.52 | 46  | 65  |
| RAN Numbers                        | 21                            | 36.86 | 34.0   | 11.63 | 21  | 78  | 25                   | 31.70 | 31.5   | 3.16 | 25  | 38  |
| RAN Colours                        | 21                            | 54.46 | 52.5   | 9.13  | 38  | 78  | 25                   | 50.74 | 51.5   | 3.62 | 44  | 57  |
| RAN Letters                        | 20                            | 38.81 | 31.0   | 7.62  | 17  | 53  | 25                   | 42.40 | 42.0   | 8.15 | 29  | 59  |

The first MANCOVA analysis between the Ukrainian monolingual and the bilingual group in L1 revealed a statistically significant difference between the groups on the combined dependent variables,  $F(14, 41) = 7.10$ ,  $p < .001$ , Wilks Lambda = .292, partial eta squared = .706. There was no statistically significant effect of parental education level on performance of cognitive and language measures  $F(14, 41) = 1.10$ ,

$p = .389$ , Wilks Lambda = .728, partial eta squared = .232. When the results for dependent variables were considered separately, there were a few differences between measures that reached statistical significance (using a Bonferroni adjusted coefficient). The results are presented in Table 13.

Table 13. Measures on which there was a statistically significant difference between the monolingual and bilingual groups: Ukrainian measures at Time 1.

| Measure                     | <i>t</i> | <i>df</i> | <i>p</i> | <i>F</i> | <i>df</i> | <i>p</i> | $\eta^2$ | Mean  | SD           | Mean       | SD   |
|-----------------------------|----------|-----------|----------|----------|-----------|----------|----------|-------|--------------|------------|------|
|                             |          |           |          |          |           |          |          |       | Monolinguals | Bilinguals |      |
| Pseudoword decoding         | 2.53     | 55        | .007     | 6.32     | 1,54      | .015     | .104     | 17.36 | 5.47         | 21.90      | 8.48 |
| PA Isolation                | 3.89     | 58        | <.001    | 13.17    | 1,54      | <.001    | .195     | 49.49 | 9.26         | 57.95      | 4.97 |
| PA Blending                 | 2.60     | 58        | .006     | 5.73     | 1,54      | .020     | .095     | 20.03 | 2.59         | 21.71      | 1.98 |
| Listening comprehension     | 4.03     | 58        | <.001    | 15.68    | 1,54      | <.001    | .224     | 19.03 | 5.20         | 23.95      | 2.77 |
| Letter Knowledge Lower Case | 2.19     | 58        | .016     | 4.08     | 1,54      | .048     | .070     | 29.54 | 3.00         | 31.10      | 1.70 |
| Sentence repetition         | 3.42     | 58        | <.001    | 11.58    | 1,54      | .001     | .170     | 28.36 | 4.46         | 31.81      | 1.57 |
| RAN Numbers                 | -3.39    | 58        | <.001    | 7.41     | 1,54      | .009     | .120     | 41.82 | 11.31        | 33.42      | 7.72 |
| RAN Letters                 | -4.16    | 57        | <.001    | 13.49    | 1,54      | <.001    | .199     | 41.80 | 10.62        | 31.47      | 8.21 |

The bilingual children outperformed the monolingual group on a number of tasks related to different cognitive measures. Specifically, they showed better results on pseudoword decoding, PA isolation, listening comprehension, LK lower case, sentence repetition and RAN alphanumeric tasks.

The MANCOVA analysis of all measures between the Polish monolingual and the bilingual group in Polish (L2) also demonstrated a statistically significant difference between the groups on the combined dependent variables,  $F(14, 29) = 9.20$ ,  $p < .001$ , Wilks Lambda = .184, partial eta squared = .803. There was no statistically significant effect of parental education level on performance of cognitive and language measures  $F(14, 29) = 1.82$ ,  $p = .085$ , Wilks Lambda = .533, partial eta squared = .132. The results for dependent variables that were different and statistically significant (using a Bonferroni adjusted coefficient) are presented in Table 14.

Overall, Polish monolingual children outperformed bilinguals in their L2 Polish. The most significant differences could be observed in oral skills measures (listening comprehension and vocabulary), in which the monolinguals performed significantly better. Yet, the bilinguals were better at RAN objects and RAN letters measures.

Table 14. Measures on which there was a statistically significant difference between the monolingual and bilingual groups: Polish measures at Time 1.

| Measure                 | <i>t</i> | <i>df</i> | <i>p</i> | <i>F</i> | <i>df</i> | <i>p</i> | $\eta^2$ | Mean  | SD           | Mean       | SD   |
|-------------------------|----------|-----------|----------|----------|-----------|----------|----------|-------|--------------|------------|------|
|                         |          |           |          |          |           |          |          |       | Monolinguals | Bilinguals |      |
| Listening comprehension | 4.49     | 44        | <.001    | 18.62    | 1,42      | <.001    | .305     | 24.72 | 1.90         | 20.95      | 3.65 |
| Vocabulary              | 4.15     | 44        | <.001    | 15.22    | 1,42      | <.001    | .265     | 20.36 | 2.56         | 16.90      | 3.08 |
| RAN Objects             | -2.25    | 44        | .029     | 5.77     | 1,42      | .021     | .120     | 55.70 | 5.52         | 50.58      | 9.68 |
| RAN Letters             | -4.46    | 43        | <.001    | 21.74    | 1,42      | <.001    | .316     | 42.40 | 8.15         | 38.81      | 7.62 |

### 7.2.3. Summary of findings

Comparison of cognitive and literacy measures between languages presented above demonstrated that the Ukrainian-Polish bilinguals tend to perform better on most measures in L1 (Ukrainian/Russian). They achieved better results on 10 out of 15 tasks. The biggest difference was observed for letter knowledge upper case ( $t = 6.28$ ) and lower case ( $t = 4.95$ ), pseudoword decoding ( $t = 5.19$ ), listening comprehension ( $t = 4.95$ ). These findings are not surprising, considering their limited exposure to Polish (L2) in comparison to Ukrainian or Russian (L1). Predictably, early teaching of letter names and sounds at home, as reported by parents in the ALDeQ and HLE questionnaires, led to better letter knowledge in a child's first language (L1). Learning of Polish letters has commenced later and was not at the same level as in L1. Expectedly, performance of listening comprehension was better in L1 due to more extensively developed oral skills in L1 in comparison to L2.

When the bilinguals' performance was compared with two monolingual groups, MANCOVA and t-tests results revealed that the Ukrainian-Polish bilingual novice readers outperformed their Ukrainian monolingual peers on most cognitive and literacy tasks. Hence, in each cognitive domain there was a task, on which the difference was

statistically significant. They performed better on pseudoword decoding tasks ( $t = 2.53$ ), phonological awareness (isolation) task ( $t = 3.89$ ), listening comprehension ( $t = 4.03$ ), letter knowledge in lower case ( $t = 2.19$ ), sentence repetition ( $t = 3.42$ ), and both alphanumeric RAN tasks. Only five measures (word reading, vocabulary, pseudoword repetition, letter knowledge upper case and RAN colors and objects tasks) were not significantly different across languages. The greatest differences were observed for listening comprehension ( $t = 4.03$ ), RAN letters ( $t = -4.16$ ), RAN numbers ( $t = -3.39$ ), PA isolation ( $t = 3.89$ ) and sentence repetition ( $t = 4.42$ ). It is speculated that exposure to two languages might enhance attention to details while listening to speech in both languages on daily bases. Hence, it might lead to somewhat better attention to the information presented in the oral task (Chapter 2). Better performance on RAN letters measure can be a result of somewhat better developed early decoding skills (word reading) in L1. Thus, it could be assumed that retrieval of letters in RAN tasks was more automatized in the bilinguals than in the monolingual group due to more practice in decoding skills. This reciprocal relationship between two constructs has been previously discussed in Chapter 2. However, they also were faster on RAN numbers tasks, which might be the case of a better familiarity with numbers. It could also be the case of faster retrieval of lexical items from long-term memory due to their exposure to two languages (enhanced executive control). Significantly better performance on the sentence repetition task (phonological working memory measure) might imply some positive effect of exposure to two languages sharing common phonological, syntactic and morphological features.

A different pattern was observed in performance on cognitive and literacy skills between the bilingual group in L2 in and the Polish monolingual group. There was no statistically significant difference on the performance of literacy (word reading and pseudoword decoding) and most cognitive tasks. The only notably observed difference were oral skills measures (listening comprehension ( $t = 4.49$ ) and vocabulary ( $t = 4.15$ ), where the Polish monolinguals significantly outperformed the Ukrainian-Polish bilinguals in their L2 Polish. This finding is consistent with previous research indicating weaker oral languages skills in bilinguals at the initial stage of formal literacy instruction (Chapter 3). However, bilinguals outperformed the monolinguals on RAN objects and letters. They were faster in naming letters and objects. One of the reasons why this might be the case is the presence of cognates in RAN task. The RAN

objects task consists of cognates, which was proved to facilitate retrieval of lexical items in the bilinguals (Bialystok et al. 2010, Comesaña et al. 2012).

Overall, both within-group and between-groups comparisons indicated that bilingual individuals demonstrated superior performance in their first language (L1) compared to their second language (L2).

### **7.3. Cognitive predictors of decoding skills: Correlational and hierarchical regression analyses**

This block of analyses explores the cognitive underpinnings of decoding skills in the bilingual group both within languages and between languages. Multiple linear regressions with interactions between categorical and continuous variables were conducted between groups to explore similarities and differences of predictors. Word reading and pseudoword decoding are reading outcome measures included in the analyses.

#### **7.3.1. Data preparation**

*Participants.* For these analyses concurrent data from the three groups described in the previous section 7.2.2. was included: the Ukrainian monolingual group ( $n = 39$ ), the Polish monolingual group ( $n = 25$ ), and the Ukrainian-Polish bilingual group ( $n = 21$ ). Data was collected at the beginning of the first year of formal literacy instruction (September – November 2020/2021) at T1.

*Data normalisation.* As data appeared to violate the assumption of normality, the distribution of all variables was rank transformed (using Bloom's proportion estimation formula) to make the data amenable to parametric statistical analyses. All raw scores are converted into percentile ranks and then produce a  $z$  score which would correspond to the percentile rank under a perfectly normal distribution. This transformation creates normalised  $z$  scores, which were used in correlational and regression analyses in this study.

*Composite scores.* Considering a large number of variables included in the current study, the creation of composite scores for some domains was explored. This

approach was necessary as to reduce a number of variables used in regression analyses to improve statistical power. Composite scores were based on normalized z scores of raw data. To explore whether combining variables into those groups was valid empirically, correlation matrices were checked. Inspection of matrices showed many coefficients ( $r_p$ ) of .3 and above. A number of variable groups was created based on theoretical and empirical assumptions. Correlations of variables used to create composite scores are presented in Table 15. The list of composite variables is presented below:

- (1) phonological awareness: phoneme blending and phoneme isolation,
- (2) phonological working memory: sentence repetition and pseudoword repetition,
- (3) oral language: listening comprehension and vocabulary,
- (4) rapid automatized naming: RAN colours, objects, letters and digits,
- (5) letter knowledge: letter names/sounds (upper case and lower case).

### **7.3.2. Correlations between cognitive predictors and decoding skills in the bilingual group**

As the next step in the analysis, concurrent Pearson's correlations between predictor variables and reading outcomes (word reading and pseudoword decoding) were produced. Four analyses were run: two within languages and two between languages. Within-language analyses include correlations between cognitive predictors measured and reading outcomes measured in the same language. The between-language analyses provide cross-language correlations between cognitive predictors in L1 and reading outcomes in L2 and the other way round. They are reported in Tables 16 and 17.

*Within-language correlations.* All correlations (apart from RAN tasks)<sup>2</sup> between predictors and decoding skills tasks were in the predicted direction (positive). In general, the strongest correlations in both languages are observed between reading tasks

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<sup>2</sup> In this study, RAN measure was time in seconds, during which a child named all stimuli presented on a screen. Therefore, the relationship between RAN-reading is negative: less time spent on RAN tasks indicates a higher number of words/pseudowords read.

(word reading and pseudoword decoding) as well as phonological awareness tasks. Measures of phonological awareness correlated moderately to strongly with both reading tasks. Measures of phonological working memory showed moderate relationships with reading tasks in L1 and L2. Whereas PWM measure (sentence repetition) demonstrated significant moderate correlations with literacy outcome in L1 (word reading) and both tasks in L2, pseudoword repetition tasks demonstrated significant moderate correlation only with pseudoword reading in both languages. Oral language skills showed weak to moderate correlations in both languages yet listening comprehension and vocabulary knowledge in L1 correlated significantly only with word reading. Alphanumeric RAN tasks in both languages correlated significantly with both reading tasks, non-alphanumeric showed rather weak and non-significant correlations. Letter knowledge demonstrated weak to moderate significant correlations with reading in both languages L1 and L2.

*Between-language correlations.* Analyses revealed significant crosslinguistic correlations between some cognitive predictors in L1 and reading outcomes in L2 as well as predictors in L2 and reading outcomes in L1. The strongest correlations are observed between similar reading tasks in both languages (word reading and pseudoword decoding), which are as strong and significant as within language correlations. Measures of phonological awareness correlated moderately to strongly with both reading tasks across languages. Sentence repetition (PWM measure) correlated moderately with both literacy tasks. As to oral language skills, listening comprehension and vocabulary measured in L1 demonstrated significant correlations only with word reading measured in L2. Similar to the within language analyses, alphanumeric RAN tasks correlated significantly across languages with reading tasks, though patterns were different (Table 17). Only RAN objects measured in L1 was a moderate significant correlate with L2 pseudoword reading. Finally, though letter



Table 15. Correlations (Pearson's *r*) between variables used for creation of composite scores in all groups.

| Composite variable          |                         | Bilinguals L1 (Ukrainian) |           | Bilinguals L2 (Polish) |           | Ukrainian (monolingual) |          | Polish (monolingual) |           |
|-----------------------------|-------------------------|---------------------------|-----------|------------------------|-----------|-------------------------|----------|----------------------|-----------|
|                             |                         | <i>r</i>                  | <i>p</i>  | <i>r</i>               | <i>p</i>  | <i>r</i>                | <i>p</i> | <i>r</i>             | <i>p</i>  |
| Phonological awareness      | Phoneme blending        | .56                       | .008      | .71                    | <.001     | .69                     | <.001    | .64                  | .006      |
|                             | Phoneme isolation       |                           |           |                        |           |                         |          |                      |           |
| Phonological working memory | Sentence repetition     | .51                       | .019      | .66                    | .001      | .35                     | .035     | .48                  | .020      |
|                             | Pseudoword repetition   |                           |           |                        |           |                         |          |                      |           |
| Oral language skills        | Listening comprehension | .54                       | .047      | .36                    | .012      | .37                     | .020     | .58                  | .015      |
|                             | Vocabulary              |                           |           |                        |           |                         |          |                      |           |
| RAN                         | RAN objects, RAN colors | from .54 to .62           | all < .05 | from .40 to .54        | all < .05 | from .45 to .62         | all <.05 | from .48 to .55      | all < .05 |
|                             | RAN digits, RAN letters |                           |           |                        |           |                         |          |                      |           |
| Letter knowledge            | Upper case              | .86                       | < .001    | .83                    | <.001     | .97                     | <.001    | .74                  | <.001     |
|                             | Lower case              |                           |           |                        |           |                         |          |                      |           |
| Reading efficiency          | Word reading            | .92                       | <.001     | .87                    | < .001    | .85                     | <.001    | .86                  | <.001     |
|                             | Pseudoword decoding     |                           |           |                        |           |                         |          |                      |           |

Table 16. Within-language correlations between cognitive predictors and reading outcomes (Pearson's  $r$ , two-tailed) in L1 (Ukrainian) and L2 (Polish) at T1: Bilingual group ( $n = 21$ ).

| Domain                      | Measure (L1/L2)          | Word reading (L1) | Pseudoword decoding (L1) | Word reading (L2) | Pseudoword decoding (L2) | Difference (Fisher's $Z$ ) |                     |
|-----------------------------|--------------------------|-------------------|--------------------------|-------------------|--------------------------|----------------------------|---------------------|
|                             |                          |                   |                          |                   |                          | Word reading               | Pseudoword decoding |
| Reading efficiency          | Word reading             |                   | .92**                    |                   | .84**                    | 1.1                        | -                   |
|                             | Pseudoword decoding      | .92**             |                          | .84**             |                          |                            |                     |
| Phonological Awareness      | Phoneme blending         | .67**             | .58**                    | .76**             | .81**                    | .56                        | 1.39                |
|                             | Phoneme isolation        | .73**             | .75**                    | .78**             | .80**                    | .35                        | .38                 |
| Phonological Working Memory | Sentence repetition      | .42*              | .41                      | .61*              | .59*                     | .78                        | .73                 |
|                             | Pseudoword repetition    | .40               | .43*                     | .42               | .46*                     | .07                        | .11                 |
| Oral Language               | Listening comprehension  | .45*              | .28                      | .35               | .32                      | .36                        | .13                 |
|                             | Vocabulary               | .41*              | .39                      | .29               | .38                      | .41*                       | .68                 |
| Speed of Processing         | RAN colours              | -.35              | -.34                     | -.38              | -.40                     | .10                        | .21                 |
|                             | RAN objects              | -.36              | -.38                     | -.40              | -.39                     | .14                        | .04                 |
|                             | RAN letters              | -.46*             | -.41*                    | -.35*             | -.49*                    | .40                        | .30                 |
|                             | RAN numbers              | -.45*             | -.48*                    | -.55*             | -.64**                   | .08                        | .71                 |
| Letter knowledge            | Letter names/sounds (UC) | .61*              | .46*                     | .47*              | .49*                     | .27                        | .12                 |
|                             | Letter names/sounds (LC) | .54*              | .49*                     | .36*              | .38*                     | .68                        | .41                 |

Note: UC – upper case, LC – lower case; \*\*,  $p < .001$ , \*  $p < .05$

Table 17. Across-language correlations between cognitive predictors and reading outcomes (Pearson's  $r$ , two-tailed): Bilingual group ( $n = 21$ )

| Domain                      | Measure (L1)             | Word reading (L2) | Pseudoword decoding (L2) | Measure (L2)            | Word reading (L1) | Pseudoword decoding (L1) | Difference (Fisher's $Z$ ) |                     |
|-----------------------------|--------------------------|-------------------|--------------------------|-------------------------|-------------------|--------------------------|----------------------------|---------------------|
|                             |                          |                   |                          |                         |                   |                          | Word reading               | Pseudoword decoding |
| Reading efficiency          | Word reading             | .94**             | .89**                    | Word reading            | .94**             | .91**                    | 0                          | .32                 |
|                             | Pseudoword decoding      | .91**             | .84**                    | Pseudoword decoding     | .89**             | .84**                    | .32                        | 0                   |
| Phonological Awareness      | Phoneme blending         | .63**             | .57**                    | Phoneme blending        | .81**             | .85**                    | 1.16                       | 1.83                |
|                             | Phoneme isolation        | .79**             | .85**                    | Phoneme isolation       | .73**             | .74**                    | .89                        | .97                 |
| Phonological Working Memory | Sentence repetition      | .44*              | .42*                     | Sentence repetition     | .61**             | .62**                    | .71                        | .83                 |
|                             | Pseudoword repetition    | .41               | .40                      | Pseudoword repetition   | .42               | .43                      | .04                        | .11                 |
| Oral Language               | Listening comprehension  | .38*              | .34                      | Listening comprehension | .33               | .31                      | .17                        | .01                 |
|                             | Vocabulary               | .35*              | .31                      | Vocabulary              | .31               | .37                      | .36                        | .13                 |
| Speed of Processing         | RAN colours              | -.23              | -.38                     | RAN colours             | -.27              | -.25                     | .13                        | .43                 |
|                             | RAN objects              | -.44              | -.52*                    | RAN objects             | -.23              | -.35                     | .71                        | .63                 |
|                             | RAN letters              | -.46*             | -.41                     | RAN letters             | -.47*             | -.38                     | .14                        | .04                 |
|                             | RAN numbers              | -.44              | -.49*                    | RAN numbers             | -.55*             | -.63**                   | .44                        | .62                 |
| Letter knowledge            | Letter names/sounds (UC) | .36               | .33                      | LK (UC)                 | .35               | .20                      | .03                        | .42                 |
|                             | Letter names/sounds (LC) | .29               | .45                      | LK (LC)                 | .36               | .30                      | .23                        | .53                 |

knowledge demonstrated correlations with both literacy tasks, they were weak and non-significant across languages.

In four analyses, the Fisher's  $z$ -statistics were calculated to explore if the differences within and between languages were statistically significant. For word reading, vocabulary was a stronger predictor in L1 than in L2. Other results appeared to be statistically insignificant (Tables 16, 17).

### **7.3.3. Regression analyses: Predictors of decoding skills in the bilingual group**

As a next step in the analysis, a number of hierarchical multiple regression analyses were conducted. Each composite variable was entered systematically at the first step to explain the proportion of variance it could explain and at the last step in each analysis to measure the proportion of outcome variance it could explain uniquely, i.e. after controlling for all other blocks. In addition, a significance of differences between two beta weights ( $\beta$  L1 and  $\beta$  L2) for which composite variable was calculated. The statistical algorithm ( $R^2$  significance analysis) used for computing  $t$ -statistic ( $p$ -value) written in  $R$  can be found in Appendix N.

Preliminary analyses were run to ensure no serious violation of the assumptions of normality, multicollinearity, linearity, and homoscedasticity (Appendix M). Stevens (2002) recommends 15 participants per one predictor or Green (1991)  $N \geq 50 + 8k$ . In the analyses that were conducted in the study, there are 5 predictors. Thus, a sample size of 75 (following Stevens' guidelines) or 90 (according to Green) would be ideal. The sample size in this study does not meet this requirement (maximum sample size for all predictors = 21). Considering the modest sample size, the statistical power of the study is limited. Consequently, the findings presented here should be interpreted with caution.

Word reading and pseudoword decoding measures were used to create a composite score of reading efficiency measure (i.e. an average of correctly read words and correctly decoded pseudowords per minute). The reading efficiency was included in the analyses as dependent variables. The following composite variables were included in the regression analyses as independent (predictor) variables:

(1) phonological awareness

- (2) phonological working memory
- (3) oral language
- (4) rapid automatized naming
- (5) letter knowledge

The composite variables correspond to the composite variables described previously in this section (7.3.1).

The results of the regression analyses conducted within languages in L1 and L2 and between languages (cognitive measures in L1 - reading outcomes in L2 and cognitive measures in L2 - reading outcomes in L1), exploring the ability of predictors to explain variance in reading efficiency are presented in Tables 18.1 and 18.2. For the reasons of readability and clarity, only the  $R$  squared,  $B$  and  $\beta$  values are reported below. All statistics necessary to understand the model fully (including standard errors, 95% confidence intervals,  $t$ -values and their corresponding  $p$ -values) are reported in Appendix O.

Table 18.1. Predictors of reading efficiency: Results of hierarchical multiple regression within languages.

|                             | Entered first          | Entered last |       |         | Entered first | Entered last |        |         |        |
|-----------------------------|------------------------|--------------|-------|---------|---------------|--------------|--------|---------|--------|
| Predictors                  | Ukrainian/Russian (L1) |              |       |         | Polish (L2)   |              |        |         |        |
|                             | $R^2$ change           |              | $B$   | $\beta$ | $R^2$ change  |              | $B$    | $\beta$ | $p(t)$ |
| Phonological Awareness      | .625*                  | .216*        | .844  | .741    | .775**        | .252**       | .995   | .917    | .605   |
| Phonological Working Memory | .120                   | .009         | .145  | .118    | .498*         | .030         | .095   | .079    | .563   |
| Oral Language               | .212*                  | .003         | .088  | .074    | .236*         | .020         | .299   | .207    | .396   |
| RAN                         | .204*                  | .044         | -.152 | -.224   | .103          | .000         | -.002  | -.002   | .507   |
| Letter knowledge            | .401*                  | .023         | .192  | .179    | .117          | .021         | .188   | .148    | .988   |
| Adjusted $R^2$              | .712**                 |              |       |         |               |              | .821** |         |        |
| final model (all blocks)    |                        |              |       |         |               |              |        |         |        |

Note:  $p$ -value of  $t$ -statistic is the significance of differences between two  $\beta$  weights (in L1 and L2) for each composite variable; \*\*  $p < .001$ , \*  $p < .05$

*Within-language analyses.* The five cognitive predictors predicted individual differences in reading efficiency in both languages L1 and L2 very well, explaining over two-thirds of its variance (Fig. 5, 6). All five cognitive predictors correlated significantly with reading efficiency tasks (composite score of word and pseudoword

reading) in both languages, except for phonological working memory in L1 as well as RAN and letter knowledge in L2. These correlations were non-significant. Only phonological awareness variable made a significant unique contribution to the prediction of reading efficiency in both languages. Overall, the pattern of the concurrent regression analyses in both languages was rather similar, with phonological awareness being the strongest and unique predictor of reading efficiency.

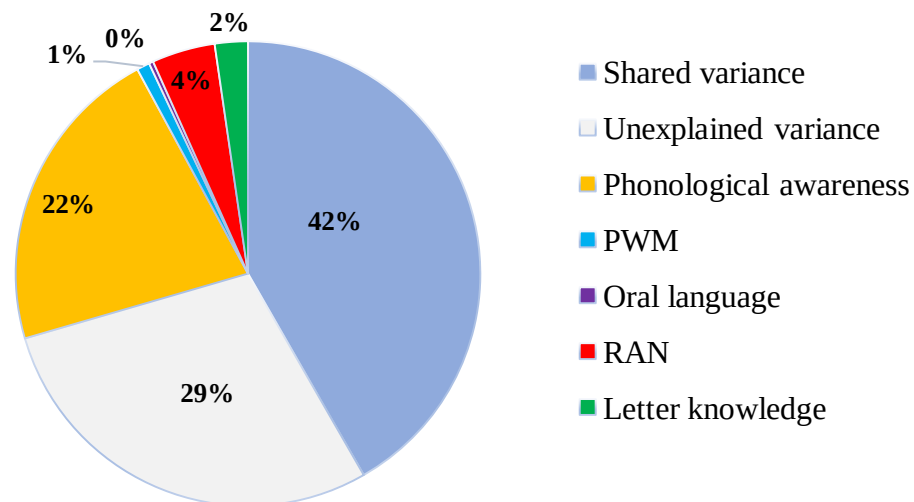


Fig. 5. Percentage of variance in T1 decoding skills explained by unique and shared contributions of predictor variables in L1 (Ukrainian/Russian).

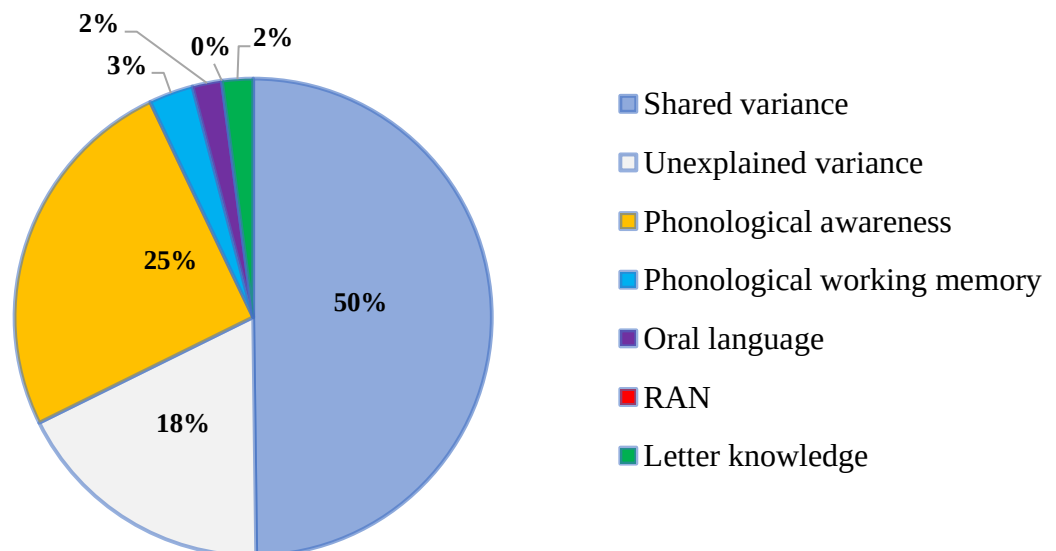


Fig. 6. Percentage of variance in T1 decoding skills explained by unique and shared contributions of predictor variables in L2 (Polish).

Table 18.2. Predictors of reading efficiency: Results of hierarchical multiple regression across languages.

| Predictors L1/L2                        | Entered first | Entered last |         |       | Entered first         | Entered last |         |             |      |
|-----------------------------------------|---------------|--------------|---------|-------|-----------------------|--------------|---------|-------------|------|
|                                         | Polish (L2)   |              |         |       | Ukrainian/Polish (L1) |              |         |             |      |
|                                         | $R^2$ change  | $B$          | $\beta$ |       | $R^2$ change          | $B$          | $\beta$ | $p$ ( $t$ ) |      |
| Phonological Awareness                  | .710*         | .261*        | .933    | .819  | .733*                 | .260*        | .942    | .931        | .741 |
| Phonological Working Memory             | .220*         | .005         | .092    | .079  | .392*                 | .000         | .003    | .003        | .825 |
| Oral Language                           | .224*         | .007         | .158    | .140  | .229*                 | .012         | .219    | .162        | .948 |
| RAN                                     | .152          | .041         | -.141   | -.212 | .128*                 | .001         | -.020   | -.030       | .595 |
| Letter knowledge                        | .328*         | .042         | .247    | .229  | .056                  | .004         | .082    | .081        | .665 |
| Adjusted $R^2$ final model (all blocks) | .728**        |              |         |       | .657**                |              |         |             |      |

Note:  $p$ -value of  $t$ -statistic is the significance of differences between two  $\beta$  weights (in L1 and L2) for each composite variable; \*\*  $p < .001$ , \*  $p < .05$

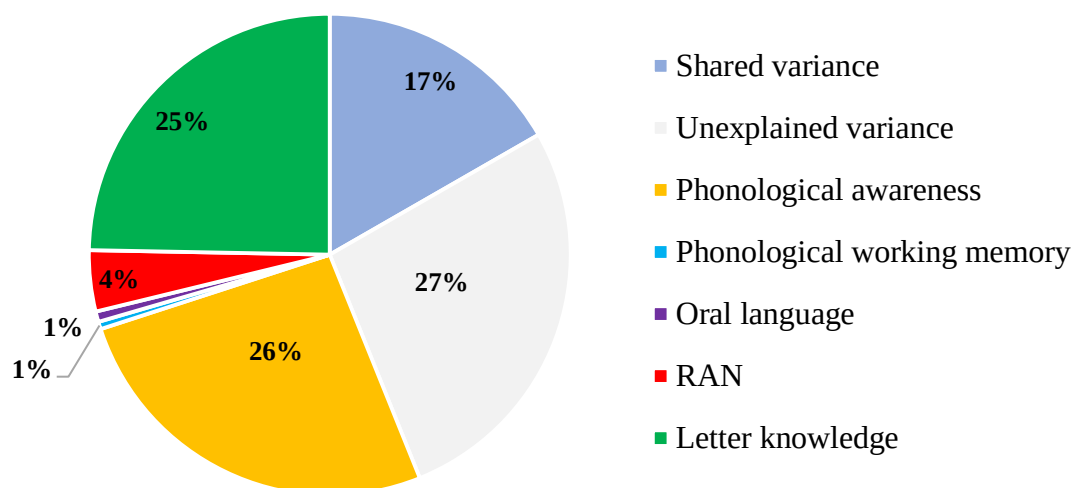


Fig. 7. Percentage of variance in T1 decoding skills explained by unique and shared contributions of predictor variables across languages (L1-L2).

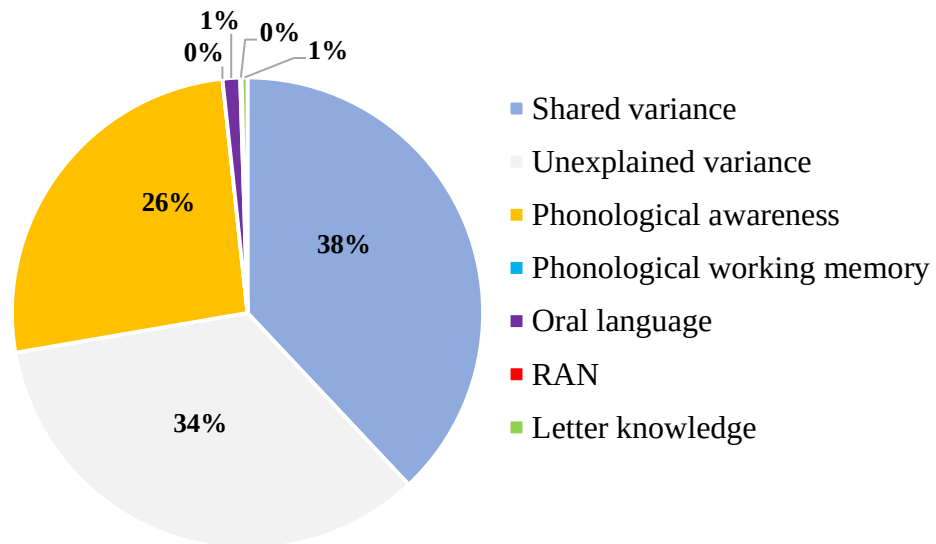


Fig 8. Percentage of variance in T1 decoding skills predicted by unique and shared contributions of predictor variables across languages (L2-L1).

*Between-language analyses.* Regarding crosslinguistic relationships, 5 cognitive measures predicted the reading efficiency in both language combinations, explaining 72.8% (Fig. 7) of its variance in L1 and 65.7% in L2 (Fig. 8). When measured in L1, all cognitive predictors correlated significantly with reading efficiency measured in L2, except for RAN measure. All measures in L2 significantly correlated with reading efficiency in L1, but letter knowledge. In both cases, only phonological awareness measures made a significant and distinctive contribution to the prediction (explanation) of the reading outcome variance, which is similar to the results of the within-language analyses described earlier.

To compare a significance of differences between  $\beta$  weights in L1 and L2, a number of within- and between-language  $R^2$  significance analyses were run. None of differences appeared to be significant. Given the overall similarity of unique variance explained across analyses, it may be concluded that unique predictors in L1, L2 as well as across-languages (L1-L2, L2-L1) are broadly similar.



#### 7.3.4. Cognitive predictors of decoding skills between the three groups: Results of regression analyses

As the last step, two multiple linear regression analyses with interactions between categorical and continuous variables were conducted. These analyses aimed to compare cognitive predictors of decoding skills between the Ukrainian-Polish bilingual group and the Ukrainian monolingual group in Ukrainian as well as predictors of decoding skills between the same bilingual group and the Polish monolingual group in Polish. In these analyses the group was a categorical variable. The continuous variables were five predictor variables, for which composite scores were created as described previously (section 7.3.1). Reading efficiency (composite score of word reading and pseudoword decoding) was entered as an independent variable. The correlations coefficients ( $r_p$ ) between word reading and pseudoword reading measures in all groups are given in Table 15.

Dummy variables for the categorical variable (group) were created. A dummy variable is a numerical value (0 or 1) used in regression analyses to represent the categorical variable (for *group\_b* variable, the bilingual group was assigned number 1, the Ukrainian monolingual = 0, the Polish monolingual = 0; for *group\_u* variable, the Ukrainian monolingual group was assigned 1, the other two groups were 0; for *group\_p* variable the Polish monolingual got 1 and other groups were assigned 0).

In the first regression analyses, predictors of reading efficiency measured in Ukrainian were compared between the bilingual group and the Ukrainian monolingual group. Similarly, the second analyses compared predictors of reading efficiency in Polish between the bilingual and the Polish monolingual group. The results of linear regression analyses are presented in Table 19.

Results of multiple linear regression revealed that two regression models were statistically significant. Exploring predictors in the Ukrainian monolingual and the Ukrainian-Polish bilingual groups, the first model explained 50,1% of the reading skill variability in decoding skills ( $R^2$  adjusted = .501,  $F(11, 45) = 5.01$ ,  $p < .001$ ). In the analyses with the Polish monolinguals and the bilinguals (L2), the model explained 54,7% of individual variance in decoding skills ( $R^2$  adjusted = .547,  $F(11, 33) = 4.90$ ,  $p < .001$ ). In all groups letter knowledge and PA appeared to be significant predictors of decoding skills (reading efficiency). In the Ukrainian language, RAN also demonstrated

significance in predicting decoding skills. In both models, there was a significant group by phonological awareness interaction that indicated that phonological awareness was a significant predictor in the bilingual group and of less importance in both monolingual groups (Fig. 9, 10). When significance of difference between  $\beta$  weights in two models was compared (the same R code was used as in section 7.3.3, Appendix N), it turned out to be insignificant  $p = .823$ . Thus, it may be assumed that at the beginning of formal literacy instruction, phonological awareness is an equally important predictor of reading in L1 and L2 for bilinguals and two monolingual groups (Ukrainian and Polish).

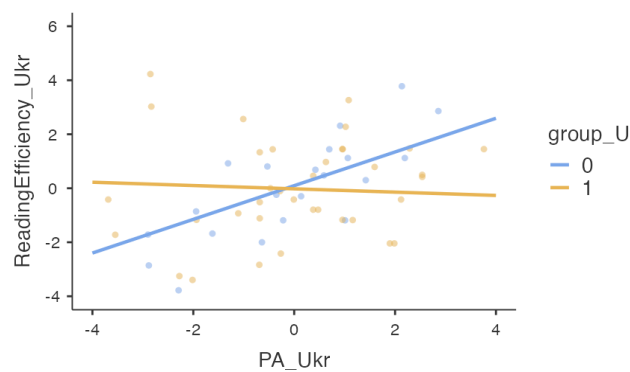


Fig.9. Group\*PA interaction in the regression with reading efficiency in Ukrainian. 0 (blue line) – the bilingual group (L1), 1 (yellow line) – the Ukrainian monolingual group.

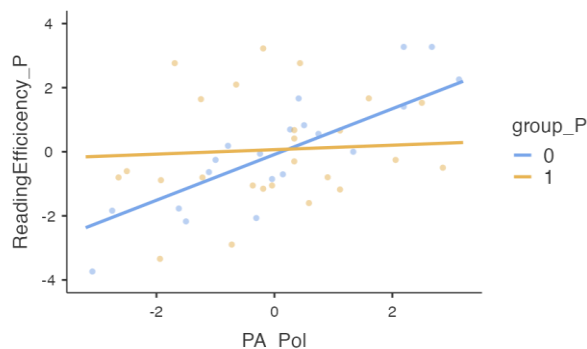


Fig.10. Group\*PA interaction in the regression with reading efficiency in Polish. 0 (blue line) - the bilingual group (L2), 1 (yellow line) - the Polish monolingual group.

Table 19. Comparison of reading efficiency predictors between the bilingual and the monolingual groups: Results of multiple linear regression with categorical and continuous variables and their interactions.

|                      | Comparison with Ukrainian monolinguals |             |        |         |         |          |          |                                 | Comparison with Polish monolinguals |             |        |        |         |          |          |                                 |
|----------------------|----------------------------------------|-------------|--------|---------|---------|----------|----------|---------------------------------|-------------------------------------|-------------|--------|--------|---------|----------|----------|---------------------------------|
|                      | <i>B</i>                               | <i>SE B</i> | Low CI | High CI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup><br>change | <i>B</i>                            | <i>SE B</i> | Low CI | HighCI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup><br>change |
| (Intercept)          | .01                                    | .34         | -.66   | .69     | .00     | .04      | .971     |                                 | .08                                 | .28         | -.49   | .64    | .00     | .28      | .783     |                                 |
| Group                | -.10                                   | .42         | -.96   | .75     | -.06    | -.24     | .808     | .00                             | -.16                                | .42         | -1.02  | .70    | -.09    | -.38     | .702     | .00                             |
| PA*                  | .10                                    | .16         | -.23   | .45     | .07     | 1.63     | .050     | .01                             | .33                                 | .17         | -.03   | .69    | .30     | 1.84     | .049     | .02                             |
| PWM                  | -.08                                   | .17         | -.43   | .27     | -.33    | -.48     | .637     | .00                             | .19                                 | .18         | -.18   | .57    | .15     | 1.03     | .308     | .00                             |
| Oral language        | .16                                    | .16         | -.17   | .49     | .13     | .97      | .338     | .01                             | .10                                 | .18         | -.28   | .48    | .08     | .53      | .596     | .00                             |
| RAN*                 | -.18                                   | .08         | -.33   | -.03    | -.28    | -2.41    | .020     | .07                             | -.14                                | .10         | -.35   | .067   | -.16    | -1.38    | .174     | .01                             |
| Letter knowledge*    | .43                                    | .15         | .13    | .72     | .39     | 2.91     | .005     | .11                             | .38                                 | .14         | .10    | .66    | .37     | 2.75     | .009     | .22                             |
| Group:PA*            | -.69                                   | .24         | -1.17  | -.20    | -.65    | -2.83    | .007     | .09                             | -.63                                | .27         | -1.18  | -.07   | -.56    | -2.30    | .027     | .07                             |
| Group: PWM           | .45                                    | .30         | -1.05  | .16     | -1.05   | -1.49    | .143     | .08                             | -.41                                | .35         | -1.11  | .28    | -.32    | -1.21    | .241     | .02                             |
| Group: Oral language | -.19                                   | .28         | -.75   | .37     | -.16    | -.68     | .498     | .07                             | .09                                 | .36         | -.62   | .80    | .07     | .25      | .811     | .00                             |
| Group: RAN           | .05                                    | .15         | -.26   | .36     | .08     | .35      | .730     | .01                             | -.03                                | .18         | -.40   | .35    | -.03    | -.14     | .892     | .00                             |
| Group: LK            | -.14                                   | .26         | -.6    | .37     | -.13    | -.56     | .583     | .00                             | .31                                 | .27         | -.23   | .86    | .30     | 1.17     | .249     | .02                             |

### 7.3.5. Summary of findings

Cognitive predictors and literacy decoding skills within and between languages were investigated within the bilingual group and between the three groups. In the bilingual group, a number of Pearson correlations analyses revealed the following correlational patterns between cognitive predictors and reading outcomes (word reading and pseudoword decoding). PA skills demonstrated significant moderate to strong correlations with literacy measures both within and across languages. Similarly, alphanumeric RAN tasks (letters and numbers) showed significant weak to moderate correlations with literacy measures within and between languages. LK (both cases) correlations with word reading and pseudoword decoding were significant and moderate within both languages, whereas across languages LK did not reveal significant relationships. The strength of phonological working memory measure (sentence repetition) appeared to be moderate in both languages, whereas pseudoword decoding correlations were significant for pseudoword decoding only. Listening comprehension measure showed significant weak to moderate correlation only with word reading tasks in L1. Other predictors' correlations were non-significant.

In addition, crosslinguistic effect of several cognitive tasks with reading outcomes was found in a number of correlational analyses. Thus, both literacy tasks measured in one language significantly strongly correlated with similar literacy tasks in L2. Phonological awareness and sentence repetition task (PWM measure) demonstrated rather similar correlations in cross-language relationships, other cognitive predictors revealed different patterns of interactions (alphanumeric RAN, oral skills). There was no crosslinguistic interaction effect found for a number of measures (non-alphanumeric RAN tasks, pseudoword repetition, and letter knowledge).

To explore the role of cognitive predictors in explaining variance in decoding skills, a number of hierarchical multiple regression analyses within and across languages were run. In the bilingual group, all five cognitive predictors explained over two-thirds of the variance in L1 and L2 reading as well as across languages. However, only PA made a unique contribution to prediction of decoding skills development both within and across languages.

#### 7.4. Summary of Chapter 7

Chapter 7 sought to analyze and contrast cognitive and literacy skills in the bilingual group, comparing their performance in L1 and L2. Additionally, it investigated the performance of the bilingual group in relation to two monolingual groups, examining their skills in cognitive and literacy domains. Moreover, early predictors of reading were compared across languages in the bilingual group as well as within language comparisons were conducted between the bilingual and the two monolingual groups.

First, an examination of the Ukrainian-Polish novice readers' performance in both languages revealed bilinguals' better results on both literacy skills tasks as well as seven cognitive measures (listening comprehension, vocabulary, letter knowledge in both cases, phonological working memory tasks, PA isolation and RAN numbers) in L1 at the onset of the formal schooling. These findings are not surprising given children's limited exposure to L2 (Polish) in comparison to L1 (Ukrainian/Russian) at the outset of formal literacy acquisition. There was no difference on other measures.

Secondly, comparison of performance on cognitive predictors and reading outcomes between two monolingual groups and the bilingual group revealed that the Ukrainian-Polish bilingual novice readers were better on the majority of tasks in their L1 than the Ukrainian monolinguals. Expectedly, they underperformed their Polish monolingual peers on oral skill tasks (listening comprehension and vocabulary). Yet, performance on other tasks did not differ significantly between the groups.

Thirdly, within- and cross-language relationships between cognitive predictors and reading outcomes were also explored. In the bilingual group, correlational analyses revealed some similar patterns of relationships between predictors and reading outcomes. Hence, three predictors (PA, alphanumeric RAN and LK) correlated significantly with both reading tasks within and across languages (except for LK, which was significant only in within-languages comparisons). Yet, relationships of other cognitive measures with decoding skills varied across languages. Sentence repetition (PWM measure) correlated significantly with all literacy measures within and across languages. Yet, pseudoword repetition was a significant correlate only with pseudoword decoding within languages, not showing crosslinguistic effect. Oral skills correlated significantly with word reading only in L1 and across languages from L1 to

L2, suggesting importance of those skills for reading development in a more proficient language.

In the bilingual group, results of regression analyses identified that all cognitive measures (combined together) significantly predicted the variance of reading outcomes within language (by over two-thirds) as well as across languages (over 72.8% of its variance in L1 and 65.7% in L2). PA was the only significant predictor that could account for reading outcomes variance uniquely both within and across languages. PA role appeared to be similarly important in bilinguals' L1 and L2.

Overall, the concurrent analyses revealed some key cognitive underpinnings (PA, LK and RAN) of decoding skills that were similar across languages as well as identified the crosslinguistic interaction of cognitive skills measured in one language and reading outcomes in another language. The comparison of performance on a number of cognitive and literacy tasks between the monolinguals and bilinguals demonstrated superior results in bilinguals' L1 when compared to the Ukrainian monolingual group. When their L2 cognitive and literacy skills were measured, the Polish monolinguals demonstrated better oral skills competences. Though results of descriptive statistics (raw data) indicated Polish monolinguals' overall better performance on almost all tasks, the measures did not differ significantly.

## **Chapter 8: Early predictors of decoding skills and reading comprehension in bilingual children: Concurrent (T2) and longitudinal analyses**

### **8.1. Introduction**

This chapter presents results of concurrent analyses (T2) and longitudinal analyses. Results are described in accordance with the research questions (RQ 7 – 11) formulated in Chapter 6 (section 6.2). Similarly to the approach used in Chapter 7, they are grouped into two blocks:

- (1) concurrent and longitudinal comparison of cognitive and literacy skills in L1 and L2 in the bilingual group (RQ 7) at T2; comparison of cognitive and literacy skills measured in two monolingual groups and the Ukrainian-Polish bilingual group (RQ 8, 9),
- (2) concurrent and longitudinal cognitive predictors of decoding skills and reading comprehension in L1 and L2 in the bilingual children (RQ 10) as well as comparison of those predictors between the three groups (RQ 11).

## **8.2. Comparison of cognitive and literacy skills in the bilingual group**

### **8.2.1. Concurrent (T2) and longitudinal comparison of cognitive and literacy skills across languages in the bilingual group**

As the first step, descriptive statistics (based on raw scores) were created for all Ukrainian measures and Polish measures at T1 and T2 (Table 20.1). Results are available for the bilingual group.

To explore the differences between performance across languages in the bilingual group concurrently (T2), a one-way repeated measures multivariate analysis of variance (within-subject) MANOVA and a dependent samples t-test were conducted. As in the previous study (Chapter 7) preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity (Appendix M). Data was found to deviate from the assumption of normality, but MANOVA is reasonably robust to modest violations of normality (Blanca 2017). Language was the within-subject variable. Cognitive and literacy measures in L1 and L2 were entered as dependent variables. All variables included in the analyses are comparable across languages.

In order to evaluate the progress of bilingual children in both L1 and, particularly, in L2 (Polish) over a period of 9 months, repeated measures ANOVAs were utilized. These analyses involved two within-subject factors: time and language. The purpose was to examine the performance of literacy and language skills longitudinally and determine any significant changes or improvements observed over the course of the study.

Concurrent results of MANOVA and t-tests are reported first. There was a statistically significant difference between Ukrainian/Russian and Polish measures on the combined dependent variable (comprised of 11 directly comparable tasks),  $F(10, 6) = 6.48$ ,  $p = .016$ , Wilks Lambda = .078, partial eta squared = .922. Within-subject univariate analyses (using Bonferroni correction) indicated that there were significant differences in children's performance on a number of tasks. Table 21 shows the tasks on which significant differences were apparent across languages.



Overall, the bilingual children performed slightly better in their L1 (Ukrainian/Russian) on all measures presented in the Table 20.2. Yet, the significance level was marginal for word reading and vocabulary measures, which suggests slight difference between the performance in two languages. There was no significant difference between other measures in L1 and L2.

Table 20.1. Descriptive statistics of all measures in L1 and L2 at T2: Bilingual group ( $n = 17$ ).

| Variable (maximum possible score)  |    | L1 (Ukrainian/Russian) |        |       |         | L2 (Polish) |        |       |         |
|------------------------------------|----|------------------------|--------|-------|---------|-------------|--------|-------|---------|
|                                    |    | Mean                   | Median | SD    | Min-Max | Mean        | Median | SD    | Min-Max |
| Reading comprehension (4)          | T1 | -                      | -      | -     | -       | -           | -      | -     | -       |
|                                    | T2 | 3.53                   | 3.50   | .33   | 3 - 4   | 3.44        | 3.50   | .35   | 3 - 4   |
| Word reading                       | T1 | 23.59                  | 23.00  | 6.26  | 17-40   | 20.24       | 20.00  | 4.19  | 13-29   |
|                                    | T2 | 54.76                  | 54.00  | 11.12 | 33-84   | 52.18       | 52.18  | 9.35  | 30-80   |
| Pseudoword decoding                | T1 | 22.82                  | 23.00  | 6.78  | 15-38   | 20.06       | 20.00  | 4.85  | 12-30   |
|                                    | T2 | 51.41                  | 51.00  | 9.61  | 32-76   | 47.06       | 47.00  | 8.39  | 23-65   |
| <i>Phonological Awareness</i>      |    |                        |        |       |         |             |        |       |         |
| Phoneme deletion (40)              | T1 | -                      | -      | -     | -       | -           | -      | -     | -       |
|                                    | T2 | 34.53                  | 35.00  | 4.78  | 20-40   | 32.41       | 33.00  | 3.84  | 22-38   |
| Phoneme isolation (64)             | T1 | 56.06                  | 60.00  | 9.71  | 28-64   | 49.47       | 54.00  | 10.74 | 24-61   |
|                                    | T2 | 57.41                  | 55.94  | 5.92  | 42-64   | 55.94       | 56.06  | 6.64  | 40-64   |
| Phoneme blending (24)              | T1 | 21.65                  | 22.00  | 2.29  | 16-24   | 21.65       | 23.00  | 2.42  | 15-24   |
|                                    | T2 | 23.35                  | 24.00  | 1.12  | 20-24   | 23.06       | 23.00  | 1.20  | 20 -24  |
| <i>Oral skills</i>                 |    |                        |        |       |         |             |        |       |         |
| Listening comprehension (30/15)    | T1 | 21.95                  | 21.00  | 3.65  | 15-26   | 20.94       | 20.00  | 4.07  | 12-25   |
|                                    | T2 | 13.53                  | 14.00  | .94   | 12-15   | 13.59       | 13.00  | 1.01  | 12-15   |
| Vocabulary (25)                    | T1 | 21.18                  | 21.00  | 2.04  | 17-24   | 17.35       | 17.00  | 2.74  | 13-22   |
|                                    | T2 | 22.12                  | 23.00  | 1.73  | 19-24   | 21.18       | 23.00  | 2.04  | 19-24   |
| <i>Phonological working memory</i> |    |                        |        |       |         |             |        |       |         |
| Sentence repetition (34)           | T1 | 32.24                  | 32.00  | 1.33  | 28-34   | 30.94       | 32.00  | 2.54  | 22-33   |
|                                    | T2 | 32.41                  | 33.00  | 1.84  | 28-34   | 32.29       | 32.00  | 1.76  | 29-34   |
| <i>Rapid Automatized Naming</i>    |    |                        |        |       |         |             |        |       |         |
| RAN Numbers                        | T1 | 26.27                  | 27.00  | 4.37  | 18-38   | 37.27       | 34.00  | 12.42 | 21-78   |
|                                    | T2 | 27.71                  | 27.00  | 7.18  | 15- 45  | 35.24       | 34.00  | 6.63  | 21-48   |
| RAN Letters                        | T1 | 30.99                  | 29.50  | 8.12  | 17-46   | 31.48       | 29.00  | 8.40  | 17-53   |
|                                    | T2 | 21.41                  | 22.00  | 3.52  | 16-28   | 22.12       | 21.00  | 3.81  | 16-30   |

Table 20.2. Measures on which bilingual children demonstrated significant difference between languages at T2 ( $n = 17$ ).

| Measure             | $t$   | $df$ | $p$   | $F$   | $df$ | $p$   | $\eta^2$ |
|---------------------|-------|------|-------|-------|------|-------|----------|
| Word reading        | 2.15  | 16   | .048  | 4.60  | 1,16 | .048  | .223     |
| Pseudoword decoding | 3.56  | 16   | .003  | 12.64 | 1,16 | .003  | .441     |
| PA Deletion         | 3.96  | 16   | .001  | 15.69 | 1,16 | .001  | .495     |
| PA Isolation        | 2.58  | 16   | .020  | 6.67  | 1,16 | .020  | .294     |
| PA Blending         | 2.57  | 16   | .020  | 6.66  | 1,16 | .020  | .293     |
| Vocabulary          | 2.22  | 16   | .041  | 4.92  | 1,16 | .041  | .235     |
| RAN Numbers         | -4.77 | 16   | <.001 | 22.74 | 1,16 | <.001 | .323     |

As the next step, several repeated measures ANOVAs with two within-subject factors (time: T1 and T2; language: L1 and L2) were run to explore changes in performance of language and literacy skills in bilinguals' both languages longitudinally. The results are presented in Table 21.

Table 21. Longitudinal comparison of language and literacy skills in bilinguals' L1 and L2 ( $n = 17$ ).

| Variables                          | Effects         | $F$                           | Interpretation                                                                                                |
|------------------------------------|-----------------|-------------------------------|---------------------------------------------------------------------------------------------------------------|
| Word reading                       | Time            | $F(1, 16) = 402.56, p < .001$ | Scores improve over time.                                                                                     |
|                                    | Language        | $F(1, 16) = 6.78, p = .019$   | UKR outperform PL                                                                                             |
|                                    | Time x Language | $F(1, 16) = 5.121, p = .038$  | The UKR > PL advantage is greater at T1 ( $t = 3.05, p < .034$ ) than at T2 ( $t = 2.15, p = .181$ )          |
| Pseudoword decoding                | Time            | $F(1, 16) = 419.38, p < .001$ | Scores improve over time.                                                                                     |
|                                    | Language        | $F(1, 16) = 12.78, p = .003$  | UKR outperform PL                                                                                             |
|                                    | Time x Language | $F(1, 16) = 5.53, p = .032$   | The UKR > PL advantage is slightly greater at T2 ( $t = 3.56, p = .013$ ) than at T1 ( $t = 3.28, p = .022$ ) |
| Phonological awareness (isolation) | Time            | $F(1, 16) = 10.84, p = .005$  | Scores improve over time.                                                                                     |
|                                    | Language        | $F(1, 16) = 16.84, p < .001$  | UKR outperform PL                                                                                             |
|                                    | Time x Language | $F(1, 16) = 6.88, p = .018$   | The UKR > PL advantage is greater at T1 ( $t = 3.51, p = .014$ ) than at T2 ( $t = 2.58, p = .08$ )           |
| Phonological awareness (blending)  | Time            | $F(1, 16) = 9.87, p = .001$   | Scores improve over time.                                                                                     |
|                                    | Language        | $F(1, 16) = .18, p = .681$    | Equal performance in both languages                                                                           |
|                                    | Time x Language | $F(1, 16) = .85, p = .370$    | No significant difference                                                                                     |

|                         |                                     |                                                                                               |                                                                                                                                                                         |
|-------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Listening comprehension | Time<br>Language<br>Time x Language | $F(1, 16) = 211.77, p < .001$<br>$F(1, 16) = 72.87, p < .001$<br>$F(1, 16) = 73.68, p < .001$ | Scores improve over time.<br>UKR outperform PL<br>The UKR > PL advantage is greater at T1 ( $t = 8.57, p < .001$ ) than at T2 ( $t = 1, p = .75$ )                      |
| Vocabulary              | Time<br>Language<br>Time x Language | $F(1, 16) = 37.28, p < .001$<br>$F(1, 16) = 73.00, p < .001$<br>$F(1, 16) = 73.00, p < .001$  | Scores improve over time.<br>UKR outperform PL<br>The UKR > PL advantage is greater at T1 ( $t = 8.54, p < .001$ ) than at T2 ( $t = 1.52, p = .172$ )                  |
| Sentence repetition     | Time<br>Language<br>Time x Language | $F(1, 16) = 2.86, p = .110$<br>$F(1, 16) = 9.66, p = .007$<br>$F(1, 16) = 2.57, p = .128$     | Scores remain similar over time.<br>UKR outperform PL<br>No significant difference                                                                                      |
| RAN (digits)            | Time<br>Language<br>Time x Language | $F(1, 16) = .094, p = .763$<br>$F(1, 16) = 45.14, p < .001$<br>$F(1, 16) = 1.65, p = .217$    | Scores remain similar over time.<br>UKR outperform PL<br>No significant difference across time                                                                          |
| RAN (letters)           | Time<br>Language<br>Time x Language | $F(1, 16) = .09, p = .764$<br>$F(1, 16) = 3.09, p = .099$<br>$F(1, 16) = 27.39, p < .001$     | Scores remain similar over time.<br>Similar in both languages<br>The UKR > PL advantage is greater at T1 ( $t = 4.86, p < .001$ ) than at T2 ( $t = -5.25, p < .001$ ). |

Overall, bilingual children improved performance on most tasks at T2 compared to T1. Children were slightly better in their L1 than in L2 on most tasks with a few exceptions, where the performance remained similar across languages (PA blending, sentence repetition and RAN letters). Bilinguals achieved almost ceiling effect on two tasks in both languages, PA blending and sentence repetition. Additionally, for RAN letters task the performance appeared to be also identical between languages. When bilinguals' performance was compared between languages across two time points, it appeared that the difference between L1 and L2 diminished over time for all measures.

### 8.2.2. Comparison of cognitive predictors and literacy skills measures between the bilingual group and two monolingual groups

First, descriptive statistics (based on raw scores) were created for all Ukrainian measures and Polish measures at T2 for all groups. Results for the Ukrainian

monolingual group and the bilingual group measures in L1 can be found in Table 22.1. Respectively, results for the Polish monolingual group as well as the bilingual group measures in L2 are presented in Table 22.2.

Table 22.1. Descriptive statistics of all measures at Time 2: Ukrainian ( $n = 26$ ) and Bilingual L1 ( $n = 17$ ).

| Variable<br>(maximum<br>possible score) | Monolingual (Ukrainian) |        |       |         | Bilingual L1 |        |       |         |
|-----------------------------------------|-------------------------|--------|-------|---------|--------------|--------|-------|---------|
|                                         | Mean                    | Median | SD    | Min-Max | Mean         | Median | SD    | Min-Max |
| Reading comprehension (8)               | 3.15                    | 3.00   | .56   | 2-4     | 3.53         | 3.50   | .33   | 3-4     |
| <i>Decoding skills</i>                  |                         |        |       |         |              |        |       |         |
| Word reading                            | 38.04                   | 39.00  | 10.18 | 22-56   | 54.76        | 54.00  | 11.12 | 33-84   |
| Pseudoword decoding                     | 34.19                   | 36.00  | 9.46  | 18-51   | 51.41        | 50.00  | 9.61  | 32-76   |
| <i>Phonological awareness</i>           |                         |        |       |         |              |        |       |         |
| Phoneme deletion (40)                   | 33.40                   | 34.00  | 3.86  | 24-39   | 34.53        | 35.00  | 4.78  | 20-40   |
| Phoneme isolation (64)                  | 53.31                   | 54.50  | 5.20  | 40-61   | 57.41        | 60.00  | 5.92  | 42-64   |
| Phoneme blending (24)                   | 21.50                   | 21.50  | 1.82  | 18-24   | 23.35        | 24.00  | 1.12  | 20-24   |
| <i>Oral skills</i>                      |                         |        |       |         |              |        |       |         |
| Listening comprehension (15)            | 11.04                   | 11.00  | 2.54  | 6-15    | 13.53        | 14.00  | .94   | 12-15   |
| Vocabulary (25)                         | 19.27                   | 19.50  | 2.92  | 15-24   | 22.12        | 23.00  | 1.73  | 19-24   |
| <i>Phonological working memory</i>      |                         |        |       |         |              |        |       |         |
| Sentence repetition (34)                | 30.00                   | 32.00  | 4.89  | 16-34   | 32.41        | 33.00  | 1.84  | 28-34   |
| <i>Rapid Automatized Naming</i>         |                         |        |       |         |              |        |       |         |
| RAN Numbers                             | 37.23                   | 34.00  | 14.57 | 23-98   | 27.71        | 27.00  | 7.18  | 15-45   |
| RAN Letters                             | 38.30                   | 38.25  | 13.52 | 23-85   | 21.41        | 22.00  | 3.52  | 16-28   |

The bilinguals outperformed the Ukrainian monolinguals on all tasks. The most noticeable differences between groups can be seen for reading efficiency measures, listening comprehension and both RAN tasks.

Table 22.2. Descriptive statistics of all measures at Time 2: Polish ( $n = 22$ ) and Bilingual L2 ( $n = 17$ ).

| Variable (maximum<br>possible score) | Monolingual (Polish) |        |     |         | Bilingual (L2) |        |     |         |
|--------------------------------------|----------------------|--------|-----|---------|----------------|--------|-----|---------|
|                                      | Mean                 | Median | SD  | Min-Max | Mean           | Median | SD  | Min-Max |
| Reading comprehension (8)            | 3.48                 | 3.00   | .42 | 3-4     | 3.45           | 3.44   | .35 | 3-4     |

*Decoding skills*

|                     |       |       |      |       |       |       |      |        |
|---------------------|-------|-------|------|-------|-------|-------|------|--------|
| Word reading        | 45.95 | 47.00 | 7.12 | 30-57 | 52.18 | 52.00 | 9.35 | 30 -80 |
| Pseudoword decoding | 41.32 | 43.00 | 6.31 | 28-52 | 47.06 | 47.00 | 8.39 | 23- 65 |

*Phonological awareness*

|                        |       |       |      |       |       |       |      |       |
|------------------------|-------|-------|------|-------|-------|-------|------|-------|
| Phoneme deletion (40)  | 35.64 | 36.00 | 1.92 | 32-39 | 32.41 | 33.00 | 3.84 | 22-38 |
| Phoneme isolation (64) | 59.05 | 60.00 | 2.66 | 52-62 | 55.94 | 57.00 | 6.64 | 40-64 |
| Phoneme blending (24)  | 23.27 | 24.00 | .94  | 21-24 | 23.06 | 23.00 | 1.20 | 20-24 |

*Oral skills*

|                              |       |       |      |       |       |       |      |       |
|------------------------------|-------|-------|------|-------|-------|-------|------|-------|
| Listening comprehension (15) | 11.73 | 12.00 | 1.42 | 9-14  | 13.59 | 14.00 | 1.01 | 12-15 |
| Vocabulary (25)              | 22.95 | 23.00 | 1.17 | 20-24 | 21.18 | 23.00 | 2.04 | 19-24 |

*Phonological working memory*

|                          |       |       |      |       |       |       |      |       |
|--------------------------|-------|-------|------|-------|-------|-------|------|-------|
| Sentence repetition (34) | 30.09 | 31.50 | 4.09 | 18-34 | 32.29 | 32.00 | 1.76 | 29-34 |
|--------------------------|-------|-------|------|-------|-------|-------|------|-------|

*Rapid Automatized Naming*

|             |       |       |      |       |       |       |      |       |
|-------------|-------|-------|------|-------|-------|-------|------|-------|
| RAN Numbers | 26.64 | 27.00 | 4.60 | 23-45 | 35.24 | 34.00 | 6.63 | 21-48 |
| RAN Letters | 22.12 | 25.00 | 3.81 | 21-43 | 22.12 | 21.00 | 3.81 | 16-30 |

Differences between the bilinguals' performance in L2 (Polish) and the Polish monolingual group varied across cognitive domains of the measures. Thus, Polish monolinguals marginally outperformed the bilinguals on all PA tasks, vocabulary and RAN numbers task. Interestingly, the bilinguals performed better on a number of literacy and cognitive tasks, including word reading and pseudoword decoding. Reading comprehension appeared to be quite similar between the two groups, considering raw scores results.

To further investigate the differences between monolingual and bilingual groups, two one-way between groups multivariate analysis of covariance (MANCOVAs) and two independent sample t-tests were performed. Parental level of education (computed as a mean score of both parents' education level) was a covariate variable. All variables measured at T2 were entered as dependent variables. The independent variable was languages.

The first MANCOVA analysis between the Ukrainian monolingual and the bilingual group in L1 (Ukrainian) revealed a statistically significant difference between the groups on the combined dependent variables (11 directly comparable tasks),  $F(11, 29) = 6.56$ ,  $p < .001$ , Wilks Lambda = .287, partial eta squared = .713. There was no statistically significant effect of parental education level on performance of cognitive

and language measures  $F(11, 29) = 1.88$ ,  $p = .565$ , Wilks Lambda = .749, partial eta squared = .124. When the results for dependent variables were considered separately, there were a few differences between measures that reached statistical significance (using a Bonferroni adjusted coefficient). The results are presented in Table 23.

Table 23. Measures on which there was a statistically significant difference between the monolingual and bilingual groups: Ukrainian measures at Time 2.

| Measure                 | $t$   | $df$ | $p$   | $F$   | $df$ | $p$   | $\eta^2$ | Mean         | SD    | Mean       | SD    |
|-------------------------|-------|------|-------|-------|------|-------|----------|--------------|-------|------------|-------|
|                         |       |      |       |       |      |       |          | Monolinguals |       | Bilinguals |       |
| Text comprehension      | 2.28  | 41   | .028  | 5.28  | 1,39 | .027  | .119     | 6.81         | 1.56  | 7.53       | .62   |
| Word reading            | 5.08  | 41   | <.001 | 23.60 | 1,39 | <.001 | .377     | 38.04        | 10.18 | 54.76      | 11.12 |
| Pseudoword decoding     | 5.80  | 41   | <.001 | 30.92 | 1,39 | <.001 | .442     | 34.19        | 9.46  | 51.41      | 9.61  |
| PA Isolation            | 2.40  | 41   | .021  | 5.30  | 1,39 | .027  | .110     | 53.31        | 5.20  | 57.41      | 5.92  |
| PA Blending             | 3.76  | 41   | <.001 | 13.89 | 1,39 | <.001 | .245     | 21.50        | 1.82  | 23.35      | 1.12  |
| Vocabulary              | 3.62  | 41   | <.001 | 11.79 | 1,39 | .001  | .230     | 19.27        | 2.92  | 22.12      | 1.73  |
| Listening comprehension | 3.86  | 41   | <.001 | 13.93 | 1,39 | <.001 | .263     | 11.04        | 2.54  | 13.53      | .94   |
| RAN Numbers             | -2.50 | 41   | .017  | 5.49  | 1,39 | .025  | .122     | 37.23        | 14.57 | 27.71      | 7.18  |
| RAN Letters             | -5.03 | 41   | <.001 | 23.51 | 1,39 | <.001 | .372     | 38.30        | 13.52 | 21.41      | 3.52  |

The results present statistically significant differences and provide support to the descriptive data given in Table 22.1. The monolinguals performed worse on a number of tasks when compared to their bilingual peers in L1. Only PA deletion and sentence repetition tasks were not significantly different between the two groups.

The following step in this study was the MANCOVA analysis of all measures between the Polish monolingual and the bilingual group in Polish (L2), which also demonstrated a statistically significant difference between the groups on the combined dependent variables,  $F(11, 26) = 12.88$ ,  $p < .001$ , Wilks Lambda = .155, partial eta squared = .843. Similar to the previous analyses, there was no statistically significant effect of parental education level on performance of cognitive and language measures between groups  $F(11, 26) = .91$ ,  $p = .541$ , Wilks Lambda = 0.721, partial eta squared = .137. The results for dependent variables that were different and statistically significant (using a Bonferroni adjusted coefficient) are presented in Table 24.

Table 24. Measures on which there was a statistically significant difference between the monolingual and bilingual groups: Polish measures at Time 2.

| Measure                 | <i>t</i> | <i>df</i> | <i>p</i> | <i>F</i> | <i>df</i> | <i>p</i> | $\eta^2$ | Mean         | SD   | Mean       | SD   |
|-------------------------|----------|-----------|----------|----------|-----------|----------|----------|--------------|------|------------|------|
|                         |          |           |          |          |           |          |          | Monolinguals |      | Bilinguals |      |
| Word reading            | 2.36     | 37        | .030     | 5.5      | 1,36      | .024     | .131     | 45.95        | 7.12 | 52.18      | 9.35 |
| Pseudoword decoding     | 2.44     | 37        | .026     | 5.96     | 1,36      | .020     | .139     | 41.32        | 6.31 | 47.06      | 8.39 |
| PA deletion             | 3.43     | 37        | .001     | 11.46    | 1,36      | .002     | .241     | 35.64        | 1.92 | 32.41      | 3.84 |
| PA isolation            | 2.00     | 37        | .053     | 4.01     | 1,36      | .050     | .098     | 59.05        | 2.66 | 55.94      | 6.64 |
| Sentence repetition     | 2.07     | 37        | .045     | 4.19     | 1,36      | .048     | .104     | 30.09        | 4.09 | 32.29      | 1.76 |
| Listening Comprehension | 4.79     | 37        | <.001    | 20.45    | 1,36      | <.001    | .362     | 11.73        | 1.42 | 13.59      | 1.01 |
| RAN Numbers             | 4.78     | 37        | <.001    | 22.85    | 1,36      | <.001    | .382     | 26.64        | 4.60 | 35.24      | 6.63 |

Overall, the bilinguals outperformed the Polish monolingual group on a number of tasks at T2, including word reading and pseudoword reading. Polish monolingual children marginally outperformed bilinguals on two PA tasks.

### 8.2.3. Summary of findings

In the bilingual group, concurrent comparison of cognitive and literacy measures between the two languages demonstrated that the Ukrainian-Polish bilinguals performed slightly better on PA tasks, pseudoword reading and RAN letters in L1 (Ukrainian/Russian) than in L2. Word reading and vocabulary measures demonstrated marginally significant difference across languages, while other measures were broadly similar across languages. When cognitive and literacy measures in both languages were compared longitudinally, there was a noticeable shift in performance in L2 from T1 to T2 for most measures, except for pseudoword decoding tasks, in which the difference between L1-L2 was greater at T2.

When performance on literacy and language measures was compared between the bilingual and two monolingual groups, patterns were quite similar to those at T1 for Ukrainian (L1), yet different for Polish (L2). The bilinguals outperformed the Ukrainian monolinguals on 9 out of 11 tasks. Namely, they demonstrated significantly higher performance on reading efficiency tasks word reading ( $t = 5.08, p < .001$ ) and pseudoword decoding ( $t = 5.80, p < .001$ ), followed by oral language tasks: listening comprehension ( $t = 3.86, p < .001$ ) and vocabulary ( $t = 3.62, p < .001$ ). These findings are not surprising considering the bilinguals' better performance on these skills at T1. Intriguingly, the bilinguals demonstrated better literacy skills over the Polish monolinguals over a nine-month period of formal literacy instruction. They were better at word reading ( $t = 2.36, p = .030$ ), pseudoword decoding ( $t = 2.44, p < .026$ ) and listening comprehension ( $t = 4.79, p < .001$ ). However, performance on PA (deletion and isolation) and RAN numbers tasks appeared to be better in the Polish monolinguals. Though the extent of the compared differences between the bilinguals' L1 with Ukrainian monolinguals is greater than that strength for the bilinguals' L2 with Polish monolinguals, improvements in bilinguals' L2 are obvious.

### **8.3. Cognitive predictors of decoding skills and reading comprehension: Correlational and hierarchical regression analyses**

This block of analyses investigates the cognitive underpinnings of decoding skills and reading comprehension in the bilingual group both within languages and across languages. It also explores the role of cognitive predictors in explaining variability in reading skills between the three groups. Word reading, pseudoword decoding and reading comprehension are reading outcome measures included in the analyses.

#### **8.3.1. Data preparation**

*Participants.* For these analyses concurrent data (T1) and longitudinal data (T2) from the three groups described in the previous subchapter 8.3.1. was included: the Ukrainian monolingual group ( $n = 26$ ), the Polish monolingual group ( $n = 22$ ), and the



Ukrainian-Polish bilingual group ( $n = 17$ ). Data for T2 was collected at the end of the first year (May-July 2021/2022) of formal literacy instruction.

*Data normalisation.* Data appeared to violate the assumption of normality, the distribution of all variables was rank transformed (using Bloom's proportion estimation formula) to make the data amenable to parametric statistical analyses. All raw scores are converted into percentile ranks and then produce a  $z$  score which would correspond to the percentile rank under a perfectly normal distribution. This transformation creates normalised  $z$  scores, which were used in correlational and regression analyses in this study.

*Composite scores.* As in the previous chapter, composite scores for several cognitive domains were explored. This approach was necessary as to reduce a number of variables used in regression analyses to improve statistical power. Composite scores were based on normalized  $z$  scores of raw data. To explore whether combining variables into those groups was valid empirically, correlation matrices were checked. Inspection of matrices showed many coefficients ( $r_p$ ) of .3 and above. Correlations coefficients of variables used to create composite scores are presented in Table 25. At T2, PWM memory domain comprises one variable – sentence repetition measure. A number of variable groups presented below is the same as at T1:

- (1) phonological awareness: phoneme deletion, phoneme isolation and phoneme blending,
- (2) phonological working memory: sentence repetition,
- (3) oral language: listening comprehension and vocabulary,
- (4) speed of processing: RAN letters and numbers,
- (5) letter knowledge (T1): letter names/sounds (upper case and lower case),
- (6) reading efficiency (T1): word reading and pseudoword decoding,
- (7) reading efficiency (T2): word reading and pseudoword decoding.

Table 25. Correlations (Pearson's  $r$ ) between variables used for creation of composite scores in all groups (T2).

| Composite variable      |                         | Bilinguals L1 (Ukrainian) |       | Bilinguals L2 (Polish) |       | Ukrainian (monolingual) |       | Polish (monolingual) |       |
|-------------------------|-------------------------|---------------------------|-------|------------------------|-------|-------------------------|-------|----------------------|-------|
|                         |                         | $r$                       | $p$   | $r$                    | $p$   | $r$                     | $p$   | $r$                  | $p$   |
| Phonological awareness  | Phoneme deletion        | Del:Iso .517              | .011  | Del:Iso .578           | .015  | Del:Iso .584            | .050  | Del:Iso .582         | .004  |
|                         | Phoneme blending        | Bld:Del. 596              | .012  | Bld:Del .602           | .011  | Bld:Del .506            | .010  | Bld:Del .626         | .002  |
|                         | Phoneme isolation       | Bld:Del. 604              | .003  | Bld:Del .519           | .033  | Bld:Del .691            | <.001 | Bld:Del .510         | .015  |
| Oral language skills    | Listening comprehension |                           |       |                        |       |                         |       |                      |       |
|                         | Vocabulary              | .559                      | .020  | .552                   | .022  | .494                    | .010  | .516                 | .016  |
|                         | RAN digits              |                           |       |                        |       |                         |       |                      |       |
| RAN                     | RAN letters             | .470                      | .05   | .490                   | .002  | .707                    | <.001 | .542                 | .019  |
|                         | Upper case              | .855                      | <.001 | .869                   | <.001 | .963                    | <.001 | .804                 | <.001 |
| Letter knowledge (T1)   | Lower case              |                           |       |                        |       |                         |       |                      |       |
|                         | Word reading            |                           |       |                        |       |                         |       |                      |       |
| Reading efficiency (T2) | Pseudoword decoding     | .768                      | <.001 | .734                   | .019  | .931                    | <.001 | .810                 | <.001 |
|                         | Word reading            |                           |       |                        |       |                         |       |                      |       |
| Reading efficiency (T1) | Pseudoword decoding     | .831                      | <.001 | .902                   | <.001 | .889                    | <.001 | .823                 | <.001 |
|                         |                         |                           |       |                        |       |                         |       |                      |       |

### **8.3.2. Concurrent (T2) and longitudinal correlations between cognitive predictors and reading outcomes in the bilingual group**

As the next step in the analysis, concurrent and longitudinal Pearson's correlations between predictor variables and decoding skills (word reading, pseudoword decoding). Considering reading comprehension, several point-biserial correlations were run. This approach was chosen as the results of reading comprehension measure turned to be dichotomous (e.g. participants scored either 3 or 4 points) in the bilingual group. Eight analyses were run: four within languages (longitudinal and concurrent at T2 in both languages) and four between languages (longitudinal and concurrent at T2). Within-language analyses include correlations between cognitive predictors and reading outcomes measured in the same language. Whereas the between-language analyses provide cross-language correlations between cognitive predictors in L1 and reading outcomes in L2 and between L2 cognitive predictors and L1 reading outcomes. In the longitudinal analyses, correlations between cognitive measures and literacy skills measures at T1 with reading outcomes at T2 were explored. In the concurrent analysis, only measures assessed at T2 were included. The results are reported in Tables 26.1, 26.2, 26.3 and 26.4.

*Word reading and pseudoword decoding: Within-language correlations* (L1, Table 26.1). Both literacy measures significantly correlated with cognitive skills measured concurrently and longitudinally except for a few measures. Thus, longitudinal correlations between PA blending and sentence repetition with word reading tasks were weak and non-significant. Concurrently, only PA deletion and sentence repetition correlations with pseudoword decoding were insignificant.

*Reading comprehension: Within-language correlations* (L1). Reading efficiency measures demonstrated strong and significant correlations with reading comprehension both concurrently and longitudinally. Longitudinally, all cognitive measures correlated significantly (weak to moderate) with reading comprehension, except for LK (lower case) and PA blending tasks. The strongest correlations were with decoding skills, phonological working memory and oral skills measures. Concurrently, oral skills, PA tasks and RAN letters were found to significantly correlate with RC.

Table 26.1. Longitudinal and concurrent (T2) within-language correlations between cognitive predictors and reading outcomes (Pearson's  $r$ , two-tailed, point-biserial) in L1 (Ukrainian/Russian): Bilingual group ( $n = 17$ ).

| Domain                            | Measures                    | Word<br>reading<br>( $r_p$ ) | Pseudoword<br>decoding<br>( $r_p$ ) | Reading<br>comprehension<br>( $r_{pb}$ ) | Word<br>reading<br>( $r_p$ ) | Pseudoword<br>decoding( $r_p$ ) | Reading<br>comprehension<br>( $r_{pb}$ ) | Difference<br>(Fisher's $Z$ )<br>WR | Difference<br>(Fisher's $Z$ )<br>PD | Difference<br>(Fisher's $Z$ )<br>RC |
|-----------------------------------|-----------------------------|------------------------------|-------------------------------------|------------------------------------------|------------------------------|---------------------------------|------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Concurrent T2                     |                             |                              |                                     |                                          | Longitudinal T1-T2           |                                 |                                          |                                     |                                     |                                     |
| Reading<br>efficiency             | Word reading                |                              | .77**                               | .64**                                    | .83**                        | .77**                           | .68**                                    | -.44                                | -.69                                | -.19                                |
|                                   | Pseudoword decoding         | .77**                        |                                     | .77**                                    | .67**                        | .81**                           | .63**                                    | .55                                 | .28                                 | .74                                 |
| Phonological<br>Awareness         | Phoneme blending            | .47*                         | .55*                                | .51*                                     | .38                          | .53*                            | .30                                      | .29                                 | -.07                                | .67                                 |
|                                   | Phoneme isolation           | .51*                         | .53*                                | .46*                                     | .64**                        | .73**                           | .38*                                     | -.52                                | .26                                 | .26                                 |
|                                   | Phoneme deletion            | .59*                         | .43                                 | .50*                                     |                              |                                 |                                          | -                                   | -                                   | -                                   |
| Phonological<br>Working<br>Memory | Sentence repetition         | .53*                         | .41                                 | .21                                      | .48                          | .51*                            | .55*                                     | .18                                 | .34                                 | -1.07                               |
|                                   | Pseudoword repetition       |                              |                                     |                                          | .56*                         | .66**                           | .54*                                     | -                                   | -                                   | -                                   |
| Oral<br>Language                  | Listening<br>comprehension  | .67**                        | .65**                               | .66**                                    | .65**                        | .56*                            | .52*                                     | .09                                 | .38                                 | .57                                 |
|                                   | Vocabulary                  | .70**                        | .60*                                | .58*                                     | .69**                        | .57*                            | .65**                                    | .05                                 | .12                                 | -.03                                |
| Rapid<br>automatized<br>naming    | RAN letters                 | -.48*                        | -.54**                              | -.39*                                    | -.42**                       | -.49**                          | -.38*                                    | .02                                 | .18                                 | .03                                 |
|                                   | RAN numbers                 | -.62*                        | -.43*                               | -.38                                     | -.46*                        | -.42*                           | -.43**                                   | .06                                 | .03                                 | .16                                 |
| Letter<br>knowledge               | Letter names/sounds<br>(UC) |                              |                                     |                                          | .62*                         | .59*                            | .48*                                     | -                                   |                                     |                                     |
|                                   | Letter names/sounds<br>(LC) |                              |                                     |                                          | .65*                         | .58*                            | .45                                      | -                                   |                                     |                                     |

Note: \*\*  $p < .001$ ; \*  $p < .05$

Table 26.2. Longitudinal and concurrent (T2) within-language correlations between cognitive predictors and reading outcomes (Pearson's  $r$ , two-tailed, point-biserial) in L2 (Polish): Bilingual group ( $n = 17$ ).

| Domain                      | Measures                 | Word reading<br>( $r_p$ ) | Pseudoword decoding<br>( $r_p$ ) | Reading comprehension<br>( $r_{pb}$ ) | Word reading<br>( $r_p$ ) | Pseudoword decoding( $r_p$ ) | Reading comprehension<br>( $r_{pb}$ ) | Difference<br>(Fisher's Z)<br>WR | Difference<br>(Fisher's Z)<br>PD | Difference<br>(Fisher's Z)<br>RC |
|-----------------------------|--------------------------|---------------------------|----------------------------------|---------------------------------------|---------------------------|------------------------------|---------------------------------------|----------------------------------|----------------------------------|----------------------------------|
|                             |                          | Concurrent T2             |                                  |                                       | Longitudinal T1-T2        |                              |                                       |                                  |                                  |                                  |
| Reading efficiency          | Word reading             | -                         | .76**                            | .55**                                 | .76**                     | .61**                        | .60*                                  | 0                                | .76                              | -.2                              |
|                             | Pseudoword decoding      | .76**                     | -                                | .57**                                 | .62**                     | .78**                        | .69**                                 | .72                              | -.13                             | 1.05                             |
| Phonological Awareness      | Phoneme blending         | .54*                      | .35                              | .39*                                  | .58*                      | .40*                         | .62**                                 | -.15                             | -.15                             | .83                              |
|                             | Phoneme isolation        | .56*                      | .48*                             | .41*                                  | .48*                      | .40*                         | .56*                                  | .22                              | 0                                | .56                              |
|                             | Phoneme deletion         | .53*                      | .49                              | .42*                                  |                           |                              |                                       | -                                | -                                | -                                |
| Phonological Working Memory | Sentence repetition      | .55*                      | .45*                             | .30*                                  | .39                       | .49*                         | .37                                   | .55                              | -.14                             | .21                              |
|                             | Pseudoword repetition    |                           |                                  |                                       | .39                       | .45**                        | .42                                   | -                                | -                                | -                                |
| Oral Language               | Listening comprehension  | .52**                     | .59**                            | .58*                                  | .53*                      | .44                          | .55*                                  | -.04                             | .54                              | .12                              |
|                             | Vocabulary               | .49*                      | .55*                             | .44*                                  | .49                       | .48                          | .64**                                 | 0                                | .25                              | -.76                             |
| Rapid automatized naming    | RAN letters              | -.35                      | -.45*                            | -.41*                                 | -.55**                    | -.54**                       | -.57**                                | -.63                             | -.32                             | .56                              |
|                             | RAN numbers              | -.37                      | -.38                             | -.33                                  | -.56*                     | -.52*                        | -.46*                                 | -.56                             | -.47                             | .41                              |
| Letter knowledge            | Letter names/sounds (UC) | -                         | -                                | -                                     | .57*                      | .69**                        | .50*                                  | -                                | -                                | -                                |
|                             | Letter names/sounds (LC) | -                         | -                                | -                                     | .51*                      | .56*                         | .45                                   | -                                | -                                | -                                |

*Word reading and pseudoword decoding: Within-language correlations (L2, Table 26.2).* Most cognitive measures correlated significantly with both reading efficiency measures. Similarly to L1, there were a few exceptions. Concurrently, two PA tasks (blending and deletion) and RAN numbers did not show significant correlations with pseudoword reading tasks. Longitudinally, no significant relationships were observed for two phonological working memory tasks and vocabulary with word reading as well as for vocabulary and listening comprehension with pseudoword decoding tasks.

*Reading comprehension: Within-language correlations (L2).* Both longitudinally and concurrently reading comprehension correlated significantly with reading efficiency measures. All cognitive measures demonstrated weak to moderate significant correlations with reading comprehension with a few exceptions. No significant relationships were identified for PWM tasks and LK (lower case) longitudinally. RAN numbers correlation with reading comprehension was also insignificant.

*Word reading and pseudoword decoding: Between-language correlations (L1-L2).* Concurrently, all decoding skills significantly correlated with word reading. As to pseudoword decoding, only two PA tasks (blending and isolation), listening comprehension and RAN demonstrated significant relationships. Longitudinally, only a few correlations were significant for word reading (PA isolation, listening comprehension, RAN). Pseudoword decoding correlated significantly with LK, RAN letters, vocabulary and PWM tasks.

*Reading comprehension: Within-language correlations (L1-L2).* Longitudinally and concurrently, reading efficiency tasks correlated significantly with reading comprehension, with longitudinal correlations being slightly stronger. Correlations of cognitive skills with reading comprehension were less pronounced in the concurrent analysis: only two PA tasks, listening comprehension and RAN letters showed weak significant relationships. Longitudinally, RAN and oral language skills tasks demonstrated significant correlations.

Table 26.3. Longitudinal and concurrent (T2) between-language (L1-L2) correlations between cognitive predictors and reading outcomes (Pearson's  $r$ , two-tailed, point-biserial); Bilingual group ( $n = 17$ ).

| Domain                            | Measures<br>L1              | Word reading<br>( $r_p$ ) | Pseudoword<br>decoding<br>( $r_p$ ) | Reading<br>comprehension<br>( $r_{pb}$ ) | Word reading<br>( $r_p$ ) | Pseudoword<br>decoding( $r_p$ ) | Reading<br>comprehension<br>( $r_{pb}$ ) | Difference<br>(Fisher's $Z$ )<br>WR | Difference<br>(Fisher's $Z$ )<br>PD | Difference<br>(Fisher's $Z$ )<br>RC |
|-----------------------------------|-----------------------------|---------------------------|-------------------------------------|------------------------------------------|---------------------------|---------------------------------|------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Concurrent T2                     |                             |                           |                                     | Longitudinal T1-T2                       |                           |                                 |                                          |                                     |                                     |                                     |
| Reading<br>efficiency             | Word reading                | .66*                      | .56*                                | .55*                                     | .82**                     | .71**                           | .71**                                    | -.96                                | -.67                                | -.71                                |
|                                   | Pseudoword<br>decoding      | .56*                      | .66*                                | .57*                                     | .55**                     | .54**                           | .60**                                    | .04                                 | .05                                 | -.12                                |
| Phonological<br>Awareness         | Phoneme blending            | .54*                      | .44*                                | .39*                                     | .38                       | .45*                            | .47                                      | .54                                 | -.03                                | -.26                                |
|                                   | Phoneme isolation           | .51*                      | .46*                                | .56*                                     | .49*                      | .35                             | .48*                                     | .07                                 | .35                                 | .29                                 |
|                                   | Phoneme deletion            | .53*                      | .43                                 | .44                                      |                           |                                 |                                          | -                                   | -                                   | -                                   |
| Phonological<br>Working<br>Memory | Sentence repetition         | .47*                      | .23                                 | .32                                      | .40                       | .51*                            | .37                                      | .23                                 | -.87                                | -.15                                |
|                                   | Pseudoword<br>repetition    |                           |                                     |                                          | .38                       | .51*                            | .33                                      | -                                   | -                                   | -                                   |
| Oral<br>Language                  | Listening<br>comprehension  | .69**                     | .59**                               | .51*                                     | .41**                     | .38                             | .42*                                     | -1.09                               | .73                                 | .30                                 |
|                                   | Vocabulary                  | .45*                      | .35                                 | .27                                      | .43                       | .49*                            | .52**                                    | 1.04                                | -.25                                | -.79                                |
| Rapid<br>automatized<br>naming    | RAN letters                 | -.48*                     | -.43**                              | -.44*                                    | -.49**                    | -.51**                          | -.42*                                    | .03                                 | .52                                 | -.06                                |
|                                   | RAN numbers                 | -.48*                     | -.43*                               | -.31                                     | -.46*                     | -.38                            | -.46**                                   | -.07                                | -.16                                | .47                                 |
| Letter<br>knowledge               | Letter names/sounds<br>(UC) |                           |                                     |                                          | .42                       | .44*                            | .21                                      | -                                   | -                                   | -                                   |
|                                   | Letter names/sounds<br>(LC) |                           |                                     |                                          | .34                       | .42*                            | .37                                      | -                                   | -                                   | -                                   |

Table 26.4. Longitudinal and concurrent (T2) between-language (L2-L1) correlations between cognitive predictors and reading outcomes (Pearson's  $r$ , two-tailed, point-biserial); Bilingual group ( $n = 17$ ).

| Domain                            | Measures<br>L1              | Word<br>reading<br>( $r_p$ ) | Pseudoword<br>decoding<br>( $r_p$ ) | Reading<br>comprehension<br>( $r_{pb}$ ) | Word<br>reading<br>( $r_p$ ) | Pseudoword<br>decoding<br>( $r_p$ ) | Reading<br>comprehension<br>( $r_{pb}$ ) | Difference<br>(Fisher's $Z$ )<br>WR | Difference<br>(Fisher's $Z$ )<br>PD | Difference<br>(Fisher's<br>$Z$ )<br>RC |
|-----------------------------------|-----------------------------|------------------------------|-------------------------------------|------------------------------------------|------------------------------|-------------------------------------|------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|
| Concurrent T2                     |                             |                              |                                     |                                          | Longitudinal T1-T2           |                                     |                                          |                                     |                                     |                                        |
| Reading<br>efficiency             | Word reading                | .69**                        | .67**                               | .51**                                    | .70**                        | .71**                               | .57*                                     | -.05                                | -.02                                | -.22                                   |
|                                   | Pseudoword<br>decoding      | .65**                        | .79**                               | .55**                                    | .64**                        | .76**                               | .56*                                     | .05                                 | .02                                 | -.04                                   |
| Phonological<br>Awareness         | Phoneme blending            | .53*                         | .30                                 | .26                                      | .49*                         | .43*                                | .24                                      | .14                                 | -.40                                | .06                                    |
|                                   | Phoneme isolation           | .62**                        | .67**                               | .36                                      | .45                          | .48                                 | .30                                      | .64                                 | .76                                 | .18                                    |
|                                   | Phoneme deletion            | .58*                         | .41                                 | .48                                      | -                            | -                                   | -                                        | -                                   | -                                   | -                                      |
| Phonological<br>Working<br>Memory | Sentence repetition         | .58*                         | .55*                                | .30                                      | .39                          | .47*                                | .44                                      | .66                                 | .29                                 | -.43                                   |
|                                   | Pseudoword<br>repetition    | -                            | -                                   | -                                        | .27                          | .43*                                | .34                                      |                                     |                                     |                                        |
| Oral<br>Language                  | Listening<br>comprehension  | .40*                         | .39                                 | .37                                      | .43*                         | .36                                 | .32                                      | -.10                                | .09                                 | .15                                    |
|                                   | Vocabulary                  | .59*                         | .56*                                | .50*                                     | .30                          | .65*                                | .54*                                     | .97                                 | -.38                                | -.15                                   |
| Rapid<br>automatized<br>naming    | RAN letters                 | -.51*                        | -.46*                               | -.48*                                    | -.52*                        | -.43*                               | -.40*                                    | .04                                 | -.10                                | -.26                                   |
|                                   | RAN numbers                 | -.43                         | -.30                                | -.33                                     | -.45                         | -.33                                | -.34                                     | .07                                 | .09                                 | .03                                    |
| Letter<br>knowledge               | Letter<br>names/sounds (UC) | -                            | -                                   | -                                        | .48                          | .39                                 | .38                                      | -                                   | -                                   | -                                      |
|                                   | Letter<br>names/sounds (LC) | -                            | -                                   | -                                        | .44                          | .48                                 | .41                                      | -                                   | -                                   | -                                      |



*Word reading and pseudoword decoding: Between-language correlations (L2-L1).* Concurrently, word reading demonstrated weak to moderate significant correlations with most cognitive measures, except for RAN numbers. Longitudinally, only PA blending, listening comprehension and RAN letters demonstrated significant relationships with word reading. A few cognitive measures of cognitive correlated with pseudoword reading concurrently (PA isolation, sentence repetition, vocabulary, RAN letters) and longitudinally (PA blending, pseudoword repetition, vocabulary and RAN letters).

*Reading comprehension: Between-language correlations (L2-L1).* As in the previous analyses, reading efficiency tasks correlated significantly with reading comprehension both concurrently and longitudinally. Only a few cognitive skills demonstrated weak to moderate significant correlations: concurrently (vocabulary and RAN letters) and longitudinally (vocabulary, RAN letters and pseudoword repetition).

### **8.3.3. Cognitive predictors of reading in the bilingual group: Longitudinal results of regression analyses**

A number of hierarchical multiple regression analyses were conducted as the next step in the analysis. Each composite variable was entered systematically at the first step to measure the proportion of the outcome variance and at the last step in each analysis to measure the proportion of the outcome variance it could explain uniquely, i.e. after controlling for all other blocks. In addition, a significance of differences between two beta weights ( $\beta$  L1 and  $\beta$  L2) for each statistically significant predictor in the models was calculated. The statistical algorithm ( $R^2$  significance analysis) used for computing  $t$ -statistics ( $p$ -value) in  $R$  can be found in Appendix N.

As in the concurrent study (T1), preliminary analyses were run to ensure no serious violation of the assumptions of normality, multicollinearity, linearity, and homoscedasticity. Stevens (2002) recommends 15 participants per one predictor or Green (1991)  $N \geq 50 + 8k$ . In the longitudinal analyses that were conducted in the study, there are 6 predictors. Thus, a sample size of 90 (following Stevens' guidelines) or 98 (according to Green) would be ideal. The sample size in this study does not meet this requirement (maximum sample size for all predictors = 17). Considering the modest

sample size, the statistical power of the study is limited. Consequently, the findings presented here should be interpreted with caution.

Reading words and pseudoword decoding measures were used to create a composite score of reading efficiency measure (i.e. an average of correctly read words and pseudowords per minute). The reading efficiency and reading comprehension (i.e. a number of correct responses given after the passage reading) were included in the separate analyses as dependent variables. Where the reading efficiency was analysed longitudinally, it was controlled for the baseline of the reading efficiency (an autoregressor) measured at T1. It was done to explore whether cognitive skills are still significant predictors (as the autoregressor is known to be the best predictor of the performance of a particular skill). The following blocks were included in the regression analyses as independent (predictor) variables in the longitudinal analyses:

- (1) reading efficiency,
- (2) phonological awareness,
- (3) phonological working memory,
- (4) oral language,
- (5) rapid automatized naming,
- (6) letter knowledge.

The composite scores correspond to the composite variables described previously in this section (section 8.3.1).

The results of the longitudinal regression analyses conducted in both languages, exploring the ability of predictors to explain variation in reading comprehension and reading efficiency (word reading and pseudoword decoding) are presented in Tables 27.1 and 27.2.

Table 27.1. Predictors of reading comprehension: Longitudinal results of hierarchical multiple regression analyses within languages ( $n = 17$ ).

| Predictors                              | Entered first | Entered last |         |       | Entered first | Entered last |         |         |      |
|-----------------------------------------|---------------|--------------|---------|-------|---------------|--------------|---------|---------|------|
| Ukrainian/Russian (L1)                  |               |              |         |       | Polish (L2)   |              |         |         |      |
|                                         | $R^2$ change  | $B$          | $\beta$ |       | $R^2$ change  | $B$          | $\beta$ | $p$ (t) |      |
| Reading efficiency                      | .465*         | .045*        | .409    | .451  | .438*         | .035*        | .370    | .379    | .852 |
| Phonological Awareness                  | .352*         | .117*        | .627    | .625  | .429*         | .019         | .214    | .219    | .742 |
| Phonological Working Memory             | .381*         | .088         | .435    | .419  | .333*         | .025         | .502    | .499    | .828 |
| Oral Language                           | .411*         | .016         | .240    | .245  | .618*         | .162*        | .756    | .645    | .734 |
| RAN                                     | .472*         | .060         | -.378   | -.389 | .599*         | .053         | -.424   | -.415   | .823 |
| Letter knowledge                        | .237*         | .070         | .112    | .117  | .037          | .000         | .156    | .225    | .734 |
| Adjusted $R^2$ final model (all blocks) | .687*         |              |         |       | .663**        |              |         |         |      |

Note:  $p$ -value of  $t$ -statistic is the significance of differences between two beta weights across languages (in L1 and L2) for each composite variable; \*\*  $p < .001$ , \*  $p < .05$

Overall, the six cognitive correlates predicted reading comprehension in both languages L1 and L2 well, explaining 68.7% (L1) and 66.3% (L2) of its variance. All six cognitive predictors correlated significantly with reading comprehension tasks in both languages, except for letter knowledge in L2. In both languages reading efficiency (a combined variable of word reading and pseudoword decoding) made a significant unique contribution to the prediction of reading comprehension. In addition, phonological awareness skills (in L1) and oral languages skills (in L2) demonstrated significant and unique contribution to the prediction of reading comprehension.

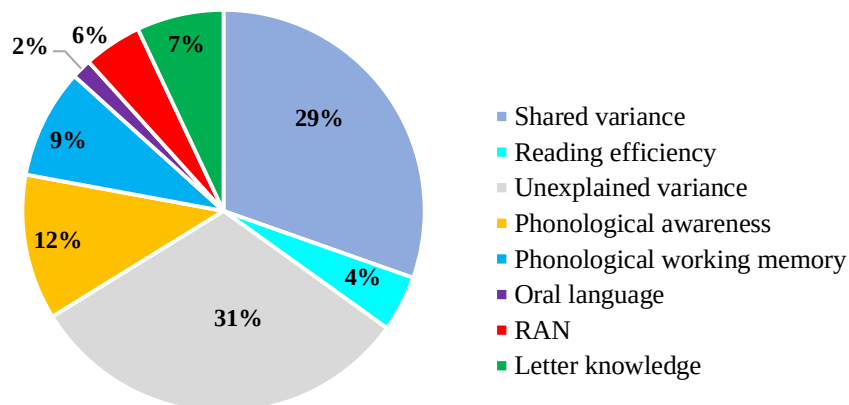


Fig. 11. Percentage of variance in T2 reading comprehension skills explained by unique and shared contributions of predictors in L1 (Ukrainian/Russian).

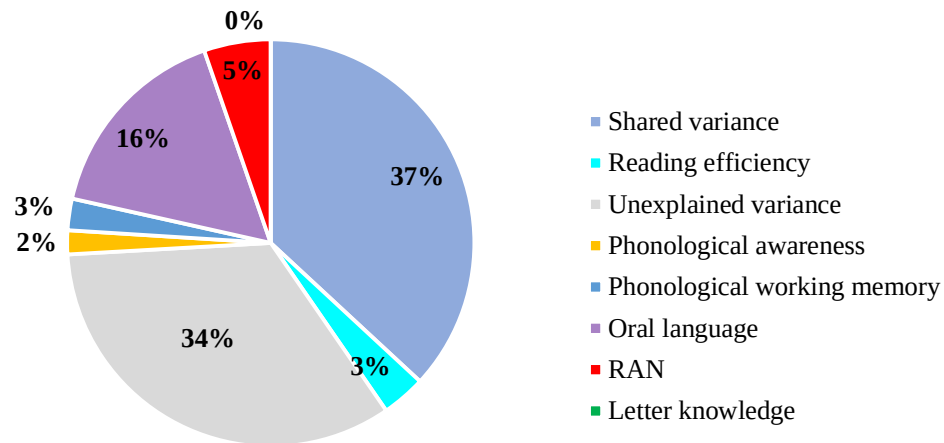


Fig. 12. Percentage of variance in T2 reading comprehension skills explained by unique and shared contributions of predictors in L2 (Polish).

Table 27.2. Predictors of reading efficiency: Longitudinal results of hierarchical multiple regression within languages ( $n = 17$ ).

| Predictors                              | Entered first          | Entered last |         |        | Entered first | Entered last |         |         |      |
|-----------------------------------------|------------------------|--------------|---------|--------|---------------|--------------|---------|---------|------|
|                                         | Ukrainian/Russian (L1) |              |         |        | Polish (L2)   |              |         |         |      |
|                                         | $R^2$ change           | $B$          | $\beta$ |        | $R^2$ change  | $B$          | $\beta$ | $p$ (t) |      |
| Autoregressor                           | .789**                 | .078*        | .588    | .591   | .641**        | .052*        | .650    | .721    | .737 |
| Phonological Awareness                  | .001                   | .000         | .025    | .023   | .000          | .002         | .072    | .075    | .645 |
| Phonological Working Memory             | .004                   | .023         | -.598   | - .561 | .005          | .015         | .398    | .369    | .745 |
| Oral Language                           | .001                   | .013         | .238    | .221   | .001          | .001         | .088    | .093    | .865 |
| RAN                                     | .103*                  | .124*        | .246    | .216   | .046          | .026         | .308    | .315    | .665 |
| Letter knowledge                        | .003                   | .005         | .106    | .102   | .168*         | .176*        | .463    | .481    | .865 |
| Adjusted $R^2$ final model (all blocks) |                        | .874**       |         |        |               | .797**       |         |         |      |

\*\* $p < .001$ , \*  $p < .05$

The six cognitive predictors and the autoregressor (a reading efficiency measured at T1) included in the model predicted reading efficiency in both languages L1 and L2, explaining 87.4% (L1) and 79.7% (L2) of its variance. T1 reading efficiency significantly and uniquely predicted the same skill at T2. After controlling for autoregressor, only RAN skills (in L1) and LK (in L2) demonstrated significant and unique contribution to predicting variance in reading efficiency.

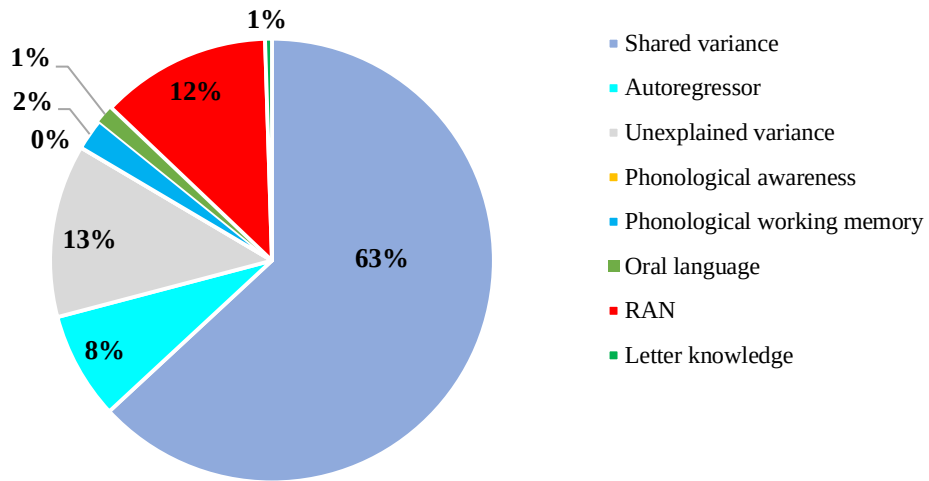


Fig. 13. Percentage of variance in T2 decoding skills explained by unique and shared contribution of predictors in L1 (Ukrainian/Russian).

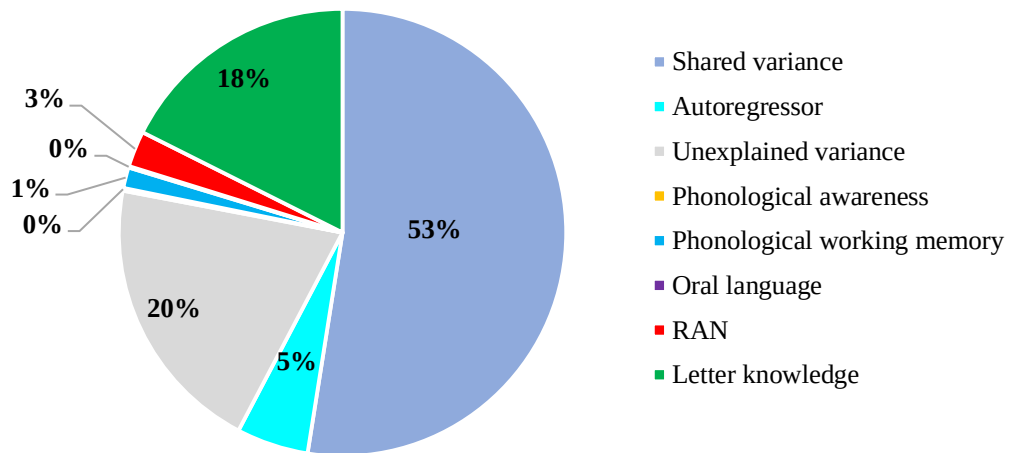


Fig. 14 . Percentage of variance in T2 decoding skills explained by unique and shared contribution of predictors in L2 (Polish).

The results of the concurrent regression analyses conducted in both languages, exploring predictive strength of cognitive skills to explain variation in reading comprehension and reading efficiency are presented in Tables 28.1 and 28.2.

Table 28.1. Predictors of reading comprehension: Concurrent results of hierarchical multiple regression within languages at T2 ( $n = 17$ ).

| Predictors                              | Entered first          | Entered last |       |         | Entered first | Entered last |       |         |         |
|-----------------------------------------|------------------------|--------------|-------|---------|---------------|--------------|-------|---------|---------|
|                                         | Ukrainian/Russian (L1) |              |       |         | Polish (L2)   |              |       |         |         |
|                                         | $R^2$ change           | $B$          |       | $\beta$ | $R^2$ change  | $B$          |       | $\beta$ | $p$ (t) |
| Reading efficiency                      | .564**                 | .181*        | .288  | .316    | .535**        | .226*        | .419  | .431    | .726    |
| Phonological Awareness                  | .176*                  | .003         | .128  | .142    | .232*         | .006         | .092  | .085    | .857    |
| Phonological Working Memory             | .045                   | .006         | -.122 | -.129   | .091          | .034         | .100  | .104    | .758    |
| Oral Language                           | .594**                 | .083         | .463  | .441    | .194*         | .023         | .015  | .017    | .642    |
| RAN                                     | .525**                 | .027         | -.337 | -.291   | .332*         | .002         | -.446 | -.417   | .753    |
| Adjusted $R^2$ final model (all blocks) |                        | .589*        |       |         |               | .544*        |       |         |         |

\*\*  $p < .001$ , \*  $p < .05$

Overall, as in the longitudinal analysis all cognitive predictors included in the model predicted reading comprehension in both languages L1 (58,9%) and L2 (54,4%), explaining slightly more than a half of its variance. In both languages reading efficiency made a significant and unique contribution in predicting reading comprehension variance. In both languages all measures correlated significantly, except for PWM in L1 and L2.

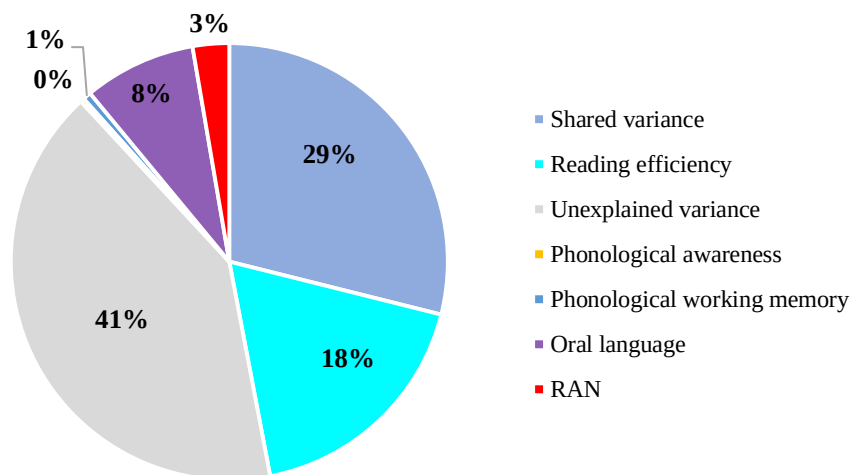


Fig. 15. Percentage of variance in T2 reading comprehension skills explained by unique and shared contribution of predictors in L1 (Ukrainian/Russian).

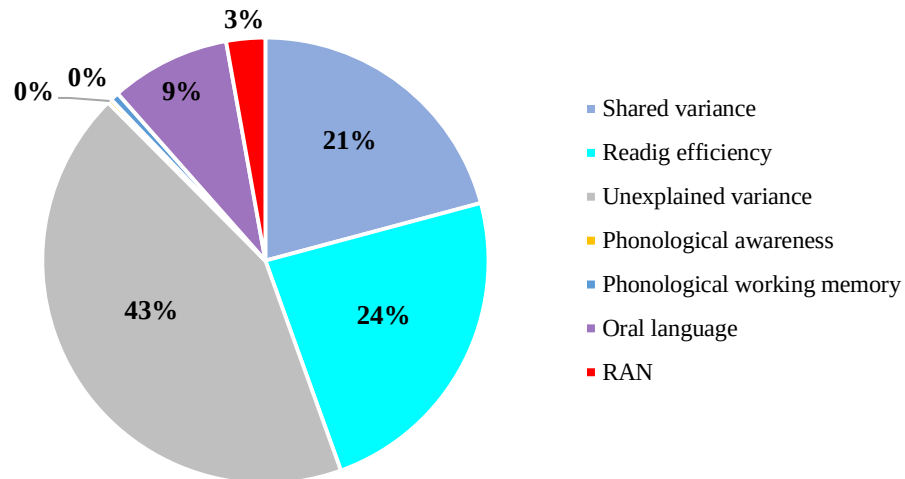


Fig. 16. Percentage of variance in T2 reading comprehension skills explained by unique and shared contribution of predictors in L2 (Polish).

Table 28.2. Predictors of reading efficiency: Concurrent results of hierarchical multiple regression within languages at T2 ( $n = 17$ ).

| Predictors                              | Entered first          | Entered last | Entered first |       |              |       | Entered last |        |      |  |
|-----------------------------------------|------------------------|--------------|---------------|-------|--------------|-------|--------------|--------|------|--|
|                                         | Ukrainian/Russian (L1) |              |               |       | Polish (L2)  |       |              |        |      |  |
|                                         | $R^2$ change           | $B$          | $\beta$       |       | $R^2$ change | $B$   | $\beta$      | $p(t)$ |      |  |
| Phonological Awareness                  | .318*                  | .011         | .268          | .197  | .204*        | .005  | .140         | .127   | .856 |  |
| Phonological Working Memory             | .246*                  | .001         | .046          | .048  | .257*        | .006  | .117         | .118   |      |  |
| Oral Language                           | .567*                  | .055         | .371          | .322  | .631*        | .031* | .510         | .471   |      |  |
| RAN                                     | .679**                 | .108*        | -.603         | -.474 | .479*        | .019  | -.190        | -.173  |      |  |
| Adjusted $R^2$ final model (all blocks) | .714*                  |              |               |       | .599*        |       |              |        |      |  |

Similarly to the previous within languages longitudinal analysis, all cognitive measures predicted reading efficiency in both languages L1 and L2 with different predictive strength, explaining 71.4% (L1) and 59.9% (L2) of its variance. Only RAN skills in L1 and oral language skills in L2 demonstrated significant and unique contribution to the prediction of variance in reading efficiency.

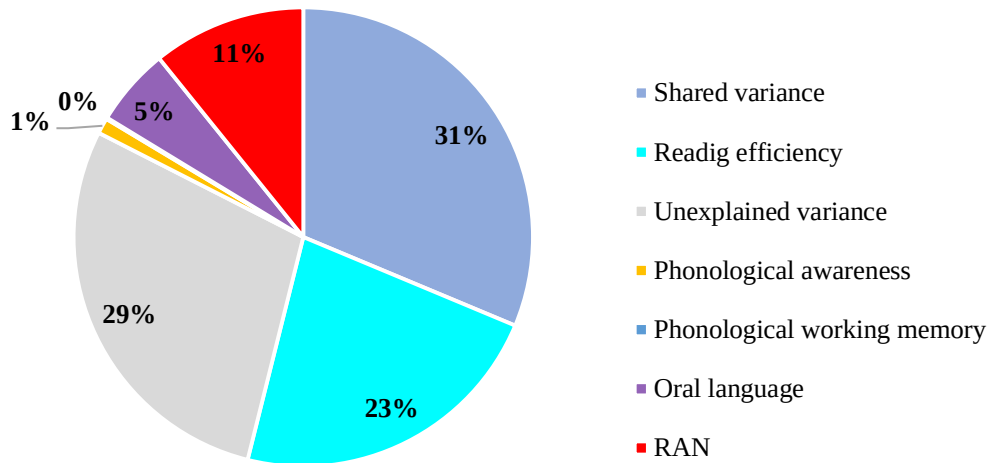


Fig. 17. Percentage of variance in T2 decoding skills explained by unique and shared contribution of predictors in L1 (Ukrainian/Russian).

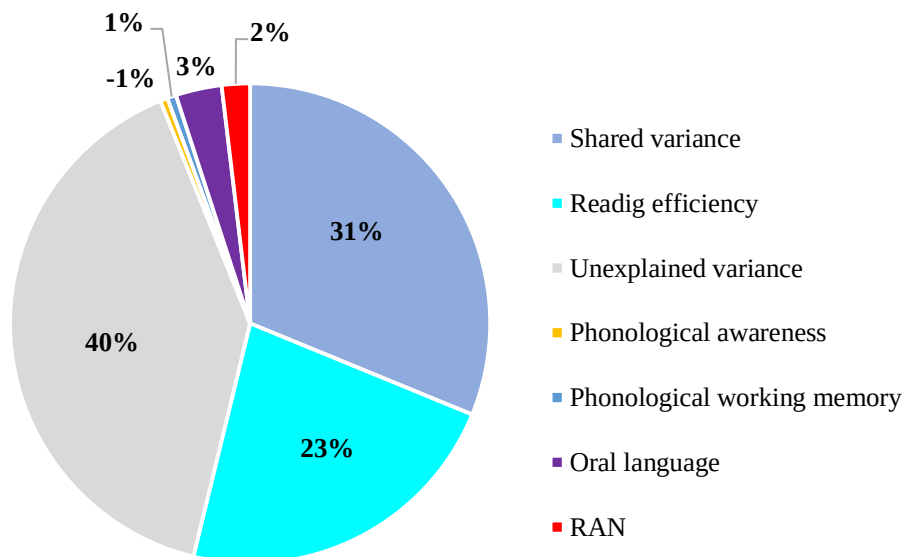


Fig. 18. Percentage of variance in T2 decoding skills explained by unique and shared contirbution of predictors in L2 (Polish).

To compare the significance of differences between  $\beta$  weights in L1 and L2 longitudinally and concurrently (T2), a number across languages  $R^2$  significance analyses were run. Reading efficiency appeared to predict similarly variance in reading comprehension in both languages concurrently (T2) and longitudinally. Expectedly, autoregressor (T1 decoding skills) was similarly predictive of T2 decoding skills (reading efficiency) at T2 in both languages. Apart from similar predictors, there were



some differences in predictive patterns across languages. Longitudinally, PA in L1 and oral language skills in L2 appeared to be unique predictors of reading comprehension. When controlled for autoregressor, in L1 RAN appeared to be unique predictor of decoding skills both concurrently (L2) and longitudinally, but not for L2. Early letter knowledge (measured at T1) and oral skills at T2 appeared to be unique predictors of decoding skills in L2 (Polish).

#### **8.3.4. Cognitive predictors of reading skills between the three groups: Results of regression analyses**

As the last step, several multiple linear regression analyses with interactions between categorical and continuous variables were conducted between the three groups. These analyses aimed to compare cognitive predictors of reading comprehension and decoding skills between the Ukrainian-Polish bilingual group and two monolingual groups. In the analyses, the group was a categorical variable. Predictor variables were six continuous variables, for which composite scores were previously created. Reading comprehension and reading efficiency (a composite variable of word reading and pseudoword decoding) were entered as independent variables. Dummy variables for categorical variables (groups) were created following the same approach as in the concurrent study (T1) in Chapter 7.

In the first set of regression analyses, predictors of reading efficiency and reading comprehension measured in Ukrainian were compared between the bilingual group and the Ukrainian monolingual group longitudinally and concurrently. Similarly, the second set of analyses compared predictors of reading efficiency in Polish between the bilingual and the Polish monolingual group.

*Longitudinal predictors of reading comprehension.* The influence of the group (monolingual vs bilingual) and six variables (reading efficiency, phonological awareness, phonological working memory, oral language, RAN and letter knowledge) measured at T1 on reading comprehension measured at T2 was explored. Overall, models explained more than a half of the reading comprehension variability in both languages, 63,6 % for Ukrainian ( $R^2$  adjusted = .636,  $F(13, 26) = 5.75$ ,  $p < .001$ , partial eta squared = .758) and 59 % for Polish ( $R^2$  adjusted = .590,  $F(13, 25) = 5.20$ ,  $p < .001$ , partial eta squared = .731). In all groups early decoding skills and oral language skills

were predictive of later reading comprehension (Table 29). For the Ukrainian language, a group by PA and group by RAN interactions were observed (Figures 19, 20). That might imply that for the bilinguals PA and RAN in L1 (Ukrainian) were stronger predictors of reading comprehension than for their monolingual peers.

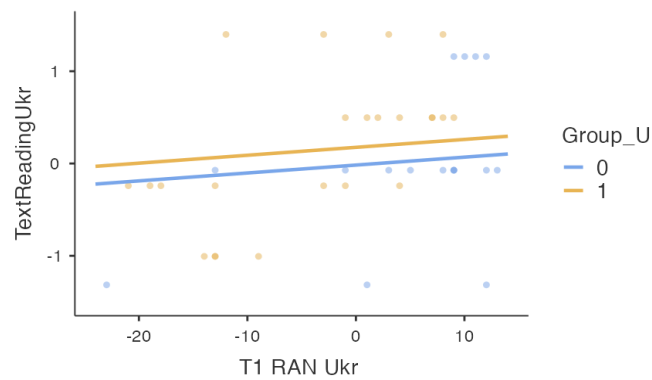


Fig.19. Group\*RAN interaction in the regression with reading comprehension, 0 (blue line) – the Ukrainian monolingual group, 1 (yellow line) – the Ukrainian-Polish bilingual group.

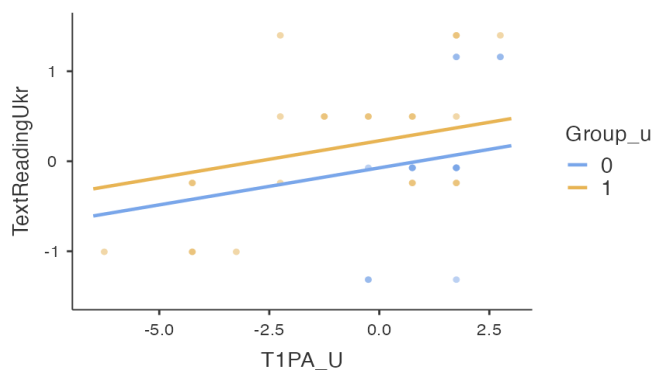


Fig.20. Group\*PA interaction in the regression with reading comprehension, 0 (blue line) – the Ukrainian monolingual group, 1 (yellow line) – the Ukrainian-Polish bilingual group.

Table 29. Comparison of early predictors of reading comprehension between the bilingual and the monolingual groups: Longitudinal results of multiple linear regressions with categorical and continuous variables and their interactions.

|                           | Comparison with Ukrainian monolinguals (T2) |             |        |         |         |          |          |                              | Comparison with Polish monolinguals (T2) |             |        |        |         |          |          |                              |
|---------------------------|---------------------------------------------|-------------|--------|---------|---------|----------|----------|------------------------------|------------------------------------------|-------------|--------|--------|---------|----------|----------|------------------------------|
|                           | <i>B</i>                                    | <i>SE B</i> | Low CI | High CI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup> change | <i>B</i>                                 | <i>SE B</i> | Low CI | HighCI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup> change |
| (Intercept)               | .09                                         | .08         | -.08   | .25     | .00     | 1.21     | .297     |                              | .02                                      | .13         | -.24   | .03    | .00     | .17      | .863     |                              |
| Group                     | .10                                         | .16         | -.23   | -.43    | .13     | .64      | .528     | .118                         | .04                                      | .17         | -.09   | .32    | .02     | .22      | .826     | .010                         |
| Reading efficiency*       | .40                                         | .16         | .06    | .73     | .45     | 2.42     | .023     | .057                         | .35                                      | .27         | -.05   | .65    | .36     | 1.80     | .049     | .034                         |
| PA                        | .17                                         | .18         | -.02   | .30     | .17     | .98      | .338     | .005                         | .21                                      | .25         | -.30   | .73    | .21     | .84      | .401     | .002                         |
| PWM                       | .33                                         | .15         | .02    | .63     | .31     | 2.22     | .136     | .061                         | .50                                      | .35         | -.03   | .56    | .06     | .07      | .339     | .032                         |
| Oral language*            | .25                                         | .17         | -.11   | .60     | .24     | 1.44     | .063     | .014                         | .94                                      | .38         | .16    | 1.71   | .86     | 2.47     | .021     | .001                         |
| RAN                       | -.05                                        | .16         | -.37   | .28     | -.05    | -.30     | .766     | .000                         | -.42                                     | .30         | -1.05  | .20    | -.40    | -1.41    | .171     | .001                         |
| Letter knowledge          | .14                                         | .13         | -.13   | .41     | .14     | 1.05     | .305     | .012                         | .02                                      | .17         | -.39   | .32    | -.07    | -.22     | .826     | .024                         |
| Group: reading efficiency | .03                                         | .33         | -.69   | .65     | .04     | .08      | .937     | .028                         | .01                                      | .25         | -.04   | .37    | .01     | .01      | .991     | .000                         |
| Group: PA*                | .91                                         | .34         | .19    | 1.63    | .627    | 2.60     | .015     | .030                         | .01                                      | .35         | -.71   | .73    | .01     | .02      | .064     | .001                         |
| Group: PWM                | -.22                                        | .29         | -.82   | .38     | -.21    | -.76     | .459     | .030                         | .66                                      | .60         | -.57   | 1.89   | .60     | 1.11     | .278     | .004                         |
| Group: Oral language      | .02                                         | .34         | -.69   | .72     | .01     | .04      | .972     | .019                         | -.60                                     | .45         | -1.53  | .33    | -.55    | -1.33    | .197     | .011                         |
| Group: RAN*               | .66                                         | .31         | .02    | 1.31    | .68     | 2.11     | .044     | .000                         | .38                                      | .40         | -.45   | 1.20   | .36     | .95      | .359     | .002                         |
| Group: LK                 | .11                                         | .26         | -.49   | .60     | .06     | .21      | .839     | .025                         | .37                                      | .25         | -.15   | .89    | .38     | 1.47     | .154     | .003                         |

Statistically significant predictors and group \* predictor interactions, \**p* <.05

*Longitudinal predictors of reading efficiency.* Similar approach was used to test the influence of the group (monolingual vs bilingual) and six variables (reading efficiency (T1), phonological awareness, phonological working memory, oral language, RAN and letter knowledge) measured at T1 on reading efficiency measured at T2. Models explained more than two thirds of the reading comprehension variability in both languages, 84,5 % for Ukrainian ( $R^2$  adjusted = .845,  $F(13, 26) = 17,32$ ,  $p < .001$ , partial eta squared = .896) and 59,0% for Polish ( $R^2$  adjusted = .688,  $F(13, 26) = 7.46$ ,  $p < .001$ , partial eta squared = .795). Expectedly, for all groups reading efficiency at T1 (autoregressor) was predictive of reading efficiency at T2 (Table 30). In both languages, RAN turned out to be a significant predictor of decoding skills for all groups (monolingual and bilingual). Whereas letter knowledge was found to be a significant correlate with reading efficiency only in Polish. For Ukrainian, a group by RAN interactions was observed (Figure 21), which might indicate that for the bilinguals RAN was a stronger predictor of reading efficiency skills than for their monolingual peers. RAN measure was time (in seconds) during which a child named highly familiar items. The declining slope indicates that the more time the child spent on RAN task, the less words were read during word reading task.

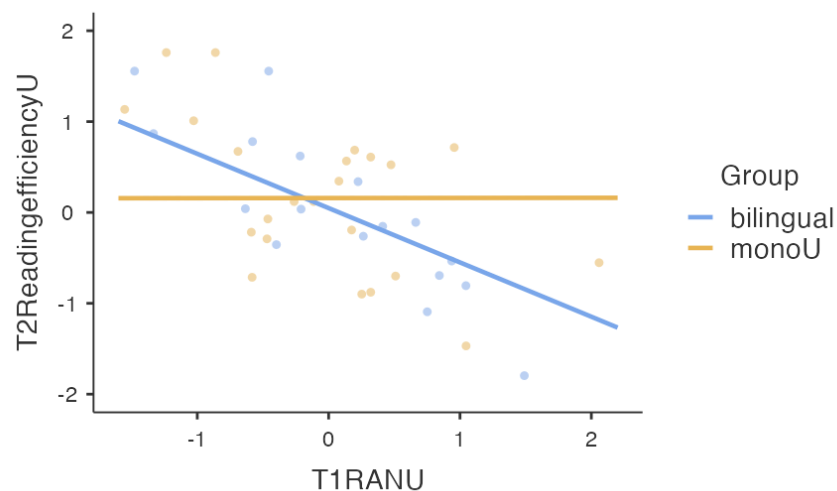


Fig. 21. Group \* RAN interaction in the regression with reading efficiency measure in L1 (Ukrainian), longitudinal analysis.

Table 30. Comparison of early predictors of reading efficiency between the bilingual and the monolingual groups: Longitudinal results of multiple linear regression with categorical and continuous variables and their interactions.

|                           | Comparison with Ukrainian monolinguals (T2) |             |        |         |         |          |          |                              | Comparison with Polish monolinguals (T2) |             |        |        |         |          |          |                              |
|---------------------------|---------------------------------------------|-------------|--------|---------|---------|----------|----------|------------------------------|------------------------------------------|-------------|--------|--------|---------|----------|----------|------------------------------|
|                           | <i>B</i>                                    | <i>SE B</i> | Low CI | High CI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup> change | <i>B</i>                                 | <i>SE B</i> | Low CI | HighCI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup> change |
| (Intercept)               | .05                                         | .08         | -.12   | .22     | .00     | .57      | .081     | -                            | .01                                      | 0.12        | -.24   | .25    | .00     | .05      | .963     | -                            |
| Group                     | .11                                         | .11         | -.12   | .34     | .13     | 1.00     | .326     | .001                         | .01                                      | .16         | -.34   | .31    | .01     | .07      | .941     | .000                         |
| Reading efficiency (T1)** | .59                                         | .20         | .18    | .99     | .62     | 2.96     | <.001    | .025                         | .65                                      | .41         | -.20   | 1.49   | .67     | 1.58     | .026     | .026                         |
| PA                        | .03                                         | .19         | -.37   | .42     | .02     | .131     | .897     | .001                         | .07                                      | .23         | .88    | .26    | .28     | 1.11     | .758     | .008                         |
| PWM                       | .15                                         | .10         | -.05   | .36     | .14     | 1.53     | .138     | .002                         | -.30                                     | .28         | -.88   | .26    | -.28    | -1.12    | .273     | .013                         |
| Oral language             | -.05                                        | .12         | -.29   | .19     | -.04    | -.41     | .682     | .000                         | .09                                      | .35         | -.63   | .80    | .08     | .25      | .802     | .000                         |
| RAN*                      | -.30                                        | .11         | -.52   | -.08    | -.28    | -2.78    | .010     | .020                         | -.46                                     | .13         | -.73   | -.19   | -.41    | -3.48    | .002     | .098                         |
| Letter knowledge*         | .05                                         | .09         | -.13   | .24     | .05     | .60      | .551     | .015                         | .47                                      | .16         | .13    | .79    | .46     | 2.90     | .008     | .067                         |
| Group: reading efficiency | .06                                         | .23         | -.39   | .53     | .07     | .65      | .770     | .002                         | -.24                                     | .51         | -1.28  | .81    | -.24    | -.47     | .644     | .030                         |
| Group: PA                 | .04                                         | .24         | -.15   | .45     | .05     | .17      | .869     | .000                         | .26                                      | .32         | -.40   | .91    | .24     | .79      | .432     | .016                         |
| Group: PWM                | .18                                         | .20         | -.56   | .29     | .19     | .92      | .366     | .001                         | .04                                      | .37         | -.72   | .79    | .03     | .11      | .918     | .009                         |
| Group: Oral language      | .38                                         | .24         | -.11   | .86     | .35     | 1.61     | .120     | .000                         | -.06                                     | .42         | -.91   | .79    | -.05    | .15      | .886     | .000                         |
| Group: RAN*               | .60                                         | .21         | .16    | 1.04    | .57     | 2.79     | .010     | .004                         | .51                                      | .55         | -.61   | 1.64   | .44     | .94      | .356     | .003                         |
| Group: LK                 | .33                                         | .18         | -.05   | .69     | .31     | 1.78     | .087     | .000                         | -.29                                     | .23         | -.77   | .19    | -.28    | -1.24    | .226     | .000                         |

Statistically significant predictors and group \* predictor interactions: \*\*  $p < .001$ , \* $p < .05$

*Concurrent predictors of reading comprehension.* To test the influence of the group (monolingual vs bilingual) and five variables (reading efficiency, phonological awareness, phonological working memory, oral language and RAN) on reading comprehension concurrently, several regression analyses were run. Overall, models explained more than a half the reading comprehension variability in both languages, 73,7 % for Ukrainian ( $R^2$  adjusted = .737,  $F(11, 31) = 11,69$ ,  $p < .001$ , partial eta squared = .806) and 56,3% for Polish ( $F(13, 26) = 7.27$ ,  $p < .008$ , partial eta squared = .661). Similarly to the longitudinal results, for all groups reading efficiency (T2) was predictive of reading comprehension at T2 (Ukrainian  $p = <.002$ , Polish  $p = .050$  (Table 31). In addition, oral language skills were also found to be predictive of reading comprehension in both languages. For Ukrainian, a group by RAN interactions was observed (Figure 21). It indicates that for the bilinguals RAN was a stronger predictor of reading efficiency skills than for their monolingual peers. Other interactions between the group and predictors did not appear to be significant.

*Concurrent predictors of reading efficiency.* Regression analyses results demonstrated that models explained more than a half of variance in reading efficiency skills. 61,7 % for the Ukrainian language  $F(9, 31) = 8,53$ ,  $p < .001$ , partial eta squared = .699 and 55,5 % for the Polish language  $F(9, 27) = 6.27$ ,  $p < .001$ , partial eta squared = .661. Oral language skills and RAN turned out to be significant predictors of reading skills both in Ukrainian and Polish languages.

Table 31. Comparison of predictors of reading efficiency and comprehension between the bilingual and the monolingual groups: Concurrent results of multiple linear regression with categorical and continuous variables and their interactions (T2).

|                              | Comparison with Ukrainian monolinguals (T2) |             |        |         |         |          |          |                              | Comparison with Polish monolinguals (T2) |             |        |        |         |          |          |                              |
|------------------------------|---------------------------------------------|-------------|--------|---------|---------|----------|----------|------------------------------|------------------------------------------|-------------|--------|--------|---------|----------|----------|------------------------------|
|                              | <i>B</i>                                    | <i>SE B</i> | Low CI | High CI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup> change | <i>B</i>                                 | <i>SE B</i> | Low CI | HighCI | $\beta$ | <i>t</i> | <i>p</i> | <i>R</i> <sup>2</sup> change |
| <i>Reading efficiency</i>    |                                             |             |        |         |         |          |          |                              |                                          |             |        |        |         |          |          |                              |
| (Intercept)                  | .01                                         | .13         | -.25   | .28     | .00     | .02      | .925     | -                            | .01                                      | .14         | -.29   | .29    | .00     | .03      | .974     | -                            |
| Group                        | -.01                                        | .17         | -.35   | .36     | -.01    | -.04     | .971     | .000                         | .01                                      | .19         | -.37   | .39    | .01     | .04      | .965     | .000                         |
| PA                           | .26                                         | .15         | -.04   | .56     | .21     | 1.74     | .090     | .025                         | .14                                      | .33         | -.53   | .81    | .12     | .43      | .073     | .028                         |
| PWM                          | .05                                         | .27         | -.93   | .89     | .05     | .17      | .866     | .004                         | .23                                      | .26         | -.41   | .65    | .11     | .45      | .654     | .001                         |
| Oral language*               | .43                                         | .15         | .14    | .73     | .37     | 2.99     | .005     | .075                         | .51                                      | .24         | .01    | 1.01   | .44     | 2.10     | .045     | .083                         |
| RAN*                         | -.41                                        | .14         | -.70   | -.12    | -.36    | -2.88    | .006     | .069                         | -.39                                     | .15         | -.68   | -.09   | -.34    | -2.62    | .013     | .077                         |
| Group: PA                    | .08                                         | .26         | -.61   | .46     | .06     | -.29     | .777     | .001                         | .24                                      | .39         | -.56   | 1.04   | .20     | .61      | .382     | .009                         |
| Group: PWM                   | .01                                         | .21         | -.44   | .41     | .01     | .06      | .950     | .001                         | .08                                      | .25         | -.44   | .57    | .18     | .06      | .790     | .001                         |
| Group: Oral language         | .06                                         | .23         | -.51   | -.39    | .06     | .273     | .786     | .001                         | .14                                      | .32         | -.79   | .52    | .15     | -.44     | .663     | .003                         |
| Group: RAN*                  | -.41                                        | .142        | -.70   | .12     | -.36    | 2.89     | .006     | .000                         | -.39                                     | .25         | -1.04  | .26    | -.32    | -1.23    | .159     | .023                         |
| <i>Reading comprehension</i> |                                             |             |        |         |         |          |          |                              |                                          |             |        |        |         |          |          |                              |
| (Intercept)                  | .00                                         | .11         | -.14   | .14     | .00     | .05      | .961     | -                            | .00                                      | .11         | -.22   | .21    | .00     | .02      | .982     | -                            |
| Group                        | -.01                                        | .14         | -.29   | .27     | -.01    | -.04     | .968     | .000                         | -.02                                     | .21         | -.45   | .42    | .02     | -.08     | .940     | .000                         |
| Reading efficiency*          | .65                                         | .14         | .37    | .93     | .69     | 4.67     | <.001    | .151                         | .20                                      | .21         | -.23   | .63    | .21     | 2.95     | .050     | .011                         |
| PA                           | .13                                         | .13         | -.14   | .40     | .11     | .96      | .345     | .006                         | .32                                      | .23         | -.01   | .72    | .28     | 1.58     | .242     | .040                         |
| PWM                          | .09                                         | .10         | -.31   | .12     | .10     | .86      | .391     | .005                         | -.09                                     | .18         | -.46   | .29    | -.09    | -.48     | .636     | .110                         |
| Oral language*               | .30                                         | .14         | .02    | .58     | .28     | 2.21     | .035     | .028                         | .39                                      | .18         | .04    | .74    | .36     | 2.24     | .032     | .079                         |
| RAN                          | .11                                         | .13         | -.16   | .38     | .10     | .78      | .438     | .004                         | -.23                                     | .19         | -.07   | .71    | -.21    | -1.25    | .219     | .025                         |
| Group:Reading efficiency     | .46                                         | .31         | .17    | 1.09    | .49     | 1.49     | .145     | .007                         | -.07                                     | .25         | -.58   | .45    | -.07    | -.254    | .801     | .001                         |
| Group: PA                    | .39                                         | .36         | .34    | 1.11    | .33     | 1.08     | .287     | .001                         | .22                                      | .29         | -.37   | .82    | .20     | .76      | .452     | .009                         |
| Group: PWM                   | .19                                         | .24         | -.30   | 0.69    | .21     | .169     | .100     | .019                         | .15                                      | .26         | -.36   | .68    | .16     | .57      | .571     | .005                         |
| Group: Oral language         | .32                                         | .27         | -.10   | 0.23    | .30     | 1.19     | .244     | .000                         | .27                                      | .29         | -.29   | .84    | .25     | .98      | .331     | .015                         |
| Group: RAN                   | .60                                         | .32         | -.02   | 1.27    | .59     | 1.97     | .058     | .001                         | .16                                      | .30         | -.45   | .77    | .15     | .54      | .591     | .005                         |

Statistically significant predictors and group \* predictor interactions: \**p* <.05

### 8.3.5. Summary of findings

This section explored predictors of reading comprehension and reading efficiency (word reading and pseudoword decoding skills) longitudinally and concurrently (T2) in the bilingual group and two monolingual groups.

In the bilingual group, reading comprehension correlated moderately and significantly with reading efficiency tasks within and across languages with relatively similar strength. Notably, longitudinal correlations (both within and across languages) tended to be slightly higher than the concurrent correlations at T2. Cognitive predictors revealed from weak to moderate relationships with reading comprehension in both within languages (L1 and L2) analyses. However, just a few correlations between cognitive measures and reading comprehension were significant in the between languages analyses.

Word reading and pseudoword decoding skills demonstrated weak to moderate significant correlations with most cognitive predictors within both languages (with a few exceptions). In L1, no significant relationships were observed between: (a) PA blending, sentence repetition and word reading (concurrently); (b) PA deletion and sentence repetition (both concurrently and longitudinally). In L2, PA (blending and deletion), RAN numbers (concurrently with word reading), PWM skills (longitudinally with pseudoword decoding) did not correlate significantly. The across languages analyses identified a smaller number of significant correlations between cognitive and reading efficiency measures.

In longitudinal regression analyses, cognitive correlates consistently demonstrated a strong predictive relationship with reading comprehension in both languages, explaining a substantial amount of its variance. In L1, cognitive predictors accounted for 68.7% of the variance, while in L2, they explained 66.3%. The predictive power of these cognitive factors was even higher for the measure of reading efficiency, explaining 87.4% of the variance in L1 and 79.7% in L2. Predictably, decoding skills measured at the initial time point (T1) emerged as unique predictors of reading comprehension (T2) in both languages, explaining 4.5% of the variance in L1 and 3.5% in L2. Phonological awareness (PA) was found to be a unique predictor only in L1,



explaining 11.7% of the variance, while oral language skills uniquely explained 6.2% of the variance in reading comprehension in L2. Regarding reading efficiency skills, after accounting for the autoregressor (which was the strongest unique predictor in both languages), rapid automatized naming (RAN) was found to be significant in L1, explaining 12.4% of the variance, while letter knowledge emerged as a significant predictor in L2, explaining 17.6% of the variance.

In a concurrent analysis, when considering reading comprehension, only reading efficiency in both languages emerged as a unique and significant predictor, explaining up to 18.1% of the variation in L1 and 22.6% in L2. In terms of decoding skills (reading efficiency), RAN appeared to be a unique predictor for reading in L1, accounting for 10.8% of the variance. Conversely, oral language skills were found to be predictive of decoding skills in L2, explaining 3.1% of the variance. These findings highlight the importance of reading efficiency as a key factor in predicting reading comprehension, while also demonstrating the unique contribution of specific cognitive skills in each language.

Analyses of predictors among the three groups yielded the following patterns. Over the course of the study, reading efficiency and oral language skills emerged as strong predictors of reading comprehension in all groups. Additionally, the results indicated that PA and RAN measured at T1 were better predictors of variance in later reading comprehension in the bilingual's L1 (Ukrainian) compared to the Ukrainian monolingual group.

Predictably, decoding skills measured at the initial time point (T1) uniquely accounted for variance in reading efficiency and reading comprehension (T2) in all groups. RAN demonstrated a similar significant predictive power across all groups as well. Notably, RAN was found to be more predictive of reading efficiency in L1 (Ukrainian) in the bilingual group when compared to the Ukrainian monolingual group.

#### 8.4. Summary of Chapter 8

Chapter 8 aimed to examine and compare the cognitive and literacy skills in the bilingual group. These analyses were conducted both concurrently (T2) and longitudinally (T1-T2) comparing bilinguals' performance in both L1 (Ukrainian/Russian) and L2 (Polish). Additionally, the chapter examined to what extent the bilingual group's performance on cognitive and literacy skills is comparable to those of two monolingual groups. Furthermore, early predictors of reading were compared within and across languages in the bilingual group. Additionally, within-language comparisons were conducted between the bilingual group and the two monolingual groups to explore and compare the predictors of reading within each language group.

First, an examination of the Ukrainian-Polish novice readers' performance in both languages revealed bilinguals' significant improvement on all cognitive and literacy skills in both languages (most notably in L2) over a nine-month period of formal literacy instruction. The difference between skills in L1 was marginally higher over those skills in L2. These findings are justifiable taken that initially (at T1) their performance on cognitive and literacy skills in L1 was superior to those skills L2.

Secondly, comparison of performance on cognitive predictors and reading outcomes at T2 between two monolingual groups and the bilingual group demonstrated the bilinguals' better results on all reading tasks in L1 and L2 (except for reading comprehension) over the two monolingual groups. Outperformed by the Polish monolingual group at the initial stage of literacy instruction (T1), the bilinguals significantly improved their performance in L2, slightly outperforming the Polish monolinguals on most cognitive and literacy tasks at T2.

Thirdly, within- and cross-language relationships between cognitive predictors and reading outcomes were also explored in the bilingual group. Correlational analyses revealed some similar patterns between predictors and reading outcomes across languages. Hence, two decoding skills tasks (word reading and pseudoword decoding) correlated moderately and significantly with reading comprehension, both within and across languages. In both languages, PA, RAN, oral language skills and letter knowledge (longitudinally) demonstrated weak to moderate significant correlations with all reading outcomes with a few exceptions. These associations were slightly weaker in cross-language comparisons, yet significant.

Fourthly, in the bilingual group, results of regression analyses identified that all cognitive measures (combined together) significantly predicted the variance of reading outcomes within language (by over two-thirds) as well as across languages. Decoding skills measured at the initial time point (T1) and concurrently (T2) emerged as unique predictors of reading comprehension in both languages. Longitudinally, PA was found to be a unique predictor only in L1, while oral language skills uniquely explained variance in reading comprehension in L2. For reading efficiency skills, decoding skills measured at T1 (autoregressor) was the strongest unique predictor in both languages, followed by rapid automatized naming (RAN) in L1, and letter knowledge in L2.

Finally, comparison of predictors between the two monolingual groups and the bilingual group revealed some similar patterns. Both longitudinally and concurrently, decoding skills and oral language skills appeared to be significant and fundamental predictors of reading comprehension in all groups. Longitudinally, letter knowledge appeared to be significant only in Polish for monolinguals and bilinguals. In addition, RAN was a similar unique predictor across groups for decoding skills only.

Overall, comprehensive analyses of reading development patterns in the bilingual and monolingual groups suggest broadly similar predictors of reading skills in all groups. Moreover, when cognitive and literacy correlates were examined within and across languages in the bilingual group, results indicated crosslinguistic interaction between reading predictors in L1 and reading outcomes in L2 and the other way round.

## **Chapter 9: Discussion**

### **9.1. Introduction**

This thesis sought to investigate several questions pertaining to reading development in bilingual children. As the study is longitudinal, children were assessed on cognitive and literacy tasks twice: at the onset of their schooling (T1) and at nine months of formal literacy instruction (T2). This chapter provides a discussion of findings based on research questions addressed in this study. First, cognitive and literacy skills in the two languages (L1 and L2) of the bilinguals are compared at the initial stage of the schooling and over nine months. Second, performance on cognitive and literacy skills is contrasted between the bilingual children and their Ukrainian and Polish monolingual peers, both concurrently (T1) and longitudinally. Third, early predictors of reading outcomes (word reading and pseudoword decoding) and reading comprehension are explored within and across languages in the bilinguals' L1 and L2, both concurrently (T1) and at nine months of the schooling. Finally, early predictors of reading are compared between the three groups cross sectionally and longitudinally. In addition, limitations of the study as well as future research perspectives are outlined. Following that, theoretical and practical implications of the study are discussed.

The results reported in the study revealed similarities and differences in relationships between early reading predictors and reading outcomes in the two languages of the bilinguals. In addition, findings indicated that precursors of reading skills are broadly similar for bilinguals and monolinguals.

## **9.2. Cognitive and literacy skills: Differences within and between groups**

### **9.2.1. The bilingual children**

Results of concurrent (T1) and longitudinal analyses of cognitive and literacy skills in both languages of the bilinguals revealed that, overall, the bilingual children performed slightly better in their L1 (Ukrainian/Russian) than in L2 (Polish) on most tasks, including both reading measures (word reading and pseudoword decoding). There were a few measures on which no significant difference was observed. At T1, participants achieved quite similar results in L1 and L2 on two PA tasks (blending and deletion) as well as on three RAN tasks (objects, colours, and letters). These results are not surprising, given that L1 is the language spoken at home and the bilinguals' exposure to L2 at this stage of assessment was still limited.

Over nine months of formal literacy instruction (at T2), bilingual children improved their performance on most tasks in L2, narrowing down a range of skills on which the difference across languages was significant. Reading comprehension skills appeared to be similar in both languages, indicating that bilinguals' ability to comprehend the written text in L1 and L2 did not differ significantly. Yet, children were still better at L1 word reading and pseudoword decoding tasks as well as at all phonological awareness and RAN numbers tasks. However, the strength of difference between performance in the two languages at T2 was weaker than at T1, making it possible to assume greater similarities across both languages than differences between them.

Considering bilinguals' L2 performance in a nine-month period, it should be acknowledged that all skills significantly improved and reached quite a similar level on most tasks in both languages. The fact that children still performed better in their L1 on several measures (namely, decoding skills tasks) is not surprising, given that initially bilinguals demonstrated better results in their first language at T1. In addition, their better performance in L1 might be partly accounted for the remote mode of teaching due to COVID-19. It should be noted that bilingual participants ( $n = 18$ ) recruited in the first wave of the study (September - November 2020) commenced the first grade remotely. Their exposure to Polish over this period remained quite limited. Moreover, literacy teaching was mostly performed by parents beyond online lessons. Of note,

conducting online classes with primary school students posed extra challenges to teachers (e.g. technical issues, outside distractions during lessons, diminished attention level, and other factors). Undoubtedly, these factors impacted literacy acquisition in participants' L2. It might be assumed that in an in-person learning environment greater exposure to L2 would have been more beneficial for the bilinguals' skills in L2 as the exposure to L2 would have significantly increased.

### **9.2.2. The bilingual versus the monolingual children**

Concurrent comparison (T1) of the bilinguals' and their monolingual peers' performance on a number of cognitive and literacy skills revealed that, overall, the bilinguals outperformed their Ukrainian monolingual peers on most tasks with a few exceptions where there was no difference between the bilingual and monolingual groups. Hence, bilingual children demonstrated slightly better results on phonological processing tasks (PA isolation, blending), alphanumeric RAN measures, phonological working memory (sentence repetition) and pseudoword decoding tasks. When these skills were assessed at nine months of formal literacy instruction (T2), bilinguals' superiority in L1 (Ukrainian/ Russian) over their Ukrainian monolingual peers on some tasks remained. Bilinguals achieved better results in decoding skills (word reading and pseudoword decoding), a number of language (oral skills) as well as cognitive (PA and RAN) skills.

When the bilinguals' performance in L2 (Polish) was compared with the Polish monolingual group, a somewhat different pattern was observed. While there was no significant difference between the groups on most tasks, the bilinguals achieved significantly lower scores on oral skills measures (listening comprehension and vocabulary) in their L2, which is not surprising considering the bilinguals' limited exposure to L2 at the onset of the schooling. Intriguingly, when cognitive and literacy measures were compared with the Polish monolingual group over nine months (T2), the bilinguals demonstrated better performance on literacy tasks (word reading and pseudoword decoding), sentence repetition, listening comprehension and RAN numbers measures. Polish monolinguals were slightly better at both PA tasks (deletion and isolation).

Overall, the results of the study demonstrate that bilinguals outperformed their monolingual peers in both languages on decoding skills at T2. These findings are in line with previous research suggesting that bilinguals might develop decoding skills at a similar rate or even faster than monolinguals (e.g. Bialystok, Luk and Kwan 2005; Papastefanou et al. 2021). The above differences are unlikely to be accounted for by better parental education in the bilingual group. Somewhat surprisingly, parents' education did not make a significant contribution to predicting children's skills in any of the MANCOVA analyses (though the variability in the education level was rather low, with a vast majority of parents having a university degree). A possible explanation of the findings might be the bilinguals' exposure to two structurally similar languages with relatively transparent orthographies (at least, in a feedforward direction), which may affect positively decoding skills development. Additionally, various contextual factors (e.g. time of daily exposure to print in both languages, parental engagement in literacy teaching in L1 and L2, remote learning during COVID-19) might have affected the process as well. It should be acknowledged that the effect of only one factor (parental level of education) was directly tested in this study and did not demonstrate any significant impact on reading performance across the groups in our cohorts of participants. Yet, literacy acquisition in all groups during the pandemic might have been affected by a handful of external factors, namely, the level of parental engagement into literacy acquisition (e.g. time allocated for daily reading practice, lexical complexity, mode of reading - digital or print). Therefore, the role of factors related to parental engagement and home literacy practices in explaining differences between mono- and bilingual groups awaits further study.

### **9.3. Predictors of literacy skills: Concurrent and longitudinal analyses**

#### **9.3.1. The bilingual group: Predictors of reading within and across languages**

The study also addressed the question of patterns of correlations between cognitive predictors and reading within and across languages in the bilingual group. Correlational and regression results revealed similarities and differences in these relationships within each of the bilinguals' languages and across languages. Several findings and

conclusions emerged from the analyses. Similar predictors for L1 and L2 are discussed first.

- Concurrently (T1), phonological awareness and alphanumeric RAN tasks (letters and digits) demonstrated significant correlations (albeit with varying strength) with both literacy tasks (word reading and pseudoword decoding) within and across languages. Letter knowledge was also found to moderately correlate with decoding skills, but only within languages. Cross-language correlations were not significant, which is not surprising, given that the languages use different scripts. Moreover, regression analyses revealed that PA was uniquely predictive of decoding skills over and above other skills measured (both concurrently (T1) and longitudinally).
- Longitudinally, PA, RAN and LK remained to be predictive of all reading measures (decoding skills and reading comprehension) in both languages of the bilinguals. As to crosslinguistic interaction, L1 RAN demonstrated weak to moderate correlations with reading outcomes in L2, but not the other way round. PA and LK patterns of correlations with reading outcomes across languages varied. In addition, decoding skills and oral language skills demonstrated significant weak to moderate correlations with reading comprehension within L1 and L2 and across languages (but not for oral language skills). In addition, regression analyses revealed that decoding skills measured at T1 were a unique predictor of decoding skills as well as reading comprehension at T2 in both languages.

However, there were some predictors, whose correlations with reading outcomes varied between and across languages. Differences between cognitive predictors in bilinguals' L1 and L2 are present below.

- Concurrently (T1), oral language skills (listening comprehension and vocabulary tasks) demonstrated significant correlations within L1 with word reading and the same pattern was observed from L1 to L2. Such an effect was not found within L2 and across languages from L2 to L1. PWM skills measures also showed significant moderate correlations within and across languages. However, the strength of these relationships varied depending on the type of the task. Namely, sentence repetition tasks correlated with decoding skills in L2 and across languages (from L2 to L1). Whereas, within L1 and from L1 to L2, its strength was weaker.



- Longitudinally, correlations between both oral language measures (listening comprehension and vocabulary) with decoding skills was observed only in L1, while in L2, only one of oral language skills measures (listening comprehension) showed a significant correlation with word reading. As to PWM, the correlations were significant for all reading measures in L1, but in L2 it was essential only for pseudoword decoding. Regression analyses findings identified RAN to be uniquely predictive of reading comprehension in L1, whereas in L2, it was letter knowledge that emerged to be a distinct predictor. For reading comprehension, in L1 PA was identified as a unique predictor, while in bilinguals' L2, they were oral language skills.

The findings outlined above clearly demonstrate some similar predictive patterns within and across both languages of the bilinguals. PA, RAN and LK appear to be robust concurrent and longitudinal correlates of reading skills in the bilinguals' L1 and L2. Their crosslinguistic relationships with reading outcomes are somewhat different. PA correlations with word reading and pseudoword decoding ranged from moderate to strong and are, in fact, the highest among all predictors. PA appeared to be the only unique predictor of decoding skills at T1 and of reading comprehension in L1 longitudinally when other predictors were controlled for. These findings corroborate previous research on early reading development, indicating that phonological awareness skills are robust predictors of future reading success within languages (Melby-Lervåg et al. 2012, Landerl et al. 2022) as well as across languages (Chung et al. 2021). An ability to identify and manipulate speech sounds is vital for development of decoding skills, which greatly relies on speech sound manipulation. Additionally, there appeared to be crosslinguistic interaction of PA skills in one language and decoding skills in another one. In practical terms, it means that assessment of bilingual children's PA skills in their L1 at the initial stage of reading acquisition can be predictive of reading success in L2 (at least over the first year of their formal schooling), which makes it possible to identify potential reading difficulties in L2 via early screening in bilinguals' respective native language.

The present findings also revealed that RAN tasks demonstrated significant correlations (weak to moderate) with decoding skills. Not surprisingly, alphanumeric RAN tasks were identified as crucial predictors within and across languages as cognitive mechanisms underlying RAN tasks to great extent resemble the reading

process. In line with earlier research findings, RAN tasks correlated with reading outcomes in both languages of the bilinguals as well as across languages (e.g. Chung et al. 2021, Vataja et al. 2021, see Kishchak et al. 2023 for a review). Significant correlations for RAN alphanumeric tasks with reading outcomes can be explained by the fact that knowledge of letters plays direct and more crucial role in reading than the knowledge of colours and objects. Non-alphanumeric RAN tasks are more informative of reading outcomes when measured at an earlier stage (last year of kindergarten) when children do not know letters and numbers yet. In this study, all participants knew numbers and almost all letters, therefore, alphanumeric RAN correlated more strongly with reading outcomes. Moreover, RAN appeared to be a unique longitudinal predictor of reading comprehension in L1 when decoding skills were controlled for.

Correlations between letter knowledge and decoding skills between the two languages of the bilinguals are quite predictable and straightforward, as learning letters is the first step to acquire literacy skills when the formal literacy instruction commences. In other words, to acquire mapping of graphemes with phonemes, a child simply needs to know letter names and sounds.

Investigations of the relationships between PWM skills and reading measures showed significant moderate correlations within and across languages. However, the strength of these relationships varied depending on the type of the PWM task. Namely, the sentence repetition task correlated more strongly with decoding skills in L2 and across languages (from L2 to L1), whereas within L1 and across languages (L1 - L2) its strength was weaker. A possible explanation might be the participants' higher language proficiency in L1, which accounted for better performance on sentence repetition tasks in L1 (reaching almost ceiling effect), which could not fully capture the relationships between sentence repetition task and decoding skills measures in L1. Pseudoword repetition task moderately correlated only with pseudoword decoding in both languages. Indeed, while performing pseudoword decoding tasks participants rely on phonological memory more than when reading words. Decoding of unfamiliar items (pseudowords) requires simultaneous step-by-step identification of graphemes, their mapping with phonemes and blending into words (similar to reading of new words). As pseudowords lack semantic meaning, their decoding might require more active engagement of phonological working memory, which accounts for storage, manipulation and retrieval of phonemes. That might partly explain non-significant correlations of pseudoword tasks with word reading in the two languages of bilinguals.

While oral language skills are indisputably essential for reading comprehension, their relationship with decoding skills is more pronounced when it comes to word reading compared to pseudoword decoding. Semantic knowledge (word meaning) is essential for understanding words, which facilitates their recognition and lexical retrieval, enhancing word reading efficiency. However, at the initial stage its role in learning to read words in L2 might be less essential as L2 proficiency is less developed than in L1. It can be assumed that bilinguals might rely more on other cognitive skills (PWM) while learning to read in L2. However, over nine months vocabulary and listening comprehension appeared to significantly correlate with reading comprehension in both languages. Moreover, oral languages skills appeared to be a unique predictor of reading comprehension in bilinguals' L2 at T2.

Overall, based on the correlational and regression results, it can be inferred that PA, RAN and LK are common correlates for decoding skills in the two languages of bilinguals. Moreover, PA and RAN are predictive of reading skills not only within languages but also across languages, which supports the notion of these skills being language universal predictors. LK relationships with decoding skills are limited to within languages only when different scripts are used. Decoding skills (in both languages) and oral language skills (in L2) emerged as unique predictors of reading comprehension in both languages of the bilinguals, validating the SVR (Hough and Tunmer 1986, Hoover and Gough 1990) which posits the importance of both skills (word recognition and listening comprehension) for reading comprehension.

### **9.3.2. Predictors of reading: Comparing monolingual and bilingual children**

Over the course of the study, early cognitive and literacy predictors of reading skills between the bilingual and monolingual groups were compared. While the pattern of relationships between predictors and reading comprehension was broadly similar for monolingual and bilingual children, differences emerged when reading efficiency was examined at two testing sessions (T1 and T2). It appeared that the role of cognitive predictors in explaining individual variance in reading efficiency skills might change as children develop proficiency in decoding skills.

At the initial stage of early literacy acquisition, two cognitive skills (PA and LK) emerged as significant predictors of reading efficiency (decoding skills) in all

groups. When children were assessed at T2 (nine months later), their word reading and pseudoword decoding skills were better predicted by RAN and oral language skills in both languages, Ukrainian and Polish. LK remained a significant predictor only for Polish. When children commence their journey with literacy acquisition, early PA skills and initial partial letter knowledge might play more essential role in mastering decoding skills. According to Chall's (1996) stage model at the *initial or decoding* stage children gain insight about the nature of the spelling system of the alphabetic language and acquire letter-sound knowledge. In relatively transparent orthographies, these skills are mostly acquired in the second half of the first year or by the end of the first grade of the formal schooling. Once these skills are mastered, children develop automaticity of high-frequency words, which enhances decoding skills. Thus, novice readers might rely on other skills when reading words: on RAN – for developing fluency and on oral skills – faster retrieval of familiar lexical items.

Longitudinally, early decoding skills appeared to be the best predictors of the same skills at a later stage. When initial decoding skills were controlled for, RAN measured at T1 appeared to be the only unique predictor of later decoding skills. Its role was found to be more essential for the bilinguals' L1 reading skills than for the Ukrainian monolinguals. Similarly, to the concurrent data (T2), LK uniquely predicted reading efficiency only in Polish.

Overall, PA, RAN, LK and oral language skills appear to effectively predict decoding skills. While the role of PA and LK skills gradually diminishes its predictive strength of reading efficiency, RAN remains a robust predictor over the first year of formal schooling. The role of oral language skills for word reading emerges later when automaticity of word reading is achieved.

In all groups, early decoding skills measured at T1 as well as oral language skills measures were identified as significant predictors of later reading comprehension skills in Polish and Ukrainian. Again, these findings provide support for the SVR (Gough and Tunmer 1986, Hoover and Gough 1990), which postulates the importance of both oral language skills and decoding for reading comprehension.

Overall, the present findings demonstrate that patterns of early cognitive predictors of reading across groups are broadly similar with a few exceptions. These findings indicate that reading development in the bilinguals and monolinguals is largely comparable. Yet, the results of the study should be interpreted with caution as sample sizes of the groups in this study are relatively small to consider these results conclusive.

#### **9.4. Limitations**

There are several obvious limitations of the current study that should be acknowledged. Limitations described below can be to some extent attributed to two factors that significantly impacted the whole project implementation: the COVID-19 pandemic and the outbreak of full-scale war in Ukraine.

All of the groups had modest sample sizes. At T1, the COVID – 19 lockdown restrained access to kindergartens, schools and other public places (e.g. churches, NGOs for immigrants), where the information about the study could have been circulated. Recruitment of participants was strictly limited to online social media and the researcher's personal contacts.

The COVID-19 outbreak also led to a significant modification of the study's initial design. It necessitated essential changes in the data collection mode from in-person to online. As a result, remote data collection led to several changes and challenges. These are: adaptation of materials for online presenting (materials were presented in PPTs instead of printed cards); managing technical issues arising during testing sessions; managing external disruptions during testing sessions; planning for entertaining activities like, for example, drawing online, to reduce the participants' fatigue during the testing sessions; monitoring tasks performance online. While online testing provides the advantage of flexibility in terms of time and location, it is important to acknowledge that there are several disadvantages that outweigh these benefits. Online testing significantly reduced participants' attention span when compared to an in-person mode. Children get more focused when an administrator of the test is in the same room and directly interacts with a participant.

Another limitation related to COVID-19 is online schooling per se, which could have varied across regions, schools, countries. Children could also have had different experiences with frequency of exposure to print, types of reading materials (online vs. printed books). These external factors might have affected data collected to some extent.

At T2, the outbreak of full-scale war in Ukraine caused a significant dropout of participants in the Ukrainian monolingual group as well as in the bilingual one. As a result, small sample sizes of the groups may have played a role in limiting the significance of some statistical analyses conducted. Relatively low statistical power did not allow to thoroughly explore unique contribution of all cognitive predictors in

explaining individual variance in reading outcomes. Hence, results of correlational and regression analyses should be interpreted with caution. Further research with larger groups might reveal additional unique cognitive predictors in the bilingual novice readers.

One characteristic of the bilingual sample might to some extent be considered a limitation: the bilingual children in the study spoke either Ukrainian or Russian as their L1. Historically, this linguistic feature has been prevailing in Ukraine for many decades. People in Ukraine speak Ukrainian or/and Russian or a mixed dialect at home. Thus, the composition of the bilingual sample in the study is roughly representative of linguistic practices in Ukraine. As it is common in migrant populations, the children recruited in the study were from different parts of the country, thus, their L1 was either Russian or Ukrainian. In terms of practical implications, they are all Ukrainian children in Polish schools. Initially, a possibility of separate analyses between Ukrainian and Russian subgroups within the bilingual group was considered. However, such a division would dramatically decrease the overall sample size, which would make comparisons between groups impossible.

### **9.5. Practical implications of the study**

The findings of the present study offer crucial practical implications for literacy assessment in bilingual novice readers. As the bilingual group recruited in the study was biliterate, it made possible a direct comparison of early reading predictors within languages as well as across languages. If cognitive skills measured in one language can predict reading outcomes in the other language, literacy assessment of a bilingual child can be conducted in one of the two languages. Thus, if a child's language proficiency in L2 is relatively low, assessment in L1 can provide essential information on reading development, capturing potential problems and, thus, allowing for early intervention.

The findings of the study revealed crosslinguistic interaction between several cognitive (PA, RAN) and language skills with decoding skills and reading comprehension skills both longitudinally and concurrently. The implication of these findings might be beneficial for practitioners working with bilingual children as well as for parents. If a child's L2 proficiency level is not sufficient for early literacy assessment in L2, then it can be administered in L1, allowing for early screening of

potential literacy difficulties. While empirical research provided sufficient evidence of the validity of crosslinguistic assessment, lack of assessment tools in a particular language (e.g. Ukrainian) often makes an early assessment impossible. Thus, the adaptation of MABEL psychometric tests into Ukrainian, Russian and Polish, which was partly done for the purposes for the current study and continues as a separate project, aims to provide practitioners with psychometric tools to be used in those languages. The uniqueness of the MABEL psychometric battery is its comparability across several languages (amongst which are Polish and Ukrainian). This project contributes to the extension of the language range within the MABEL battery tests by adding new language versions of the tests.

By and large, this study can be considered as exploratory. It is the first study exploring early reading development in the Ukrainian-Polish bilingual context. Hence, further research should examine role of cognitive predictors in groups with larger sample sizes to test the validity of findings of this study as well as to extend them. It would be essential to compare the current study results (collected remotely) with data collected in in-person settings to investigate whether the mode of data collection affected measurements of cognitive, language and reading skills.

## Conclusion

As the number of children who begin their schooling in a language that is not their native continues to rise, it becomes increasingly important for educators, speech and language therapists, and parents to closely monitor literacy development of bilingual children. Early identification of potential reading difficulties is crucial in order to provide timely support and interventions. However, assessing early literacy skills in bilingual children remains a challenging task, especially in less studied languages like Ukrainian. Given the increasing numbers of immigrant children from Ukraine in Polish classrooms, it is vital to gain a deeper understanding of early reading development in bilinguals as well as to provide research-based evidence on cognitive underpinnings that contribute to reading development in the two languages of the bilinguals.

Investigating early reading development in the Ukrainian-Polish bilinguals longitudinally, this study explored bilingual children's performance on language and cognitive skills in comparison to their monolingual peers. The results of the study revealed broadly similar patterns of cognitive foundations of reading skills in bilinguals' L1 and L2, finding PA, RAN and LK to be predictive of word reading in both languages of the bilinguals. Moreover, PA and RAN skills measured in one of bilinguals' languages were found to predict decoding skills in another language, which provides some support for crosslinguistic interaction of cognitive and literacy skills in the bilinguals. The results of this study also provide support for the validity of the Simple View of Reading (Gough and Tunmer 1986, Hoover and Gough 1990) as a framework of reading comprehension in bilinguals. The findings also corroborate the contribution of decoding skills and oral language skills to reading comprehension in bilinguals and monolinguals. This aligns with previous studies (e.g. Verhoeven and van



Leeuwe. 2012, Papastefanou et al. 2021) demonstrating significance of both subcomponents of reading comprehension in bilinguals and monolinguals.

Being the first study to address reading development in the Ukrainian-Polish context, the present thesis added a new language pair to the growing body of research on reading acquisition across different orthographies. Yet, further research is needed to investigate the role of other cognitive skills (e.g. morphological, syntactic knowledge) on reading acquisition in bilingual children, to explore contextual factors related to bilingualism on reading acquisition. By continuing to explore these areas, future research can deepen our understanding of bilingual reading acquisition and inform educational practices for bilingual learners.

## **Abstract**

This dissertation explores early (grade 1) reading acquisition of Ukrainian-Polish bilingual children from the psycholinguistic perspective. It focuses on identifying predictors of individual differences in emerging reading skills. Here, the bilingual learners are compared against their monolingual (Polish-speaking and Ukrainian-speaking) peers, to identify potential differences between the mono- and bilingual patterns of learning.

Chapter 1 is a comprehensive literature review of theoretical models of reading development. The first part of the chapter provides an overview of prominent stage and phase theories of word reading development in children. The second part presents an overview of theoretical accounts of reading comprehension development in children. The final section introduces the Simple View of Reading (Gough and Tunmer 1986; Hoover and Gough 1990), an influential theoretical framework which offers an account of the development of reading comprehension by identifying its key cognitive prerequisites and interactions between them.

Chapter 2 provides an overview of the cognitive and language skills that have been identified as the most important early predictors of reading in prior research. It explores phonological awareness, letter knowledge, rapid automatized naming (RAN), phonological working memory and oral language skills. The review attempts to identify causal mechanisms responsible for the reported correlations between each of the aforementioned predictors and the literacy outcomes.

Chapter 3 presents an overview of prominent theoretical accounts of research on bilingual acquisition. The first section provides an overview of theoretical accounts of crosslinguistic transfer, starting with applied linguistic approaches, early bilingualism research and ending with current models of cross linguistic transfer. The next two

sections focus on the empirical findings related to the interactions between L1 skills and L2 reading outcomes, as well as the reciprocal relationship between L2 skills and L1 reading outcomes. Following that, moderator variables (SES, motivation, language proficiency) are discussed. The last part of the chapter presents a review of empirical findings in bilingual reading within the Simple View of Reading.

Chapter 4 explores the influence of orthography on the process of learning to read. It begins with a linguistic analysis of parameters that set different orthographies apart: orthographic consistency, regularity, transparency, depth, and grain size. The Orthographic Depth Hypothesis and the Psycholinguistic Grain Size Theory are then introduced: two influential theoretical accounts of how those crosslinguistic differences in orthographies affect reading acquisition. Then, crosslinguistic differences in spoken language, namely phonology, syllabic and morphological complexity of languages are discussed, as well as their impact on reading acquisition. Finally, an overview of studies exploring development of decoding and reading comprehension in transparent orthographies is offered.

Chapter 5 is a description of main linguistic characteristics of the three languages under study (Ukrainian, Russian, Polish). The first section discusses key features of those three Slavic languages: their phonology, orthography, and morphology. The following section presents an overview of research on reading development in the three languages.

Chapter 6 describes the current study. It begins with the statement of research questions. Several questions were asked, all exploring similarities and differences in learning to read Polish, as opposed to learning to read Ukrainian. Questions were asked from the perspective of within-group comparisons (e.g. bilingual children's performance in Ukrainian compared to their performance in Polish) as well as between group comparisons (bilingual children's performance in both languages compared to the performance of their monolingual counterparts). The main interest was in identifying *predictors of individual differences in literacy skills*, though the *level of mastery* of literacy skills (and their predictors) and the *rate of learning* those skills were also explored. The following sections provide a detailed description of the methodology of the study, which can be summarized as follows. The longitudinal correlational design was adopted. At T1, a total of 85 participants were recruited, comprising three groups: the Ukrainian monolingual group, the Polish monolingual group and the Ukrainian-Polish bilingual group. At T2, the number of participants decreased to 65.

All participants were assessed at two time points: at the beginning of the first grade and at the end. Bilinguals were assessed in both languages. A number of cognitive and literacy measures were administered at each testing session in an online mode via Zoom.

Chapter 7 presents results of the testing session 1 (T1) conducted at the beginning of the 1<sup>st</sup> grade. At that point, bilingual children performed better in their first (Ukrainian/Russian) than second (Polish) language on most predictor and literacy tasks. They also outperformed their Ukrainian monolingual peers on a number of Ukrainian language tasks. Their performance on Polish language tasks was on a par with Polish monolingual peers, except for oral language skills. When the *predictors* of reading skills in L1 (Ukrainian) and L2 (Polish) were compared within the bilingual group, similar patterns emerged, with phonological awareness being uniquely predictive of decoding skills in bilinguals' both languages. When predictors of reading were compared *between* the three groups, phonological awareness as well as letter knowledge appeared to be significant predictors in all groups.

Chapter 8 reports the results of the testing session 2 (T2) conducted at the end of the 1<sup>st</sup> grade. Over the period of nine months, the bilingual children improved significantly in their literacy and predictor skills in both languages. At this point, the bilingual group outperformed both monolingual groups on most task, except for phonological awareness tested in Polish, where Polish monolinguals performed significantly better. Reading comprehension in both languages of the bilinguals was well predicted by early decoding skills measured at T1. When the predictors of reading comprehension were compared *between* the three groups, broadly similar patterns emerged: decoding and oral language skills were predictive of future reading comprehension in monolinguals as well as bilinguals.

Chapter 9 serves as a general discussion of the results obtained in the study, considering them in the context of the research questions posed at both testing sessions. The chapter begins with a summary of key findings and discussion of how they contribute to our understanding of bilingual literacy. Additionally, this chapter acknowledges the limitations of the study, and identifies areas where further investigation is needed. The chapter concludes with practical implications of the study findings for educational practices, such as early literacy assessment of bilingual children.

## Streszczenie

Celem rozprawy jest zbadanie wczesnego (klasa 1) przyswajania umiejętności czytania przez dzieci dwujęzyczne ukraińsko-polskie z perspektywy psycholingwistycznej. Głównym celem badania przedstawionego w rozprawie jest zidentyfikowanie predyktorów różnic indywidualnych w rozwoju umiejętności czytania. W przeprowadzonym badaniu porównano uczniów dwujęzycznych z ich monolingwalnymi (polsko- i ukraińskojęzycznymi) rówieśnikami w celu identyfikacji potencjalnych różnic między rozwojem umiejętności czytania u osób monolingwalnych i dwujęzycznych.

Rozdział pierwszy zawiera systematyczny przegląd teoretycznych modeli rozwoju umiejętności czytania. Pierwsza część rozdziału przedstawia przegląd najważniejszych teorii etapów i faz rozwoju czytania wyrazów u dzieci. Druga część przedstawia przegląd teoretycznych modeli związanych z rozwojem rozumienia czytanego tekstu u dzieci. Ostatnia część wprowadza Prosty Model Czytania (ang. *Simple View of Reading*, Gough i Tunmer 1986; Hoover i Gough 1990), ważną ramę teoretyczną, która przedstawia opis rozwoju rozumienia tekstu czytanego poprzez identyfikację kluczowych czynników poznawczych oraz interakcji między nimi.

Rozdział drugi zawiera przegląd umiejętności poznawczych i językowych, które zostały uznane za najważniejsze wczesne predyktory umiejętności czytania we wcześniejszych badaniach, takich jak świadomość fonologiczna, znajomość liter, szybkie zautomatyzowane nazywanie (RAN), fonologiczna pamięć robocza oraz umiejętności językowe. Przegląd ten ma na celu zidentyfikowanie mechanizmów przyczynowo-skutkowych odpowiedzialnych za korelacje między poszczególnymi predyktorami a wynikami w czytaniu na podstawie wyników wcześniejszych badań.

Rozdział trzeci przedstawia przegląd najważniejszych teoretycznych modeli dotyczących nabywania kompetencji dwujęzycznych. Pierwszy podrozdział zawiera przegląd teoretycznych modeli transferu międzyjęzykowego, poczynając od podejść lingwistyki stosowanej, wczesnych badań nad dwujęzycznością, a kończąc na aktualnych modelach transferu międzyjęzykowego. Kolejne dwa podrozdziały koncentrują się na wynikach badań empirycznych nad interakcjami między umiejętnościami czytania w języku pierwszym a stopniem opanowania umiejętności czytania w języku drugim, a także wzajemnym związkiem między umiejętnościami czytania w języku drugim a stopniem opanowania umiejętności czytania w języku pierwszym. Następnie omówiono zmienne moderujące (status socjo-ekonomiczny, motywacja, biegłość językowa). Ostatnia część rozdziału przedstawia przegląd wyników badań empirycznych dotyczących czytania dwujęzycznego w ramach Prostej Teorii Czytania.

Rozdział czwarty bada wpływ ortografii na proces nauki czytania. Rozdział rozpoczyna się od analizy parametrów językowych, które charakteryzują poszczególne ortografie, takich jak spójność ortograficzna, regularność, przejrzystość, głębokość i ziarnistość. Następnie przedstawiono hipotezę głębokości ortograficznej (ang. *Orthographic Depth Hypothesis*) i psycholingwistyczną teorię ziarnistości (ang. *Psycholinguistic Grain Size Theory*) - dwie ważne teorie dotyczące tego, w jaki sposób różnice między ortografiami wpływają na nabywanie umiejętności czytania. Następnie omówiono różnice międzyjęzykowe w języku mówionym, a mianowicie fonologię, złożoność sylabiczną i morfologiczną języków, a także ich wpływ na nabywanie umiejętności czytania. Na zakończenie przedstawiono przegląd badań dotyczących rozwoju dekodowania i rozumienia tekstu czytanego w transparentnych ortografiach.

Rozdział piąty przedstawia opis głównych cech trzech badanych języków (ukraińskiego, rosyjskiego i polskiego). Pierwsza część omawia kluczowe cechy tych trzech języków słowiańskich: ich fonologię, ortografię i morfologię. Następny podrozdział przedstawia przegląd badań dotyczących rozwoju czytania w tych trzech językach.

Rozdział szósty przedstawia badanie przeprowadzone w ramach pracy. Rozdział rozpoczyna się od przedstawienia pytań badawczych. Postawiono kilka pytań, które dotyczyły podobieństw i różnic w nauce czytania po polsku w porównaniu do nauki czytania po ukraińsku. Pytania były zadawane zarówno w kontekście porównań

wewnątrzgrupowych (np. wyniki dzieci dwujęzycznych w czytaniu po ukraińsku w porównaniu do wyników w czytaniu po polsku), jak i międzygrupowych (wyniki dzieci dwujęzycznych w obu językach w porównaniu do wyników ich jednojęzycznych rówieśników). Głównym celem było zidentyfikowanie *predyktorów różnic indywidualnych w umiejętności czytania*. Ponadto zbadano *poziom opanowania* tych umiejętności (oraz ich predyktorów) i *tempo uczenia się*. Kolejne podrozdziały zawierają szczegółowy opis metodologii badania, które można w skrócie scharakteryzować jako podłużne badanie korelacyjne. W pierwszej sesji testowej (T1) do badania zakwalifikowano łącznie 85 uczestników, obejmujących trzy grupy: grupę jednojęzyczną ukraińską, grupę jednojęzyczną polską oraz grupę dwujęzyczną ukraińsko-polską. W drugiej sesji testowej (T2) liczba uczestników zmniejszyła się do 65. Wszyscy uczestnicy byli badani dwukrotnie: na początku pierwszej klasy i na jej zakończenie. Dwujęzyczni uczestnicy byli badani w obu językach. Podczas obu sesji testowych wykorzystano szereg testów poznawczych i czytania, które zostały przeprowadzone online za pomocą platformy Zoom.

Rozdział siódmy przedstawia wyniki pierwszej sesji testowej (T1), przeprowadzonej na początku pierwszej klasy. Na tym etapie dzieci dwujęzyczne wypadły lepiej w swoim pierwszym języku (ukraińskim/ rosyjskim) niż w drugim języku (polskim) w większości zadań mierzących predyktory oraz umiejętności czytania. Ponadto, w przypadku kilku zadań w języku ukraińskim, osiągnęły również wyższe wyniki od swoich jednojęzycznych rówieśników ukraińskojęzycznych. W przypadku zadań w języku polskim, osiągnięcia dzieci dwujęzycznych były na podobnym poziomie jak ich jednojęzycznych rówieśników polskojęzycznych, z wyjątkiem umiejętności posługiwania się mówionym językiem polskim. Porównanie *predyktorów* umiejętności czytania w języku pierwszym (ukraiński) i drugim (polski) w grupie bilingwalnej wykazało podobne zależności, przy czym świadomość fonologiczna była specyficznym predyktorem umiejętności dekodowania w obu językach dzieci dwujęzycznych. Kiedy predyktory czytania porównano *między* trzema grupami, to świadomość fonologiczna oraz znajomość liter okazały się istotnymi predyktorami we wszystkich grupach.

W rozdziale ósmym przedstawione zostały wyniki drugiej sesji testowej (T2) przeprowadzonej pod koniec pierwszej klasy. W ciągu dziewięciu miesięcy, dzieci dwujęzyczne znacząco poprawiły swoje umiejętności czytania oraz umiejętności

określane jako predyktory umiejętności czytania w obu językach. Na tym etapie, grupa dwujęzyczna wypadła lepiej od obu grup jednojęzycznych w większości zadań, z wyjątkiem świadomości fonologicznej badanej w języku polskim, gdzie jednojęzyczni Polacy osiągnęli istotnie lepsze wyniki. Rozumienie tekstu czytanego w obu językach u dzieci dwujęzycznych było dobrze przewidziane przez wczesne umiejętności dekodowania mierzone w sesji T1. Porównanie predyktorów rozumienia tekstu czytanego *między* trzema grupami wykazało zasadniczo podobne zależności: umiejętności dekodowania i umiejętności posługiwania się językiem mówionym przewidywały przyszłe umiejętności rozumienia tekstu czytanego zarówno u dzieci jednojęzycznych, jak i u dwujęzycznych.

W rozdziale dziewiątym przedstawiono ogólną dyskusję wyników uzyskanych w badaniu, rozważając je w kontekście postawionych pytań badawczych na obu etapach testowych. Rozdział rozpoczyna się podsumowaniem kluczowych wyników i omówieniem ich wkładu w nasze rozumienie dwujęzycznej umiejętności czytania. Dodatkowo, w tym rozdziale omówiono ograniczenia badania i wskazano obszary, które wymagają dalszych badań. Rozdział kończy się przedstawieniem praktycznych implikacji wyników badania w edukacji, w szczególności dla wczesnej oceny umiejętności czytania u dzieci dwujęzycznych.



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## Appendix A: Parents' written consent

### Ukrainian

Шановний Пане/Пані,

Прохимо дати згоду на участь вашої дитини у міжнародному науковому дослідженні, метою якого є вивчення процесу читання у дітей, які володіють однією мовою (українською або польською) та двома мовами дітей (українською та польською).

Пропонуване дослідження триватиме **два роки** і розпочнеться в **1 класі та закінчиться в 2 класі**. За цей період діти будуть проходити тестування *три рази*. Дослідження охоплюватиме три групи: одномовні українські діти, які проживають в Україні, одномовні польські діти, які проживають у Польщі, та двомовні українські діти, які проживають у Польщі. Ми будемо тестувати читання окремих слів і розуміння прочитаного, а також знання літер, словниковий запас і розуміння текстів зі слуху.

Подібні дослідження проводилися в англійській, німецькій та інших європейських мовах. Отже наш проєкт буде важливим внеском у науку, досліджуючи розвиток читання у двомовних дітей. Участь Вашої дитини стане важливим кроком у розвитку науки.

Ми прагнемо створити тести, які зможуть швидко і точно виявити сильні та слабкі сторони розвитку дитини вже на самому початку шкільної освіти. Це допоможе батькам та вчителям вчасно надати необхідну допомогу та підтримку дітям під час навчання.

#### Хід дослідження:

Отримавши вашу згоду на дослідження, **буде визначена дата, година та місце проведення тестування, також усно дитину буде запитано про згоду на участь у дослідженні**. Двомовні діти будуть проходити тестування двома мовами у різні дні. Тривалість одного тестування - 60 хвилин з перервою. Відповіді дитини будуть записані на диктофон. Усі отримані результати будуть закодовані, отже жодні персональні дані не будуть надані стороннім особам.

Дослідження координується факультетом англійської мови університету Адама Міцкевича в Познані. Додаткову інформацію можна отримати за телефоном 576 018 022 або електронною поштою [wikkis@amu.edu.pl](mailto:wikkis@amu.edu.pl)

ЗГОДА НА УЧАСТЬ ДИТИНИ У ДОСЛІДЖЕННІ

Ім'я та прізвище дитини-учасника .....  
Дата народження .....

Цим заявляю, що даю згоду на участь моєї дитини/підопічного у дослідженні розвитку читання. Мені відомо про те, що я можу відмовитися від участі дитини у дослідженні на будь-якому етапі її тривалості без вказання причин. Я ознайомлений/на з інформацією про дослідження. Я прочитав/ла правила та погоджуюся з умовами дослідження. Особисті дані (ім'я та прізвище дитини, клас, рік народження) та дані дослідження будуть захищені/закодовані, переглядатимуться лише особами, які проводять та координують дослідження. Я даю згоду на використання отриманих даних та матеріалів дослідження в наукових цілях.

Підпис батьків/опікуна, місце та дата

jest prowadzone przez doktorantkę Kishchak Victorię i koordynowane przez Wydział Anglistyki Uniwersytetu im. Adama Mickiewicza w Poznaniu. Dodatkowe informacje można uzyskać pod numerem telefonu 576 018 022 bądź drogą mailową [wikis@amu.edu.pl](mailto:wikis@amu.edu.pl) mgr. Kiszczak, [marcinszczerbinski@gmail.com](mailto:marcinszczerbinski@gmail.com) Dr. Marcin Szczerbiński, [aewert@amu.edu.pl](mailto:aewert@amu.edu.pl) Prof. Anna Ewert.

#### ZGODA NA UDZIAŁ DZIECKA/PODOPIECZNEGO W BADANIU

Imię i nazwisko osoby badanej

(dziecka).....

Data urodzenia.....

Niniejszym oświadczam, że wyrażam świadomą i dobrowolną zgodę na udział mojego dziecka/podopiecznego w badaniu zrozumienia procesu nabywania umiejętności czytania u dzieci jednojęzycznych (polskich i ukraińskich) oraz dzieci dwujęzycznych.

- Jestem świadoma/świadomy faktu, że mogę zrezygnować z udziału dziecka/podopiecznego w badaniu na każdym etapie jego trwania, bez podania przyczyny, *zawiadamiając w formie elektronicznej osobę prowadzącą badanie*.
- Otrzymałam/em wystarczające informacje na temat badania. Zapoznałam/em się z nimi i akceptuję procedury prowadzenia badania.
- Dane osobowe (imię i nazwisko dziecka, klasa, rok urodzenia) i badawcze będą chronione i pozostają do wglądu wyłącznie osobom prowadzącym i koordynującym badanie.
- Wyrażam świadomą zgodę na wykorzystanie uzyskanych danych oraz materiałów badawczych do celów naukowych.

.....  
podpis rodzica/opiekuna miejscowość i data

Szanowny Panie/Szanowna Pani,

Proszę o zgodę na uczestnictwo Pani/Pana dziecka/podopiecznego w badaniu Wczesne predyktory rozwoju czytania u dzieci jedno- i dwujęzycznych: badanie podłużne, którego celem jest lepsze zrozumienie procesu nabywania umiejętności czytania u dzieci jednojęzycznych (polskich i ukraińskich) oraz dzieci dwujęzycznych.

Planujemy przeprowadzić badania longitudinalne, które rozpoczną się w klasie 1 a zakończą w klasie 2. W tym okresie dzieci będą badane trzykrotnie. Badania obejmą trzy grupy: jednojęzyczne dzieci ukraińskie mieszkające na Ukrainie, jednojęzyczne dzieci polskie mieszkające w Polsce oraz dwujęzyczne dzieci ukraińskie mieszkające w Polsce. Będziemy mierzyć umiejętności czytania (czytanie wyrazów i rozumienie czytanych tekstów) oraz znajomość liter, słownictwo, zasób słownikowy, rozumienie tekstów słuchanych.

Głównym oczekiwanym rezultatem badań będzie lepsze zrozumienie poznawczych uwarunkowań czytania.

#### Przebieg badania:

Po uzyskaniu Pana/Pani zgody na badanie. Następnie ustalimy czas spotkania na przeprowadzenie badania. Z każdym dzieckiem spotkam się indywidualnie online przez Zoom. Czas trwania badania wynosi 60 min z przerwą. Odpowiedzi dziecka będą nagrane za pomocą programu Zoom w postaci nagrania dźwiękowego. Udział dziecka w badaniu jest dobrowolny, a wszystkie uzyskane wyniki będą zanonimizowane, zanim zostaną poddane analizie - baza danych, którą będę analizować, nie będzie zawierać żadnych danych osobowych. Ta zanonimizowana baza danych może zostać przekazana innym badaczom zainteresowanym zagadnieniami, którymi się zajmuję. Na wniosek rodziców wyniki testów dziecka mogą być przekazane pisemnie w formie krótkiego sprawozdania. Badanie |

Уважаемый Господин/Госпожа,

Просим дать согласие на участие вашего ребенка в международном научном исследовании, целью которого является изучение процесса чтения у детей, владеющих одним языком (украинским или польским) и двуязычных детей (украинским (или) русским и польским).

Предлагаемое исследование будет длиться два года и начнется в 1 классе, а закончится во 2 классе. За этот период дети будут проходить тестирование три раза. Исследование будет охватывать три группы: монолингвальные украинские дети, проживающие в Украине, монолингвальные польские дети, проживающие в Польше, и двуязычные украинские дети, проживающие в Польше. Мы будем тестировать чтение отдельных слов и понимание прочитанного, а также знание букв, словарный запас и понимание текстов на слух.

Подобные исследования проводились в английском, немецком и других европейских языках. Так что наш проект будет важным вкладом в науку, исследуя развитие чтения у двуязычных детей. Участие Вашего ребенка станет важным шагом в развитии науки.

Мы стремимся создать тесты, которые смогут быстро и точно выявить сильные и слабые стороны развития чтения у ребенка уже в самом начале школьного образования. Это поможет родителям и учителям вовремя оказать необходимую помощь и поддержку детям, у которых могут наблюдаться потенциальные проблемы с чтением.

Ход исследования:

Получив ваше согласие на исследование, будет определена дата, время и место проведения тестирования, также в устной форме ребенок будет спрошен о согласии на участие в исследовании. Двуязычные дети будут проходить тестирование на двух языках в разные дни. Продолжительность одного тестирования - 60 минут с перерывом. Ответы ребенка будут записаны на диктофон. Все полученные результаты будут закодированы, следовательно никакие персональные данные не будут предоставлены посторонним лицам.

Исследование координируется факультетом английского языка университета Адама Мицкевича в Познани. Дополнительную информацию можно получить по телефону 576 018 022 или по электронной почте [wikis@amu.edu.pl](mailto:wikis@amu.edu.pl)

СОГЛАСИЕ НА УЧАСТИЕ РЕБЕНКА В ИССЛЕДОВАНИИ

Имя и фамилия ребенка-участника .....  
Дата рождения .....

Настоящим заявляю, что даю согласие на участие моего ребенка/подопечного в исследовании развития чтения. Мне известно о том, что я могу отказаться от участия ребенка в исследовании на любом этапе его продолжительности без указания причин. Я ознакомлен/на с информацией об исследовании. Я прочитал/ла правила и согласен с условиями исследования. Личные данные (имя и фамилия ребенка, класс, год рождения) и данные исследования будут защищены/закодированы, будут просматриваться только лицами, которые проводят и координируют исследование. Я даю согласие на использование полученных данных и материалов исследования в научных целях.

Подпись родителей / опекуна, место и дата

## Appendix B: Child's oral assent

### Ukrainian

#### Згода дитини



Привіт! Мене звати Вікторія і я з міста Познань у Польщі

Хочу дізнатися, як діти вчатьсЯ читати на різних мовах.

Що легко, а що важко?



читати слова!

Будемо грати



!



Називати та

слова!

Називати звуки!



Малювати!



Повторювати



Скажи мені, коли будеш втомлений/-а, зробимо перерву.



Якщо тобі зовсім не буде подобатися, то можемо припинити тестування

Хочеш взяти участь у тестуванні?



## Polish

### Informacja – zgoda dziecka



Cześć! Mam na imię Victoria, mieszkam w Poznaniu.

Jestem ciekawa, jak dzieci uczą się czytać w różnych językach.

Co jest trudne, a co łatwe?



Będziemy dziś bawic  
czytać słówka!



się!



Nazywać oraz

słówka!

Nazywać dźwięki!



Rysować!



Powtarzać



Daj mi znać, jeśli jesteś zmęczony/-a, będziemy mieli przerwę.

Możesz całkowicie przestać, jeśli ci się to nie podoba.



Chcesz wziąć udział w tej grze?

## Russian

### Согласие ребенка



Привет! Меня зовут Виктория и я из города Познань в Польше.

Хочу узнать, как дети учатся читать на разных языках.

Что легко, а что трудно?



Будем играть



!



Называть и читать слова!

слова!

Называть звуки!



Рисовать!



Повторять



Скажи мне, когда ты устанешь, и мы сделаем перерыв.

Если тебе совсем не будет нравиться, то можем прекратить тестирование



Хочешь поучаствовать в тестировании?



## Appendix C: Alberta language environment questionnaire (ALEQ) for bilingual children

### Ukrainian version

Paradis, J., Emmerzael, K., & Sorenson Duncan, T. (2010). Assessment of English Language Learners: Using Parent Report on First Language Development. *Journal of Communication Disorders*, 43, 474-497. Child English as a Second Language Resource Centre: <http://www.chesl.ualberta.ca>

#### АНКЕТА ОЦІНЮВАННЯ МОВНОГО СЕРЕДОВИЩА (Адаптація англomовної версії ALEQ)

Ім'я та прізвище дитини: \_\_\_\_\_  
Дата народження: \_\_\_\_\_  
Стать: \_\_\_\_\_  
Дата: \_\_\_\_\_

| <u>Вік дитини на момент тестування</u> |       |        |       | <u>Вік дитини на момент переїзду до країни</u> |       |        |       | <u>Проживання у польськомовному середовищі</u>                     |
|----------------------------------------|-------|--------|-------|------------------------------------------------|-------|--------|-------|--------------------------------------------------------------------|
|                                        | Рік   | Місяць | День  |                                                | Рік   | Місяць | День  | Інформація стр 8<br>(заповнюється особою, що проводить тестування) |
| Дата тестування                        | _____ | _____  | _____ | Дата прибуття                                  | _____ | _____  | _____ |                                                                    |
| Дата народження                        | _____ | _____  | _____ | Дата народження                                | _____ | _____  | _____ |                                                                    |
| Вік на момент тестування               | _____ | _____  | _____ | Вік на момент переїзду                         | _____ | _____  | _____ |                                                                    |

| А. Питання до мами дитини:                                                                                                                                                                                                                                                  |                                                                                    |                                                                                             |                                                                                                                                           |                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| 1a. Як довго ви проживаєте в Польщі? _____<br>Приблизна дата переїзду (місяць/рік)? _____                                                                                                                                                                                   |                                                                                    |                                                                                             |                                                                                                                                           | В місяцях: _____                                                                                                       |
| 1b. Дитина переїхала разом з Вами? <span style="float: right;">Так Ні</span><br><br>Якщо ні, то коли дитини переїхала?<br><br><b>Примітка:</b> Якщо мама/батьки переїхали до народження дитини, то чи народилася дитина у Польщі? <span style="float: right;">Так Ні</span> |                                                                                    |                                                                                             |                                                                                                                                           | Дата переїзду: _____                                                                                                   |
| 2. Як часто ви використовуєте польську мову? (самооцінювання)                                                                                                                                                                                                               |                                                                                    |                                                                                             |                                                                                                                                           |                                                                                                                        |
| 0<br>не володію польською<br><br>не розумію і не говорю польською                                                                                                                                                                                                           | 1<br>Обмежене володіння<br><br>Дещо розумію та можу відповісти короткими реченнями | 2<br>Задовільний рівень володіння<br><br>Добре розумію та можу висловитися вільно польською | 3<br>Досить вільне володіння<br><br>Використовую польську у роботі та у повсякденному житті у різних сферах                               | 4<br>Вільне володіння<br><br>Вільне розуміння майже всієї інформації на різні теми, вільне висловлювання на різні теми |
|                                                                                                                                                                                                                                                                             | Наприклад, можу відповісти на телефонний дзвінок                                   | Наприклад, можу пояснити у лікаря, що турбує                                                | Наприклад, можу ефективно спілкуватися з вчителями у школі або у садочку, добре розумію, про що йдеться у фільмах, телевізійних програмах |                                                                                                                        |

| Затверджується особою, що проводить тестування                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------|------------------------|-------------------------------------|--------|------------|-----------------|-----------|--------|-------------------------|--------------------------------|-------------------|------------------------|-------------------------------------|--------|--|-----------------|--------|--|----------------|--------|--|---------------------|--------|--|
| Бал: /4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| <p>3. Якою мовою ви розмовляєте з дитиною?</p> <p>ROL – польська мова RM – рідна мова (якщо відома від української, то зазначити яка)</p> <table border="1"> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>ROL ніколи<br/>RM завжди</td> <td>ROL рідко<br/>RM більшість часу</td> <td>ROL 50%<br/>RM 50%</td> <td>ROL завжди<br/>RM рідко</td> <td>ROL майже завжди<br/>RM майже ніколи</td> </tr> </table>                                                                               |                                |                   |                        |                                     | 0      | 1          | 2               | 3         | 4      | ROL ніколи<br>RM завжди | ROL рідко<br>RM більшість часу | ROL 50%<br>RM 50% | ROL завжди<br>RM рідко | ROL майже завжди<br>RM майже ніколи |        |  |                 |        |  |                |        |  |                     |        |  |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                              | 2                 | 3                      | 4                                   |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| ROL ніколи<br>RM завжди                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ROL рідко<br>RM більшість часу | ROL 50%<br>RM 50% | ROL завжди<br>RM рідко | ROL майже завжди<br>RM майже ніколи |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| <p>4. Якою мовою говорить дитина, коли звертається до мамі?</p> <table border="1"> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>ROL ніколи<br/>RM завжди</td> <td>ROL рідко<br/>RM більшість часу</td> <td>ROL 50%<br/>RM 50%</td> <td>ROL завжди<br/>RM рідко</td> <td>ROL майже завжди<br/>RM майже ніколи</td> </tr> </table>                                                                                                                                                         |                                |                   |                        |                                     | 0      | 1          | 2               | 3         | 4      | ROL ніколи<br>RM завжди | ROL рідко<br>RM більшість часу | ROL 50%<br>RM 50% | ROL завжди<br>RM рідко | ROL майже завжди<br>RM майже ніколи |        |  |                 |        |  |                |        |  |                     |        |  |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                              | 2                 | 3                      | 4                                   |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| ROL ніколи<br>RM завжди                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ROL рідко<br>RM більшість часу | ROL 50%<br>RM 50% | ROL завжди<br>RM рідко | ROL майже завжди<br>RM майже ніколи |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| <p>5. Якою мовою ви спілкуєтесь <i>найчастіше</i> з іншими людьми, коли ви вдома?</p> <p>0 1 2 3 4</p>                                                                                                                                                                                                                                                                                                                                                                                                                 |                                |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| <p>6а. Ви працюєте поза межами дому?<br/><i>Чи Ви студентка?</i></p> <p>Так Ні</p>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| <p>6б. Якщо так, то чи є польська мова основною мовою на роботі/навчанні?</p> <table border="1"> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>ROL ніколи<br/>RM завжди</td> <td>ROL рідко<br/>RM більшість часу</td> <td>ROL 50%<br/>RM 50%</td> <td>ROL завжди<br/>RM рідко</td> <td>ROL майже завжди<br/>RM майже ніколи</td> </tr> </table>                                                                                                                                           |                                |                   |                        |                                     | 0      | 1          | 2               | 3         | 4      | ROL ніколи<br>RM завжди | ROL рідко<br>RM більшість часу | ROL 50%<br>RM 50% | ROL завжди<br>RM рідко | ROL майже завжди<br>RM майже ніколи |        |  |                 |        |  |                |        |  |                     |        |  |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                              | 2                 | 3                      | 4                                   |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| ROL ніколи<br>RM завжди                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ROL рідко<br>RM більшість часу | ROL 50%<br>RM 50% | ROL завжди<br>RM рідко | ROL майже завжди<br>RM майже ніколи |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| <p>7. Яку освіту ви маєте?</p> <table border="1"> <tr> <th>Освіта</th> <th>Закінчена?</th> <th>Кількість років</th> </tr> <tr> <td>Початкова</td> <td>Так Ні</td> <td></td> </tr> <tr> <td>Середня</td> <td>Так Ні</td> <td></td> </tr> <tr> <td>Середньо-професійна освіта</td> <td>Так Ні</td> <td></td> </tr> <tr> <td>Вища – Бакалавр</td> <td>Так Ні</td> <td></td> </tr> <tr> <td>Вища – Магістр</td> <td>Так Ні</td> <td></td> </tr> <tr> <td>Вища – Докторантура</td> <td>Так Ні</td> <td></td> </tr> </table> |                                |                   |                        |                                     | Освіта | Закінчена? | Кількість років | Початкова | Так Ні |                         | Середня                        | Так Ні            |                        | Середньо-професійна освіта          | Так Ні |  | Вища – Бакалавр | Так Ні |  | Вища – Магістр | Так Ні |  | Вища – Докторантура | Так Ні |  |
| Освіта                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Закінчена?                     | Кількість років   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| Початкова                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Так Ні                         |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| Середня                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Так Ні                         |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| Середньо-професійна освіта                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Так Ні                         |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| Вища – Бакалавр                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Так Ні                         |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| Вища – Магістр                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Так Ні                         |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |
| Вища – Докторантура                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Так Ні                         |                   |                        |                                     |        |            |                 |           |        |                         |                                |                   |                        |                                     |        |  |                 |        |  |                |        |  |                     |        |  |

| В. Питання до батька дитини                                             |                                                     |                                                    |                                                                          |                                                                                           |
|-------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 8.                                                                      |                                                     |                                                    |                                                                          |                                                                                           |
| Як довго ви проживаєте в Польщі? – Приблизна дата прибуття (місяць/рік) |                                                     |                                                    |                                                                          | Вписати в місяць:                                                                         |
| 9. Як часто ви використовуєте польську мову? (самооцінювання)           |                                                     |                                                    |                                                                          |                                                                                           |
| 0                                                                       | 1                                                   | 2                                                  | 3                                                                        | 4                                                                                         |
| не володію польською                                                    | Обмежене володіння                                  | Задовільний рівень володіння                       | Достатнє володіння                                                       | Вільне володіння                                                                          |
| не розумію і не говорю польською                                        | Дещо розумію та можу відповісти короткими реченнями | Добре розумію та можу висловитися вільно польською | Використовую польську у роботі та у повсякденному житті у різних сферах  | Вільне розуміння майже всієї інформації на різні теми, вільне висловлювання на різні теми |
|                                                                         | Наприклад, можу відповісти на телефонні дзвінок     | Наприклад, можу похитати у лікар, що турбує        | Наприклад, можу ефективно спілкуватися з вчителем у школі або у садовку  |                                                                                           |
|                                                                         |                                                     |                                                    | Наприклад, можу доглядати за дітьми, ходити у фітнес, медичних програмах |                                                                                           |
| Додаткова інформація та коментарі (якщо є):                             |                                                     |                                                    |                                                                          |                                                                                           |
| 10. Якою мовою ви розмовляєте з дитиною?                                |                                                     |                                                    |                                                                          |                                                                                           |
| 0                                                                       | 1                                                   | 2                                                  | 3                                                                        | 4                                                                                         |
| ROL ніколи<br>RM завжди                                                 | ROL рідко<br>RM більшість часу                      | ROL 50%<br>RM 50%                                  | ROL завжди<br>RM рідко                                                   | ROL майже завжди<br>RM майже ніколи                                                       |
| 11. Якою мовою говорить дитина, коли звертається до тата?               |                                                     |                                                    |                                                                          |                                                                                           |
| 0                                                                       | 1                                                   | 2                                                  | 3                                                                        | 4                                                                                         |
| ROL ніколи<br>RM завжди                                                 | ROL рідко<br>RM більшість часу                      | ROL 50%<br>RM 50%                                  | ROL завжди<br>RM рідко                                                   | ROL майже завжди<br>RM майже ніколи                                                       |
| Бал: /4                                                                 |                                                     |                                                    |                                                                          |                                                                                           |
| Вписати до таблиці «Розрахунковий бал використання мови»                |                                                     |                                                    |                                                                          |                                                                                           |
| Бал: /4                                                                 |                                                     |                                                    |                                                                          |                                                                                           |
| Вписати до таблиці «Розрахунковий бал використання мови»                |                                                     |                                                    |                                                                          |                                                                                           |



|                                                                            |                                     |                                                                                                                                                                                                                                |                             |                                                   |
|----------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------|
| 12. Якою мовою ви спілкуєтесь найчастіше з іншими людьми, коли ви вдома?   |                                     | <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">0</div> <div style="margin: 0 5px;">—</div> <div style="border: 1px solid black; padding: 2px 10px;">4</div> </div> |                             | Бал: /4<br>Внести у якості зміної у Файл з даними |
| 13a. Ви працюєте поза межами дому?<br><i>Чи Ви студент?</i>                |                                     | Так Ні                                                                                                                                                                                                                         |                             |                                                   |
| 13b. Якією мовою, то чи є польська мова основною мовою на роботі/навчанні? |                                     |                                                                                                                                                                                                                                |                             | Score: /4                                         |
| 0<br>ROL ніколи<br>RM завжди                                               | 1<br>ROL рідко<br>RM більшість часу | 2<br>ROL 50%<br>RM 50%                                                                                                                                                                                                         | 3<br>ROL завжди<br>RM рідко | 4<br>ROL майже завжди<br>RM майже ніколи          |
| 14. Яку освіту ви маєте?                                                   |                                     |                                                                                                                                                                                                                                |                             |                                                   |
| Освіта                                                                     | Закінчена?                          | Кількість років                                                                                                                                                                                                                |                             |                                                   |
| Початкова                                                                  | Так Ні                              |                                                                                                                                                                                                                                |                             |                                                   |
| Середня                                                                    | Так Ні                              |                                                                                                                                                                                                                                |                             |                                                   |
| Середньо-професійна освіта                                                 | Так Ні                              |                                                                                                                                                                                                                                |                             |                                                   |
| Вища – Бакалавр                                                            | Так Ні                              |                                                                                                                                                                                                                                |                             |                                                   |
| Вища – Магістр                                                             | Так Ні                              |                                                                                                                                                                                                                                |                             |                                                   |
| Вища – Докторантура                                                        | Так Ні                              |                                                                                                                                                                                                                                |                             |                                                   |

Будь ласка, вкажіть будь-який інший вид освіти, якщо в переліку відсутній

|                                                                                                                                    |                                     |                        |                             |                                          |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------|-----------------------------|------------------------------------------|
| С. Питання до батьків щодо інших членів родини.                                                                                    |                                     |                        |                             |                                          |
| 15a. Чи проживають з Вами інші члени родини? Наприклад, бабуся?                                                                    |                                     |                        |                             |                                          |
| Так Ні                                                                                                                             |                                     |                        |                             |                                          |
| 15b. Якщо так, то скільки осіб? _____                                                                                              |                                     |                        |                             |                                          |
| 16. Якщо так, то чи ця особа проводить найбільше часу з дитиною та бере участь у вихованні дитини?                                 |                                     |                        |                             |                                          |
| Так Ні                                                                                                                             |                                     |                        |                             |                                          |
| 18. Якою мовою дитина говорить з іншими членами родини, які беруть активну участь у вихованні дитини (якщо стосується)?            |                                     |                        |                             |                                          |
| 0<br>ROL ніколи<br>RM завжди                                                                                                       | 1<br>ROL рідко<br>RM більшість часу | 2<br>ROL 50%<br>RM 50% | 3<br>ROL завжди<br>RM рідко | 4<br>ROL майже завжди<br>RM майже ніколи |
| 19a. Якщо є інші члени родини (окрім особи, яка постійно бере участь у вихованні дитини), то чи вони спілкуються з дитиною? Так Ні |                                     |                        |                             |                                          |
| 0<br>ROL ніколи<br>RM завжди                                                                                                       | 1<br>ROL рідко<br>RM більшість часу | 2<br>ROL 50%<br>RM 50% | 3<br>ROL завжди<br>RM рідко | 4<br>ROL майже завжди<br>RM майже ніколи |
| 19b. Якщо так, то якою мовою вони найбільше розмовляють з дитиною?                                                                 |                                     |                        |                             |                                          |
| 0<br>ROL ніколи<br>RM завжди                                                                                                       | 1<br>ROL рідко<br>RM більшість часу | 2<br>ROL 50%<br>RM 50% | 3<br>ROL завжди<br>RM рідко | 4<br>ROL майже завжди<br>RM майже ніколи |
| 20. Якою мовою дитина звертається до родичів, які не беруть участь у постійному вихованні дитини (якщо стосується)?                |                                     |                        |                             |                                          |
| 0<br>ROL ніколи<br>RM завжди                                                                                                       | 1<br>ROL рідко<br>RM більшість часу | 2<br>ROL 50%<br>RM 50% | 3<br>ROL завжди<br>RM рідко | 4<br>ROL майже завжди<br>RM майже ніколи |
| Бал: /4                                                                                                                            |                                     |                        |                             |                                          |

## Appendix D: Alberta language and development questionnaire (ALDeQ)

### Polish version

Paradis, J., Emmerzael, K., & Sorenson Duncan, T. (2010). Assessment of English Language Learners: Using Parent Report on First Language Development. *Journal of Communication Disorders*, 43, 474-497.  
Child English as a Second Language Resource Centre: <http://www.chesl.ualberta.ca>

Imię \_\_\_\_\_ Nazwisko \_\_\_\_\_

#### Kwestionariusz językowy i rozwojowy (wersja dostosowana ALDeQ)©

##### A. Wczesne kluczowe etapy rozwoju

|                                                                                                                                                                                                                                                                                    |                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Kiedy Państwa dziecko zaczęło chodzić? _____                                                                                                                                                                                                                                    | 3 = < 15 miesięcy<br>0 = > 16 miesięcy<br><b>wynik: /3</b>                                                                                     |
| 2. Ile lat miało Państwa dziecko, kiedy po raz pierwszy wypowiedziało słowo?<br><br><i>Przykłady pierwszych słów dziecka (wraz z tłumaczeniami):</i>                                                                                                                               | 6 = <15 miesięcy (niemowlę)<br>4 = 16-24 miesięcy (older toddler - starszy maluch)<br>0 = >25 miesięcy (2 lata lub więcej)<br><b>wynik: /6</b> |
| 3. Ile lat miało Państwa dziecko, kiedy zaczęło składać słowa w krótkie zdania? _____<br><br><i>krótkie zdania = dwa słowa, przykład = „więcej mleka” „więcej wody”</i><br><i>Przykłady krótkich zdań (z tłumaczeniami):</i>                                                       | 6 = <24 miesięcy (maluch)<br>4 = 25 - 30 miesięcy (2 to 2 ½ w przybliżeniu)<br>0 = > 31<br><b>wynik: /6</b>                                    |
| 4. Kiedy myśli Pani o innych dzieciach które Pani zna w tym wieku, czy myśli Pani, że Pani dziecko różniło się tym, kiedy zaczęło używać języka?<br><br><b>3 = nie różniło się wcale; 2 = trochę się różniło; 1 = różniło się w znaczącym stopniu 0 = bardzo się różniło</b>       | <b>wynik: /3</b>                                                                                                                               |
| <b>Aby obliczyć sumę częściową dla Części A, dodaj jako mianownik całkowity możliwy wynik dla wszystkich pytań na które udzielono odpowiedzi. Następnie dodaj wyniki odpowiedzi rodziców jako licznik. Jeśli udzielono odpowiedzi na wszystkie pytania, mianownik wyniosłby 18</b> | <b>SUB TOTAL A</b><br><br>/                                                                                                                    |

|                                                                                                                                                                                                                      |                                        |                        |                             |                                          |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------|-----------------------------|------------------------------------------|---------|
| 21. Чи у дитини є брати та/чи сестри? <span style="float: right;">Так</span><br><i>Якщо так, то перейдіть до питання 22-27</i>                                                                                       |                                        |                        |                             |                                          |         |
| 22. <b>Рідний брат/сестра 1</b> <span style="float: right;">Старший/-а Молодший /-а</span><br>Стать: <span style="margin-left: 100px;">Ч</span> <span style="margin-left: 100px;">Ж</span><br>Дата народження: _____ |                                        |                        |                             |                                          |         |
| 23. Якою мовою/-ами говорить Рідний брат/сестра 1 з дитною?                                                                                                                                                          |                                        |                        |                             |                                          | Бал: /4 |
| 0<br>POL ніколи<br>PM завжди                                                                                                                                                                                         | 1<br>POL рідко<br>PM більшість<br>часу | 2<br>POL 50%<br>PM 50% | 3<br>POL завжди<br>PM рідко | 4<br>POL майже завжди<br>PM майже ніколи |         |
| 24. Якою мовою/-ами говорить дитина з Рідним братом/сестрою 1?                                                                                                                                                       |                                        |                        |                             |                                          | Бал: /4 |
|                                                                                                                                                                                                                      |                                        |                        |                             |                                          |         |
| 25. <b>Рідний брат/сестра 2</b> <span style="float: right;">Старший/-а Молодший /-а</span><br>Стать: <span style="margin-left: 100px;">Ч</span> <span style="margin-left: 100px;">Ж</span><br>Дата народження: _____ |                                        |                        |                             |                                          |         |
| 26. Якою мовою/-ами говорить Рідний брат/сестра 2 з дитною?                                                                                                                                                          |                                        |                        |                             |                                          | Бал: /4 |
|                                                                                                                                                                                                                      |                                        |                        |                             |                                          |         |
| 27. Якою мовою/-ами говорить дитина з Рідним братом/сестрою 1?                                                                                                                                                       |                                        |                        |                             |                                          | Бал: /4 |
| 0<br>POL ніколи<br>PM завжди                                                                                                                                                                                         | 1<br>POL рідко<br>PM більшість<br>часу | 2<br>POL 50%<br>PM 50% | 3<br>POL завжди<br>PM рідко | 4<br>POL майже завжди<br>PM майже ніколи |         |
| (Якщо у родині є більше дітей, то слід додатково заповнити відповіді для кожної дитини)                                                                                                                              |                                        |                        |                             |                                          |         |

#### A. Aktualne umiejętności w pierwszym języku

|                                                                                                                                                                                                                                                                                                                                        |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 5. W porównaniu z innymi dziećmi w tym samym wieku, jak Pani zdaniem dziecko wyraża siebie?<br><b>0 = niezbyt dobrze; 1 = trochę gorzej niż inni; 2 = tak samo; 3 = bardzo dobrze / lepiej</b>                                                                                                                                         | <b>wynik: /3</b> |
| 6. Jak Pani myśli, w porównaniu z innymi dziećmi w tym samym wieku, jak Pani dziecko wymawia słowa?<br><b>0 = niezbyt wyraźnie; 1 = czasami niewyraźnie; 2 = tak samo wyraźnie; 3 = bardzo wyraźnie, jest jednym/jedną z najlepszych</b>                                                                                               | <b>wynik: /3</b> |
| 7. Czy rozmowa z dzieckiem jest łatwa dla rodziny lub przyjaciół?<br><b>3 = bardzo łatwa; 2 = wystarczająco łatwa; 1 = czasami niełatwa; 0 = nie, bardzo trudna</b>                                                                                                                                                                    | <b>wynik: /3</b> |
| 8. Czy w porównaniu z innymi dziećmi w tym samym wieku Pani dziecko ma trudności z tworzeniem poprawnych zdań?<br><i>Przykład: ma odpowiednie słownictwo, poprawną gramatykę, wystarczająco długie zdania aby przekazać myśl</i><br><b>3 = bez trudności, może lepiej; 2 = tak samo; 1 = ma pewne trudności; 0 = ma dużo trudności</b> | <b>wynik: /3</b> |
| 9. Czy jest Pani zadowolona z tego jak Pani dziecko mówi w języku ojczystym?<br><b>3 = w pełni zadowolona; 2 = zadowolona; 1 = niezbyt zadowolona; 0 = w ogóle niezadowolona</b>                                                                                                                                                       | <b>wynik: /3</b> |
| Aby obliczyć sumę częściową dla Części B, dodaj jako mianownik całkowity możliwy wynik dla wszystkich pytań, na które udzielono odpowiedzi. Następnie dodaj wyniki odpowiedzi rodziców jako licznik. Jeśli udzielono odpowiedzi na wszystkie pytania, mianownik wyniosłby 18                                                           |                  |
| <b>Wynik B</b>                                                                                                                                                                                                                                                                                                                         | <b>/</b>         |

#### B. Wzorce zachowań i preferencje dotyczące aktywności

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11. Czy Pani dziecko lubi czytać książki lub lubi, jeśli ktoś czyta mu/jej książki?<br><b>0 = nigdy; 1 = rzadko; 2 = czasami; 3 = bardzo</b>                                                                                                                                                                                                                                                                                                                                                  | <b>wynik: /3</b>                                                                                                                                                              |
| 12. Jak Pani dziecko czyta i pisze (w języku ojczystym) w porównaniu z innymi dziećmi w jego / jej wieku?<br><i>Jezeli dziecko czyta i pisze = cyfry i alfabety / znaki oraz rozpoznawanie niektórych słów. Jeśli dziecko nie było jeszcze uczzone, proszę pominąć to pytanie</i><br><b>0 = wyraźnie gorzej niż inne dzieci; 1 = nie tak dobrze jak inne dzieci; 2 = tak samo jak inne dzieci; 3 = bardzo dobrze, może lepiej niż inne dzieci</b>                                             | <b>wynik: /3</b>                                                                                                                                                              |
| 13. W jakich aktywnościach Pani dziecko lubi brać udział?<br><b>3 = Gry językowe (np. czytanie, pisanie, zabawa w szkole)</b><br><b>2 = Gry poznawcze (np. puzzle, rysowanie, gry umysłowe, gry komputerowe, samochody)</b><br><b>1 = gry fizyczne (np. piłka nożna, baseball, pływanie)</b><br><b>0 = inne (np. telewizja, gry wideo, przebieranki lub dziecięce gry z uwzględnieniem wieku)</b>                                                                                             | (Jeśli rodzic wskazuje więcej niż jedną kategorię, należy wziąć pod uwagę sumę wyników podzieloną przez liczbę punktów, a następnie zaokrąglić odpowiedź, jeśli to konieczne) |
| 14. Jak szybko / jak łatwo Pani dziecko uczy się nowych rzeczy?<br><i>Przykłady: sport; słowa; gry / taniec; z nowymi zabawkami (poznaj zasady sporów zespołowych, takich jak piłka nożna, łączenie klocków, gry komputerowe)</i><br><i>Przykłady uczenia się nowych rzeczy przez dziecko:</i><br><b>3 = ten sam dzień / natychmiast; 2 = kilka prób; 1 = potrzebuje pomocy i czasu, aby się tego nauczyć; 0 = długi czas / czasami nigdy się tego nie uczy</b>                               | <b>wynik: /3</b>                                                                                                                                                              |
| 15. Jakie wzorce aktywności wykazuje Pani dziecko?<br><i>Wyjaśnienie: Zajęcia = gry, jedzenie, oglądanie telewizji, zabawa zabawkami / rękodziełem, muzyka, taniec. Rozpoczyna jedną lub więcej z nich i czy kończy to, co zaczyna?</i><br><b>3 = jedna czynność na raz i kończy ją; 2 = jedna lub dwie czynności na raz i kończy jedną; 1 = od dwóch do czterech czynności jednocześnie i kończy jedną; 0 = więcej niż dwie / wiele czynności na raz i rzadko kończy którąkolwiek z nich</b> | <b>wynik: /3</b>                                                                                                                                                              |
| Wynik /3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                               |

|                                                                                                                                                                                                                                                                              |              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 16. Czy Pani dziecko jest sfrustrowane, gdy nie może przekazać swoich myśli?                                                                                                                                                                                                 | wynik: / 3   |
| 3 = wcale; 2 = czasami; 1 = często; 0 = bardzo często                                                                                                                                                                                                                        |              |
| Aby obliczyć sumę częściowa dla Części C, dodaj jako mianownik całkowity możliwy wynik dla wszystkich pytań, na które udzielono odpowiedzi. Następnie dodaj wyniki odpowiedzi rodziców jako licznik. Jeśli udzielono odpowiedzi na wszystkie pytania, mianownik wyniosłby 18 | Część C<br>/ |

A. Historia rodziny

|                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17a. Czy mogłaby Pani nam opowiedzieć o swoich krewnych? Jakże wykształcenie i zawody mają w swoim kraju?<br><i>Celem tego pytania jest przedstawienie kontekstu do interpretacji odpowiedzi na pytanie 17b</i> |                                                                                                                                                                                                                                                    |
| 17b. Czy wszyscy członkowie Pani rodziny skończyli liceum? Jeśli nie, czy może Pani podać powód?                                                                                                                | 3 = Tak<br>0 = Nie<br>Wynik: / 3<br> Jeśli rodzic poda powód środowiskowy lub zewnętrzny (np. wojna lub brak funduszy, dostępność), pytanie nie podlega ocenie |

|                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |      |             |              |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------------|--------------|---|
| 19. Czy wśród najbliższej rodziny lub innych krewnych dziecka jest ktoś, kto miał trudności w nauce czytania i pisania, mówienia i wynowy, zbyt wolno uczył się mówić? Czy mogłaby Pani wytłumaczyć?                                                                       | pozytywna historia rodzina?<br><br>6=brak wskazania<br>3=tak,<br>prawdopodobnie<br>0=tak,<br>zdecydowanie                                                                                                                                                                                                                                                                                                                                  |        |      |             |              |   |
| Jeśli rodzic jest otwarty na bardziej szczegółowe pytania i wydaje się, że ma historię, kontynuuj korzystając z dolnej części jako przewodnika albo na podstawie tego, co sami opowiadają, albo zadając pytania bezpośrednio. Nie musisz zadawać wszystkich pytań          | Wynik: / 6<br><br>Uwaga: dla 6 punktów rodzic musi wskazać, że nie ma w rodzinie takich sytuacji, jeśli rodzic nie czuje się komfortowo odpowiadając na to pytanie lub nie zna odpowiedzi, nie oceniaj pytania.<br> Jeśli rodzic poda powód środowiskowy lub zewnętrzny (np. uraz lub operację), nie traktuj tych odpowiedzi za pozytywny wywiad rodzinny |        |      |             |              |   |
|                                                                                                                                                                                                                                                                            | brat czy siostra                                                                                                                                                                                                                                                                                                                                                                                                                           | ojciec | mama | krewni ojca | krewni matki |   |
| Trudności w szkole lub w nauce                                                                                                                                                                                                                                             | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Problemy z językiem lub wymową, na przykład w zdaniach, słowach i gramatyce, lub jękanie                                                                                                                                                                                   | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Zajęcia specjalne                                                                                                                                                                                                                                                          | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Terapia mowy i języka                                                                                                                                                                                                                                                      | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Problemy ze zrozumieniem wskazówek lub pytań                                                                                                                                                                                                                               | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Problemy z czytaniem lub nauką czytania                                                                                                                                                                                                                                    | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Trudności w nauce języka obcego                                                                                                                                                                                                                                            | T N                                                                                                                                                                                                                                                                                                                                                                                                                                        | T N    | T N  | T N         | T N          |   |
| Powtarzanie jednej lub więcej klas                                                                                                                                                                                                                                         | Y N                                                                                                                                                                                                                                                                                                                                                                                                                                        | Y N    | Y N  | Y N         | Y N          |   |
| Aby obliczyć sumę częściowa dla Sekcji D, dodaj jako mianownik całkowity możliwy wynik dla wszystkich pytań na które udzielono odpowiedzi. Następnie dodaj wyniki odpowiedzi rodziców jako licznik. Jeśli udzielono odpowiedzi na wszystkie pytania, mianownik wyniosłby 9 |                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |      |             |              |   |
| Seksja D                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |      |             |              | / |

## Ukrainian version

Paradis, J., Emmerzael, K., & Sorenson Duncan, T. (2010). Assessment of English Language Learners: Using Parent Report on First Language Development. *Journal of Communication Disorders*, 43, 474-497.  
Child English as a Second Language Resource Centre: <http://www.chesl.ualberta.ca>

### Анкета оцінювання розвитку мови (Адаптація англомовної версії (ALDeQ)©)

#### А. Ранній етап розвитку

|                                                                                                                                                                                                                                                      |                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 1. Коли Ваша дитина почала ходити? _____                                                                                                                                                                                                             | 3 = < 15 місяців<br>0 = > 16 місяців<br><b>Бал: /3</b>                                                                |
| 2. Коли Ваша дитина сказала перше слово?<br>_____<br><i>Якщо пам'ятаєте, то яке було перше слово дитини:</i>                                                                                                                                         | 6 = <15 місяців<br>4 = 16-24 місяців<br>0 = >25 місяців (2 роки або пізніше)<br><b>Бал: /6</b>                        |
| 3. Скільки було Вашій дитині, коли вона почала складати прості речення? _____<br><i>Прості речення = два слова, наприклад = 'більше молока' 'більше води', «дай мені»</i><br><i>Приклади коротких речень:</i>                                        | 6 = <24 місяців<br>4 = 25 - 30 місяців (2 to 2 ½ приблизно)<br>0 = > 31 місяців (ближче до 3 років)<br><b>Бал: /6</b> |
| 4. На Вашу думку, чи відрізняється Ваша дитина за розвитком від одноліток?<br><br><b>3 = не відрізняється; 2 = трохи відрізняється; 1 = досить відрізняється; 0 = дуже відрізняється</b>                                                             | <br><br><br><b>Бал: /3</b>                                                                                            |
| <b>Щоб підрахувати результат для частини А, слід додати всі максимально можливі бали і вписати в знаменник. Потім поррахувати бали відповідей батьків і вписати в чисельник. Якщо відповіді подані на всі питання, то знаменник повинен бути 18.</b> | <b>Разом частина А</b><br><br>/                                                                                       |

ALDeQ 1

|                                                                                                                                                                                                                                                                                                                                          |                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <p><b>В. Мовні здібності дитини (перша мова)</b></p> <p>5. У порівнянні з однолітками, як Ви оцінюєте здібність Вашої дитини висловлювати свої думки?</p> <p>0 = не дуже добре; 1 = трохи гірше; 2 = так само; 3 = дуже добре/краще/є одним з найкращих</p>                                                                              | <p>Бал: /3</p>                  |
| <p>6. У порівнянні з однолітками, як Ваша дитина вживає слова?</p> <p>0 = не дуже розбірливо; 1 = з невеликими помилками; 2 = так само; 3 = дуже розбірливо/одні з найкращих</p>                                                                                                                                                         | <p>Бал: /3</p>                  |
| <p>7. Чи легко членам родини та Вашим друзям вести розмову з Вашою дитиною?</p> <p>3 = дуже легко; 2 = досить легко; 1 = іноді не дуже легко; 0 = ні, дуже важко</p>                                                                                                                                                                     | <p>Бал: /3</p>                  |
| <p>8. У порівнянні з однолітками, чи Ваша дитина має труднощі з правильним побудовою речень?</p> <p><i>Наприклад: використовує необхідні слова, правильна граматична побудова, і т.д.</i></p> <p>3 = не має; 2 = іноді робить помилки; 1 = часто робить помилки; 0 = робить багато помилок, що призводить до труднощів у спілкуванні</p> | <p>Бал: /3</p>                  |
| <p>9. Чи задоволені Ви рівнем розвитку мови Вашої дитини?</p> <p>3 = цілком задоволений; 2 = задоволений; 1 = можливо трохи незадоволений; 0 = зовсім незадоволений</p>                                                                                                                                                                  | <p>Бал: /3</p>                  |
| <p>10. Чи вважаєте Ви, що Ваша дитина володіє рідною мовою на рівні з однолітками?</p> <p>0 = не так добре; 1 = майже так само, з невеликою різницею; 2 = в основному так – дуже подібно; 3 = краще</p>                                                                                                                                  | <p>Бал: /3</p>                  |
| <p>10б. Чому Ви не задоволені? В чому Ви вважаєте полігате відмінність?</p>                                                                                                                                                                                                                                                              |                                 |
| <p>Шоб пірахувати результат для частини В, слід додати всі максимально можливі бали і вписати в знаменник. Потім порахувати бали відповідей батьків і вписати в чисельник. Якщо відповіді подані на всі питання, то знаменник повинен бути 18.</p>                                                                                       | <p>Разом частина В</p> <p>/</p> |

**С. Поведінка дитини та уподобання (ігри/заняття)**

|                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <p>11. Ваша дитина любить читати книжки або щоб їй читали?</p> <p>0 = ніколи; 1 = рідко; 2 = іноді; 3 = дуже</p>                                                                                                                                                                                                                                          | <p>Бал: /3/</p>                                                                                                        |
| <p>12. Як Ваша дитина читає та пише (рідною мовою) у порівнянні з однолітками?</p> <p><i>Якщо дитина не вміє, то переходимо до наступного питання</i></p> <p>0 = помітно гірше, ніж інші діти; 1 = не так добре, як інші; 2 = так само, як інші; 3 = дуже добре, навіть краще</p>                                                                         | <p>Бал: /3/</p>                                                                                                        |
| <p>13. Який вид занять подобається дитині найбільше?</p> <p>3 = мовні ігри (читати, писати, грати у школу)</p> <p>2 = когнітивні ігри (пазли, малювання, ігри на розвиток мислення, ком'ютерні ігри з розвитку мислення)</p> <p>1 = фізичні ігри (футбол, плавання)</p> <p>0 = інше (наприклад, відео ігри або інші ігри для дітей відповідного віку)</p> | <p>(якщо зазначено більш, ніж одну відповідь, то суму балів слід розділити на кількість варіантів)</p> <p>Бал: /3/</p> |
| <p>14. Як швидко ваша дитина опанує нові види занять?</p> <p><i>Наприклад: спорт; слова; ігри/пазли; ігри з новими іграшками</i></p> <p><i>азначити приклади:</i></p> <p>3 = в той самий день/дуже швидко; 2 = декілька днів; 1 = потребує допомоги, щоб опанувати навичку; 0 = досить довго/іноді не може опанувати</p>                                  | <p>Бал: /3/</p>                                                                                                        |
| <p>15. Як зазвичай дитина виконує заняття (які остання видів їх послідовність)?</p> <p><i>Наприклад: малює, потім дивиться телевізор, потім грає і т.д. Чи може поліпшити розпочату гру і зайнятися чимсь іншим?</i></p>                                                                                                                                  |                                                                                                                        |
| <p>3 = одне заняття, закінчити, а потім починати нове; 2 = одне або два заняття одночасно, завершує щось одне; 1 = від двох до чотирьох справ одночасно, закінчує щось одне; 0 = виконує, як правило декілька справ, але майже ніколи нічого не доводить до кінця</p>                                                                                     |                                                                                                                        |

|                                                                                                                                                                                                                                              |                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 16. Чи Ваша дитина засмучується, коли не може висловитися/сформулювати думку?                                                                                                                                                                | <b>Бал: /3</b>            |
| <b>3 = зовсім ні; 2 = іноді; 1 = часто; 0 = майже завжди</b>                                                                                                                                                                                 |                           |
| Щоб підрахувати результат для частини C, слід додати всі максимально можливі бали і вписати в знаменник. Потім порахувати бали відповідей батьків і вписати в чисельник. Якщо відповіді подані на всі питання, то знаменник повинен бути 18. | <b>Частина C</b><br><br>/ |

**D. Родина історія**

17a. Можете подати інформацію щодо родини? Яку освіту мають найближчі родичі?  
*Мета цього питання – пояснення відповідей на 17b.*

|                                                                                                                                                       |                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17b. Чи всі родичі (з найближчого оточення: тьоті, діді, бабусі, дідусі і т.д.) отримали загальносередню освіту (закінчили 11 (або 10) класів школи)? | <p>3 = Так</p> <p>0 = Ні</p> <p><b>Score: /3</b></p> <p><b>510</b> Якщо зовнішні фактори (війна, тощо) були причиною нестримання освіти, то відповідь на це питання не оцінюється</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

19. Чи в найближчому оточенні дитини є рідні, що мали проблеми з мовою (складнощі з читанням, письмом, вимовою тощо). Якщо можливо, то зазначте, що саме. Як ні, то не відповідаємо на подане питання.

*Якщо є більш детальна інформація, то просимо зазначити*

|                                                          | брат або сестра | тато | мама | родичі тата | родичі мами |
|----------------------------------------------------------|-----------------|------|------|-------------|-------------|
| труднощі у навчанні                                      | +               | +    | +    | +           | +           |
| проблеми мовного характеру, побудова речень, мовна, тощо | +               | +    | +    | +           | +           |
| спеціалізований клас                                     | +               | +    | +    | +           | +           |
| терапія мови та мовлення                                 | +               | +    | +    | +           | +           |
| проблеми з визначенням напрямку та розумінням питань     | +               | +    | +    | +           | +           |
| проблеми з читанням                                      | +               | +    | +    | +           | +           |
| проблеми з вивченням іноземної мови                      | +               | +    | +    | +           | +           |
| проблеми з вивченням одного класу двічі                  | +               | +    | +    | +           | +           |

**Score: /6**

Примітка: для того, щоб поставити 6 балів, то батьки повинні зазначити, що не було жодної з зазначених ситуацій. Якщо батьки не бажають надавати відповідь, то це питання не оцінюється зовсім

**510** якщо причиною могли бути зовнішні фактори (війна і т.д.), то не рахуємо відповідь як позитивну

**Частина D**  
  
/

Щоб підрахувати результат для частини D, слід додати всі максимально можливі бали і вписати в знаменник. Потім порахувати бали відповідей батьків і вписати в чисельник. Якщо відповіді подані на всі питання, то знаменник повинен бути 18.



## Appendix E: Home literacy environment (HLE)

### Polish version

Burgess S., R. et al. (2002) Relations of the home literacy environment (HLE) to the development of reading-related abilities. *READING RESEARCH QUARTERLY* October/November/December 2002 37/4

Imię \_\_\_\_\_ Nazwisko \_\_\_\_\_

#### Kwestionariusz dotyczący środowiska językowego dziecka (język ojczysty)

| Nr | Pytanie                                                                                                                                              | Odpowiedź                                                                                                                                                                                                                               |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | W jakim wieku (w miesiącach) zaczęła Pani/zaczął Pan czytać swojemu dziecku? (Jeśli nie potrafi Pani/Pan podać dokładnego wieku, proszę oszacować)   |                                                                                                                                                                                                                                         |
| 2  | Ile czasu dziennie Państwa dziecko spędza na oglądaniu programów telewizyjnych/filmów w internecie oraz w telewizji? (proszę oszacować w godzinach). |                                                                                                                                                                                                                                         |
| 3  | Ile lat szkoły ukończyło dziecko? (jeśli dotyczy)                                                                                                    |                                                                                                                                                                                                                                         |
| 4  | Ile lat nauki Pani ukończyła? (np. szkoła podstawowa (8) + liceum (4) + licencjat 3 = 15)                                                            |                                                                                                                                                                                                                                         |
| 5  | Ile lat nauki ukończył Pani współmałżonek (lub partner)?                                                                                             |                                                                                                                                                                                                                                         |
| 6  | Czy pracuje Pani poza domem?                                                                                                                         | Tak <input type="checkbox"/> Nie <input type="checkbox"/>                                                                                                                                                                               |
| 7  | Jeśli tak, jaki jest Pani zawód?                                                                                                                     |                                                                                                                                                                                                                                         |
| 8  | Czy Pani współmałżonek (lub partner) pracuje poza domem?                                                                                             | Tak <input type="checkbox"/> Nie <input type="checkbox"/>                                                                                                                                                                               |
| 9  | Jeśli tak, jaki jest jego zawód?                                                                                                                     |                                                                                                                                                                                                                                         |
| 10 | Jaki poziom wykształcenia planujecie Państwo dla dziecka?                                                                                            | <ul style="list-style-type: none"> <li>• szkoła podstawowa,</li> <li>• liceum,</li> <li>• technikum,</li> <li>• szkoła policealna</li> <li>• wykształcenie wyższe</li> </ul>                                                            |
| 11 | Ile godzin dziennie ogląda Pani telewizję?                                                                                                           |                                                                                                                                                                                                                                         |
| 12 | Ile godzin dziennie Pani partner (współmałżonek) ogląda telewizję?                                                                                   |                                                                                                                                                                                                                                         |
| 13 | Ile godzin dziennie spędza Pani w Internecie (np. na portalach społecznościowych, itp.)                                                              |                                                                                                                                                                                                                                         |
| 14 | Ile godzin dziennie spędza Pani w internecie w sprawach pracy                                                                                        |                                                                                                                                                                                                                                         |
| 15 | Ile godzin dziennie Pani partner (współmałżonek) spędza w internecie (np. na portalach społecznościowych, itp.)                                      |                                                                                                                                                                                                                                         |
| 16 | Ile godzin dziennie Pani partner (współmałżonek) spędza w Internecie w sprawach pracy?                                                               |                                                                                                                                                                                                                                         |
| 17 | Ile książek czyta Pani miesięcznie?                                                                                                                  |                                                                                                                                                                                                                                         |
| 18 | Ile książek miesięcznie czyta Pani współmałżonek (partner)?                                                                                          |                                                                                                                                                                                                                                         |
| 19 | Czy obecnie czyta Pani książkę?                                                                                                                      | Tak <input type="checkbox"/> Nie <input type="checkbox"/>                                                                                                                                                                               |
| 20 | Jeśli tak, jaki jest jej tytuł?                                                                                                                      |                                                                                                                                                                                                                                         |
| 21 | Czy Pani współmałżonek (partner) czyta obecnie książkę?                                                                                              | Tak <input type="checkbox"/> Nie <input type="checkbox"/>                                                                                                                                                                               |
| 22 | Jeśli tak, jaki jest jej tytuł?                                                                                                                      |                                                                                                                                                                                                                                         |
| 23 | Jak często czyta Pani dziecku książki?                                                                                                               | <input type="radio"/> codziennie<br><input type="radio"/> raz na dwa dni<br><input type="radio"/> raz na tydzień<br><input type="radio"/> dwa razy na miesiąc<br><input type="radio"/> co miesiąc<br><input type="radio"/> prawie nigdy |
| 24 | Czy Pani dziecko lubi czytać (jeśli dotyczy)?<br><br>Jak często? (jeśli dotyczy)                                                                     | <input type="radio"/> codziennie<br><input type="radio"/> raz na dwa dni<br><input type="radio"/> co tydzień<br><input type="radio"/> dwa razy na miesiąc<br><input type="radio"/> co miesiąc<br><input type="radio"/> prawie nigdy     |
| 25 | Czy Pani dziecko lubi opowiadać historie?                                                                                                            | Tak <input type="checkbox"/> Nie <input type="checkbox"/>                                                                                                                                                                               |

## Ukrainian version

Burgess S., R. et al. (2002) Relations of the home literacy environment (HLE) to the development of reading-related abilities. *READING RESEARCH QUARTERLY* October/November/December 2002, 37/4

### Анкета мовного середовища дитини (рідна мова)

Ім'я та Прізвище \_\_\_\_\_

| №  | Питання                                                                                         | Відповіді                                                                                                                                                                                                                    |
|----|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | В якому віці (в місяцях) Ви почали читати дитині?<br>(якщо не пам'ятаєте, то вкажіть приблизно) |                                                                                                                                                                                                                              |
| 2  | Скільки часу дитина дивиться телебачення/відео в інтернеті щодня? (вкажіть у годинах)           |                                                                                                                                                                                                                              |
| 3  | Чи Ваша дитина ходила до дитячого садочку?                                                      | Так                      Ні                                                                                                                                                                                                  |
| 4  | Яку освіту Ви маєте?                                                                            | <ul style="list-style-type: none"> <li>• неповна середня освіта</li> <li>• середня освіта</li> <li>• середня-спеціальна освіта</li> <li>• вища освіта (бакалавр)</li> <li>• вища освіта (магістр)</li> </ul> інше            |
| 5  | Яку освіту має Ваш чоловік?                                                                     | <ul style="list-style-type: none"> <li>• неповна середня освіта</li> <li>• середня освіта</li> <li>• середня-спеціальна освіта</li> <li>• вища освіта (бакалавр)</li> <li>• вища освіта (магістр)</li> <li>• інше</li> </ul> |
| 6  | Ви працюєте?                                                                                    | Так                      Ні                                                                                                                                                                                                  |
| 7  | Якщо так, то ким Ви працюєте?                                                                   |                                                                                                                                                                                                                              |
| 8  | Чи працює Ваш чоловік?                                                                          | Так                      Ні                                                                                                                                                                                                  |
| 9  | Якщо так, то ким Він/Вона працює?                                                               |                                                                                                                                                                                                                              |
| 10 | Який рівень освіти Ви хотіли б дати своїй дитині?                                               | <ul style="list-style-type: none"> <li>• неповна середня освіта</li> <li>• середня освіта</li> <li>• середня-спеціальна освіта</li> <li>• вища освіта (бакалавр)</li> <li>• вища освіта (магістр)</li> <li>• інше</li> </ul> |
| 11 | Скільки годин щодня Ви дитивися телевізор?                                                      |                                                                                                                                                                                                                              |

|    |                                                                                                                 |                                                                                                                                                                                 |
|----|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | Скільки годин щодня Ваш чоловік дивиться телевізор?                                                             |                                                                                                                                                                                 |
| 13 | Скільки часу Ви проводите за комп'ютером або з електронними гаджетами у вільний час?                            |                                                                                                                                                                                 |
| 14 | Скільки часу Ви проводите за комп'ютером або з електронними гаджетами під час праці? (якщо стосується)          |                                                                                                                                                                                 |
| 15 | Скільки часу Ваш чоловік проводить за комп'ютером або з електронними гаджетами у вільний час?                   |                                                                                                                                                                                 |
| 16 | Скільки часу Ваш чоловік проводить за комп'ютером або з електронними гаджетами під час праці? (якщо стосується) |                                                                                                                                                                                 |
| 17 | Скільки книжок ви читаєте на місяць?                                                                            |                                                                                                                                                                                 |
| 18 | Скільки книжок Ваш чоловік читає на місяць?                                                                     |                                                                                                                                                                                 |
| 19 | Чи читаєте Ви на даний момент книгу?                                                                            | Так Ні                                                                                                                                                                          |
| 20 | Якщо відповідь так, то яка це книга (назва або автор)?                                                          |                                                                                                                                                                                 |
| 21 | Чи Ваш чоловік читає на даний момент книгу?                                                                     | Так Ні                                                                                                                                                                          |
| 22 | Якщо так, то яка це книга?                                                                                      |                                                                                                                                                                                 |
| 23 | Як часто Ви читаєте Вашій дитині книжки?                                                                        | <ul style="list-style-type: none"> <li>• Щоденно</li> <li>• Через день</li> <li>• Щотижня</li> <li>• Двічі на місяць</li> <li>• Кожен місяць</li> <li>• Майже ніколи</li> </ul> |
| 24 | Чи Ваша дитина вміє читати?                                                                                     | Так Ні                                                                                                                                                                          |
| 25 | Чи любить Ваша дитина оповідати історії?                                                                        | Так Ні                                                                                                                                                                          |

## Appendix F: Authors' permission to translate and adapt questionnaires into Polish, Ukrainian and Russian



UNIVERSITY OF ALBERTA  
FACULTY OF ARTS

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Tel: 780.492.0807  
Fax: 780.492.0806

February 18, 2021.

Dear Sir or Madam,

I give my permission to Victoria Kishchak to translate two questionnaires, the Alberta Language Environment Questionnaire (ALEQ) and the Alberta Language Development Questionnaire (ALDeQ), into Russian, Ukrainian and Polish for the purposes of her research.

Your sincerely,

Johanne Paradis  
Professor and Associate Chair - Graduate

RE: HLE\_question\_Poland



Burgess, Stephen <stephen.burgess@swosu.edu>

2/15/2021 11:53 PM



To: Wiktorina Kishchak

Hi Victoria,

Thank you for the note. Please use the survey and make the changes you need for your project. I wish you well with your project.  
If you have any questions please ask.

Stephen

Stephen Burgess  
Department of Psychology  
SWOSU

## Appendix G: Ethics committee approval



UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU  
Komisja Etyczna ds. badań naukowych prowadzonych z udziałem ludzi

SNJL/108/2020/2021

Poznań, dnia 15 marca 2021 r.

Pani  
**Mgr Victoria Kishchak**  
Zakład Angielskiego Językoznawstwa  
Stosowanego i Dydaktyki Języka Angielskiego  
Wydział Anglistyki  
w miejscu

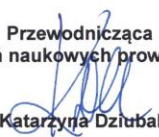
Szanowna Pani,

Uprzejmie informuję, że dnia 15 marca 2021 r. Komisja etyczna ds. badań naukowych prowadzonych z udziałem ludzi UAM wydała pozytywną opinię o projekcie badawczym pt. "Wczesne predyktory czytania u dzieci monolingwalnych oraz bilingwalnych: badanie podłużne". Pozytywna opinia dotyczy wniosku po dokonaniu korekty, złożonego przez Panią w dniu 3 marca 2021 r. (nr akt KE/2/2020).

Przesyłam w załączeniu oryginał Uchwały nr 4/2020/2021 Komisji Etycznej ds. badań naukowych prowadzonych z udziałem ludzi w wersji polskiej i angielskiej.

Z poważaniem

Przewodnicząca  
Komisji etycznej ds. badań naukowych prowadzonych z udziałem ludzi

prof. dr hab.  Katarzyna Dziubalska-Kolaczyk

### Załączniki:

1. Uchwała nr 4/2020/2021 Komisji Etycznej ds. badań naukowych prowadzonych z udziałem ludzi
2. Resolution No. 4/2020/2021 of the Ethics Committee for Research Involving Human Participants



ul. H. Wieniawskiego 1, 61-712 Poznań  
tel. +48 61 829 44 24, fax +48 61 829 44 05  
olaboch@amu.edu.pl

[www.amu.edu.pl](http://www.amu.edu.pl)

## Appendix H: Answer cards (T1,T2)

### Testing session 1. Answer card.

Name \_\_\_\_\_ Language \_\_\_\_\_ Date \_\_\_\_\_

1. RAN letters, time: card 1 \_\_\_\_\_ card 2 \_\_\_\_\_

2. PA isolation \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

3. Listening comprehension

Text 1

Text 2

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

4. \_\_\_\_\_

\_\_\_\_\_

5. \_\_\_\_\_

\_\_\_\_\_

4. Sentence repetition

Correct \_\_\_\_\_

Incorrect \_\_\_\_\_

5. RAN numbers

Time: Card 1 \_\_\_\_\_ Card 2 \_\_\_\_\_

6. PA deletion \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

7. Vocabulary knowledge

\_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

8. Listening comprehension

Text 3

Text 4

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

9. Reading words \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

10 Reading pseudowords \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes \_\_\_\_\_

11. Letter knowledge

UC \_\_\_\_\_

LC \_\_\_\_\_

12. Pseudowords repetition \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

13. RAN objects . Time: card 1 \_\_\_\_\_ card 2 \_\_\_\_\_

14 RAN colors. Time: card 1 \_\_\_\_\_ . card 2 \_\_\_\_\_

15 PA Blending (24) \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

Comments

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**Testing session 2. Answer card.**

Name \_\_\_\_\_ Language \_\_\_\_\_ Date \_\_\_\_\_

1. RAN letters, time: card 1 \_\_\_\_\_ card 2 \_\_\_\_\_

2. PA isolation \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

3. Listening comprehension

Text 1

Text 2

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

4. \_\_\_\_\_

\_\_\_\_\_

5. \_\_\_\_\_

\_\_\_\_\_

4. PA Blending (24) \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

5. Sentence repetition

Correct \_\_\_\_\_

Incorrect \_\_\_\_\_

6. RAN numbers

Time: Card 1 \_\_\_\_\_ Card 2 \_\_\_\_\_

7. PA deletion \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

8. Vocabulary knowledge

\_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

9. Listening comprehension

Text 3

Text 4

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

4. \_\_\_\_\_

\_\_\_\_\_

5. \_\_\_\_\_

\_\_\_\_\_

10. Reading words \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes

11. Reading pseudowords \_\_\_\_\_ total (n), \_\_\_\_\_ (n) mistakes \_\_\_\_\_

Comments

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## Appendix I: Consonant phonemes in the three languages

Comparison of consonant phonemes in three languages

|                     | (Bi)labial | Labio-dental | (Post)Dental/Alveolar | Alveolo-palatal | Post-alveolar | Palatal            | Velar | Glottal |
|---------------------|------------|--------------|-----------------------|-----------------|---------------|--------------------|-------|---------|
|                     | hard       | soft         | hard                  | soft            |               |                    | hard  | soft    |
| Nasal               | m          | mʲ           | n                     | nʲ              | ɲ             |                    | ŋ     |         |
| Plosive             | p          | pʲ           | t                     | tʲ              |               | c                  | k     | kʲ      |
|                     | b          | bʲ           | d                     | dʲ              |               |                    | g     | gʲ      |
| Affricate           | v ~ w      |              | ts                    | tsʲ             | ʃ             | (tʃʲ) <sup>1</sup> | tʃ    |         |
|                     |            |              | dʒ                    | dʒʲ             | ʒ             | (dʒʲ)              | dʒ    |         |
| Fricative           | f          | fʲ           | s                     | sʲ              | ʃ             | ʒ                  | x     | xʲ      |
|                     | v          | vʲ           | z                     | zʲ              | ʃʲ            | (ʒʲ)               |       | ɦ       |
| Lateral approximant |            |              | l                     | lʲ              |               |                    |       | (ɦʲ)    |
| Approximant         |            | j            |                       |                 |               | j                  | w     |         |
| Trill               |            |              | r                     | rʲ              |               |                    |       |         |

Note: **green** – common for all languages, **blue** – common for Russian and Ukrainian, **red** – common for Polish and Ukrainian, **black** – specific for Ukraine, **orange** – specific for Polish

Source: Ukrainian: Pompino-Marschall et al. 2017; Russian: Yanushevskaya et al. 2019; Polish: Jassem 2003.

<sup>1</sup> Palatalized sounds in brackets are the context-dependent allophones of the non-palatalized phonemes (i.e. the so-called “half-palatalized sounds”).

## Appendix J: Testing materials in Ukrainian

### PA blending (MABEL)

Поєднання фонем (v.1, 27.08.2022). Аркуш відповідей. [www.eldel-mabel.net](http://www.eldel-mabel.net)

|                                                                                    |                                                   |
|------------------------------------------------------------------------------------|---------------------------------------------------|
|  | <b>ПОЄДНАННЯ ФОНЕМ</b><br><b>Аркуш відповідей</b> |
|------------------------------------------------------------------------------------|---------------------------------------------------|

Особа, що проводить тестування: ..... Дата: .....

|                           |  |              |  |                             |  |
|---------------------------|--|--------------|--|-----------------------------|--|
| <b>ID дитини (код):</b>   |  | <b>Стать</b> |  | <b>Вік (роки та місяці)</b> |  |
| <b>Назва школи (код):</b> |  |              |  | <b>Вікова група/клас</b>    |  |



Тестування слід проводити відповідно до процедури та вказівок, поданих в «Поєднання фонем – інструкція з проведення та оцінювання тесту». Вказівки, виділені **червоним кольором**, не можна змінювати.

Тестування необхідно записувати на диктофон.

Необхідно мати картки для ознайомлення дитини із завданням (ДІМ, МИША).

Уважно записуйте кожну відповідь дитини, незалежно від того чи відповідь є правильною, чи ні.

Тестування слід припинити, якщо дитина зробить шість помилок підряд, тобто коли немає жодного співпадіння фонем між тестовим словом і відповіддю дитини.

\* Скорочена версія тесту для дітей старшої групи дитячого садочку - 10 слів.

#### Поєднання фонем

| Тестові одиниці (Items) |                      | IPA** | Відповідь | Результат 1/0 |
|-------------------------|----------------------|-------|-----------|---------------|
| 1                       | т-и, /т-и/ (ти)      | /ti/  |           |               |
| 2                       | з-а, /з-а/ (за)      | /za/  |           |               |
| 3                       | н-і, /н-і/ (ні)      | /ni/  |           |               |
| 4                       | ї-х, /й-і-х/ (їх)    | /jix/ |           |               |
| 5                       | л-е-в, /л-е-в/ (лев) | /lew/ |           |               |
| 6                       | д-а-х, /д-а-х/ (дах) | /dax/ |           |               |
| 7                       | с-и-р, /с-и-р/ (сир) | /sir/ |           |               |
| 8                       | р-а-к, /р-а-к/ (рак) | /rak/ |           |               |

© Caravolas, M., Kishchak, V., Mikulajová, M., Defior, S., & Seidlová Málková, G. (2022). *Multilanguage Assessment Battery of Early Literacy*. All rights reserved. Всі права захищені. Забороняється відтворення, копіювання, розповсюдження або публікація матеріалів без дозволу авторів тесту.

|     |                      |        |          |  |  |
|-----|----------------------|--------|----------|--|--|
| 9   | у-х-о, /у-х-о/       | (ухо)  | /uxɔ/    |  |  |
| 10* | о-с-а, /о-с-а/       | (оса)  | /ɔsa/    |  |  |
| 11  | г-р-а, /г-р-а/       | (гра)  | /ɦra/    |  |  |
| 12  | в-о-д-а, /в-о-д-а/   | (вода) | /wɔda/   |  |  |
| 13  | л-і-т-о, /л'-і-т-о/  | (літо) | /ʎito/   |  |  |
| 14  | п-о-л-е, /п-о-л-е/   | (поле) | /pole/   |  |  |
| 15  | р-и-б-а, /р-и-б-а/   | (риба) | /rɪba/   |  |  |
| 16  | к-о-л-о, /к-о-л-о/   | (коло) | /kolo/   |  |  |
| 17  | с-л-о-н, /с-л-о-н/   | (слон) | /slon/   |  |  |
| 18  | п-т-а-х, /п-т-а-х/   | (птаx) | /ptax/   |  |  |
| 19  | с-н-і-г, /с'-н'-і-г/ | (сніг) | /s'n'ih/ |  |  |
| 20  | х-л-і-б, /х-л'-і-б/  | (хліб) | /xl'ib/  |  |  |
| 21  | с-т-у-л, /с-т-у-л/   | (стул) | /stul/   |  |  |
| 22  | п-а-р-к, /п-а-р-к/   | (парк) | /park/   |  |  |
| 23  | м-і-с-т, /м'-і-с-т/  | (міст) | /m'ist/  |  |  |
| 24  | т-о-р-т, /т-о-р-т/   | (торт) | /tɔrt/   |  |  |

\*IPA (International Phonetic Alphabet)

|                                                           |            |                                                       |            |
|-----------------------------------------------------------|------------|-------------------------------------------------------|------------|
| <b>Сума правильних відповідей<br/>(скорочена версія):</b> | <b>/10</b> | <b>Сума правильних<br/>відповідей (повна версія):</b> | <b>/24</b> |
|-----------------------------------------------------------|------------|-------------------------------------------------------|------------|

## PA isolation (MABEL)

|                                                                                   |                                            |  |
|-----------------------------------------------------------------------------------|--------------------------------------------|--|
|  | <b>ВИОКРЕМЛЕННЯ ФОНЕМИ</b>                 |  |
|                                                                                   | <b>Аркуш відповідей – ПОЧАТКОВА ФОНЕМА</b> |  |

Особа, що проводить тестування: .....Дата: .....

|                    |  |       |  |                      |  |
|--------------------|--|-------|--|----------------------|--|
| ID дитини (код):   |  | Стать |  | Вік (роки та місяці) |  |
| Назва школи (код): |  |       |  | Вікова група/клас    |  |



Відповіді записуємо на диктофон.

Запис транскрипції відповіді дитини (повторення псевдослова та відповідь) є обов'язковою, якщо вона відрізняється від правильної відповіді.

Слід припинити тестування, якщо здійснено чотири помилки підряд в одній з частин (8 тестових одиниць) цього блоку завдань.

### Початкова фонема – Блок 1

| Склад CVC         | Транскрипція повторення | Фонема | Транскрипція відповіді | Бали 2/1/0 |
|-------------------|-------------------------|--------|------------------------|------------|
| зік /zik/         |                         | /z/    |                        |            |
| нур /nur/         |                         | /n/    |                        |            |
| пат /pat/         |                         | /p/    |                        |            |
| мош /mɔʃ/         |                         | /m/    |                        |            |
| вук /vuk/         |                         | /v/    |                        |            |
| бат /bat/         |                         | /b/    |                        |            |
| кеп /kep/         |                         | /k/    |                        |            |
| луц /luts/        |                         | /l/    |                        |            |
| Сума балів (CVC): |                         |        |                        | /16        |

| Склад CCVC                   | Транскрипція повторення | Фонема | Транскрипція відповіді | Бали 2/1/0 |
|------------------------------|-------------------------|--------|------------------------|------------|
| трач /tratʃ/                 |                         | /t/    |                        |            |
| свік /svik/                  |                         | /s/    |                        |            |
| флоп /flɔp/                  |                         | /f/    |                        |            |
| прот /prɔt/                  |                         | /p/    |                        |            |
| блич /blitʃ/                 |                         | /b/    |                        |            |
| друш /druʃ/                  |                         | /d/    |                        |            |
| клот /klɔt/                  |                         | /k/    |                        |            |
| врем /vrɛm/                  |                         | /v/    |                        |            |
| Сума балів CCVC:             |                         |        |                        | /16        |
| Початкова фонема_сума балів: |                         |        |                        | /32        |



## PA deletion (MABEL)

|                                                                                   |                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------|
|  | <b>ВИДАЛЕННЯ ФОНЕМИ</b><br><b>Аркуш відповідей</b> |
|-----------------------------------------------------------------------------------|----------------------------------------------------|

Особа, що проводить тестування: ..... Дата: .....

|                    |                   |                      |
|--------------------|-------------------|----------------------|
| ID дитини (код):   | Стать             | Вік (роки та місяці) |
| Назва школи (код): | Вікова група/клас |                      |


 Тестування слід записувати на диктофон.  
Увімкніть секундомір, як тільки дитина назве перше псевдослово з блоку.  
Вимкніть секундомір, як тільки дитина дасть останню відповідь з блоку.  
 Запис транскрипції відповіді дитини (повторення псевдослова та відповідь) є обов'язковою, якщо вона відрізняється від правильної відповіді.  
НЕ припиняйте тестування, слід виконати всі завдання.

### Початкова фонема – Блок 1

| Псевдослово  | Транскрипція повторення | Очікувана відповідь | Транскрипція відповіді | Бали 2/1/0 |
|--------------|-------------------------|---------------------|------------------------|------------|
| роф /rɔf/    |                         | (оф) /ɔf/           |                        |            |
| вак /vak/    |                         | (ак) /ak/           |                        |            |
| діс /dis/    |                         | (іс) /is/           |                        |            |
| пек /pek/    |                         | (ек) /ek/           |                        |            |
| вун /vʊn/    |                         | (ун) /ʊn/           |                        |            |
| Блок 1, час: | ..... сек               | Блок 1, сума балів  | /10                    |            |

### Початкова фонема – Блок 2

| Псевдослово      | Транскрипція повторення | Очікувана відповідь      | Транскрипція відповіді | Бали 2/1/0 |
|------------------|-------------------------|--------------------------|------------------------|------------|
| спек /spek/      |                         | (пек) /pek/              |                        |            |
| праш /praʃ/      |                         | (раш) /raʃ/              |                        |            |
| блон /blɔn/      |                         | (лон) /lɔn/              |                        |            |
| клет /klet/      |                         | (лет) /let/              |                        |            |
| трин /trin/      |                         | (рин) /rin/              |                        |            |
| Блок 2, час      | ..... сек               | Блок 2 сума балів        | /10                    |            |
| Блок 1 та 2, час | ..... сек               | Сума балів (Блок 1 та 2) | /20                    |            |

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**Аркуш відповідей**

Особа, що проводить тестування: ..... Дата: .....

|                    |                   |                      |
|--------------------|-------------------|----------------------|
| ІД дитини (код):   | Стать             | Вік (роки та місяці) |
| Назва школи (код): | Вікова група/клас |                      |

Тестування слід записувати на диктофон.

Увімкніть секундомір, як тільки дитина назве перше псевдослово з блоку.

**Вимкніть секундомір, як тільки дитина дасть останню відповідь з блоку.**

Запис транскрипції відповіді дитини (повторення псевдослова та відповідь) є обов'язковою, якщо вона відрізняється від правильної відповіді.

НЕ припиняйте тестування, слід виконати всі завдання.

Кінцева фонема – Блок 3

| Псевдослово | Транскрипція повторення | Очікувана відповідь | Транскрипція відповіді | Бали 2/1/0 |
|-------------|-------------------------|---------------------|------------------------|------------|
| nup         | /nup/                   | (ny) /nu/           |                        |            |
| gor         | /gor/                   | (ro) /gr/           |                        |            |
| mek         | /mek/                   | (me) /mε/           |                        |            |
| tash        | /taʃ/                   | (ra) /ta/           |                        |            |
| zin         | /zin/                   | (zi) /zi/           |                        |            |
| Блок 3, час | Блок 3, сума балів      |                     |                        | /10        |

**Кінцева фонема – Блок 4**

| Псевдослово      | Транскрипція повторення | Очікувана відповідь      | Транскрипція відповіді | Бали 2/1/0 |
|------------------|-------------------------|--------------------------|------------------------|------------|
| сінт /sɪnt/      |                         | (cɪn) /sɪn/              |                        |            |
| кест /kɛst/      |                         | (kɛc) /kɛs/              |                        |            |
| шолф /ʃɔlf/      |                         | (ʃɔn) /ʃɔ/               |                        |            |
| нуст /nuːst/     |                         | (nyc) /nus/              |                        |            |
| хікс /hɪks/      |                         | (xɪk) /hɪk/              |                        |            |
| Блок 4, час      | сек                     | Блок 4, сума балів       |                        | /10        |
| Блок 3 та 4, час | сек                     | Сума балів (Блок 3 та 4) |                        | /20        |

Впишіть окремо суми балів для початкової фонемі та для кінцевої фонемі, а також загальний результат.

|      | Початкова фонема<br>(блок 1 та 2) |                    | Кінцева фонема<br>(блок 3 та 4) |                    | Загальний результат    |                    |
|------|-----------------------------------|--------------------|---------------------------------|--------------------|------------------------|--------------------|
|      | Правильність<br>(бали)            | Швидкість<br>(сек) | Правильність<br>(бали)          | Швидкість<br>(сек) | Правильність<br>(бали) | Швидкість<br>(сек) |
| Сума |                                   |                    |                                 |                    |                        |                    |

## RAN colours (MABEL)



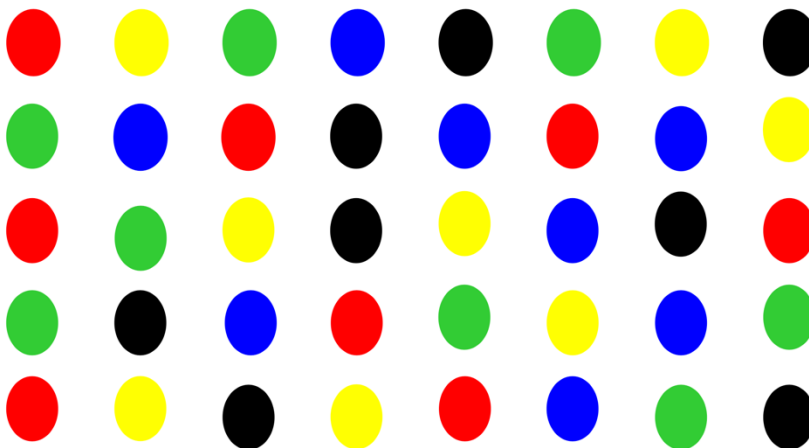
ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ (RAN) - КОЛЬОРИ  
Тренувальні та тестові картки



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Тестова картка 1

Швидке автоматизоване називання (RAN) – кольори (v.1, 27.08.2022)  
Інструкція з проведення та оцінювання тесту  
[www.eldel-mabel.net](http://www.eldel-mabel.net)



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## Швидке автоматизоване називання (RAN)

### кольори

### Аркуш відповідей

Особа, що проводить тестування: ..... Дата: .....

|                    |  |        |  |                      |  |
|--------------------|--|--------|--|----------------------|--|
| ID дитини: (код)   |  | Стать: |  | Вік (роки і місяці): |  |
| Номер школи: (код) |  |        |  | Вікова група/клас:   |  |



Тестування слід проводити відповідно до процедури та вказівок, поданих у документі “RAN кольори – інструкція з проведення та оцінювання тесту”. Не змінюйте вказівки, що зазначені **червоним кольором**.

Увімкніть секундомір, як тільки дитина почне називати перший колір.

Вимкніть секундомір, як тільки дитина назве останній колір.

Тестування слід записувати на диктофон.

Під час тестування зазначайте всі помилки на аркуші відповідей.

Пам’ятайте, що помилки, які дитина виправляє самостійно (автокорекції), **НЕ** рахуються як помилки.

### RAN кольори 1

|                   |         |          |          |                |          |         |          |
|-------------------|---------|----------|----------|----------------|----------|---------|----------|
| червоний          | жовтий  | зелений  | синій    | чорний         | зелений  | жовтий  | чорний   |
| зелений           | синій   | червоний | чорний   | синій          | червоний | синій   | жовтий   |
| червоний          | зелений | жовтий   | чорний   | жовтий         | синій    | чорний  | червоний |
| зелений           | чорний  | синій    | червоний | зелений        | жовтий   | синій   | зелений  |
| червоний          | жовтий  | чорний   | жовтий   | червоний       | синій    | зелений | чорний   |
| Час (сек.) RAN 1: |         |          |          | Помилки RAN 1: |          |         |          |

### RAN кольори 2

|                   |          |          |         |                |          |          |          |
|-------------------|----------|----------|---------|----------------|----------|----------|----------|
| зелений           | чорний   | червоний | синій   | жовтий         | червоний | чорний   | жовтий   |
| червоний          | синій    | зелений  | жовтий  | синій          | зелений  | синій    | чорний   |
| зелений           | червоний | чорний   | жовтий  | чорний         | синій    | жовтий   | зелений  |
| червоний          | жовтий   | синій    | зелений | червоний       | чорний   | синій    | червоний |
| зелений           | чорний   | жовтий   | чорний  | зелений        | синій    | червоний | жовтий   |
| Час (сек.) RAN 2: |          |          |         | Помилки RAN 2: |          |          |          |

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## RAN objects (MABEL)



## ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ (RAN) – ОБ’ЄКТИ ТРЕНУВАЛЬНІ ТА ТЕСТОВІ КАРТКИ

Тренувальна картка



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Швидке автоматизоване називання (RAN) об'єкти - тренувальні та тестові карти (v.1, 27.08.2022)  
www.eldel-mabel.net

Тестова картка 1



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|                                                                                   |                                                                                           |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
|  | <b>ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ (RAN)</b><br><b>ОБ'ЄКТИ</b><br><b>Аркуш відповідей</b> |
|                                                                                   |                                                                                           |

Особа, що проводить тестування: ..... Дата:.....

|                    |  |        |  |                      |  |
|--------------------|--|--------|--|----------------------|--|
| ID дитини: (код)   |  | Стать: |  | Вік (роки і місяці): |  |
| Назва школи: (код) |  |        |  | Вікова група/клас:   |  |


 Тестування слід проводити відповідно до процедури та вказівок, поданих у документі "RAN об'єкти – інструкція з проведення тестування та оцінювання". Не змінюйте вказівки, що зазначені **червоним кольором**.  
 Увімкніть секундомір, як тільки дитина почне називати перший малюнок.  
 Вимкніть секундомір, як тільки дитина назве останній малюнок.  
 Тестування слід записувати на диктофон.  
 Під час тестування зазначайте всі помилки на аркуші відповідей.  
 Пам'ятайте! Помилки, які дитина виправляє самостійно (автокорекції), **НЕ** зараховуються як помилки.

#### RAN картка 1

|                  |      |      |      |                |      |      |      |
|------------------|------|------|------|----------------|------|------|------|
| лев              | кіт  | око  | стіл | ключ           | стіл | око  | ключ |
| кіт              | ключ | лев  | око  | ключ           | кіт  | стіл | кіт  |
| лев              | око  | стіл | лев  | кіт            | ключ | око  | лев  |
| око              | стіл | кіт  | ключ | стіл           | лев  | ключ | око  |
| стіл             | лев  | стіл | кіт  | око            | кіт  | ключ | лев  |
| Час (сек) RAN 1: |      |      |      | Помилки RAN 1: |      |      |      |

#### RAN картка 2

|                  |      |      |      |                |      |      |      |
|------------------|------|------|------|----------------|------|------|------|
| стіл             | лев  | ключ | око  | кіт            | ключ | лев  | стіл |
| ключ             | стіл | око  | лев  | кіт            | лев  | око  | ключ |
| лев              | око  | стіл | кіт  | ключ           | око  | стіл | кіт  |
| око              | ключ | кіт  | стіл | лев            | ключ | кіт  | лев  |
| стіл             | око  | лев  | кіт  | око            | кіт  | стіл | ключ |
| Час (сек) RAN 2: |      |      |      | Помилки RAN 2: |      |      |      |

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Запишіть окремо результати першого та другого тесту, а також середній результат обох тестів.

|                                 | Час<br>(в секундах) | Помилки<br>(кількість слів) |
|---------------------------------|---------------------|-----------------------------|
| RAN картка 1                    |                     |                             |
| RAN картка 2                    |                     |                             |
| RAN об'єкти: середній результат |                     |                             |

## RAN letters (MABEL)



ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ (RAN) - ЛІТЕРИ  
Тренувальні та тестові картки

а с д п о

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Тестова картка 1

Швидке автоматизоване називання (RAN) – літери (v.1, 27.08.2022)  
Тренувальні та тестові картки. [www.eldel-mabel.net](http://www.eldel-mabel.net)

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|                                                                                   |                                                                                                                                                                                                                                                           |                    |  |                      |  |                      |  |                    |  |                    |  |  |  |  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--|----------------------|--|----------------------|--|--------------------|--|--------------------|--|--|--|--|
|  | <b>ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ<br/>(RAN) - ЛІТЕРИ</b><br><b>Аркуш відповідей</b>                                                                                                                                                                      |                    |  |                      |  |                      |  |                    |  |                    |  |  |  |  |
|                                                                                   | Особа, що проводить тестування: ..... Дата: .....                                                                                                                                                                                                         |                    |  |                      |  |                      |  |                    |  |                    |  |  |  |  |
|                                                                                   | <table border="1"> <tr> <td>ID дитини: (код)</td> <td></td> <td>Стать:</td> <td></td> <td>Вік (роки і місяці):</td> <td></td> </tr> <tr> <td>Назва школи: (код)</td> <td></td> <td colspan="2">Вікова група/клас:</td> <td></td> <td></td> </tr> </table> | ID дитини: (код)   |  | Стать:               |  | Вік (роки і місяці): |  | Назва школи: (код) |  | Вікова група/клас: |  |  |  |  |
| ID дитини: (код)                                                                  |                                                                                                                                                                                                                                                           | Стать:             |  | Вік (роки і місяці): |  |                      |  |                    |  |                    |  |  |  |  |
| Назва школи: (код)                                                                |                                                                                                                                                                                                                                                           | Вікова група/клас: |  |                      |  |                      |  |                    |  |                    |  |  |  |  |


 Тестування слід проводити відповідно до процедури та вказівок, поданих у документі “RAN літери – інструкція з проведення та оцінювання тесту”. Не змінюйте вказівки, що зазначені **червоним кольором**.  
 Увімкніть секундомір, як тільки дитина почне називати першу літеру.  
 Вимкніть секундомір, як тільки дитина назве останню літеру.  
 Тестування слід записувати на диктофон.  
 Під час тестування зазначайте всі помилки на аркуші відповідей.  
 Пам’ятайте, що помилки, які дитина виправляє самостійно (автокорекції) **НЕ** рахуються, як помилки.

**RAN літери 1**

|                  |   |   |   |                |   |   |   |
|------------------|---|---|---|----------------|---|---|---|
| п                | а | о | с | д              | о | а | д |
| о                | с | п | д | с              | п | с | а |
| п                | о | а | д | а              | с | д | п |
| о                | д | с | п | о              | а | с | о |
| п                | а | д | а | п              | с | о | д |
| Час (сек) RAN 1: |   |   |   | Помилки RAN 1: |   |   |   |

**RAN літери 2**

|                  |   |   |   |                |   |   |   |
|------------------|---|---|---|----------------|---|---|---|
| о                | д | п | с | а              | п | д | а |
| п                | с | о | а | с              | о | с | д |
| о                | п | д | а | д              | с | а | о |
| п                | а | с | о | п              | д | с | п |
| о                | д | а | д | о              | с | п | а |
| Час (сек) RAN 2: |   |   |   | Помилки RAN 2: |   |   |   |

Запишіть окремо результати першого та другого тесту, а також середній результат обох тестів.

|                                  | Час<br>(в секундах) | Помилки |
|----------------------------------|---------------------|---------|
| RAN ЛІТЕРИ 1                     |                     |         |
| RAN ЛІТЕРИ 2                     |                     |         |
| RAN (ЛІТЕРИ): середній результат |                     |         |

## RAN numbers (MABEL)



ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ (RAN) - ЦИФРИ  
ТРЕНУВАЛЬНІ ТА ТЕСТОВІ КАРТКИ

**2 3 6 7 9**

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Забороняється відтворення, копіювання, розповсюдження або публікація матеріалів без дозволу авторів тесту.

Тестова картка 1

Швидке автоматизоване називання (RAN) – цифри (v.1, 27.08.2022)  
Тренувальні та тестові картки. [www.eldel-mabel.net](http://www.eldel-mabel.net)

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>7</b> | <b>2</b> | <b>9</b> | <b>3</b> | <b>6</b> | <b>9</b> | <b>2</b> | <b>6</b> |
| <b>9</b> | <b>3</b> | <b>7</b> | <b>6</b> | <b>3</b> | <b>7</b> | <b>3</b> | <b>2</b> |
| <b>7</b> | <b>9</b> | <b>2</b> | <b>6</b> | <b>2</b> | <b>3</b> | <b>6</b> | <b>7</b> |
| <b>9</b> | <b>6</b> | <b>3</b> | <b>7</b> | <b>9</b> | <b>2</b> | <b>3</b> | <b>9</b> |
| <b>7</b> | <b>2</b> | <b>6</b> | <b>2</b> | <b>7</b> | <b>3</b> | <b>9</b> | <b>6</b> |

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# ШВИДКЕ АВТОМАТИЗОВАНЕ НАЗИВАННЯ (RAN) - ЦИФРИ Аркуш відповідей

Особа, що проводить тестування: ..... Дата: .....

|                    |  |        |  |                      |  |
|--------------------|--|--------|--|----------------------|--|
| ID дитини: (код)   |  | Стать: |  | Вік (роки і місяці): |  |
| Номер школи: (код) |  |        |  | Вікова група/клас:   |  |



Тестування слід проводити відповідно до процедури та вказівок поданих в “RAN цифри – інструкція з проведення та оцінювання тесту”. Не змінюйте вказівки, що зазначені **червоним кольором**.

**Увімкніть** секундомір, як тільки дитина почне називати першу цифру.

**Вимкніть** секундомір, як тільки дитина назве останню цифру.

Тестування слід записувати на диктофон або інший записуючий пристрій.

Під час тестування зазначте всі помилки на аркуші відповідей.

Пам’ятайте! Помилки, які дитина виправляє самостійно (автокорекції), **НЕ** зараховують як помилку.

## RAN цифри 1

|                   |         |         |       |                |         |         |         |
|-------------------|---------|---------|-------|----------------|---------|---------|---------|
| сім               | два     | дев’ять | три   | шість          | дев’ять | два     | шість   |
| дев’ять           | три     | сім     | шість | три            | сім     | три     | два     |
| сім               | дев’ять | два     | шість | два            | три     | шість   | сім     |
| дев’ять           | шість   | три     | сім   | дев’ять        | два     | три     | дев’ять |
| сім               | два     | шість   | два   | сім            | три     | дев’ять | шість   |
| Час (сек.) RAN 1: |         |         |       | Помилки RAN 1: |         |         |         |

## RAN цифри 2

|                   |       |         |         |                |         |       |         |
|-------------------|-------|---------|---------|----------------|---------|-------|---------|
| дев’ять           | шість | сім     | три     | два            | сім     | шість | два     |
| сім               | три   | дев’ять | два     | три            | дев’ять | три   | шість   |
| дев’ять           | сім   | шість   | два     | шість          | три     | два   | дев’ять |
| сім               | два   | три     | дев’ять | сім            | шість   | три   | сім     |
| дев’ять           | шість | два     | шість   | дев’ять        | три     | сім   | два     |
| Час (сек.) RAN 2: |       |         |         | Помилки RAN 2: |         |       |         |

|                                 | Час<br>(в секундах) | Помилки |
|---------------------------------|---------------------|---------|
| RAN ЦИФРИ 1                     |                     |         |
| RAN ЦИФРИ 2                     |                     |         |
| RAN (ЦИФРИ): середній результат |                     |         |

## Letter naming (MABEL)

Знання букви – усне називання (v.1, 27.08.2022)  
Аркуш відповідей [www.eldel-mabel.net](http://www.eldel-mabel.net)

|                                                                                   |                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|
|  | <b>ЗНАННЯ БУКВИ – УСНЕ НАЗИВАННЯ</b><br><b>Аркуш відповідей</b> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|

Особа, що проводить тестування:..... Дата: .....

|                  |                    |                       |
|------------------|--------------------|-----------------------|
| ID дитини: (код) | Стать:             | Вік (роки та місяці): |
| Номер школи:     | Вікова група/клас: |                       |

- Дотримуйтеся інструкцій, поданих в «Знання букви – інструкція з проведення та оцінювання тесту». Не змінюйте вказівок, що виділені **червоним кольором**.
- Записуйте тест на диктофон або інший записуючий пристрій.
- Підрахуйте окремо бали для назв букв та звуків.
- За кожну правильну відповідь ставимо ✓ у відповідній колонці *звук або назва букви*.
- За кожну неправильну відповідь ставимо ✗, у випадку автокорекції **АК**, а якщо дитина не відповідає, то ставимо —.
- Якщо дитина зробила помилку, то слід записати неправильну відповідь в колонці **Відповідь**.
- Підрахуйте результати відповідей всіх звуків та назв 33 букв українського алфавіту, враховуючи букви ініціалів дитини.
- Якщо дитини сумнівається відповідати чи ні, то слід заохотити дитину продовжувати, але не підказувати відповідь.
- Припиняємо тестування, якщо дитина не в змозі назвати п'ять букв підряд, подаючи неправильні відповіді як звуків так і букв, або зовсім не відповідає.
- Увага! Якщо в колонках *звук та назва* букви зазначені альтернативні правильні відповіді, то подання дитиною одного з варіантів вважається правильною відповіддю, за яку надається (1 бал).



**ЗНАННЯ БУКВИ – УСНЕ НАЗИВАННЯ**  
**Аркуш відповідей**

| Малі букви       |               |       |                |        |               |       |                |
|------------------|---------------|-------|----------------|--------|---------------|-------|----------------|
| букви            | звук<br>✓ / ✗ | Відп. | назва<br>✓ / ✗ | літера | звук<br>✓ / ✗ | Відп. | назва<br>✓ / ✗ |
| Ініціал імені    |               |       |                | д      | [д]           |       | де             |
| Ініціал прізвища |               |       |                | з      | [з]           |       | зе             |
| а                | [а]           |       | а              | й      | [й]           |       | йот            |
| о                | [о]           |       | о              | б      | [б]           |       | бе             |
| у                | [у]           |       | у              | г      | [г]           |       | ге             |
| и                | [и]           |       | и              | ґ      | [ґ]           |       | ґе             |
| і                | [і]           |       | і              | ж      | [ж]           |       | же             |
| е                | [е]           |       | е              | ш      | [ш]           |       | ша             |
| л                | [л]           |       | ел             | ь      | ----          |       | м'який знак    |
| м                | [м]           |       | ем             | х      | [х]           |       | ха             |
| с                | [с]           |       | ес             | ч      | [ч]           |       | ч              |
| н                | [н]           |       | ен             | я      | [ґа]          |       | я              |
| к                | [к]           |       | ка             | ц      | [ц]           |       | ц              |
| в                | [в]           |       | ве             | ю      | [йу]          |       | ю              |
| п                | [п]           |       | пе             | є      | [ґе]          |       | є              |
| р                | [р]           |       | ер             | ї      | [йі]          |       | ї              |
| т                | [т]           |       | те             | ф      | [ф]           |       | еф             |
|                  |               |       |                | щ      | [шч]          |       | ща             |

| Великі букви     |               |       |                |       |               |       |                |
|------------------|---------------|-------|----------------|-------|---------------|-------|----------------|
| буква            | звук<br>✓ / ✗ | Відп. | назва<br>✓ / ✗ | буква | звук<br>✓ / ✗ | Відп. | назва<br>✓ / ✗ |
| Ініціал імені    |               |       |                | Д     | [д]           |       | де             |
| Ініціал прізвища |               |       |                | З     | [з]           |       | зе             |
| А                | [а]           |       | а              | Й     | [й]           |       | йот            |
| О                | [о]           |       | о              | Б     | [б]           |       | бе             |
| У                | [у]           |       | у              | Г     | [г]           |       | ге             |
| И                | [и]           |       | и              | Ґ     | [ґ]           |       | ґе             |
| І                | [і]           |       | і              | Ж     | [ж]           |       | же             |
| Е                | [е]           |       | е              | Ш     | [ш]           |       | ша             |
| Л                | [л]           |       | єл             | Ь     | ----          |       | м'який знак    |
| М                | [м]           |       | єм             | Х     | [х]           |       | ха             |
| С                | [с]           |       | єс             | Ч     | [ч]           |       | ч              |
| Н                | [н]           |       | єн             | Я     | [йа]          |       | я              |
| К                | [к]           |       | ка             | Ц     | [ц]           |       | ц              |
| В                | [в]           |       | єв             | Ю     | [йу]          |       | ю              |
| П                | [п]           |       | єп             | Є     | [йє]          |       | є              |
| Р                | [р]           |       | єр             | Ї     | [йі]          |       | ї              |
| Т                | [т]           |       | єт             | Ф     | [ф]           |       | сф             |
|                  |               |       |                | Щ     | [шч]          |       | ща             |

Слід підрахувати кількість букв, що були показані дитині, кількість букв, які були названі неправильно, а також кількість букв, які були названі правильно. Окремо для букв та звуків.

|                                                                                       | Малі букви |       | Великі букви |       |
|---------------------------------------------------------------------------------------|------------|-------|--------------|-------|
|                                                                                       | звук       | назва | звук         | назва |
| Кількість букв, що були показані (до моменту припинення тестування)                   |            |       |              |       |
| Кількість неправильно названих букв (разом з відмовою відповіді або браком відповіді) |            |       |              |       |
| Кількість правильних відповідей (враховуючи автокоректи)                              |            |       |              |       |

**Language development test: Vocabulary subtest**  
**Test rozwoju językowego TRJ (Smoczyńska et. al. 2015)**

Test Rozwoju Językowego. ©Instytut Badań Edukacyjnych, Warszawa, Wrzesień 2015

Ім'я та прізвище \_\_\_\_\_

Адаптований на українську мову підтест\_TRJ

**НАЗИВАННЯ СЛІВ**

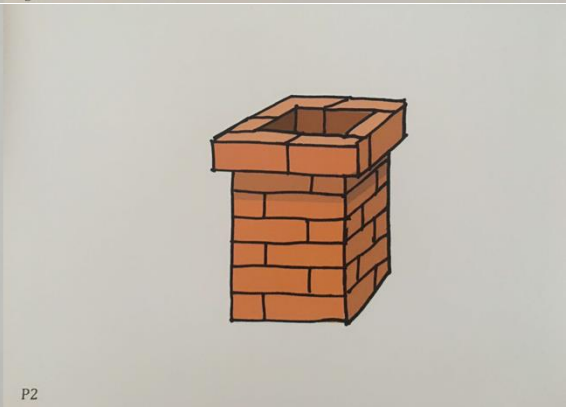
| N                                                | Слово     | Питання          | Відповідь | Бали |
|--------------------------------------------------|-----------|------------------|-----------|------|
| П1                                               | стрибає   | Що він робить?   |           |      |
| 1                                                | міряє     | Що він робить?   |           |      |
| 2                                                | доїть     | Що він робить?   |           |      |
| 3                                                | загрібає  | Що вона робить?  |           |      |
| 4                                                | вибиває   | Що він робить?   |           |      |
| 5                                                | диригує   | Що він робить?   |           |      |
| 6                                                | розплутує | Що хтось робить? |           |      |
| П2                                               | димохід   | Що це?           |           |      |
| 7                                                | кактус    | Що це?           |           |      |
| 8                                                | бобер     | Що це?           |           |      |
| 9                                                | пустиня   | Що це?           |           |      |
| 10                                               | водоспад  | Що це?           |           |      |
| 11                                               | ваги      | Що це?           |           |      |
| 12                                               | мухомор   | Що це?           |           |      |
| 13                                               | коала     | Що це?           |           |      |
| 14                                               | весло     | Що це?           |           |      |
| 15                                               | гамак     | Що це?           |           |      |
| 16                                               | вітрило   | Що це?           |           |      |
| 17                                               | компас    | Що це?           |           |      |
| 18                                               | комар     | Що це?           |           |      |
| 19                                               | дятел     | Що це?           |           |      |
| <b>Увага! У завданні номер 20 зміна питання!</b> |           |                  |           |      |
| 20                                               | ветеринар | Хто це?          |           |      |
| 21                                               | термос    | Що це?           |           |      |
| 22                                               | шалаш     | Що це?           |           |      |
| 23                                               | лук       | Що це?           |           |      |
| 24                                               | понтон    | Що це?           |           |      |
| 25                                               | манекен   | Що це?           |           |      |



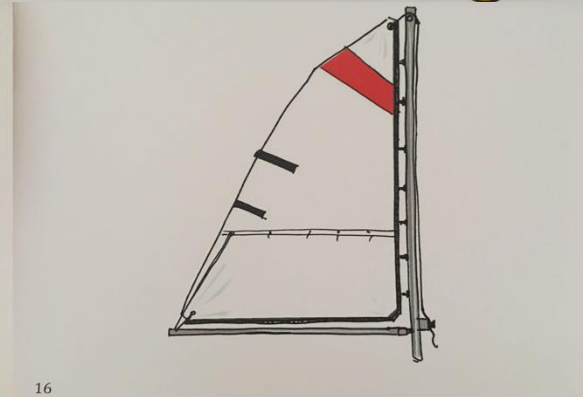
5



6



P2





18



19



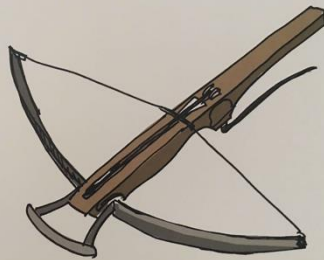
20



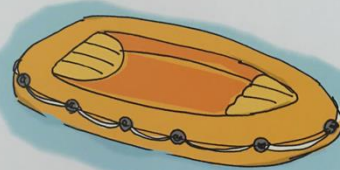
21



22



23



24



25

## Pseudoword repetition test. Test powtarzania pseudosłów (Szewczyk et al. 2015)

Test Powtarzania Pseudosłów

©Instytut Badań Edukacyjnych

Szczewczyk J. et al. (2015)

| A  | <i>Псевдослово</i> | Правильна відповідь (1 бал) -<br>підкреслити |            | Інша відповідь (0 балів) -<br>записати | Бал |
|----|--------------------|----------------------------------------------|------------|----------------------------------------|-----|
| 1  | ТОМНИ              | ТОМНИ                                        |            |                                        |     |
| 2  | НАДЕК              | НАДЕК                                        |            |                                        |     |
| 3  | ЛІХОЩ              | ЛІХОЩ                                        |            |                                        |     |
| 4  | СКРІТЕ             | СКРІТЕ                                       |            |                                        |     |
| 5  | ГОЩЕННЕ            | ГОЩЕННЕ                                      |            |                                        |     |
| 6  | ДЛОНІЛА            | ДЛОНІЛА                                      |            |                                        |     |
| 7  | ПЛАК'ЄМНІХ         | ПЛАК'ЄМНІХ                                   |            |                                        |     |
| 8  | ВИСОКІЄІ           | ВИСОКІЄІ                                     |            |                                        |     |
| 9  | ПОЧУМІЙНИЙ         | ПОЧУМІЙНИЙ                                   |            |                                        |     |
| 10 | ЧОНОВІСЬКО         | ЧОНОВІСЬКО                                   |            |                                        |     |
| 11 | АНОМОГНІЯ          | АНОМОГНІЯ                                    |            |                                        |     |
| 12 | ЗГОТАТКА           | ЗГОТАТКА                                     |            |                                        |     |
| 13 | БОБИФУТКА          | БОБИФУТКА                                    |            |                                        |     |
| 14 | ТРУВНИМ            | трувним                                      | тлувним    |                                        |     |
| 15 | ПОЧИЛ              | почил                                        | поцил      |                                        |     |
| 16 | МОЗОНТ             | мозонт                                       | можонт     |                                        |     |
| 17 | РАМЕГО             | рамего                                       | ламего     |                                        |     |
| 18 | КРУЧІСКУ           | кручіску                                     | клучіску   |                                        |     |
| 19 | ТУТУЧНЕ            | тутечне                                      | тутецне    |                                        |     |
| 20 | ПЕРАВОВ'Є          | перавов'є                                    | пелавов'є  |                                        |     |
| 21 | АРАГНЕНІЯ          | арагнення                                    | арагненія  |                                        |     |
| 22 | ОТПАРАСТАК         | отпарастак                                   | отпаластак |                                        |     |
| 23 | СТРАСУПЕЛА         | страсупела                                   | стласупела |                                        |     |
| 24 | ДЛЯТЕЧНИХИ         | длятечнихи                                   | длятецнихи |                                        |     |
| 25 | ШФАВИМАХАЙ         | шфавимахай                                   | сфавимахай |                                        |     |
| 26 | ОЧИНУЧІ            | очинучі                                      | оцинучі    |                                        |     |
| 27 | УПРИЖЕВЧИХ         | уприжевчих<br>упришевчих                     | упричевчих |                                        |     |

## Language development test: Sentence repetition subtest

Test rozwoju językowego TRJ (Smoczyńska et al. 2015)

Ім'я та Прізвище \_\_\_\_\_

### Тест на повторення речень

| Номер | Завдання та відповідь                           | Бали |
|-------|-------------------------------------------------|------|
| T 1   | У Юлі кольорова парасоля                        |      |
| T 2   | Пінгвіни гарні плавці                           |      |
| T 3   | Оленка не любить ходити в калошах.              |      |
| T 4   | Петро мусить забрати брата з садочка            |      |
| 1.    | Мама готує пироги з ягодами                     |      |
| 2.    | Стіни пофарбовані в жовтий колір                |      |
| 3     | Діти поїдуть на відпочинок до лісу              |      |
| 4.    | Антон буде пити гаряче какао                    |      |
| 5.    | Аня пішла в парк збирати каштани                |      |
| 6.    | У Марка була цукерка, але він її не з'їв        |      |
| 7     | Вони можуть з'їсти морозиво з фруктами          |      |
| 8     | Бабуся повинна була поїхати у магазин           |      |
| 9     | Сандалі сховані під ліжком                      |      |
| 10    | Вона не могла їздити на велосипеді<br>(ровері)  |      |
| 11    | Сергій не хоче писати листа до приятеля         |      |
| 12    | Машина була помитий дядею                       |      |
| 13    | Катя не буде співати пісні                      |      |
| 14    | Він не буде шукати шкарпетки у шафі             |      |
| 15    | Михайло дивиться, як чоловік фарбує<br>підлогу  |      |
| 16    | Диван був знищений псом                         |      |
| 17    | Мирослав зможе грати на комп'ютері              |      |
| 18    | Софія вважає, що в річці холодна вода           |      |
| 19    | То не та картина, яку намалювала Оля            |      |
| 20    | Стілець, на якому сидів мій дідусь,<br>зламаний |      |
| 21    | Тьотя вирішила влаштувати вечірку               |      |
| 22    | Взуття, яке вибрала Катерина, мале              |      |
| 23    | Якуб знайшов шапку, яку загубила бабця          |      |



|    |                                                          |  |
|----|----------------------------------------------------------|--|
| 24 | Соня просить тата, щоб він купив комп'ютер               |  |
| 25 | Пішли до хлібного магазину, де є свіжий хліб             |  |
| 26 | Олена годує пса, якого подарували Івану                  |  |
| 27 | Віктор сердився на сестру, бо вона зламала йому олівець. |  |
| 28 | Суп, який приготував тато, дуже смачний                  |  |
| 29 | То не той чоловік, якого запросили батьки                |  |
| 30 | Обіцяна нагорода нас стимулює до праці                   |  |
| 31 | Наталія живе в будинку, біля якого є дитячий майданчик   |  |
| 32 | Петро позичає братові рюкзак, коли він йому потрібний    |  |
| 33 | Чоловік, якому дзвонив батько, нам дуже допоміг          |  |
| 34 | Мама не буде грати з Марією, поки вона не вибачиться     |  |

## Розуміння текстів зі слуху

### Текст №0 (тест) День народження

Наближався п'ятий день народження Єви. Дівчинка сказала батькам, що хоче у подарунок отримати багато книжок. На святкування дня народження вона запросила трьох друзів: Марію, Олександра та Сергія. Друзі вирішили подарувати спільний подарунок – пазл з динозаврами. Такий подарунок можна разом скласти на день народження. В суботу від самого ранку Єва допомагала мамі готувати святковий торт, а тато поїхав за свічками та морозивом для гостей. Очептертій годині після обіду друзі зазвонили у двері, тримаючи велику коробку в руках. Побачивши величезний пакунок, Єва закричала: "Ой, яка величезна книжка!". Гості подивилися один на одного з подивом. Вони не розуміли, чому дівчинка так сказала.

Аркуш з питаннями

### Т0 День народження: тест для віком 4 та 5 років

| №  | Питання                                                  | Відповідь                                                                                                | Бали |
|----|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------|
| 1. | Які подарунки Єва хотіла би отримати на день народження? | <b>книжки</b>                                                                                            |      |
| 2  | Кому вона сказала, що хоче отримати книжки?              | <b>батькам/мамі та татові</b>                                                                            |      |
| 3  | Що друзі купили Єві у подарунок?                         | <b>пазли з динозаврами</b><br>якщо дитина говорить пазл, то слід запитати «Що було намальовано на пазлі» |      |
| 4  | Що гості будуть їсти на день народження?                 | <b>торт та морозиво</b><br>MIN 2! Якщо дитина називає тільки одну річ, то слід запитати «Що ще?»         |      |
| 5  | Скільки свічок буде на торті Єви?                        | <b>П'ять</b>                                                                                             |      |
|    |                                                          | <b>Сума відповідей</b>                                                                                   |      |

### Текст №1 Книга

Петро отримав від тьоті гарну книжку про диких тварин, які живуть в Африці. Хлопець дуже любив тварин і навіть мав власного kota, якого назвав Сніжком. Петро ще не вмів читати, проте кожен день дивився в новій книзі на малюнки жирафів, гіпопотамів та слонів. Одного разу в понеділок, коли хлопець повернувся з дитячого садочку, то побачив, що його книжки не було на полиці, куди він завжди її відкладав. Шукав всюди, але не міг її знайти. Навіть мама не знала, що сталося з його книжкою. Занепокоєний хлопець вирішив погратися зі Сніжком. Пішов до нього. Кіт лежав в своєму ліжечку, а в лапах тримав книжку Петра. Вона була відкрита на сторінці, де намальовані леви. «Мамо, - закричав хлопець. - подивися! Сніжком хотів подивитися на фото своїх друзів з Африки!»

### Т1 книжка: для дітей віком 4 та 5 років

| № | Питання                                                               | Відповідь                                                                                                                | Бали |
|---|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------|
| 1 | Які тваринки були на малюнках в книжці? Назви їх.                     | <b>Жирафи, гіпопотами, слони, леви</b><br>MIN 2! Якщо називає дитина тільки одну тваринку, то слід запитати: "Хтось ще?" |      |
| 2 | Чому Петро не читав книжки про тваринки, а тільки дивився на малюнки? | <b>Бо не вмів читати, не знав літер</b>                                                                                  |      |
| 3 | Чому Петро злякався?                                                  | <b>Бо не було його книжки, бо вона зникла і він не міг її знайти</b>                                                     |      |
| 4 | Кого він запитав про книжку?                                          | <b>Маму, батьків</b>                                                                                                     |      |
| 5 | Де Петро знайшов свою книжку?                                         | <b>У kota, під лапою у kota, у кошику у kota</b>                                                                         |      |
|   |                                                                       | <b>Загальна кількість балів</b>                                                                                          |      |

Текст № 2 Зустріч

На канікулах Наташка поїхала у гори до тьоті та дяді, які мають власне господарство. Дівчинка часто допомагає доглядати за тваринками: любить каченят та маленьких гусенят, сама годує кроликів та курочок. Одного дня, коли тьотя поїхала до міста, дядько з Наталкою пішли у гори. Вони йшли вздовж струмка, довкола були високі скелі. Раптово дядько зупинився і показав на велику тінь, яка рухалась в хащах з іншої сторони води. Дядько прошепотів: "Тихенько. Стий спокійно." Наталя побачила велику коричневу постать тварини, яка обережно, не дивлячись на них, пішла угору і зникла поміж скелями. Коли тьотя повернулася додому, Наталя розповіла про свою зустріч з ведмедем. «То досить небезпечна тварина, це не їрашковий ведмедик. Я боялася, що він на нас накинеться.» А дядько сказав: "Добре, що ми поводитися тихо, а він був по іншу сторону струмка і нас не побачив."

Т2 Зустріч: Для дітей віком 4,5,6,7,8 років

| № | Питання                                             | Відповідь                                                                                                                                                                                                                                                               | Бали |
|---|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1 | У кого Наталя була на відпочинку?                   | У тьоті та дяді<br>Якщо дитина називає тільки дядю чи тьотю, то дитина отримує 0 балів                                                                                                                                                                                  |      |
| 2 | Які тваринки були у господарстві дяді та тьоті?     | Телята (корови), вівці (барани), кролики, кури<br>MIN 2! Якщо дитина називає лише одну тваринку, то запитуюмо «Щось ще?» Назви інших тварин не впливають на кількість балів, які дитина отримує.                                                                        |      |
| 3 | Чому дядя сказав Наталі поводитися тихо?            | Бо там був ведмідь, бо побачили ведмедя, щоб ведмідь на них не напав/не побачив.<br>Важливо, щоб дитина назвала саме ведмедя, якщо говорить просто <i>тваринка</i> , то слід запитати «Яка тваринка?» Якщо у відповіді немає слова <i>ведмідь</i> , то отримує 0 балів. |      |
| 4 | Якого кольору була тварина?                         | Коричневого/темного<br>Якщо відповідь: білий чи срий, то 0 балів                                                                                                                                                                                                        |      |
| 5 | Коли Наталя розказала тьоті про зустріч з ведмедем? | Коли тьотя повернулася з міста/після того, як тьотя приїхала і зробила покупки<br>Важливо, щоб дитина дала чітку відповідь про те, що саме тьотя повернулася з міста                                                                                                    |      |
|   |                                                     | Сума балів                                                                                                                                                                                                                                                              |      |

Текст № 3 Драбина

Михайло часто відвідує свого дідуся Андрія, садівника. Мама Михайлика вважає, що найкраще там весною, коли будинок оточений квітучими яблунями, грушами та сливами. Коли вона була малою дівчинкою, бігала по садочку і захоплювалася красою білих та рожевих квітів.

На відміну від мами, Михайло дуже полюбляв приїздити до діда саме літом. Дідусь радів, що онук любить їсти вирощені ним фрукти. «Все, що знайдеш під деревом, твоє» - каже. - Але не зривай з гілок. До гілки ти ще не дотягнешся. Драбину зможеш використовувати, як трохи підростеш. Зараз ти можеш впасти."

Але сьогодні хлопець не міг відірвати очей від смачних фруктів, що сховані за листям високо угорі. "Вони мабуть дуже смачні! Ніхто не помітить, якщо я зірву декілька, - подумав хлопець. - Тільки підтягну драбину і все!" Як сказав, так і зробив: підпер драбину під груши і швидко забрався по драбині. Коли був близько біля гілки, то почув знайомі кроки. Так перелякався, що перекинувся драбину, яка впала на землю. "Ой, хтось іде. А що, як хтось побачить!"

Т3 ДРАБИНА: Додатковий текст для дітей віком 6 років

Основний текст для дітей віком 7 та 8 років

| № | Питання                                                                        | Відповідь                                                                                                                                                                | Бали |
|---|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1 | Які фруктови дерева росли у садочку у діда?                                    | Яблуні, груші та сливи<br>MIN 2! Якщо дитина називає тільки один вид дерева, питаємо «Щось ще?» Якщо називає додатково інші дерева, то це не впливає на кількість балів. |      |
| 2 | Чий батьком є дідусь Михайла?                                                  | Мами Михайла                                                                                                                                                             |      |
| 3 | Коли Михайло найбільше любив відвідувати діда?                                 | Літом, під час канікул, коли ростуть фрукти                                                                                                                              |      |
| 4 | Чому Михайло не так сильно полюбляв приїжджати до дідуса весною, як його мама? | Бо тоді не має фруктів, а він дуже любить їсти фрукти; бо фрукти весною ще не дозріли<br>Повинна бути хоча б одна відповідь, що відноситься до споживання фруктів        |      |
| 5 | Звідки Михайло міг брати фрукти?                                               | З землі, з-під дерева, з трави, ті, що впали<br>Якщо відповідь - з нижніх гілок, то дитина отримує 0 балів                                                               |      |
|   |                                                                                | Сума балів                                                                                                                                                               |      |

Текст 4 Каяки

То був початок травня. Одного разу у школі Аня та Оля дізналися про дитячий табір біля озера. Там дітей навчали плавати на каяках, вузьких човнах. Оже ті, хто планував їхати у табір, мусли бути досить сильними, щоб могли веслувати. Також дівчатам повідомили, що слід отримати дозвіл від батьків на участь у таборі. Підписані дозволи слід віддати до кінця шкільного року.

Повертаючись додому, дівчата обговорювали плани на літо. Справді, раніше жодна з дівчат не плавала на човнах, проте обидві чули, що це дуже цікаво та захоплююче. Дівчата вирішили, що вони поїдуть разом і тішилися, що на них чекають цікаві пригоди попереду. Вони вже майже дійшли до своїх домівок, планували показати батькам листівки та попросити дозвіл записатися до табору. Раптово Аня зупинилася і крикнула: "Нічого з того не вийде. Подивись! Тут написано, що треба вміти плавати". Але Оля не хотіла здаватися і швидко запропонувала: "Ходімо швиденько додому і візьмемо гроші з наших скарбничок, і тоді мерщій запишемося на плавання. Я бачила оголошення про набір на курс плавання. Він не був дуже дорогим. Коли ми навчимося плавати, тоді зможемо записатися до табору".

Т4 Каяки: Додатковий текст для дітей віком 6 років

Основний текст для дітей віком 7 та 8 років

| № | Питання                                                                                             | Відповідь                                                                                                                                               | Бали |
|---|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1 | Чому для плавання на каяках треба мати багато сили?                                                 | Для того, щоб могла веслувати, бо треба веслувати, щоб мати сили веслувати<br>Якщо дитина у відповіді не згадає про веслування, то слід надати 0 балів. |      |
| 2 | Звідки Аня довідалася, що для того, щоб потрапити до табору, треба вміти плавати?                   | З листівки, з реклами, бо так було написано в рекламі<br>Якщо відповідь – вона почула про це на зібранні пластунів, то отримує 0 балів                  |      |
| 3 | Що дівчатка вирішили зробити, коли повернулися додому, щойно довідалися, що їм треба вміти плавати? | Показати листівки батькам, попросити батьків дати згоду на виїзд, запитати батьків                                                                      |      |
| 4 | На що дівчата вирішили витратити свої заощадження?                                                  | На басейн, на карту для плавання, на навчання для плавання                                                                                              |      |

|   |                                            |                                                                                                         |  |
|---|--------------------------------------------|---------------------------------------------------------------------------------------------------------|--|
|   |                                            | Відповідь: на табір, на каяки, на канюли – 0 балів                                                      |  |
| 5 | До якого числа можна записатися до табору? | До кінця шкільного року, до кінця червня, до канікул, поки вистачить місць, поки не буде повного списку |  |
|   |                                            | Сума балів                                                                                              |  |

Текст 5 Фенек

Фенек – це маленький хижий звір, якого іноді називають пустинною лисицею. Найбільше представників цього виду живуть у пустелі Сахара. У дорослих фенеків хутро світло руде, як у лисиці. Фенек є значно меншим за розміром і має довші вуха, які служать йому не тільки для слуху, але й для охолодження тіла. Фенкі мешкають в норах, викопаних в пісках. Головна нора вимощена рослинами та пір'ям птахів. З неї виходять декілька коридорів. Завдяки цьому у разі небезпеки, тварини можуть втекти. Фенек удень спить, а вночі полює. Полює на комах, ящірок та малих птахів. Вони також їдять рослини, які для них є джерелом води, що дає їм змогу вижити у пустелі.

Т5 Фенек: Додатковий текст для дітей віком 7 та 8 років

| № | Питання                             | Відповідь                                                                                                                                                     | Бали |
|---|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1 | Де мешкає найбільше фенеків?        | У Сахарі/у пустелі/в Африці<br>Не задавати додаткових питань                                                                                                  |      |
| 2 | Чим відрізняються фенкі від лисиць? | Вони менші і мають більші вуха<br>МІН 2! Якщо дитина подає лише одну відповідь, то запитати: "Чимсь ще?"<br>Якщо називає інші ознаки, то це не впливає на бал |      |

|   |                                                                 |                                                                                           |  |
|---|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------|--|
| 3 | Окрім слуху, яку ще функцію виконують вуха у фенків?            | <b>Охолоджують тіло</b>                                                                   |  |
| 4 | Для чого фенек створює кілька підземних коридорів?              | <b>Щоб він міг втікти, щоб втікти</b><br>Відповідь: щоб сховатися (від хижаків) – 0 балів |  |
| 5 | Чому харчування рослинами є дуже важливим для пустинних лисиць? | <b>Джерело води, бо там є вода, щоб пити воду</b>                                         |  |
|   |                                                                 | <b>Сума балів</b>                                                                         |  |

## One-minute word reading task (MABEL)

|                                                                                   |                                            |
|-----------------------------------------------------------------------------------|--------------------------------------------|
|  | ЧИТАННЯ СЛІВ (1 ХВИЛИНА)<br>ТЕСТОВА КАРТКА |
|-----------------------------------------------------------------------------------|--------------------------------------------|

|     |      |       |
|-----|------|-------|
| я   | кум  | низ   |
| і   | лев  | рій   |
| ти  | ніс  | тут   |
| як  | рот  | дім   |
| ви  | око  | йод   |
| ні  | дід  | мед   |
| що  | вік  | шар   |
| на  | день | жук   |
| за  | пес  | мир   |
| ті  | хор  | світ  |
| чи  | рів  | шия   |
| ну  | м'яч | скат  |
| ми  | сон  | вода  |
| де  | оса  | зима  |
| по  | сом  | мама  |
| ох  | син  | тато  |
| їв  | віз  | сама  |
| від | рік  | мало  |
| для | тин  | рано  |
| під | рис  | літо  |
| сад | пik  | весна |
| кіт | так  | слово |
| сік | лід  | діло  |
| жар | сад  | кіно  |
| ріг | раз  | миша  |



ЧИТАННЯ СЛІВ (1 ХВИЛИНА)  
ТЕСТОВА КАРТКА

|     |      |       |
|-----|------|-------|
| я   | кум  | низ   |
| і   | лев  | рій   |
| ти  | ніс  | тут   |
| як  | рот  | дім   |
| ви  | око  | йод   |
| ні  | дід  | мед   |
| що  | вік  | шар   |
| на  | день | жук   |
| за  | пес  | мир   |
| ті  | хор  | світ  |
| чи  | рів  | шия   |
| ну  | м'яч | скат  |
| ми  | сон  | вода  |
| де  | оса  | зима  |
| по  | сом  | мама  |
| ох  | син  | тато  |
| їв  | віз  | сама  |
| від | рік  | мало  |
| для | тин  | рано  |
| під | рис  | літо  |
| сад | пік  | весна |
| кіт | так  | слово |
| сік | лід  | діло  |
| жар | сад  | кіно  |
| ріг | раз  | миша  |



ЧИТАННЯ ПСЕВДОСЛІВ (1 ХВИЛИНА)  
ТЕСТОВА КАРТКА

|     |        |         |
|-----|--------|---------|
| ї   | чак    | твеча   |
| а   | шам    | сога    |
| ле  | кох    | мигр    |
| ав  | пат    | ломпа   |
| по  | шан    | поска   |
| би  | роч    | сига    |
| со  | луф    | силка   |
| ім  | гїк    | морфа   |
| ов  | рока   | шанан   |
| ар  | семо   | влаза   |
| кі  | пуль   | кофма   |
| лу  | муло   | шкани   |
| їк  | песла  | вират   |
| ог  | рело   | помната |
| зі  | мона   | оксо    |
| са  | веста  | вумка   |
| ру  | піно   | мочет   |
| кос | жедро  | щиска   |
| хом | вісня  | силот   |
| лез | стага  | мотсовь |
| роф | піль   | ловать  |
| кіх | пісож  | мерево  |
| їхо | кісок  | фочки   |
| зар | опінь  | нездо   |
| сао | крїтка | вапог   |



|        |          |           |
|--------|----------|-----------|
| далі   | свято    | країна    |
| ліво   | гомін    | фарба     |
| вухо   | кінець   | правда    |
| муха   | люди     | земля     |
| жаба   | чашка    | приклад   |
| нога   | зошит    | співати   |
| стеля  | ручка    | футбол    |
| звуки  | вечір    | щастя     |
| книга  | пісня    | дзвоник   |
| пісня  | кухня    | веселий   |
| вікно  | цукор    | джинси    |
| один   | цвях     | квартира  |
| місто  | заєць    | радість   |
| вечір  | третій   | приклад   |
| жнива  | листи    | цілком    |
| жито   | насіння  | говорити  |
| морж   | молоко   | президент |
| шепіт  | яблука   | оглядати  |
| голос  | телефон  |           |
| сніг   | вчитель  |           |
| чисто  | червоний |           |
| чайка  | трамвай  |           |
| річка  | поїздка  |           |
| свічка | сусідка  |           |
| надія  | друзі    |           |

## Маленька танцівниця

---

Оленка дуже любить музику і танці. Дівчинка кожного понеділка та четверга ходить на танці з подружкою. Їй дуже подобається її група та тренер, яка вчить їх танцювати. На заняттях завжди весело і цікаво. В групі шість дівчаток та сім хлопців. Діти гарно спілкуються один з одним. Сьогодні важливе тренування, тому що вони готуються до виступу. Концерт відбудеться за тиждень. Оленка дуже радіє, що батьки, бабуся та дідусь зможуть побачити її виступ.



UI

Відкриті питання:

---

1. Як звати героїню цього оповідання? [Олена]
2. З ким ходить дівчинка на тренування? [з подружкою]
3. Скільки дітей у танцювальній групі? [шість дівчаток та сім хлопців]
4. До чого готуються діти? [діти готуються до виступу/концерту]

## Цікавий світ книжок

---

Петро сьогодні з класом йде до міської бібліотеки. Діти зібралися рано в школі. Вчителька Олена Василівна з захопленням оповідала дітям про книги, а також про їх похід до бібліотеки. Спочатку клас поїхав автобусом до центру міста, а потім пішки дійшли до бібліотеки. Там їх зустріла дуже привітна та усміхнена бібліотекар. Вона запросила дітей і вчительку до затишної та світлої зали. Спочатку діти подивились короткий фільм про те, як створюють та друкують книги. Потім бібліотекар розказала, як правильно шукати книжки у бібліотеці, як слід позичати та повертати книжки. Петро дуже задоволений, тому що наприкінці усі діти отримали гарні розмальовки.



- 
1. Як звати героя цієї історії? [Петро]
  2. Як діти дісталися до бібліотеки? [діти приїхали автобусом, а потім пішки діставалися до бібліотеки]
  3. Хто зустрів дітей в бібліотеці? [бібліотекар]
  4. Що отримали діти наприкінці зустрічі? [діти отримали розмальовки]

## Appendix K: Testing materials in Polish

### PA blending (MABEL)

|                                                                                   |                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------|
|  | <b>SYNTEZA FONEMOWA</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|--------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka (kod):   |  | Płeć: |  | Wiek (lata i miesiące): |  |
| Nazwa szkoły (kod): |  |       |  | Grupa wiekowa/klasa:    |  |



Postępuj ściśle według procedury przedstawionej w dokumencie „Synteza fonemowa – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

Badanie należy nagrywać.

Miej pod ręką obrazki potrzebne przy podawaniu instrukcji (DOM, MYSZ).

Zapisz dokładnie każdą odpowiedź dziecka, niezależnie od tego, czy jest prawidłowa czy nieprawidłowa.

Przerwij badanie, kiedy dziecko popełni sześć błędów pod rząd. Błąd oznacza tutaj taką odpowiedź, w której dziecko nie wymienia ani jednego fonemu, jaki występuje w analizowanym słowie.

*\*Krótką wersję testu, dla dzieci w zerówce, zakończ na pozycji 10.*

#### SYNTEZA FONEMOWA

| Pozycja |       |        | Odpowiedź dziecka | Wynik<br>1/0 |
|---------|-------|--------|-------------------|--------------|
| 1       | o-n   | (on)   |                   |              |
| 2       | m-a   | (ma)   |                   |              |
| 3       | c-o   | (co)   |                   |              |
| 4       | i-ć   | (idź)  |                   |              |
| 5       | l-e-f | (lew)  |                   |              |
| 6       | d-a-h | (dach) |                   |              |
| 7       | s-e-r | (ser)  |                   |              |
| 8       | r-a-k | (rak)  |                   |              |
| 9       | u-h-o | (ucho) |                   |              |
| 10*     | o-s-a | (osa)  |                   |              |

|    |                |         |  |  |
|----|----------------|---------|--|--|
| 11 | <b>g-r-a</b>   | (gra)   |  |  |
| 12 | <b>w-o-d-a</b> | (woda)  |  |  |
| 13 | <b>l-a-t-o</b> | (lato)  |  |  |
| 14 | <b>b-u-t-y</b> | (buty)  |  |  |
| 15 | <b>r-y-b-a</b> | (ryba)  |  |  |
| 16 | <b>k-u-r-a</b> | (kura)  |  |  |
| 17 | <b>s-ł-o-ń</b> | (słoń)  |  |  |
| 18 | <b>p-t-a-k</b> | (ptak)  |  |  |
| 19 | <b>k-r-u-l</b> | (król)  |  |  |
| 20 | <b>h-l-e-p</b> | (chleb) |  |  |
| 21 | <b>s-t-u-ł</b> | (stół)  |  |  |
| 22 | <b>p-a-r-k</b> | (park)  |  |  |
| 23 | <b>k-o-ś-ć</b> | (kość)  |  |  |
| 24 | <b>t-o-r-t</b> | (tort)  |  |  |

|                                                            |            |                                                           |            |
|------------------------------------------------------------|------------|-----------------------------------------------------------|------------|
| <b>Suma poprawnych<br/>odpowiedzi<br/>(wersja krótka):</b> | <b>/10</b> | <b>Suma poprawnych<br/>odpowiedzi<br/>(wersja długa):</b> | <b>/24</b> |
|------------------------------------------------------------|------------|-----------------------------------------------------------|------------|

## PA isolation (MABEL)

|                                                                                   |                                                                |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------|
|  | <b>WYODRĘBNIANIE FONEMÓW</b><br><b>Arkusz wyników - NAGŁOS</b> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka (kod):   |  | Płeć: |  | Wiek (lata i miesiące): |  |
| Nazwa szkoły (kod): |  |       |  | Grupa wiekowa/klasa     |  |


 Rekomendujemy nagrywanie badania.  
 Jeśli powtórzenie wyrazu lub oczekiwana odpowiedź są niezgodne z kluczem, zapisz je.  
 Przerwij badanie dziecko popełni cztery błędy pod rząd w danej serii 8 pozycji testowych i przejdź do kolejnej serii.

### NAGŁOS – seria 1

| Wyrazy CVC        | Transkrypcja powtórzenia | Oczeki-<br>wana odp. | Transkrypcja odpowiedzi | Punkty 2/1/0 |
|-------------------|--------------------------|----------------------|-------------------------|--------------|
| zyk /zɪk/         |                          | /z/                  |                         |              |
| nar /nar/         |                          | /n/                  |                         |              |
| rot /rɔt/         |                          | /r/                  |                         |              |
| łech /wɛx/        |                          | /w/                  |                         |              |
| wuk /vuk/         |                          | /v/                  |                         |              |
| pak /pak/         |                          | /p/                  |                         |              |
| hep /xɛp/         |                          | /x/                  |                         |              |
| luc /luts/        |                          | /l/                  |                         |              |
| CVC suma punktów: |                          |                      |                         | /16          |

### NAGŁOS – seria 2

| Wyrazy CCVC          | Transkrypcja powtórzenia | Oczeki-<br>wana odp. | Transkrypcja odpowiedzi | Punkty 2/1/0 |
|----------------------|--------------------------|----------------------|-------------------------|--------------|
| wrasz /vraʃ/         |                          | /v/                  |                         |              |
| słɛp /swɛp/          |                          | /s/                  |                         |              |
| glat /glat/          |                          | /g/                  |                         |              |
| prot /prɔt/          |                          | /p/                  |                         |              |
| bleh /blɛx/          |                          | /b/                  |                         |              |
| drusz /druʃ/         |                          | /d/                  |                         |              |
| klen /klɛn/          |                          | /k/                  |                         |              |
| tral /tral/          |                          | /t/                  |                         |              |
| CCVC suma punktów:   |                          |                      |                         | /16          |
| NAGŁOS suma punktów: |                          |                      |                         | /32          |

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**WYODRĘBNIANIE FONEMÓW**  
**Arkusze wyników - WYGŁOS**

Osoba badająca: .....

Data: .....

|                     |      |                        |
|---------------------|------|------------------------|
| ID dziecka (kod):   | Płeć | Wiek (lata i miesiące) |
| Nazwa szkoły (kod): |      | Grupa wiekowa/klasa    |


Rekomendujemy nagrywanie badania.

Jeśli powtórzenie wyrazu lub oczekiwana odpowiedź są niezgodne z kluczem, zapisz je.  
Przerwij badanie dziecko popełni cztery błędy pod rząd w danej serii 8 pozycji testowych i przejdź do kolejnej serii.

WYGŁOS – seria 3

| Wyrazy CVC        | Transkrypcja powtórzenia | Oczekiwana odp. | Transkrypcja odpowiedzi | Punkty 2/1/0 |
|-------------------|--------------------------|-----------------|-------------------------|--------------|
| kan /kan/         |                          | /n/             |                         |              |
| byr /bir/         |                          | /r/             |                         |              |
| zaf /zaf/         |                          | /f/             |                         |              |
| gos /xos/         |                          | /s/             |                         |              |
| tek /tek/         |                          | /k/             |                         |              |
| czel /tʃel/       |                          | /l/             |                         |              |
| wit /vit/         |                          | /t/             |                         |              |
| dum /dum/         |                          | /m/             |                         |              |
| CVC suma punktów: |                          |                 |                         | /16          |

WYGŁOS – seria 4

| Wyrazy CCVC          | Transkrypcja powtórzenia | Oczekiwana odp. | Transkrypcja odpowiedzi | Punkty 2/1/0 |
|----------------------|--------------------------|-----------------|-------------------------|--------------|
| dast /dast/          |                          | /t/             |                         |              |
| karsz /karʃ/         |                          | /l/             |                         |              |
| rump /rump/          |                          | /p/             |                         |              |
| hysk /hisk/          |                          | /k/             |                         |              |
| dolf /dɔlf/          |                          | /f/             |                         |              |
| szenc /ʃents/        |                          | /ʃs/            |                         |              |
| torn /tɔrm/          |                          | /m/             |                         |              |
| więć /viɛʦ/          |                          | /ʦ/             |                         |              |
| CCVC suma punktów:   |                          |                 |                         | /16          |
| WYGŁOS suma punktów: |                          |                 |                         | /32          |



**WYODRĘBNIANIE FONEMÓW**  
**Arkusze wyników**

Zapisz wynik dla NAGŁOSU (seria 1 + 2) | WYGŁOSU (seria 3 + 4) oraz ich sumę.

| NAGŁOS                   | WYGŁOS                   | SUMA                          |
|--------------------------|--------------------------|-------------------------------|
| Poprawność (seria 1 +2)  | Poprawność (seria 1 +2)  | Poprawność (seria 1 +2 +3 +4) |
| Wynik surowy (max. = 32) | Wynik surowy (max. = 32) | Wynik surowy (max. = 64)      |

## PA deletion (MABEL)

|                                                                                   |                                                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------|
|  | <b>USUWANIE FONEMÓW</b><br><b>Arkusz wyników - NAGŁOS</b> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka (kod):   |  | Płeć: |  | Wiek (lata i miesiące): |  |
| Nazwa szkoły (kod): |  |       |  | Grupa wiekowa/klasa:    |  |



Uruchom stoper kiedy tylko dziecko zaczyna wypowiadać pierwszą odpowiedź w danej serii.  
Zatrzymaj stoper jak tylko dziecko skończy udzielać odpowiedzi na ostatnie, piąte słowo w danej serii.  
 Jeśli dziecko udzieli odpowiedzi innej niż oczekiwana, zapisz ją w arkuszu.

### NAGŁOS – seria 1

| Item  | Transkrypcja powtórzenia | Oczekiwana odp. | Transkrypcja odpowiedzi | Punkty 2/1/0 |
|-------|--------------------------|-----------------|-------------------------|--------------|
| rof   |                          | of              |                         |              |
| bap   |                          | ap              |                         |              |
| dus   |                          | us              |                         |              |
| pek   |                          | ek              |                         |              |
| wun   |                          | un              |                         |              |
| Czas: | sekund                   | Liczba punktów: |                         | /10          |

### NAGŁOS – seria 2

| Item  | Transkrypcja powtórzenia | Oczekiwana odp. | Transkrypcja odpowiedzi | Punkty 2/1/0 |
|-------|--------------------------|-----------------|-------------------------|--------------|
| spek  |                          | pek             |                         |              |
| prasz |                          | rasz            |                         |              |
| blon  |                          | lon             |                         |              |
| klet  |                          | let             |                         |              |
| tryn  |                          | ryn             |                         |              |
| Czas: | sekund                   | Wynik:          |                         | /10          |

|                          |        |                                      |     |
|--------------------------|--------|--------------------------------------|-----|
| Czas suma (seria 1 + 2): | sekund | Liczba punktów — suma (seria 1 + 2): | /20 |
|--------------------------|--------|--------------------------------------|-----|

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**PHONEME DELETION TASK**  
**Arkuszy wyników - WYGLĄS**

Administrator: ..... Date: .....

|                            |             |                                  |
|----------------------------|-------------|----------------------------------|
| <b>Child's ID: (code)</b>  | <b>Sex:</b> | <b>Age (years &amp; months):</b> |
| <b>School Name (code):</b> |             | <b>Year Group/Grade:</b>         |

Start your stopwatch as you pronounce the first test item of the block.  
 Stop your stopwatch as the child finishes pronouncing the final answer of the block.  
 Transcribe the child's repetition and response, if different from the expected correct response.  
 Do NOT discontinue the task.

**CODAS – Block 3**

| Item         | Transkrypcja powtórzenia | Oczekiwana odp.    | Transkrypcja odpowiedzi | Score 2/1/0 |
|--------------|--------------------------|--------------------|-------------------------|-------------|
| kon          |                          | (ko)               |                         |             |
| bur /bor/    |                          | (bu)               |                         |             |
| szol /ʃɔl/   |                          | (ʃɔ)               |                         |             |
| czan /tʃan/  |                          | (tʃa)              |                         |             |
| ficz /tʃiʃ/  |                          | (fi)               |                         |             |
| <b>Czas:</b> | sekund                   | <b>Poprawność:</b> |                         | /10         |

**CODAS – Block 4**

| Item                            | Transkrypcja powtórzenia | Transkrypcja odpowiedzi | Score 2/1/0                                 |
|---------------------------------|--------------------------|-------------------------|---------------------------------------------|
| sonr /sonr/                     |                          | (son)                   |                                             |
| kest /kest/                     |                          | (kess)                  |                                             |
| szoll /ʃoll/                    |                          | (sholl)                 |                                             |
| nass /nass/                     |                          | (nass)                  |                                             |
| hiks /hiks/                     |                          | (hick)                  |                                             |
| <b>Czas:</b>                    | sekund                   | <b>Wynik:</b>           | /10                                         |
| <b>Czas suma (seria 3 + 4):</b> |                          | sekund                  | <b>Liczba punktów — suma (seria 3 + 4):</b> |
|                                 |                          |                         | /20                                         |

**USUWANIE FONEMÓW**  
**Podsumowanie wyników**

|                                              | CZAS | LICZBA PUNKTÓW |
|----------------------------------------------|------|----------------|
| NAGŁOS (seria 1 + 2)                         |      |                |
| WYGLĄS (seria 3 + 4)                         |      |                |
| <b>WYNIK OGÓLNY</b><br>(seria 1 + 2 + 3 + 4) |      |                |

## RAN colours (MABEL)<sup>3</sup>

|                                                                                   |                                                                                   |  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--|
|  | <b>SZYBKIE AUTOMATYCZNE NAZYWANIE<br/>(RAN) - KOLORY</b><br><b>Arkusz wyników</b> |  |
|                                                                                   |                                                                                   |  |

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka: (kod)   |  | Płeć: |  | wiek (lata i miesiące): |  |
| Nazwa szkoły: (kod) |  |       |  | Grupa wiekowa/klasa:    |  |


 Postępuj ściśle według procedury przedstawionej w dokumencie „RAN kolory – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).  
Uruchom stoper zaraz jak dziecko zaczyna nazywać pierwszy kolor.  
Zatrzymaj stoper zaraz jak dziecko kończy nazywać ostatni kolor.  
 Badanie należy nagrywać  
 W trakcie badania zaznacz wszystkie błędy na arkuszu wyników.  
 Pamiętaj, że błędy spontanicznie poprawione (autopoprawki) NIE są liczone jako błędy.

### RAN kolory 1

|                    |           |           |           |              |           |           |           |
|--------------------|-----------|-----------|-----------|--------------|-----------|-----------|-----------|
| czzerwony          | brązowy   | zielony   | niebieski | czarny       | zielony   | brązowy   | czarny    |
| zielony            | niebieski | czzerwony | czarny    | niebieski    | czzerwony | niebieski | brązowy   |
| czzerwony          | zielony   | brązowy   | czarny    | brązowy      | niebieski | czarny    | czzerwony |
| zielony            | czarny    | niebieski | czzerwony | zielony      | brązowy   | niebieski | zielony   |
| czzerwony          | brązowy   | czarny    | brązowy   | czzerwony    | niebieski | zielony   | czarny    |
| Czas (sek.) RAN 1: |           |           |           | Błędy RAN 1: |           |           |           |

### RAN kolory 2

|                    |           |           |           |               |           |           |           |
|--------------------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|
| zielony            | czarny    | czzerwony | niebieski | brązowy       | czzerwony | czarny    | brązowy   |
| czzerwony          | niebieski | zielony   | brązowy   | niebieski     | zielony   | niebieski | czarny    |
| zielony            | czzerwony | czarny    | brązowy   | czarny        | niebieski | brązowy   | zielony   |
| czzerwony          | brązowy   | niebieski | zielony   | czzerwony     | czarny    | niebieski | czzerwony |
| zielony            | czarny    | brązowy   | czarny    | zielony       | niebieski | czzerwony | brązowy   |
| Czas (sek.) RAN 2: |           |           |           | Błędy CZAS 2: |           |           |           |

<sup>3</sup> Testing cards for all RAN tasks (except for letters) and the vocabulary task are similar in all languages. They are presented once in the Ukrainian set of tests.

|                                                                                     |
|-------------------------------------------------------------------------------------|
| <b>SZYBKIE AUTOMATYCZNE NAZYWANIE (RAN) - KOLORY</b><br><b>Podsumowanie wyników</b> |
|-------------------------------------------------------------------------------------|

Zapisz oddzielnie wyniki pierwszej i drugiej próby jak również średnią obu tych wyników.

|                    | Czas<br>(w sekundach) | błędy |
|--------------------|-----------------------|-------|
| RAN KOLORY 1       |                       |       |
| RAN KOLORY 2       |                       |       |
| RAN KOLORY ŚREDNIA |                       |       |

## RAN digits (MABEL)

|                                                                                   |                                                                                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|  | <b>SZYBKIE AUTOMATYCZNE NAZYWANIE<br/>(RAN) - CYFRY</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka: (kod)   |  | Płeć: |  | wiek (lata i miesiące): |  |
| Nazwa szkoły: (kod) |  |       |  | Grupa wiekowa/klasa:    |  |



Postępuj ściśle według procedury przedstawionej w dokumencie „RAN cyfry – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

Uruchom stoper zaraz jak dziecko zaczyna nazywać pierwszą cyfrę.

Zatrzymaj stoper zaraz jak dziecko kończy nazywać ostatnią cyfrę.

Badanie należy nagrywać

W trakcie badania zaznacz wszystkie błędy na arkuszu wyników.

Pamiętaj, że błędy spontanicznie poprawione (autopoprawki) NIE są liczone jako błędy.

### RAN cyfry 1

|                    |          |          |        |              |          |          |          |
|--------------------|----------|----------|--------|--------------|----------|----------|----------|
| siedem             | dwa      | dziewięć | trzy   | sześć        | dziewięć | dwa      | sześć    |
| dziewięć           | trzy     | siedem   | sześć  | trzy         | siedem   | trzy     | dwa      |
| siedem             | dziewięć | dwa      | sześć  | dwa          | trzy     | sześć    | siedem   |
| dziewięć           | sześć    | trzy     | siedem | dziewięć     | dwa      | trzy     | dziewięć |
| siedem             | dwa      | sześć    | dwa    | siedem       | trzy     | dziewięć | sześć    |
| Czas (sek.) RAN 1: |          |          |        | Błędy RAN 1: |          |          |          |

### RAN cyfry 2

|                    |        |          |          |               |          |        |          |
|--------------------|--------|----------|----------|---------------|----------|--------|----------|
| dziewięć           | sześć  | siedem   | trzy     | dwa           | siedem   | sześć  | dwa      |
| siedem             | trzy   | dziewięć | dwa      | trzy          | dziewięć | trzy   | sześć    |
| dziewięć           | siedem | sześć    | dwa      | sześć         | trzy     | dwa    | dziewięć |
| siedem             | dwa    | trzy     | dziewięć | siedem        | sześć    | trzy   | siedem   |
| dziewięć           | sześć  | dwa      | sześć    | dziewięć      | trzy     | siedem | dwa      |
| Czas (sek.) RAN 2: |        |          |          | Błędy CZAS 2: |          |        |          |

|                                                                                    |
|------------------------------------------------------------------------------------|
| <b>SZYBKIE AUTOMATYCZNE NAZYWANIE (RAN) - CYFRY</b><br><b>Podsumowanie wyników</b> |
|------------------------------------------------------------------------------------|

Zapisz oddzielnie wyniki pierwszej i drugiej próby jak również średnią obu tych wyników.

|                   | Czas<br>(w sekundach) | błędy |
|-------------------|-----------------------|-------|
| RAN CYFRY 1       |                       |       |
| RAN CYFRY 2       |                       |       |
| RAN CYFRY ŚREDNIA |                       |       |

## RAN letters (MABEL)

|                                                                                   |                                                                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  | <b>SZYBKE AUTOMATYCZNE NAZYWANIE<br/>(RAN) - PRZEDMIOTY</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka: (kod)   |  | Płeć: |  | wiek (lata i miesiące): |  |
| Nazwa szkoły: (kod) |  |       |  | Grupa wiekowa/klasa:    |  |



Postępuj ściśle według procedury przedstawionej w dokumencie „RAN przedmioty – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

Uruchom stoper zaraz jak dziecko zaczyna nazywać pierwszy rysunek.

Zatrzymaj stoper zaraz jak dziecko kończy nazywać ostatni rysunek.

W trakcie badania zaznacz wszystkie błędy na arkuszu wyników.

Pamiętaj, że błędy spontanicznie poprawione (autopoprawki) NIE są liczone jako błędy.

### RAN przedmioty 1

|                    |       |      |       |              |       |       |       |
|--------------------|-------|------|-------|--------------|-------|-------|-------|
| lew                | pies  | oko  | stół  | klucz        | stół  | oko   | klucz |
| pies               | klucz | lew  | oko   | klucz        | pies  | stół  | pies  |
| lew                | oko   | stół | lew   | pies         | klucz | oko   | lew   |
| oko                | stół  | pies | klucz | stół         | lew   | klucz | oko   |
| stół               | lew   | stół | pies  | oko          | pies  | klucz | lew   |
| Czas (sek.) RAN 1: |       |      |       | Błędy RAN 1: |       |       |       |

### RAN przedmioty 2

|                    |       |       |      |               |       |      |       |
|--------------------|-------|-------|------|---------------|-------|------|-------|
| stół               | lew   | klucz | oko  | pies          | klucz | lew  | stół  |
| klucz              | stół  | oko   | lew  | pies          | lew   | oko  | klucz |
| lew                | oko   | stół  | pies | klucz         | oko   | stół | pies  |
| oko                | klucz | pies  | stół | lew           | klucz | pies | lew   |
| stół               | oko   | lew   | pies | oko           | pies  | stół | klucz |
| Czas (sek.) RAN 2: |       |       |      | Błędy CZAS 2: |       |      |       |



**SZYBKIE AUTOMATYCZNE NAZYWANIE  
(RAN) - LITERY**  
**Arkusz wyników**

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka: (kod)   |  | Płeć: |  | wiek (lata i miesiące): |  |
| Nazwa szkoły: (kod) |  |       |  | Grupa wiekowa/klasa:    |  |

 Postępuj ściśle według procedury przedstawionej w dokumencie „RAN litery – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

Uruchom stoper zaraz jak dziecko zaczyna nazywać pierwszą literę.

Zatrzymaj stoper zaraz jak dziecko kończy nazywać ostatnią literę.

Badanie należy nagrywać

W trakcie badania zaznacz wszystkie błędy na arkuszu wyników.

Pamiętaj, że błędy spontanicznie poprawione (autopoprawki) NIE są liczone jako błędy.

### RAN litery 1

|                    |   |   |   |              |   |   |   |
|--------------------|---|---|---|--------------|---|---|---|
| p                  | a | o | s | d            | o | a | d |
| o                  | s | p | d | s            | p | s | a |
| p                  | o | a | d | a            | s | d | p |
| o                  | d | s | p | o            | a | s | o |
| p                  | a | d | a | p            | s | o | d |
| Czas (sek.) RAN 1: |   |   |   | Błędy RAN 1: |   |   |   |

### RAN litery 2

|                    |   |   |   |               |   |   |   |
|--------------------|---|---|---|---------------|---|---|---|
| o                  | d | p | s | a             | p | d | a |
| p                  | s | o | a | s             | o | s | d |
| o                  | p | d | a | d             | s | a | o |
| p                  | a | s | o | p             | d | s | p |
| o                  | d | a | d | o             | s | p | a |
| Czas (sek.) RAN 2: |   |   |   | Błędy CZAS 2: |   |   |   |

|                                                                                     |
|-------------------------------------------------------------------------------------|
| <b>SZYBKIE AUTOMATYCZNE NAZYWANIE (RAN) - LITERY</b><br><b>Podsumowanie wyników</b> |
|-------------------------------------------------------------------------------------|

Zapisz oddzielnie wyniki pierwszej i drugiej próby jak również średnią obu tych wyników.

|                    | Czas<br>(w sekundach) | błędy |
|--------------------|-----------------------|-------|
| RAN LITERY 1       |                       |       |
| RAN LITERY 2       |                       |       |
| RAN LITERY ŚREDNIA |                       |       |



## RAN objects (MABEL)

|                                                                                   |                                                                                       |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  | <b>SZYBKIE AUTOMATYCZNE NAZYWANIE<br/>(RAN) - PRZEDMIOTY</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka: (kod)   |  | Płeć: |  | wiek (lata i miesiące): |  |
| Nazwa szkoły: (kod) |  |       |  | Grupa wiekowa/klasa:    |  |



Postępuj ściśle według procedury przedstawionej w dokumencie „RAN przedmioty – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

**Uruchom** stoper zaraz jak dziecko zaczyna nazywać pierwszy rysunek.

**Zatrzymaj** stoper zaraz jak dziecko kończy nazywać ostatni rysunek.

W trakcie badania zaznacz wszystkie błędy na arkuszu wyników.

Pamiętaj, że błędy spontanicznie poprawione (autopoprawki) **NIE** są liczone jako błędy.

### RAN przedmioty 1

|                    |       |      |       |              |       |       |       |
|--------------------|-------|------|-------|--------------|-------|-------|-------|
| lew                | pies  | oko  | stół  | klucz        | stół  | oko   | klucz |
| pies               | klucz | lew  | oko   | klucz        | pies  | stół  | pies  |
| lew                | oko   | stół | lew   | pies         | klucz | oko   | lew   |
| oko                | stół  | pies | klucz | stół         | lew   | klucz | oko   |
| stół               | lew   | stół | pies  | oko          | pies  | klucz | lew   |
| Czas (sek.) RAN 1: |       |      |       | Błędy RAN 1: |       |       |       |

### RAN przedmioty 2

|                    |       |       |      |               |       |      |       |
|--------------------|-------|-------|------|---------------|-------|------|-------|
| stół               | lew   | klucz | oko  | pies          | klucz | lew  | stół  |
| klucz              | stół  | oko   | lew  | pies          | lew   | oko  | klucz |
| lew                | oko   | stół  | pies | klucz         | oko   | stół | pies  |
| oko                | klucz | pies  | stół | lew           | klucz | pies | lew   |
| stół               | oko   | lew   | pies | oko           | pies  | stół | klucz |
| Czas (sek.) RAN 2: |       |       |      | Błędy CZAS 2: |       |      |       |

**SZYBKIE AUTOMATYCZNE NAZYWANIE (RAN) - PRZEDMIOTY**  
**Podsumowanie wyników**

Zapisz oddzielnie wyniki pierwszej i drugiej próby jak również średnią obu tych wyników.

|                        | Czas<br>(w sekundach) | błędy |
|------------------------|-----------------------|-------|
| RAN PRZEDMIOTY 1       |                       |       |
| RAN PRZEDMIOTY 2       |                       |       |
| RAN PRZEDMIOTY ŚREDNIA |                       |       |

## Letter naming (MABEL)

|                                                                                   |                                                                   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|
|  | <b>ZNAJOMOŚĆ LITER – NAZYWANIE LITER</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka: (kod)   |  | Płeć: |  | wiek (lata i miesiące): |  |
| Nazwa szkoły: (kod) |  |       |  | Grupa wiekowa/klasa:    |  |

- Postępuj ściśle według procedury przedstawionej w dokumencie „*Nazywanie liter – instrukcje badania i obliczania wyników*”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).
- Badanie należy nagrywać.
- Wyniki oblicz oddzielnie dla znajomości dźwięków liter oraz ich nazw.
- Dla każdej poprawnej odpowiedzi zaznacz ✓ odpowiednio w kolumnie *dźwięk* lub *nazwa*.
- W przypadku błędnej odpowiedzi zaznacz ✖, w przypadku autopoprawki zaznacz **AP**, a jeśli dziecko nie udzieli odpowiedzi postaw kreskę —
- Jeśli dziecko popełni błąd, zapisz dokładnie co powiedziało w kolumnie **Odp.**
- Oblicz wyniki dla znajomości dźwięków i nazw wszystkich 32 liter polskiego alfabetu, włączając w to litery stanowiące inicjały dziecka.
- Jeśli dziecko waha się z udzieleniem odpowiedzi zachęć go, żeby kontynuowało — ale nie podpowiadaj.
- Przerwij badanie, jeśli dziecko **w ogóle nie jest w stanie nazwać 5 kolejnych liter**, podając błędnie **zarówno ich dźwięki jak i nazwy** — lub **nie udzielając odpowiedzi**.
- UWAGA: Jeśli w kolumnach *dźwięk* i *nazwa* wymienione są alternatywne poprawne odpowiedzi, to podanie tylko jednej z nich wystarczy, aby uznać odpowiedź za prawidłową (1 punkt).

**mabel**

**ZNAJOMOŚĆ LITER – NAZYWANIE LITER**  
Arkusz wyników

| litera              | Małe litery     |                  |      |                |
|---------------------|-----------------|------------------|------|----------------|
|                     | Dźwięk<br>✓ / ✗ | Nazwa<br>✓ / ✗   | Item | Nazwa<br>✓ / ✗ |
| Inicjał<br>imienia  |                 |                  | p    | p              |
| Inicjał<br>nazwiska |                 |                  | ó    | u              |
| a                   | a               | a                | b    | b              |
| m                   | m               | em               | w    | wu             |
| o                   | o               | o                | ę    | ę              |
| l                   | l               | el               | ł    | el             |
| i                   | i               | i                | g    | gie            |
| t                   | t               | te               | ą    | ą              |
| e                   | e               | e                | c    | ce             |
| d                   | d               | de               | f    | cf             |
| y                   | y               | y (lub<br>ygrek) | z    | zet            |
| k                   | k               | ka               | ś    | ś              |
| u                   | u               | u                | ż    | ż              |
| j                   | j               | jot              | ć    | ć              |
| n                   | n               | en               | h    | ha             |
| r                   | r               | er               | ż    | ż              |
| s                   | s               | es               | ń    | ń              |

**mabel**

**ZNAJOMOŚĆ LITER – NAZYWANIE LITER**  
Arkusz wyników

| litera              | Małe litery     |                |      |                |
|---------------------|-----------------|----------------|------|----------------|
|                     | Dźwięk<br>✓ / ✗ | Nazwa<br>✓ / ✗ | Item | Nazwa<br>✓ / ✗ |
| Inicjał<br>imienia  |                 |                | P    | P              |
| Inicjał<br>nazwiska |                 |                | Ó    | u              |
| A                   | a               | a              | B    | b              |
| M                   | m               | em             | W    | wu             |
| O                   | o               | o              | Ę    | ę              |
| L                   | l               | el             | Ł    | el             |
| I                   | i               | i              | G    | gie            |
| T                   | t               | te             | Ą    | ą              |
| E                   | e               | e              | C    | ce             |
| D                   | d               | de             | F    | cf             |
| Y                   | y               | y<br>ygrek     | Z    | zet            |
| K                   | k               | ka             | Ś    | ś              |
| U                   | u               | u              | Ż    | ż              |
| J                   | j               | jot            | Ć    | ć              |
| N                   | n               | en             | H    | ha             |
| R                   | r               | er             | Ż    | ż              |
| S                   | s               | es             | Ń    | ń              |

# Vocabulary test. Test Rozwoju Językowego TRJ (Smoczyńska et. al. 2015)

STRON

## 3. SŁOWNIK - PRODUKCJA SŁÓW

| NR                                     | WYRAZ      | PYTANIE       | ODPOWIEDŹ | PUNKTY |
|----------------------------------------|------------|---------------|-----------|--------|
| P1                                     | skacze     | Co on robi?   |           |        |
| 1                                      | mierzy     | Co on robi?   |           |        |
| 2                                      | doi        | Co on robi?   |           |        |
| 3                                      | grabi      | Co ona robi?  |           |        |
| 4                                      | trzępie    | Co on robi?   |           |        |
| 5                                      | dyryguje   | Co on robi?   |           |        |
| 6                                      | pruje      | Co ktoś robi? |           |        |
| P2                                     | komin      | Co to jest?   |           |        |
| 7                                      | kaktus     | Co to jest?   |           |        |
| 8                                      | bóbr       | Co to jest?   |           |        |
| 9                                      | pustynia   | Co to jest?   |           |        |
| 10                                     | wodospad   | Co to jest?   |           |        |
| 11                                     | waga       | Co to jest?   |           |        |
| 12                                     | muchomor   | Co to jest?   |           |        |
| 13                                     | koala      | Co to jest?   |           |        |
| 14                                     | wiosło     | Co to jest?   |           |        |
| 15                                     | hamak      | Co to jest?   |           |        |
| 16                                     | żagiel     | Co to jest?   |           |        |
| 17                                     | kompas     | Co to jest?   |           |        |
| 18                                     | komar      | Co to jest?   |           |        |
| 19                                     | dzięcioł   | Co to jest?   |           |        |
| UWAGA: w zadaniu nr 20 zmiana pytania! |            |               |           |        |
| 20                                     | weterynarz | Kto to jest?  |           |        |
| 21                                     | termos     | Co to jest?   |           |        |
| 22                                     | szalasz    | Co to jest?   |           |        |
| 23                                     | kusza      | Co to jest?   |           |        |
| 24                                     | ponton     | Co to jest?   |           |        |
| 25                                     | manekin    | Co to jest?   |           |        |
| SUMA                                   |            |               |           |        |

Test Rozwoju Językowego

Prawa autorskie należą do IBE

# TEST POWTARZANIA PSEUDOSŁÓW

**ARKUSZ ODPOWIEDZI**

| <b>Imię i nazwisko dziecka</b> | <i>imię                      nazwisko</i> |  |   |                                                   |  |                                      |
|--------------------------------|-------------------------------------------|--|---|---------------------------------------------------|--|--------------------------------------|
| <b>Data urodzenia</b>          | □ □ □ □                                   |  | - | □ □ □ □<br>miesiąc           dzień                |  | <b>Płeć</b>                          |
| <b>Data badania</b>            | □ □ □ □                                   |  | - | □ □ □ □<br>miesiąc           dzień                |  | <input type="checkbox"/> dziewczynka |
| <b>Wiek</b>                    | □ □                                       |  | - | □ □ □ □<br>lata           miesiąc           dzień |  | <input type="checkbox"/> chłopiec    |

**OSOBA PRZEPROWADZAJĄCA BADANIE:**

UWAGI

## WYNIKI

[illegible]

Prawa autorskie należą do Instytutu Badań Edukacyjnych



**KAPITAŁ LUDZKI**  
NARODOWA STRATEGIA SPÓJNOŚCI



IBF



UNIA EUROPEJSKA  
EUROPEJSKI  
FUNDUSZ SPOŁECZNY

| A  | PSEUDOSŁOWO  | ODPOWIEDZI POPRAWNE (1 PKT) – PODKREŚLIĆ | ODPOWIEDŹ INNA (0 PKT) – WPISAĆ | PUNKTY |
|----|--------------|------------------------------------------|---------------------------------|--------|
| 1  | TOMNY        | tomny                                    |                                 |        |
| 2  | NADEK        | nadek                                    |                                 |        |
| 3  | LICHOĆ       | lichoć                                   |                                 |        |
| 4  | SKFITE       | skfite                                   |                                 |        |
| 5  | GODZIEŃ      | godzenie                                 |                                 |        |
| 6  | DŁONIŁA      | dłoniła                                  |                                 |        |
| 7  | PLACKIEMNICH | plackiemnich                             |                                 |        |
| 8  | WYSOKOJEJ    | wysokojej                                |                                 |        |
| 9  | POZUMIONCY   | pozumioncy                               |                                 |        |
| 10 | CIONOWISKO   | cionowisko                               |                                 |        |
| 11 | JECHAMOGNIE  | jechamognie                              |                                 |        |
| 12 | ZGOTATKE     | zgotatke                                 |                                 |        |
| 13 | BOBYTUFKA    | bobytufka                                |                                 |        |

| B              | PSEUDOSŁOWO     | ODPOWIEDZI POPRAWNE (1 PKT) – PODKREŚLIĆ                              | ODPOWIEDŹ INNA (0 PKT) – WPISAĆ | PUNKTY |
|----------------|-----------------|-----------------------------------------------------------------------|---------------------------------|--------|
| 14             | TRUWNYM         | truwnym    tluwnym    tjuwnym                                         |                                 |        |
| 15             | POCZYŁ          | poczył    pocył                                                       |                                 |        |
| 16             | MOŻONT          | możont    mozont                                                      |                                 |        |
| 17             | RAMEGO          | ramego    lamego    jamego                                            |                                 |        |
| 18             | KRUCISKU        | krucisku    klucisku    kjucisku                                      |                                 |        |
| 19             | TYTECZNIE       | tytecznie    tytecznie                                                |                                 |        |
| 20             | PIERAWOWIE      | pierawowie    pielawowie    piejawowie                                |                                 |        |
| 21             | ARAGNIENIA      | aragnienia    alagnienia    ajagnienia                                |                                 |        |
| 22             | OTPARASTAK      | otparastak    otpalastak    otpajastak                                |                                 |        |
| 23             | STRASUPEŁA      | strasupeła    stlasupeła    stjasupeła                                |                                 |        |
| 24             | DLATECZNYCHY    | dlatecznychy    dlatecnichy                                           |                                 |        |
| 25             | SZFAŁYMACHAJ    | szfałymachaj    sfałymachaj                                           |                                 |        |
| 26             | OCZYNUCI        | oczynuci    ocynuci                                                   |                                 |        |
| 27             | UPSZEDZIEFCZYCH | upszedziefczych    upsedziefcych    upsedziefczych    upszedziefczych |                                 |        |
| SUMA (1 – 27): |                 |                                                                       |                                 |        |

## Sentence repetition test. Test rozwoju językowego TRJ (Smoczyńska et. al. 2015)

### 2. GRAMATYKA - POWTARZANIE ZDAŃ

| NR | ZDANIE I ODPOWIEDŹ                       | PUNKTY |
|----|------------------------------------------|--------|
| P1 | Julka ma kolorowy parasol.               |        |
| P2 | Pingwiny są świetnymi pływakami.         |        |
| P3 | Helenka nie lubi chodzić w kaloszach.    |        |
| P4 | Krzyś musi odebrać brata z przedszkola.  |        |
| 1  | Mama robi pierogi z jagodami.            |        |
| 2  | Ściany są pomalowane na żółto.           |        |
| 3  | Dzieci pojedą na wycieczkę do lasu.      |        |
| 4  | Antek będzie pił gorące kakao.           |        |
| 5  | Ania poszła do parku zbierać kasztany.   |        |
| 6  | Marek miał cukierka, ale go nie zjadł.   |        |
| 7  | Oni mogą jeść lody z owocami.            |        |
| 8  | Babcia musiała pojechać do sklepu.       |        |
| 9  | Sandały są schowane pod łóżkiem.         |        |
| 10 | Ona nie mogła jeździć na rowerze.        |        |
| 11 | Wojtek nie chce pisać listu do kolegi.   |        |
| 12 | Auto zostało umyte przez wujka.          |        |
| 13 | Kasia nie będzie śpiewać piosenki.       |        |
| 14 | On nie będzie szukał skarpetek w szafie. |        |
| 15 | Michał patrzy, jak pan maluje podłogę.   |        |
| 16 | Kanapa została zniszczona przez psa.     |        |



| PO ZADANIU NR 16 ROBIMY KRÓTKĄ PRZERWĘ! |                                                       | PUNKTY |
|-----------------------------------------|-------------------------------------------------------|--------|
| 17                                      | Radek będzie mógł grać na komputerze.                 |        |
| 18                                      | Zosia myśli, że w rzece jest zimna woda.              |        |
| 19                                      | To jest ten obraz, który namalowała Ewa.              |        |
| 20                                      | Krzesło, na którym siedzi dziadek, jest zepsute.      |        |
| 21                                      | Ciocia wpadła na pomysł, żeby urządzić bal.           |        |
| 22                                      | Buty, które wybrała Klaudia, są za małe.              |        |
| 23                                      | Kuba znalazł czapkę, którą zgubiła babcia.            |        |
| 24                                      | Sonia prosi tatę, żeby jej kupił komputer.            |        |
| 25                                      | Idziemy do piekarni, w której jest świeży chleb.      |        |
| 26                                      | Zuzia karmi psa, którego dostał Mateusz.              |        |
| 27                                      | Marcin był zły na siostrę, bo mu złamała kredkę.      |        |
| 28                                      | Zupa, którą ugotował tata, jest pyszna.               |        |
| 29                                      | To jest ten pan, którego zaprosili rodzice.           |        |
| 30                                      | Obietnica nagrody zachęca nas do pracy.               |        |
| 31                                      | Natalia mieszka w bloku, przy którym jest plac zabaw. |        |
| 32                                      | Piotr pożycza bratu plecak, kiedy on go potrzebuje.   |        |
| 33                                      | Pan, do którego dzwonił tata, bardzo nam pomógł.      |        |
| 34                                      | Mama nie zagra z Magdą, dopóki ona jej nie przeprosi. |        |
| SUMA                                    |                                                       |        |

**Language development test: Listening comprehension subtest.  
Test rozwoju językowego TRJ (Smoczyńska et. al. 2015).**



Magdalena Smoczyńska, Ewa Haman, Agnieszka Maryniak, Ewa Czaplewska, Grzegorz Krajewski,  
Natalia Banasik, Magdalena Kochańska, Magdalena Łuniewska

## **TEST ROZWOJU JĘZYKOWEGO TRJ PODTEST: DYSKURS – ROZUMIENIE TEKSTÓW**

Tablic testowych TRJ można używać wyłącznie zgodnie z opisem zawartym w podręczniku.  
Niedopuszczalne jest posługiwanie się tablicami w sposób odbiegający od instrukcji  
i do jakichkolwiek innych celów poza opisanymi w podręczniku.

Prawa autorskie należą do Instytutu Badań Edukacyjnych

### **TEKST 0**

Zbliżały się piąte urodziny Ewy. Dziewczynka powiedziała rodzicom, że w prezencie chce dostać dużo książek. Na przyjęcie urodzinowe zaprosiła troje przyjaciół: Magdę, Grzesia i Marcina. Przyjaciele pomyśleli, że kupią jej wspólny prezent – duże puzzle z dinozaurami. Będzie można je wspólnie ułożyć na urodzinach. W sobotę od rana Ewa pomagała mamie przy pieczeniu tortu, a tata pojechał kupić świeczki urodzinowe i lody dla gości. O czwartej po południu przyjaciele zadzwonili do drzwi, trzymając w rękach wielkie pudło. Widząc zapakowany prezent, Ewa zawołała: „Ojej, ale ogromna książka!”. Goście popatrzyli na siebie zdziwieni. Nie rozumieli, czemu Ewa tak powiedziała.

### **TEKST 1**

Franek dostał od cioci piękną książkę o dzikich zwierzętach, które żyją w Afryce. Chłopiec bardzo lubił zwierzęta, nawet miał swojego kota, któremu dał na imię Psotek. Franek nie umiał jeszcze czytać, ale codziennie oglądał w nowej książce zdjęcia żyraf, hipopotamów i słoni. W poniedziałek, gdy wrócił z przedszkola, jego książki nie było na półce, gdzie zawsze ją odkładał. Szukał wszędzie, ale nie mógł jej znaleźć. Nawet mama nie wiedziała, co się stało z jego książką. Zmartwiony chłopiec postanowił pobawić się z Psotkiem. Poszedł do niego. Kot leżał w swoim koszyku, a łapę trzymał na książce Franka. Była ona otwarta na zdjęciu przedstawiającym lwy. „Mamo – zawołał chłopiec – popatrz, Psotek chciał obejrzeć zdjęcia swoich afrykańskich kolegów!”.

## TEKST 2

Na wakacje Natalia pojechała w góry do cioci i wujka, którzy mają małe gospodarstwo. Dziewczynka często im pomaga opiekować się zwierzętami: lubi głaskać cielątka i owieczki, sama karmi króliki i kury. Pewnego dnia, gdy ciocia pojechała do miasta, wujek zabrał Natalię na wyprawę w góry. Szli wzdłuż strumienia, dookoła były wysokie skały. Nagle wujek zatrzymał się i wskazał duży kształt poruszający się wśród krzaków po drugiej stronie wody. Szepnął: „Bądź cicho, stój spokojnie”. Natalia obserwowała wielkie brązowe zwierzę, które powoli, nie patrząc na nich, poszło do góry i zniknęło między skałami. Kiedy ciocia wróciła do domu, Natalia opowiedziała jej o spotkaniu z niedźwiedziem: „To jest groźne zwierzę. Zupełnie co innego niż pluszowy miś. Bałam się, że nas zaatakuje!”. A wujek dodał: „Na szczęście byliśmy cicho, a on był po drugiej stronie strumienia i nas nie zauważył.”

## TEKST 3

Mateusz często odwiedza swojego dziadka Adama, który jest sadownikiem. Mama Mateusza uważa, że najpiękniej jest tam na wiosnę, gdy dom otaczają kwitnące jabłonie, grusze i śliwy. Gdy była małą dziewczynką, zrywała się o świcie i biegła do sadu podziwiać drzewka obsypane białym i różowym kwieciami.

Ale Mateusz, który jest łakomczuchem, woli przyjeżdżać do dziadka w lecie. Dziadek cieszy się, że wnuk lubi jeść wyhodowane przez niego owoce. „Wszystko, co znajdziesz pod drzewami, jest twoje – mówi – Ale nie próbuj zrywać owoców. Do gałęzi jeszcze nie dosięgniesz, a drabiny będziesz mógł używać dopiero, jak będziesz trochę starszy. Teraz mógłbyś spaść.”

Dziś jednak chłopca skusił widok dorodnych owoców ukrytych wśród liści wysoko na drzewie. „Muszą być pyszne! Na pewno nikt nie zauważy, jak je sobie zerwę. – pomyślał – Przeciągnę tylko drabinę pod drzewo i gotowe!”. Jak pomyślał, tak zrobił: oparł drabinę o pień gruszy i szybko wspiął się po szczeblach. Gdy był już wysoko na gałęzi, usłyszał znajome kroki. Tak się przestraszył, że strącił drabinę, która z łoskotem runęła na ziemię. „Ojej, jak ja teraz zejść?” – pomyślał chłopiec.

TEKST 3: DRABINA

## TEKST 4

Był początek maja. Na zbiórce Ania i Patrycja dostały ulotki o wakacyjnym obozie harcerskim, który miał się odbyć nad jeziorem. Druh ogłosił, że główną atrakcją będzie pływanie na kajakach, więc kto chce jechać na obóz, musi mieć dużo siły do wiosłowania. Zapowiedział, że zgłoszenia, podpisane przez rodziców, będzie przyjmował do końca roku szkolnego.

Wracając ze zbiórki, obie harcerki omawiały plany wakacyjne. Wprawdzie żadna z nich nigdy przedtem nie pływała łódkami, ale słyszały, że sporty wodne to świetna zabawa. Dziewczynki zdecydowały, że pojadą razem i cieszyły się na myśl o czekających je przygodach. Przyjaciółki dochodziły już do swojego osiedla. Za chwilę miały pokazać ulotki rodzicom i zapytać, czy mogą się zapisać na obóz. Nagle Ania stanęła jak wryta i zawołała z rozpaczą w głosie: „Nic z tego! Nie mamy szans! Tu jest napisane: >>wymagana umiejętność pływania<<”. Ale Patrycja nie miała zamiaru się poddać: „O nie, Aniu! Biegnijmy do domów. Opróżnimy nasze skarbonki i od razu pojedziemy na basen. Na tablicy ogłoszeń wisiły jakieś informacje o kursach pływania. Chyba nie były bardzo drogie. Może uda nam się zdobyć kartę pływacką, zanim lista chętnych na obóz się zapełni.”

TEKST 4: KAJAKI

## TEKST 5

Fenek to mały drapieżny ssak, który bywa też nazywany lisem pustynnym. Najwięcej przedstawicieli tego gatunku żyje na Saharze. Dorosłe fenki mają jasnorudą sierść tak jak lisy. Są jednak od nich mniejsze i mają znacznie większe uszy. Ten narząd służy zwierzętom nie tylko do słuchania, ale także do chłodzenia ciała. Fenki całymi rodzinami mieszkają w norkach wykopanych w piasku. Główna komora norki wyłożona jest roślinami, sierścią i ptasimi piórami. Prowadzi z niej kilka korytarzy. Dzięki temu w razie zagrożenia zwierzątka mogą uciec na zewnątrz. Fenek w dzień śpi, a w nocy wyrusza na łowy. Poluje na owady, jaszczurki i małe ptaszki. Jada też rośliny, które są dla niego źródłem wody, co umożliwia mu przetrwanie na pustyni.

TEKST 5: FENEK

|                                                                                   |                                                             |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------|
|  | <b>CZYTANIE WYRAZÓW (1 MINUTA)</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |       |  |                         |  |
|---------------------|--|-------|--|-------------------------|--|
| ID dziecka (kod):   |  | Płeć: |  | Wiek (lata i miesiące): |  |
| Nazwa szkoły (kod): |  |       |  | Grupa wiekowa/klasa     |  |

 Postępuj ściśle według procedury przedstawionej w dokumencie „Czytanie wyrazów – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

Badanie należy nagrywać

Uruchom stoper kiedy tylko dziecko zaczyna wypowiadać pierwszy wyraz.

Przerwij badanie po 60 sekundach.

Jeśli dziecko skończy czytać wyrazy na pierwszej stronie przed upływem 60 sekund, szybko obróć arkusz testowy na drugą stronę (wyrazy 76 - 142) i powiedz **Czytaj dalej!**, wskazując palcem na pierwszy wyraz w lewym górnym rogu.

Jeśli dziecko ma trudność w przeczytaniu jakiegoś wyrazu, zachęć je, żeby kontynuowało.

Nie udzielaj informacji zwrotnej w trakcie badania.

Postaw poziomą kreskę pod ostatnim wyrazem, które dziecko próbowało przeczytać, kiedy minął czas badania.

W kolumnie „odpowiedź dziecka”:

- zaznacz ✓ przy każdym **poprawnie** odczytanym wyrazie
- zaznacz X przy każdym **błędnie** przeczytanym wyrazie [i zapisz, co dokładnie dziecko powiedziało]
- zaznacz AK przy każdej **autokorekcie** (dziecko odczytuje wyraz błędnie ale zaraz się poprawia), a następnie przyznaj jej ✓
- zaznacz POM przy każdym wyrazie, które dziecko **pomięło**.
- Zaznacz technikę czytania, jaką stosuje dziecko, np.:
 

|         |                           |         |                         |
|---------|---------------------------|---------|-------------------------|
| . . . . | głoskowanie bez syntezy   | . . . . | głoskowanie z syntezą   |
| ----    | sylabizowanie bez syntezy | ----    | sylabizowanie z syntezą |

|                                                                                     |                                                                   |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|
|  | <b>CZYTANIE WYRAZÓW (1 MINUTA)</b><br><b>Podsumowanie wyników</b> |
| Wyrazy przeczytane prawidłowo (w tym autopoprawki[✓])                               |                                                                   |
| Wyrazy przeczytane błędnie [X]                                                      |                                                                   |
| Wyrazy pominęte [POM]                                                               |                                                                   |

### One-minute word reading (MABEL)

| Wyraz | Odpowiedź dziecka | Wyraz | Odpowiedź dziecka | Wyraz | Odpowiedź dziecka |
|-------|-------------------|-------|-------------------|-------|-------------------|
| 1     | i                 | 26    | pod               | 51    | piśro             |
| 2     | u                 | 27    | król              | 52    | taki              |
| 3     | za                | 28    | ples              | 53    | mało              |
| 4     | po                | 29    | dać               | 54    | dzieci            |
| 5     | na                | 30    | przy              | 55    | może              |
| 6     | do                | 31    | czas              | 56    | inny              |
| 7     | ty                | 32    | się               | 57    | siła              |
| 8     | co                | 33    | twój              | 58    | żona              |
| 9     | ja                | 34    | być               | 59    | słowo             |
| 10    | tu                | 35    | głos              | 60    | ręka              |
| 11    | od                | 36    | stać              | 61    | stary             |
| 12    | te                | 37    | trzy              | 62    | okno              |
| 13    | ser               | 38    | chleb             | 63    | zegar             |
| 14    | dom               | 39    | wziąć             | 64    | gałąź             |
| 15    | tak               | 40    | przed             | 65    | każdy             |
| 16    | sto               | 41    | swój              | 66    | mucha             |
| 17    | kot               | 42    | chcieć            | 67    | bilet             |
| 18    | pan               | 43    | dźwięk            | 68    | niebo             |
| 19    | las               | 44    | gdzie             | 69    | dziura            |
| 20    | rok               | 45    | jego              | 70    | fale              |
| 21    | tam               | 46    | ale               | 71    | życie             |
| 22    | brat              | 47    | osa               | 72    | motyl             |
| 23    | dwa               | 48    | góra              | 73    | młody             |
| 24    | krok              | 49    | nogi              | 74    | dziadek           |
| 25    | lis               | 50    | para              | 75    | doktor            |

| Wyraz | Odpowiedź dziecka | Wyraz | Odpowiedź dziecka | Wyraz | Odpowiedź dziecka |
|-------|-------------------|-------|-------------------|-------|-------------------|
| 76    | mama              | 101   | prezent           | 126   | słyszec           |
| 77    | woda              | 102   | tylko             | 127   | światło           |
| 78    | tato              | 103   | zostać            | 128   | myśleć            |
| 79    | oni               | 104   | ludzie            | 129   | zawsze            |
| 80    | lato              | 105   | dużo              | 130   | jabłko            |
| 81    | sama              | 106   | wieczór           | 131   | poczuć            |
| 82    | balon             | 107   | znowu             | 132   | człowiek          |
| 83    | zima              | 108   | dobry             | 133   | prawda            |
| 84    | koło              | 109   | pamięć            | 134   | słońce            |
| 85    | biały             | 110   | wielki            | 135   | przykład          |
| 86    | rano              | 111   | kwiaty            | 136   | wszystko          |
| 87    | patrzeć           | 112   | podać             | 137   | kartka            |
| 88    | więcej            | 113   | ładna             | 138   | kościół           |
| 89    | praca             | 114   | krzesło           | 139   | ulica             |
| 90    | miasto            | 115   | podczas           | 140   | rodzina           |
| 91    | zęby              | 116   | jeszcze           | 141   | prezydent         |
| 92    | który             | 117   | dosyć             | 142   | kolorowy          |
| 93    | blisko            | 118   | chwila            |       |                   |
| 94    | jakiś             | 119   | gdyby             |       |                   |
| 95    | lepszy            | 120   | liczba            |       |                   |
| 96    | chory             | 121   | także             |       |                   |
| 97    | jedna             | 122   | chodzić           |       |                   |
| 98    | widzieć           | 123   | trochę            |       |                   |
| 99    | ładny             | 124   | wrócić            |       |                   |
| 100   | potem             | 125   | razem             |       |                   |

# One-minute pseudoword reading MABEL

Czytanie Pseudowyrazów (1 minuta) (v.2, 29.11.2019)

Arkusz wyników

[www.eldel-mabel.net](http://www.eldel-mabel.net)

|                                                                                   |                                                                   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|
|  | <b>CZYTANIE PSEUDOWYRAZÓW (1 MINUTA)</b><br><b>Arkusz wyników</b> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|

Osoba badająca: ..... Data: .....

|                     |  |      |  |                        |  |
|---------------------|--|------|--|------------------------|--|
| ID dziecka (kod):   |  | Płeć |  | Wiek (lata i miesiące) |  |
| Nazwa szkoły (kod): |  |      |  | Grupa wiekowa/klasa    |  |



Postępuj ściśle według procedury przedstawionej w dokumencie „Czytanie pseudowyrazów – instrukcje badania i obliczania wyników”. Nie zmieniaj treści poleceń przeznaczonych dla dziecka (zaznaczonych **na czerwono**).

Badanie należy nagrywać

Uruchom stoper kiedy tylko dziecko zaczyna wypowiadać pierwszy wyraz.

Przerwij badanie po 60 sekundach.

Jeśli dziecko skończy czytać wyrazy na pierwszej stronie przed upływem 60 sekund, szybko obróć arkusz testowy na drugą stronę (wyrazy 76 - 142) i powiedz **Czytaj dalej!**, wskazując palcem na pierwszy wyraz w lewym górnym rogu.

Jeśli dziecko ma trudność w przeczytaniu jakiegoś wyrazu, zachęć je, żeby kontynuowało.

Nie udzielaj informacji zwrotnej w trakcie badania.

Postaw poziomą kreskę pod ostatnim wyrazem, które dziecko próbowało przeczytać, kiedy minął czas badania.

W kolumnie „odpowiedź dziecka”:

- zaznacz ✓ przy każdym **poprawnie** odczytanym wyrazie
- zaznacz **X** przy każdym **błędnie** przeczytanym wyrazie [i zapisz, co dokładnie dziecko powiedziało]
- zaznacz **AK** przy każdej **autokorekcie** (dziecko odczytuje wyraz błędnie ale zaraz się poprawia), a następnie przyznaj jej ✓
- zaznacz **POM** przy każdym wyrazie, które dziecko **pomięło**.
- Zaznacz technikę czytania, jaką stosuje dziecko, np.:
 

|                                 |                               |
|---------------------------------|-------------------------------|
| . . . . głoskowanie bez syntezy | . . . . głoskowanie z syntezą |
| ---- sylabizowanie bez syntezy  | ---- sylabizowanie z syntezą  |

|                                                                                     |                                                                   |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|
|  | <b>CZYTANIE WYRAZÓW (1 MINUTA)</b><br><b>Podsumowanie wyników</b> |
| Pseudowyrazy przeczytane prawidłowo (w tym autopoprawki[✓])                         |                                                                   |
| Pseudowyrazy przeczytane błędnie [X]                                                |                                                                   |
| Pseudowyrazy pominięte [POM]                                                        |                                                                   |

| Wyraz   | Odpowiedź dziecka | Wyraz     | Odpowiedź dziecka | Wyraz      | Odpowiedź dziecka |
|---------|-------------------|-----------|-------------------|------------|-------------------|
| 1 e     |                   | 26 pyd    |                   | 51 diło    |                   |
| 2 y     |                   | 27 pról   |                   | 52 teko    |                   |
| 3 ka    |                   | 28 wies   |                   | 53 nafo    |                   |
| 4 fo    |                   | 29 pać    |                   | 54 dziazi  |                   |
| 5 nu    |                   | 30 przo   |                   | 55 żemo    |                   |
| 6 de    |                   | 31 szas   |                   | 56 imno    |                   |
| 7 ry    |                   | 32 zię    |                   | 57 wifa    |                   |
| 8 so    |                   | 33 glój   |                   | 58 nažo    |                   |
| 9 ju    |                   | 34 boć    |                   | 59 słamo   |                   |
| 10 pu   |                   | 35 tros   |                   | 60 rąfa    |                   |
| 11 ad   |                   | 36 słaś   |                   | 61 złary   |                   |
| 12 le   |                   | 37 trzo   |                   | 62 afno    |                   |
| 13 zer  |                   | 38 szlet  |                   | 63 sedar   |                   |
| 14 dum  |                   | 39 zgjęś  |                   | 64 dařą    |                   |
| 15 taf  |                   | 40 przab  |                   | 65 kožby   |                   |
| 16 ste  |                   | 41 zmój   |                   | 66 machu   |                   |
| 17 kol  |                   | 42 chcioń |                   | 67 biat    |                   |
| 18 byn  |                   | 43 dźmiak |                   | 68 niado   |                   |
| 19 tes  |                   | 44 wdzia  |                   | 69 dziepa  |                   |
| 20 ref  |                   | 45 gelo   |                   | 70 lefa    |                   |
| 21 kam  |                   | 46 ate    |                   | 71 ciży    |                   |
| 22 drat |                   | 47 asu    |                   | 72 mařyl   |                   |
| 23 bra  |                   | 48 roga   |                   | 73 dlomy   |                   |
| 24 krot |                   | 49 nały   |                   | 74 dziobuk |                   |
| 25 fas  |                   | 50 rapa   |                   | 75 towdor  |                   |

| Wyraz      | Odpowiedź dziecka | Wyraz        | Odpowiedź dziecka | Wyraz         | Odpowiedź dziecka |
|------------|-------------------|--------------|-------------------|---------------|-------------------|
| 76 momo    |                   | 101 przyont  |                   | 126 złaszyć   |                   |
| 77 dota    |                   | 102 tulka    |                   | 127 świedło   |                   |
| 78 dado    |                   | 103 sozdać   |                   | 128 wyźlać    |                   |
| 79 amu     |                   | 104 fodzia   |                   | 129 suwsze    |                   |
| 80 laso    |                   | 105 deża     |                   | 130 gubka     |                   |
| 81 sunu    |                   | 106 miaczór  |                   | 131 dorzać    |                   |
| 82 daton   |                   | 107 znamu    |                   | 132 czapiek   |                   |
| 83 cina    |                   | 108 bodry    |                   | 133 drawdo    |                   |
| 84 roto    |                   | 109 powięć   |                   | 134 dłańce    |                   |
| 85 bioty   |                   | 110 wiałki   |                   | 135 drzywiad  |                   |
| 86 zawo    |                   | 111 kwioy    |                   | 136 mszystka  |                   |
| 87 padrać  |                   | 112 padyć    |                   | 137 darfka    |                   |
| 88 miącej  |                   | 113 żebna    |                   | 138 dościót   |                   |
| 89 droco   |                   | 114 krzazło  |                   | 139 olacu     |                   |
| 90 mierzdo |                   | 115 nadczos  |                   | 140 nadziro   |                   |
| 91 sedy    |                   | 116 faszczco |                   | 141 trazydant |                   |
| 92 stomy   |                   | 117 dyzyć    |                   | 142 rolokowy  |                   |
| 93 dlirko  |                   | 118 chwoli   |                   |               |                   |
| 94 gawiś   |                   | 119 gdaba    |                   |               |                   |
| 95 dapszy  |                   | 120 ficzbo   |                   |               |                   |
| 96 chyro   |                   | 121 fulże    |                   |               |                   |
| 97 jaderno |                   | 122 sudzić   |                   |               |                   |
| 98 wudziać |                   | 123 trachą   |                   |               |                   |
| 99 tapny   |                   | 124 droćić   |                   |               |                   |
| 100 motep  |                   | 125 ryzam    |                   |               |                   |



## Reading comprehension task

Source: [www.superkid.pl](http://www.superkid.pl)

### Mały artysta

Marek lubi kolorować obrazki. Ma na półce mnóstwo książeczek do kolorowania: z dinozaurami, pojazdami i zwierzętami. Dziś dostał od babci nowe kredki ołówkowe. W jednym pudełku tyle kolorów! Gdy chłopiec układa kredki obok siebie, wyglądają jak barwna tęcza. Tym razem Marek nie będzie kolorował ulubionych samochodów. Narysuje laurkę, ponieważ jutro są imieniny mamy. Babcia jest zachwycona: „Jaki ten mój wnusio zdolny! Kupię mu jeszcze nowe farby i blok rysunkowy”.



1. Co Marek lubi kolorować? (obrazki)
2. Kto kupił wnukowi nowe kredki? (babcia)
3. Co lubi rysować Marek? (samochody)
4. Dla czego Marek rysuje laurkę? (jutro są imieniny mamy)

# Warto uczyć się języków

---



Amelka bardzo tęskni za swoją kuzynką Adą. Ciocia, wujek i Ada wyjechali dwa lata temu do Wielkiej Brytanii. Dziewczynki teraz rozmawiają ze sobą dzięki połączeniom internetowym.

Gdy mieszkali blisko, dziewczynki widywały się nawet codziennie. W wakacje Amelka i jej rodzice odwiedzili wujostwo. Ada chodzi do angielskiej szkoły i świetnie dogaduje się z innymi. Amelka niechętnie uczyła się języków obcych i niewiele rozumiała z rozmów rówieśników. Po powrocie postanowiła, że od nowego roku szkolnego musi to zmienić. Teraz wie, że znajomość innych języków naprawdę może się przydać.

1. Kto wyjechał do Wielkiej Brytanii?
2. Jak teraz rozmawiają ze sobą dziewczynki?
3. Czy lubiła Ada uczyć się języka angielskiego?
4. Co postanowiła Ada po powrocie z Anglii?

## Appendix L: Testing materials in Russian

### PA blending (MABEL)



**СИНТЕЗ ФОНЕМ**  
**Ответы**

|                       |  |     |  |                       |  |
|-----------------------|--|-----|--|-----------------------|--|
| ID ребенка(код):      |  | Пол |  | Возраст (год и месяц) |  |
| Название школы (код): |  |     |  | Группа/клас           |  |



ий:

.....

.....

.....

.....

.....

.....

...

Дата:

.....

.....

- Тестирование следует проводить в соответствии с процедурой и указаний представленных в документе "Синтез фонем - инструкция тестирования и подсчет результатов". Указания, указанные красным цветом, нельзя менять.
- Тестирование следует записывать.
- Необходимо иметь карточки для ознакомления ребенка с заданием (ДОМ, МЫШЬ).
- Внимательно записывайте каждый ответ ребенка, независимо от того, ответ является правильным или нет.
- Тестирование следует прекратить, если ребенок сделает шесть ошибок подряд. Ошибкой считается такой ответ, когда ребенок не назовет слово, которое состоит из фонем, которые ребенок называет
- Сокращенную версию теста для детей старшей группы детского сада следует проводить до 10 слова.

| ... | Звуковая единица  | Ответ | Результат<br>1/0 |
|-----|-------------------|-------|------------------|
| 1   | т-ы (ты)/ty/      |       |                  |
| 2   | м-у (му)/mu/      |       |                  |
| 3   | н-о (но)/no/      |       |                  |
| 4   | и-х (их)/ih/      |       |                  |
| 5   | л-е-ф (лев) /lew/ |       |                  |
| 6   | с-о-н (сон) /son/ |       |                  |
| 7   | с-ы-р (сыр) /syr/ |       |                  |

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|     |                |               |  |  |
|-----|----------------|---------------|--|--|
| 8   | <b>р-а-к</b>   | (рак) /rak/   |  |  |
| 9   | <b>у-х-о</b>   | (ухо) /uho/   |  |  |
| 10* | <b>о-с-а</b>   | (оса) /osa/   |  |  |
| 11  | <b>и-г-р-а</b> | (игра) /igra/ |  |  |
| 12  | <b>в-о-д-а</b> | (вода) /woda/ |  |  |
| 13  | <b>л-е-т-о</b> | (лето) /leto/ |  |  |
| 14  | <b>к-о-т-ы</b> | (коты) /koty/ |  |  |
| 15  | <b>р-ы-б-а</b> | (рыба) /ryba/ |  |  |
| 16  | <b>к-у-р-ы</b> | (куры) /kury/ |  |  |
| 17  | <b>с-л-о-н</b> | (слон) /slon/ |  |  |
| 18  | <b>п-л-о-т</b> | (плот) /ptah/ |  |  |
| 19  | <b>с-н-е-х</b> | (снег) /sneh/ |  |  |
| 20  | <b>х-л-е-п</b> | (хлеб) /hleb/ |  |  |
| 21  | <b>с-т-у-л</b> | (стул) /stul/ |  |  |
| 22  | <b>п-а-р-к</b> | (парк) /park/ |  |  |
| 23  | <b>м-о-с-т</b> | (мост) /most/ |  |  |
| 24  | <b>т-о-р-т</b> | (торт) /tort/ |  |  |

|     |     |
|-----|-----|
| /10 | /24 |
|-----|-----|

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## PA isolation (MABEL)

|                                                                                   |                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  | <b>Изолирование фонем</b><br><b>Карта оценивания – НАЧАЛЬНАЯ</b><br><b>ФОНЕМА</b> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|

ТЕСТИРУЮЩИЙ: ..... Дата .....

|                       |  |     |  |                       |  |
|-----------------------|--|-----|--|-----------------------|--|
| ID ребенка (код):     |  | Пол |  | Возраст (год и месяц) |  |
| Название школы (код): |  |     |  | Группа/класс          |  |

 Тестирование следует записывать.  
 Включите секундомер, как только начнете называть первое слово (тестовую единицу) с каждого блока. Выключите секундомер, как только ребенок предоставит последнюю ответ из блока. Следует прекратить тестирование, если ребенок назвал **четыре позиции** неправильно в одном из блоков, который состоит из 8 единиц.

Начало слова – Блок 1

| Слог CVC                | Транскрипция повторения | Фонема | Транскрипция ответа | Балы 2/1/0 |
|-------------------------|-------------------------|--------|---------------------|------------|
| зик /zik/               |                         | /z/    |                     |            |
| нур /nur/               |                         | /n/    |                     |            |
| рат /rat/               |                         | /r/    |                     |            |
| мос/ mɔh/               |                         | /m/    |                     |            |
| вук /vuk/               |                         | /v/    |                     |            |
| бак /bak/               |                         | /b/    |                     |            |
| кеп /kep/               |                         | /k/    |                     |            |
| лун /lun/               |                         | /l/    |                     |            |
| Правильные ответы(CVC): |                         |        |                     | /16        |

| Слог CCVC                            | Транскрипция повторения | Фонема | Транскрипция ответа | Балы 2/1/0 |
|--------------------------------------|-------------------------|--------|---------------------|------------|
| трач / tratʃ /                       |                         | /t/    |                     |            |
| свик /swɪk/                          |                         | /s/    |                     |            |
| флоп /flop/                          |                         | /f/    |                     |            |
| прот/prot/                           |                         | /p/    |                     |            |
| блич/blytʃ/                          |                         | /b/    |                     |            |
| друш /druʃ/                          |                         | /d/    |                     |            |
| клот /klot/                          |                         | /k/    |                     |            |
| цвам / tsvam /                       |                         | /c/    |                     |            |
| Правильные ответы CCVC:              |                         |        |                     | /16        |
| Общее количество правильных ответов: |                         |        |                     | /32        |

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|                       |              |                       |
|-----------------------|--------------|-----------------------|
| ИД ребенка (код):     | Пол          | Возраст (год и месяц) |
| Название школы (код): | Группа/класс |                       |

Окончание слова – Блок 2

| Слог CVC                    | Транскрипция повторения | фонема | Транскрипция ответа | Балы 2/1/0 |
|-----------------------------|-------------------------|--------|---------------------|------------|
| кан /kan/                   |                         | /n/    |                     |            |
| мар /mar/                   |                         | /r/    |                     |            |
| зал /zal/                   |                         | /l/    |                     |            |
| тер /ter/                   |                         | /r/    |                     |            |
| тап /tap/                   |                         | /p/    |                     |            |
| лус /lus/                   |                         | /s/    |                     |            |
| ним /nim/                   |                         | /m/    |                     |            |
| дуф /duf/                   |                         | /f/    |                     |            |
| Слог CVC правильные ответы: |                         |        |                     | /16        |

| Слог CVCC               | Транскрипция повторения | фонема | Транскрипция ответа | Балы 2/1/0 |
|-------------------------|-------------------------|--------|---------------------|------------|
| даст /dast/             |                         | /t/    |                     |            |
| корш /kɔʃ/              |                         | /ʃ/    |                     |            |
| рамп /rɒmp/             |                         | /p/    |                     |            |
| хаск /hɜːsk/            |                         | /k/    |                     |            |
| торм /tɔːrm/            |                         | /m/    |                     |            |
| бенс /rens/             |                         | /s/    |                     |            |
| перк /pɜːk/             |                         | /k/    |                     |            |
| висл /visl/             |                         | /l/    |                     |            |
| Правильные ответы CVCC: |                         |        |                     | /16        |

Запись общего количества ответов двух подтестов (начало слова) и (конец слова)

| Начальная фонема             |                                  | Последняя фонема             |                                   | Общее количество             |                                   |
|------------------------------|----------------------------------|------------------------------|-----------------------------------|------------------------------|-----------------------------------|
| Точность                     | Начальная оценка/бал (max. = 32) | Точность                     | Начальная оценка /бал (max. = 32) | Точность                     | Начальная оценка /бал (max. = 64) |
| Стандартизованная оценка/бал |                                  | Стандартизованная оценка/бал |                                   | Стандартизованная оценка/бал |                                   |
| Предел ошибки                |                                  | Предел ошибки                |                                   | Предел ошибки                |                                   |
| процент                      |                                  | процент                      |                                   | процент                      |                                   |

## PA deletion (MABEL)

|                                                                                   |                                         |
|-----------------------------------------------------------------------------------|-----------------------------------------|
|  | <b>УДАЛЕНИЕ ФОНЕМ<br/>КАРТА ОТВЕТОВ</b> |
|-----------------------------------------------------------------------------------|-----------------------------------------|

ТЕСТИРУЮЩИЙ: ..... Дата .....

|                       |  |     |  |                       |  |
|-----------------------|--|-----|--|-----------------------|--|
| ID ребенка (код):     |  | Пол |  | Возраст (год и месяц) |  |
| Название школы (код): |  |     |  | Группа/класс          |  |



Тестирование следует записывать.

Включите секундомер, как только начнете называть первое слово (тестовую единицу) с каждого блока.

Выключите секундомер, как только ребенок предоставит последнюю ответ из блока.

Внимательно записывайте каждый ответ ребенка, независимо от того, ответ является правильным или нет.

НЕ прекращайте тестирования, следует выполнить все задания.

### Начальная фонема – Блок 1.

| Тестовая единица | Запись транскрипции |                                       | Запись ответа | Баллы 2/1/0 |
|------------------|---------------------|---------------------------------------|---------------|-------------|
| роф /rɔf/        |                     | (оф) /ɔf/                             |               |             |
| бат /bak/        |                     | (ат) /at/                             |               |             |
| дус /dʊs/        |                     | (ус) /ʊs/                             |               |             |
| пек /pek/        |                     | (ек) /ɛk/                             |               |             |
| вун /vʊn/        |                     | (ун) /ʊn/                             |               |             |
| Блок 1 время:    | ..... секунд        | Блок 1 количество правильных ответов: |               | /10         |

### Начальная фонема – Блок 2.

| Тестовая единица  | Запись транскрипции |                                             | Запись ответа | Баллы 2/1/0 |
|-------------------|---------------------|---------------------------------------------|---------------|-------------|
| спек /spek/       |                     | (пек) /pek/                                 |               |             |
| праш /praʃ/       |                     | (раш) /raʃ/                                 |               |             |
| блон /blon/       |                     | (лон) /lon/                                 |               |             |
| клет /klet/       |                     | (лет) /let/                                 |               |             |
| трын /trin/       |                     | (рин) /trin/                                |               |             |
| Блок 2 время      | ..... секунд        | Блок 2 количество правильных ответов:       |               | /10         |
| Блок 1 та 2 время | ..... секунд        | Количество правильных ответов (Блок 1 та 2) |               | /20         |

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УДАЛЕНИЕ ФОНЕМ  
КАРТА ОТВЕТОВ

ТЕСТИРУЮЩИЙ: .....
 Дата: .....

|                       |     |                       |
|-----------------------|-----|-----------------------|
| ID ребенка (код):     | Пол | Возраст (год и месяц) |
| Название школы (код): |     | Группа/класс          |

Последняя фонема – Блок 3.

| Тестовая единица | Запись транскрипции | Запись ответов                        | Балы 2/1/0 |
|------------------|---------------------|---------------------------------------|------------|
| нуп /nup/        |                     | (ny)/ny/                              |            |
| горф /gorf/      |                     | (gor)/gor/                            |            |
| мек /mek/        |                     | (me)/me/                              |            |
| таш /taʃ/        |                     | (ta)/ta/                              |            |
| зант /zant/      |                     | (zan)/zan/                            |            |
| Блок 3 время:    | ..... секунд        | Блок 3 Количество правильных ответов: | /10        |

Последняя фонема – Блок 4.

| Тестовая единица | Запись транскрипции | Запись ответа                         | Балы 2/1/0 |
|------------------|---------------------|---------------------------------------|------------|
| сонг /song/      |                     | (son)/son/                            |            |
| кест /kest/      |                     | (kes)/kes/                            |            |
| шолф /loif/      |                     | (sol)/sol/                            |            |
| наст /nast/      |                     | (nas)/nas/                            |            |
| хинс /hɪks/      |                     | (xik)/hɪk/                            |            |
| Блок 4 время:    | ..... секунд        | Блок 4 Количество правильных ответов: | /10        |

|                                               |              |                                                                      |     |
|-----------------------------------------------|--------------|----------------------------------------------------------------------|-----|
| Последняя фонема<br>Общее время (Блок 3 та 4) | ..... секунд | Последняя фонема – Общее количество правильных ответов (Блок 3 та 4) | /20 |
| Последняя фонема<br>Общее время (Все блоки)   | ..... секунд | Последняя фонема – Общее количество правильных ответов (Все блоки)   | /20 |

В данной таблице впишите суммы результатов отдельно, а также суммарный результат каждого блока.

|                        | Начальная фонема |          | Последняя фонема |          | Общий результат |          |
|------------------------|------------------|----------|------------------|----------|-----------------|----------|
|                        | Точность         | Скорость | Точность         | Скорость | Точность        | Скорость |
| Ответы                 |                  |          |                  |          |                 |          |
| Стандарт               |                  |          |                  |          |                 |          |
| Доверительный интервал |                  |          |                  |          |                 |          |
| Процент                |                  |          |                  |          |                 |          |



## RAN colours (MABEL)

|                                                                                   |                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  | <b>Тест быстрого автоматического<br/>называния(RAN) - цвета<br/>Карта ответов</b> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|

Тестирующий: ..... Дата: .....

|                              |  |             |  |                                        |  |
|------------------------------|--|-------------|--|----------------------------------------|--|
| <b>ID ребенка: (код)</b>     |  | <b>Пол:</b> |  | <b>Возраст (полных лет и месяцев):</b> |  |
| <b>Название школы: (код)</b> |  |             |  | <b>Группа/класс</b>                    |  |



Тестирование следует проводить в соответствии с процедурой и указаний представленных в документе "RAN цвета - инструкция к тестированию и подсчет результатов теста". Указания, указанные красным цветом, нельзя менять.

Включите секундомер, как только ребенок начнет называть первый цвет.

Выключите секундомер, как только ребенок назовет последний цвет.

Тестирование следует записывать.

Во время тестирования укажите все ошибки на листе ответов.

Помните, что ошибки, которые ребенок исправляет самостоятельно (автокорректы) НЕ считаются, как ошибки.

### RAN цвета 1

|                     |            |            |            |               |            |            |            |
|---------------------|------------|------------|------------|---------------|------------|------------|------------|
| красный             | коричневый | зеленый    | синий      | черный        | зеленый    | коричневый | черный     |
| зеленый             | синий      | красный    | черный     | синий         | красный    | синий      | коричневый |
| красный             | зеленый    | коричневый | черный     | коричневый    | синий      | черный     | красный    |
| зеленый             | черный     | синий      | красный    | зеленый       | коричневый | синий      | зеленый    |
| красный             | коричневый | черный     | коричневый | красный       | синий      | зеленый    | черный     |
| Время (сек.) RAN 1: |            |            |            | Ошибки RAN 1: |            |            |            |

### RAN цвета 2

|                     |            |            |            |               |         |            |            |
|---------------------|------------|------------|------------|---------------|---------|------------|------------|
| зеленый             | черный     | красный    | синий      | коричневый    | красный | черный     | коричневый |
| красный             | синий      | зеленый    | коричневый | синий         | зеленый | синий      | черный     |
| зеленый             | красный    | черный     | коричневый | черный        | синий   | коричневый | зеленый    |
| красный             | коричневый | синий      | зеленый    | красный       | черный  | синий      | красный    |
| зеленый             | черный     | коричневый | черный     | зеленый       | синий   | красный    | коричневый |
| Время (сек.) RAN 2: |            |            |            | Ошибки RAN 2: |         |            |            |

Запишите отдельно результаты первого и второго тестов, а также средний результат двух тестов.

|                                | Время<br>(в секундах) | Ошибки |
|--------------------------------|-----------------------|--------|
| RAN Цвета 1                    |                       |        |
| RAN Цвета 2                    |                       |        |
| RAN Цвета СРЕДНИЙ<br>РЕЗУЛЬТАТ |                       |        |

## RAN objects (MABEL)

|                                                                                   |                                                                                                       |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|  | <b>Тест быстрого автоматического<br/>повторения названий (RAN) – предметы</b><br><b>Карта ответов</b> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|

Тестирующий: ..... Дата: .....

|                      |  |      |  |                                 |  |
|----------------------|--|------|--|---------------------------------|--|
| ID ребенка: (код)    |  | Пол: |  | Возраст (полных лет и месяцев): |  |
| Название школы (код) |  |      |  | Группа/класс:                   |  |



Тестирование следует проводить в соответствии с процедурой и указаний представленных в документе "RAN буквы - инструкция к тестированию и подсчет результатов теста". Указания **красным цветом**, нельзя менять.

Включите секундомер, как только ребенок начнет называть первую букву.

Выключите секундомер, как только ребенок назовет последнюю букву.

Тестирование следует записывать.

Во время тестирования укажите все ошибки на листе ответов.

Помните, что ошибки, которые ребенок исправляет самостоятельно (автокорректы) НЕ считаются ошибками

### RAN карта1

|                     |      |      |      |               |      |      |      |
|---------------------|------|------|------|---------------|------|------|------|
| лев                 | пес  | глаз | стол | ключ          | стол | глаз | ключ |
| пес                 | ключ | лев  | глаз | ключ          | пес  | стол | пес  |
| лев                 | глаз | стол | лев  | пес           | ключ | глаз | лев  |
| глаз                | стол | пес  | ключ | стол          | лев  | ключ | глаз |
| стол                | лев  | стол | пес  | глаз          | пес  | ключ | лев  |
| Время (сек.) RAN 1: |      |      |      | Ошибки RAN 1: |      |      |      |

|                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------|
| <p align="center"><b>Тест быстрого автоматического повторения названий (RAN) –<br/>предметы<br/>Карта ответов</b></p> |
|-----------------------------------------------------------------------------------------------------------------------|

**RAN карта 2**

|                     |      |      |      |               |      |      |      |
|---------------------|------|------|------|---------------|------|------|------|
| стол                | лев  | ключ | глаз | пес           | ключ | лев  | стол |
| ключ                | стол | глаз | лев  | пес           | лев  | глаз | ключ |
| лев                 | глаз | стол | пес  | ключ          | глаз | стол | пес  |
| глаз                | ключ | пес  | стол | лев           | ключ | пес  | лев  |
| стол                | глаз | лев  | пес  | глаз          | пес  | стол | ключ |
| Время (сек.) RAN 2: |      |      |      | Ошибки RAN 2: |      |      |      |

Отдельно запишите результаты первого и второго теста, а также средний результат двух тестов.

|                                | Время<br>(в секундах) | Ошибки |
|--------------------------------|-----------------------|--------|
| RAN буквы 1                    |                       |        |
| RAN буквы 2                    |                       |        |
| RAN предметы СРЕДНИЙ РЕЗУЛЬТАТ |                       |        |

## RAN digits (MABEL)

|                                                                                   |                                                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|  | <b>Тест быстрого автоматического<br/>повторения названий (RAN) - цифры</b><br><b>Карта ответов</b> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|

Тестирующий: ..... Дата: .....

|                             |  |             |  |                                       |  |
|-----------------------------|--|-------------|--|---------------------------------------|--|
| <b>ID ребенка: (код)</b>    |  | <b>Пол:</b> |  | <b>Возраст (полных лет и месяцев:</b> |  |
| <b>Название школы (код)</b> |  |             |  | <b>Группа/класс:</b>                  |  |



Тестирование следует проводить в соответствии с процедурой и указаний представленных в документе "RAN цифры - инструкция к тестированию и подсчет результатов теста". Указания **красным цветом**, нельзя менять.

Включите секундомер, как только ребенок начнет называть первую цифру.

Выключите секундомер, как только ребенок назовет последнюю цифру.

Тестирование следует записывать.

Во время тестирования укажите все ошибки на листе ответов.

Помните, что ошибки, которые ребенок исправляет самостоятельно (автокорректы) НЕ считаются ошибками

### RAN цифры 1

|                     |        |        |       |               |        |        |        |
|---------------------|--------|--------|-------|---------------|--------|--------|--------|
| семь                | два    | девять | три   | шесть         | девять | два    | шесть  |
| девять              | три    | семь   | шесть | три           | семь   | три    | два    |
| семь                | девять | два    | шесть | два           | три    | шесть  | семь   |
| девять              | шесть  | три    | семь  | девять        | два    | три    | девять |
| семь                | два    | шесть  | два   | семь          | три    | девять | шесть  |
| Время (сек.) RAN 1: |        |        |       | Ошибки RAN 1: |        |        |        |

|                                                                                                |
|------------------------------------------------------------------------------------------------|
| <b>Тест быстрого автоматического повторения названий (RAN) - цифры</b><br><b>Карта ответов</b> |
|------------------------------------------------------------------------------------------------|

**RAN цифры 2**

|                     |       |        |        |               |        |       |        |
|---------------------|-------|--------|--------|---------------|--------|-------|--------|
| девять              | шесть | семь   | три    | два           | семь   | шесть | два    |
| семь                | три   | девять | два    | три           | девять | три   | шесть  |
| девять              | семь  | шесть  | два    | шесть         | три    | два   | девять |
| семь                | два   | три    | девять | семь          | шесть  | три   | семь   |
| девять              | шесть | два    | шесть  | девять        | три    | семь  | два    |
| Время (сек.) RAN 2: |       |        |        | Ошибки RAN 2: |        |       |        |

Отдельно запишите результаты первого и второго теста, а также средний результат двух тестов.

|                                | Время<br>(в секундах) | Ошибки |
|--------------------------------|-----------------------|--------|
| RAN цифры 1                    |                       |        |
| RAN цифры 2                    |                       |        |
| RAN цифры СРЕДНИЙ<br>РЕЗУЛЬТАТ |                       |        |

## RAN letters (MABEL)

|                                                                                   |                                                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|  | <b>Тест быстрого автоматического<br/>повторения названий (RAN) - буквы</b><br><b>Карта ответов</b> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|

Тестирующий: ..... Дата: .....

|                      |  |      |  |                                 |  |
|----------------------|--|------|--|---------------------------------|--|
| ID ребенка: (код)    |  | Пол: |  | Возраст (полных лет и месяцев): |  |
| Название школы (код) |  |      |  | Группа/класс:                   |  |



Тестирование следует проводить в соответствии с процедурой и указаний представленных в документе "RAN буквы - инструкция к тестированию и подсчет результатов теста". Указания **красным цветом**, нельзя менять.

Включите секундомер, как только ребенок начнет называть первую букву.

Выключите секундомер, как только ребенок назовет последнюю букву.

Тестирование следует записывать.

Во время тестирования укажите все ошибки на листе ответов.

Помните, что ошибки, которые ребенок исправляет самостоятельно (автокоррекции) НЕ считаются ошибками

### RAN буквы 1

|                     |   |   |   |               |   |   |   |
|---------------------|---|---|---|---------------|---|---|---|
| п                   | а | о | с | д             | о | а | д |
| о                   | с | п | д | с             | п | с | а |
| п                   | о | а | д | а             | с | д | п |
| о                   | д | с | п | о             | а | с | о |
| п                   | а | д | а | п             | с | о | д |
| Время (сек.) RAN 1: |   |   |   | Ошибки RAN 1: |   |   |   |

**Тест быстрого автоматического повторения названий (RAN) - буквы**  
**Карта ответов**

**RAN буквы 2**

|                     |   |   |               |   |   |   |   |
|---------------------|---|---|---------------|---|---|---|---|
| о                   | д | п | с             | а | п | д | а |
| п                   | с | о | а             | с | о | с | д |
| о                   | п | д | а             | д | с | а | о |
| п                   | а | с | о             | п | д | с | п |
| о                   | д | а | д             | о | с | п | а |
| Время (сек.) RAN 2: |   |   | Ошибки RAN 2: |   |   |   |   |

Отдельно запишите результаты первого и второго теста, а также средний результат двух тестов.

|                                | Время<br>(в секундах) | Ошибки |
|--------------------------------|-----------------------|--------|
| RAN буквы 1                    |                       |        |
| RAN буквы 2                    |                       |        |
| RAN буквы СРЕДНИЙ<br>РЕЗУЛЬТАТ |                       |        |



Pseudoword repetition test

Test powtarzania pseudosłów (Szewczyk et al. 2015)

Szewczyk J. et al. (2015)

©Instytut Badań Edukacyjnych

Test Powtarzania Pseudosłów

ТЕСТ ПОВТОРЕНИЯ ПСЕВДОСЛОВ

Бланк ответов

|                           |  |         |
|---------------------------|--|---------|
| Имя и фамилия ребенка     |  |         |
| Дата рождения             |  | Пол     |
| Дата проведения теста     |  | Девочка |
| Возраст                   |  | Мальчик |
| Дополнительная информация |  |         |

Результаты

|                        |            |              |                        |
|------------------------|------------|--------------|------------------------|
| Количество предложений | Правильные | Неправильные | Дополнительные заметки |
|                        |            |              |                        |

| A  | <i>Псевдослово</i> | Правильный ответ (1 бал) -<br>подчеркнуть | Другой ответ (0 баллов) -<br>записать | Бал |
|----|--------------------|-------------------------------------------|---------------------------------------|-----|
| 1  | ТОМНЫ              | ТОМНЫ                                     |                                       |     |
| 2  | НАДЕК              | НАДЕК                                     |                                       |     |
| 3  | ЛИХОТЬ             | ЛИХОТЬ                                    |                                       |     |
| 4  | СКРИТА             | СКРИТА                                    |                                       |     |
| 5  | ГОССЕНИЙ           | ГОСЕННИЙ                                  |                                       |     |
| 6  | ДЛОНИЛА            | ДЛОНИЛА                                   |                                       |     |
| 7  | ПЛАКУНЧИХ          | ПЛАКУНЧИХ                                 |                                       |     |
| 8  | ВЫСАКОЙ            | ВИСАКОЙ                                   |                                       |     |
| 9  | ПОЧУМЕЙНЫЙ         | ПОЧУМЕЙНЫЙ                                |                                       |     |
| 10 | ГОНОВИСТО          | ГОНОВИСТО                                 |                                       |     |
| 11 | АНОМОГНИЯ          | АНОМОГНИЯ                                 |                                       |     |
| 12 | ЗГОТАТКА           | ЗГОТАТКА                                  |                                       |     |

Test Powtarzania Pseudosłów

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Szczewczyk J. et al. (2015)

|    |            |                                        |  |  |
|----|------------|----------------------------------------|--|--|
| 13 | БОБИФУТКА  | БОБИФУТКА                              |  |  |
| 14 | ТРУВНЫМ    | трувним      тлувним                   |  |  |
| 15 | ПОЧАТ      | почат      поцил                       |  |  |
| 16 | МОЗОНТ     | мозонт      можонт                     |  |  |
| 17 | РАМЕГО     | рамего      ламего                     |  |  |
| 18 | КРУЧАСКИ   | кручаски      клучаски                 |  |  |
| 19 | ТУТУЧНЕ    | тутечне      тутечне                   |  |  |
| 20 | ПЕРАВОВЬЯ  | перавое      пелавове                  |  |  |
| 21 | АРАГНЕНИЯ  | арагнения      арагнения               |  |  |
| 22 | ОТПАРАСТАК | отпарастак      отпаластак             |  |  |
| 23 | СТРАСУПЕЛА | страсупела      стласупела             |  |  |
| 24 | ДЛЯТЕЧНИХИ | длятечнихи      длятецнихи             |  |  |
| 25 | ШФАВИМАХАЙ | шфавимахай      сфавимахай             |  |  |
| 26 | ОЧИНУЧИ    | очинучи      очинучи                   |  |  |
| 27 | УПРИЖЕВЧИХ | уприжевчих    упричевчих    упришевчих |  |  |

**Sentence repetition test. Test rozwoju językowego TRJ (Smoczyńska et. al. 2015)**

Имя и фамилия \_\_\_\_\_

**Тест на повторение предложений**

| <b>Номер</b> | <b>Предложения и ответы</b>                   | <b>Балы</b> |
|--------------|-----------------------------------------------|-------------|
| Т 1          | У Юли цветной зонтик                          |             |
| Т 2          | Пингвины хорошие плавцы                       |             |
| Т 3          | Лена не любит ходить в калошах.               |             |
| Т 4          | Петя должен забрать брата из садика           |             |
| 1.           | Мама готовит пироги с ягодами                 |             |
| 2.           | Стены окрашены в желтый цвет                  |             |
| 3            | Дети поедут на отдых в лес                    |             |
| 4.           | Антон будет пить горячее какао                |             |
| 5.           | Аня пошла в парк собирать каштаны             |             |
| 6.           | У Марка была конфета, но он ее не съел        |             |
| 7            | Они могут съесть мороженное с фруктами        |             |
| 8            | Бабушка должна была поехать в магазин         |             |
| 9            | Сандали спрятаны под кроватью                 |             |
| 10           | Она не умеет ездить на велосипеде             |             |
| 11           | Сергей не хочет писать письмо другу           |             |
| 12           | Машина была вымыта дядей                      |             |
| 13           | Катя не будет петь песни                      |             |
| 14           | Он не будет искать носки у шкафу              |             |
| 15           | Миша смотрит, как мужчина красит пол          |             |
| 16           | Ковер был испорчен псом                       |             |
| 17           | Мирослав сможет играть на компьютере          |             |
| 18           | София думает, что в реке холодная вода        |             |
| 19           | Это не та картина, которую нарисовала<br>Оля  |             |
| 20           | Стул, на котором сидел мой дедушка,<br>сломан |             |
| 21           | Тетя решила устроить вечеринку                |             |
| 22           | Обувь, которую выбрала Катерина,<br>маленькая |             |

|    |                                                                |  |
|----|----------------------------------------------------------------|--|
| 23 | Егор нашел шапку, которую потеряла бабушка                     |  |
| 24 | Соня просит папу, чтобы он купил компьютер                     |  |
| 25 | Пойдем в хлебный магазин, где есть свежий хлеб                 |  |
| 26 | Алена кормит песика, которого подарили Ивану                   |  |
| 27 | Виктор сердился на сестру, потому что она сломала ему карандаш |  |
| 28 | Суп, который приготовил папа, очень вкусный                    |  |
| 29 | Это не тот мужчина, которого пригласили родители               |  |
| 30 | Обещанная награда нас стимулирует к работе                     |  |
| 31 | Наталья живет в доме, возле которого есть детская площадка     |  |
| 32 | Петя одалживает брату рюкзак тогда, когда он ему нужен         |  |
| 33 | Мужчина, которому звонил отец, нам очень помог                 |  |
| 34 | Мама не будет играть с Марией, пока она не извинится           |  |

## Vocabulary test. Test rozwoju językowego TRJ (Smoczyńska et. al. 2015)

Test Rozwoju Językowego. ©Instytut Badań Edukacyjnych, Warszawa, Wrzesień 2015

Имя и фамилия \_\_\_\_\_

Адаптированный на русский язык подтест\_TRJ

### НАЗЫВАНИЕ СЛОВ

| N                                       | Слово      | Вопрос         | Ответ | Балы |
|-----------------------------------------|------------|----------------|-------|------|
| П1                                      | прыгает    | Что он делает? |       |      |
| 1                                       | меряет     | Что он делает? |       |      |
| 2                                       | доит       | Что он делает? |       |      |
| 3                                       | загребает  | Что он делает? |       |      |
| 4                                       | выбивает   | Что он делает? |       |      |
| 5                                       | дирижирует | Что он делает? |       |      |
| 6                                       | расплетает | Что он делает? |       |      |
| П2                                      | дымоход    | Что это?       |       |      |
| 7                                       | кактус     | Что это?       |       |      |
| 8                                       | бобер      | Что это?       |       |      |
| 9                                       | пустыня    | Что это?       |       |      |
| 10                                      | водопад    | Что это?       |       |      |
| 11                                      | весы       | Что это?       |       |      |
| 12                                      | мухомор    | Что это?       |       |      |
| 13                                      | коала      | Что это?       |       |      |
| 14                                      | весло      | Что это?       |       |      |
| 15                                      | гамак      | Что это?       |       |      |
| 16                                      | парус      | Что это?       |       |      |
| 17                                      | компас     | Что это?       |       |      |
| 18                                      | комар      | Что это?       |       |      |
| 19                                      | дятел      | Что это?       |       |      |
| Внимание! В задании № 20 смена вопроса! |            |                |       |      |
| 20                                      | ветеринар  | Кто это?       |       |      |
| 21                                      | термос     | Что это?       |       |      |
| 22                                      | шалаш      | Что это?       |       |      |
| 23                                      | лук        | Что это?       |       |      |
| 24                                      | понтон     | Что это?       |       |      |
| 25                                      | манекен    | Что это?       |       |      |

**Language development test. Listening comprehension subtest.**  
**Russian subtest. Test rozwoju językowego TRJ (Smoczyńska et. al. 2015).**

Test Rozwoju Językowego. ©Instytut Badań Edukacyjnych, Warszawa, Wrzesień 2015

**Текст №1 Пазл**

Оля очень любила разные истории о путешествиях. Она каждый день смотрела мультфильмы и мечтала, что однажды она полетит самолетом далеко-далеко. Она очень хотела попасть в Дисней Лэнд. Там много героев из сказок: принцесс, рыцарей и забавных клоунов. Однажды ее тетя подарила девочке большой пазл, на обложке которого виднелся Дисней Лэнд. Конечно, Оля сама еще не могла собрать такой большой пазл. Ее старшая сестра Мария решила помочь. Девочки начали собирать пазл вечером. На следующий день они играли и составляли пазл до поздней ночи. И уже радовались, что картинка почти готова, как заметили, что одной части пазла не хватает. Они его искали целый вечер, пока не нашли его у своего любимого пса - Тошки. «Смотри! - закричала Оля. - Наш Тошка тоже хочет поехать в Дисней Лэнд»

**T1 Пазл: Для детей возрастом 4 и 5 лет**

| № | Вопрос                                 | Ответ                                                                 | Баллы 0/1 |
|---|----------------------------------------|-----------------------------------------------------------------------|-----------|
| 1 | О чем мечтала Оля?                     | О путешествии/о путешествии в Дисней Лэнд/о Дисней Лэнде              |           |
| 2 | Кто подарил пазл девочке?              | Тетя                                                                  |           |
| 3 | Почему Оля сама не могла собрать пазл? | Потому что она была еще маленькой/Потому что пазл был слишком большой |           |
| 4 | Кто помог Оле собрать пазл?            | Сестра/старшая сестра                                                 |           |
| 5 | Где Оля нашла часть пазла?             | Возле своего пса/возле пса                                            |           |
|   |                                        | Сумма баллов                                                          |           |

Test Rozwoju Językowego. ©Instytut Badań Edukacyjnych, Warszawa, Wrzesień 2015

**Устное понимание текстов**

**Текст №0 (тест) Рождество**

Приближался самый любимый праздник - Рождество. Дима написал в письме Деду Морозу, что хочет получить под елочку футбольный мяч. Семья готовилась к Рождественскому ужину. Все помогали украшать дом. Дима очень радовался и закрывал глаза, когда представлял, что скоро увидит свой мяч. Вечером все было готово к празднованию. На столе стояли праздничные блюда и елка была очень красивой. В семь часов вечера дедушка и бабушка пришли в гости. Они держали в руках много подарков для всех. Один из них был самым большим. Мальчик очень заинтересовался подарком. После ужина ему разрешили открыть тот таинственный подарок. «Ой, так Дед Мороз все таки прочитал мою открытку!» - закричал Дима.

**T\_0 Рождество: текст для возраста 4,5,6 лет**

| № | Вопрос                                             | Ответ                                                                                                   | Баллы 0/1 |
|---|----------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------|
| 1 | Какой подарок мальчик хотел получить на рождество? | Футбольный мяч                                                                                          |           |
| 2 | Что делала семья вечером ?                         | Готовились к рождественскому вечеру/ украшали дом                                                       |           |
| 3 | Кто пришел вечером в гости?                        | Бабушка и дедушка<br>Если ребенок назовет только бабушку или дедушку, то нужно спросить – «Кто-то еще?» |           |
| 4 | Что увидел Дима у бабушки и дедушки в руках?       | Много подарков/круглый и большой подарок                                                                |           |
| 5 | Когда Диме разрешили открыть подарок?              | После ужина                                                                                             |           |
|   |                                                    | Сумма ответов                                                                                           |           |

### Текст № 2 Путешествие

Летом Олег с родителями всегда ездит на море. Он очень любит плавать, нырять и играть в волейбол на пляже. Он целый год учился хорошо плавать в бассейне. Итак, они с родителями ехали к морю целых четыре часа. Наконец в окне мальчик заметил, как сверкают на солнце волны. «Какое же море красивое и теплое», - подумал мальчик. Через несколько минут семья доехала к домику, в котором они планировали провести целых семь дней. Олег быстро выбежал из машины и вдохнул полной грудью свежий воздух. «Как здесь классно!» - подумал мальчик. Он помог быстро родителям с чемоданами и забежал в домик! Здесь его ждал сюрприз. Над кроватью, на которую Олег положил свой рюкзак, висела картина с белым кораблем на синем море. Мальчик восторженно смотрел на картину. Он представлял себя капитаном этого корабля. Он лег на кровать и мечтательно закрыл глаза.

#### T2 Путешествие: для детей возрастом 4, 5, 6, 7, 8 лет

| № | Вопрос                                        | Ответ                                                                                                                                                    | Баллы 0/1 |
|---|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1 | С кем Олег всегда едет на море?               | <b>С папой и мамой/с родителями</b><br>Если ребенок называет только маму или папу, то получает 0 баллов                                                  |           |
| 2 | Что любит Олег делать на море?                | <b>Плавать, нырять и играть в волейбол</b><br>MIN 2! Если ребенок называет что-то одно, то уточняем «Еще что-то?» Назови, что Олег любит делать на море. |           |
| 3 | Где семья мальчика планировала провести лето? | <b>У дяди</b>                                                                                                                                            |           |
| 4 | Что увидел в домике мальчик, когда вошел?     | <b>Картину, картину с кораблем</b>                                                                                                                       |           |
| 5 | О чем начал мечтать мальчик?                  | <b>О том, как он станет капитаном</b>                                                                                                                    |           |
|   |                                               | <b>Сумма</b>                                                                                                                                             |           |

### Текст № 3 Малиновый пирог

Аленка часто навещает свою бабушку в деревне. Особенно девочка любит приезжать, когда поспеет малина. Именно тогда она с бабушкой готовит вкусный малиновый пирог. Но чтобы его приготовить, следует много поработать. С самого утра девочка идет в сад, чтобы собрать малину. Эта ягодка такая вкусная и сочная. На солнце ее цвет просто завораживает. Девочка каждую малинку осторожно срывает и кладет в корзину. Следует быть осторожным, потому что ветви малины могут быть колючими. Вот одна ягодка в корзину, а другая в ротик. Так можно и бабушке помочь, и насладиться вкусными ягодками. Потом Лена идет на кухню, где она помогает бабушке готовить тесто. «Следует хорошо вымешивать тесто, - говорит бабушка. - Тогда оно хорошо испечется.» Аленка старательно месит тесто. Но самое любимое - это украшать пирог. Девочка с удовольствием выкладывает каждую малинку на поверхность пирога, чтобы получился круг. В самом конце девочка сверху немного посыпает сахаром, чтобы было еще слаще. Наступает время для пирога печенье. Прошел час и бабушка с гордостью достает ароматный пирог. «Какая у меня хорошая помощница! Без тебя я бы не справилась».

#### T3 Малиновый пирог: Дополнительный текст для детей в возрасте от 7 лет

##### Основной текст для детей в возрасте 7 и 8 лет

| № | Вопрос                                               | Ответ                                                          | Баллы 0/1 |
|---|------------------------------------------------------|----------------------------------------------------------------|-----------|
| 1 | Кого Аленка часто навещает в деревне?                | <b>Бабушку</b>                                                 |           |
| 2 | Почему Аленка любит приезжать, когда поспеет малина? | <b>Потому что тогда они с бабушкой готовят малиновый пирог</b> |           |
| 3 | Что девочка делает перед тем, как испечь пирог?      | <b>Собирает малину/идет собирать малину</b>                    |           |
| 4 | Что нужно сделать, чтобы пирог хорошо испекся?       | <b>Нужно хорошо его вымесить</b>                               |           |
| 5 | Что девочка посыпала сверху на пирог?                | <b>Сахар</b>                                                   |           |
|   |                                                      | <b>Сумма баллов</b>                                            |           |

Текст 4 Велосипед

Был очень жаркий день. Почти середина августа. Лето уже подходило к концу. Вася и Петя играли в тени на своем дворе. За лето они привыкли поздно вставать, играть целый день на улице, потом поздно вечером прибегать домой и сразу ложиться спать. Так день за днем незаметно лето подошло к концу. Но был один вопрос, которая волновал ребят - это велосипеды. У Николая, который жил в доме напротив, есть замечательный черный велосипед. Но не простой, а настоящий спортивный, очень быстрый, с большими колесами. Руль был серебристым и всегда сверкал на солнце, когда парень на нем проезжал мимо. Василий и Петя очень завидовали Николаю. Они хотели бы иметь такие красивые велосипеды. Одажды папа Петя приехал домой пораньше. Петя задумался, почему это папа был такой загадочный. «Почему он улыбнулся, когда посмотрел на меня?» - подумал мальчик. «Петя, иди сюда!» - крикнул из гаража папа. Когда мальчик зашел, то чуть не упал, от неожиданности. Перед ним стоял новенький серебристый велосипед, такой же как у Николая. «Да нет, даже лучше!» - подумал мальчик. Он сел на велосипед и поехал к своему другу. Но как только выехал, то увидел, что ему навстречу ехал Василий, тоже на новом велосипеде.

Т4 Велосипед: Дополнительный текст для детей в возрасте 6 лет

Основной текст для детей в возрасте 7 и 8 лет

| № | Вопрос                                   | Ответ                                           | Баллы |
|---|------------------------------------------|-------------------------------------------------|-------|
| 1 | Почему Петя и Вася завидовали Коле?      | Потому что у него был хороший велосипед         |       |
| 2 | Какого цвета был руль велосипеда у Коли? | Серебристый                                     |       |
| 3 | Кто приехал домой раньше?                | Папа Петя                                       |       |
| 4 | Куда позвал папа Петю?                   | В гараж                                         |       |
| 5 | Кого увидел Петя, когда вышел на улицу?  | Увидел своего друга, который ехал на велосипеде |       |
|   |                                          | Сумма баллов                                    |       |

Текст 5 Лебеди

Лебедь - это большая водоплавающая птица. Оперение лебедей бывает чисто белое, серое или черное. Их перья водонепроницаемые. У лебедей очень длинная и красивая шея, что позволяет им обыскивать дно в поисках пищи. Размах их крыльев достигает двух метров. Лебеди могут летать на тысячи километров. Лебеди - это очень верные птицы. Они воспитывают своих детей вместе. Обычно у лебедей бывает до шести птенцов. Они строят свои гнезда весной на реках, озерах, в камышах, там, где их будет трудно найти и увидеть. Большинство этих прекрасных птиц живет в городских парках. Они являются украшением городов. Эти птицы заворачивают своим величием и красотой, а также восхищают верностью и благородностью.

Т5 Лебедь: Дополнительный текст для детей в возрасте 7 и 8 лет

| № | Вопрос                                        | Ответ                                                                                                                  | Баллы |
|---|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------|
| 1 | Какого цвета оперение у лебедей?              | Белый, черный, серый<br>Дополнительных вопросов не задавать, ребенок должен назвать МИН 2 цвета, чтобы получить 1 бал. |       |
| 2 | Для чего у лебедей такая длинная шея?         | Чтобы искать еду на дне озера/реки                                                                                     |       |
| 3 | Где строят лебеди свои гнезда?                | На озерах, на речках, в местах, где их тяжело будет увидеть                                                            |       |
| 4 | Где можно часто увидеть этих прекрасных птиц? | В парках европейских стран                                                                                             |       |
| 5 | Почему люди восхищаются этими птицами?        | Потому что они верные и благородные                                                                                    |       |
|   |                                               | Сумма баллов                                                                                                           |       |



## One-minute word reading (MABEL)

|                                                                                   |                                                       |
|-----------------------------------------------------------------------------------|-------------------------------------------------------|
|  | <b>Чтение слов (1 минута)</b><br><b>Карта ответов</b> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------|

Тестирующий: ..... Дата: .....

|                             |  |             |  |                      |  |
|-----------------------------|--|-------------|--|----------------------|--|
| <b>ID ребенка: (код)</b>    |  | <b>Пол:</b> |  | <b>Возраст</b>       |  |
| <b>Название школы (код)</b> |  |             |  | <b>Группа/Класс:</b> |  |



Ознакомьтесь с инструкциями проведения теста Чтение слов

Включайте секундомер, как только ребенок прочитает первое слово

Выключите после 60 секунд.

В колонке «Ответы» следует отметить + напротив правильно прочитанного слова, X у слов, которые были прочитаны неверно, АК у слов, которые ребенок самостоятельно исправил ошибку и - (черту) у слов, которые были пропущены или которые ребенок отказалась называть.

Если ребенок остановился, то следует его попросить продолжить читать.

Подчеркните последнее слово, которое он прочитал.

| Слово | Ответ | Слово | Ответ | Слово | Ответ |
|-------|-------|-------|-------|-------|-------|
| 1     | я     | 20    | над   | 39    | оса   |
| 2     | и     | 21    | сад   | 40    | сом   |
| 3     | ты    | 22    | кот   | 41    | сын   |
| 4     | он    | 23    | сок   | 42    | воз   |
| 5     | вы    | 24    | кот   | 43    | дом   |
| 6     | не    | 25    | сок   | 44    | лис   |
| 7     | да    | 26    | кум   | 45    | рис   |
| 8     | на    | 27    | лев   | 46    | пис   |
| 9     | за    | 28    | нос   | 47    | так   |
| 10    | ты    | 29    | рот   | 48    | лед   |
| 11    | ля    | 30    | год   | 49    | низ   |
| 12    | ну    | 31    | дед   | 50    | рой   |
| 13    | мы    | 32    | век   | 51    | тут   |
| 14    | до    | 33    | день  | 52    | дай   |
| 15    | по    | 34    | пес   | 53    | йод   |
| 16    | ох    | 35    | хор   | 54    | мед   |
| 17    | им    | 36    | ров   | 55    | шар   |
| 18    | под   | 37    | мяч   | 56    | жук   |
| 19    | для   | 38    | сон   | 57    | мир   |

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| Слово    | Ответ | Слово       | Ответ         | Слово | Ответ |
|----------|-------|-------------|---------------|-------|-------|
| 58 свет  |       | 87 поле     | 116 учитель   |       |       |
| 59 шея   |       | 88 пшено    | 117 красный   |       |       |
| 60 скат  |       | 89 морж     | 118 трамвай   |       |       |
| 61 вода  |       | 90 шепот    | 119 поездка   |       |       |
| 62 зима  |       | 91 шумно    | 120 соседка   |       |       |
| 63 мама  |       | 92 снег     | 121 друзья    |       |       |
| 64 папа  |       | 93 чисто    | 122 страна    |       |       |
| 65 сама  |       | 94 чайка    | 123 краска    |       |       |
| 66 мало  |       | 95 речка    | 124 правда    |       |       |
| 67 рано  |       | 96 свечка   | 125 земля     |       |       |
| 68 лето  |       | 97 надежда  | 126 пример    |       |       |
| 69 весна |       | 98 радость  | 127 танцевать |       |       |
| 70 слово |       | 99 подарок  | 128 футбол    |       |       |
| 71 дело  |       | 100 человек | 129 счастье   |       |       |
| 72 кино  |       | 101 чашка   | 130 звонок    |       |       |
| 73 даль  |       | 102 тетрадь | 131 веселый   |       |       |
| 74 лево  |       | 103 ручка   | 132 джинсы    |       |       |
| 75 шкаф  |       | 104 рассвет | 133 пример    |       |       |
| 76 муха  |       | 105 песня   | 134 кровать   |       |       |
| 77 жаба  |       | 106 кухня   | 135 говорить  |       |       |
| 78 нога  |       | 107 сахар   | 136 президент |       |       |
| 79 стена |       | 108 гвоздь  | 137 готовить  |       |       |
| 80 звуки |       | 109 барсук  | 138 мечтать   |       |       |
| 81 книга |       | 110 третий  | 139 костюм    |       |       |
| 82 песня |       | 111 листья  | 140 лекарство |       |       |
| 83 окно  |       | 112 семена  | 141 поездка   |       |       |
| 84 один  |       | 113 молоко  | 142 альбом    |       |       |
| 85 место |       | 114 яблока  | 143 сапоги    |       |       |
| 86 вечер |       | 115 телефон | 144 рецепт    |       |       |

|                                       |
|---------------------------------------|
| Количество правильно прочитанных слов |
| Количество ошибок                     |

|                                                                                   |                                |
|-----------------------------------------------------------------------------------|--------------------------------|
|  | Чтение слов (1 минута)<br>Итог |
|-----------------------------------------------------------------------------------|--------------------------------|

Записываем общее количество слов, которые ребенок прочитал

|                                                               | Количество | Стандартизованный бал | Доверительный интервал | Процент |
|---------------------------------------------------------------|------------|-----------------------|------------------------|---------|
| Прочитанные слова                                             |            |                       |                        |         |
| Количество неправильно прочитанных слов                       |            |                       |                        |         |
| Количество правильно прочитанных слов, в том числе авто-копий |            |                       |                        |         |

## One-minute pseudoword reading (MABEL)

|                                                                                   |                                                        |
|-----------------------------------------------------------------------------------|--------------------------------------------------------|
|  | <b>ЧТЕНИЕ ПСЕВДОСЛОВ (1 МИНУТА)<br/>ТЕСТОВАЯ КАРТА</b> |
|-----------------------------------------------------------------------------------|--------------------------------------------------------|

|     |      |       |
|-----|------|-------|
| ю   | тай  | таша  |
| о   | шам  | куна  |
| ле  | кыр  | слок  |
| ав  | лон  | кажа  |
| по  | мот  | корн  |
| би  | зук  | ноба  |
| со  | лаш  | утма  |
| ми  | вак  | номы  |
| от  | вох  | мысо  |
| ар  | тор  | шапы  |
| ки  | таг  | стом  |
| лу  | баша | спиф  |
| ик  | мено | руст  |
| ог  | воса | мофе  |
| зи  | ларш | лиша  |
| са  | вюк  | рока  |
| ру  | гис  | зика  |
| кес | пека | узок  |
| хом | сыло | зонк  |
| лет | тино | кова  |
| дот | рѣд  | руза  |
| иса | бод  | лиск  |
| гѣс | угра | глата |
| зар | слуз | мора  |
| дов | рапо | важа  |

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|              |                |
|--------------|----------------|
| <b>хова</b>  | <b>утюш</b>    |
| <b>мата</b>  | <b>калан</b>   |
| <b>лусы</b>  | <b>лачка</b>   |
| <b>банма</b> | <b>вчета</b>   |
| <b>мубы</b>  | <b>лукет</b>   |
| <b>кало</b>  | <b>кворец</b>  |
| <b>моза</b>  | <b>внику</b>   |
| <b>ремья</b> | <b>тепка</b>   |
| <b>сужок</b> | <b>пласье</b>  |
| <b>кело</b>  | <b>ленок</b>   |
| <b>петка</b> | <b>сирог</b>   |
| <b>нелка</b> | <b>ситать</b>  |
| <b>влеск</b> | <b>мирог</b>   |
| <b>уроли</b> | <b>певочка</b> |
| <b>ремья</b> | <b>фрава</b>   |
| <b>фети</b>  | <b>вонце</b>   |
| <b>хусто</b> |                |
| <b>миса</b>  |                |
| <b>кного</b> |                |
| <b>зождь</b> |                |
| <b>врес</b>  |                |
| <b>прач</b>  |                |
| <b>бочна</b> |                |
| <b>кухтя</b> |                |
| <b>ташка</b> |                |

## Маленькая танцовщица

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Лена очень любит музыку и танцы. Девочка каждый понедельник и четверг ходит на танцы с подружкой. Ей очень нравится ее группа и тренер, который учит их танцевать. На занятиях всегда весело и интересно. В группе шесть девочек и семь мальчиков. Дети хорошо общаются друг с другом. Сегодня важная тренировка, потому что они готовятся к выступлению. Концерт состоится через неделю. Лена очень рада, что родители, бабушка и дедушка смогут увидеть ее выступление.



Открытые вопросы:

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1. Як звать героиню этой истории? [Олена]
2. С кем девочка ходит на тренировки? [з подружкой]
3. Сколько детей в танцевальной группе? [шесть девочек и семь мальчиков]
4. К чему готовятся дети? [дети готовятся к выступлению/концерту]

## Интересный мир книг

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Петр сегодня с классом идет в городскую библиотеку. Дети собрались рано в школе. Учительница Елена Васильевна с восторгом рассказывала детям о книгах, а также об их походе в библиотеку. Сначала класс поехал автобусом в центр города, а затем пешком дошли до библиотеки. Там их встретила очень приветливая и улыбочивая библиотекарь. Она пригласила детей и учительницу в уютный и светлый зал. Сначала дети посмотрели короткий фильм о том, как создают и печатают книги. Затем библиотекарь рассказала, как правильно искать книги в библиотеке, как следует занимать и возвращать книги. Петр очень доволен, потому что в конце все дети получили хорошие раскраски.



- 
1. Як звать героя этой истории? [Петя]
  2. Як дети добирались до библиотеки? [дети поехали автобусом, а потом они шли пешком]
  3. Кто встретил детей в библиотеке? [библиотекарь]
  4. Что дети получили в конце встречи? [дети получили раскраски]

## Appendix M: Descriptive statistics T1, T2 (all groups)

### Testing session 1 (dataset)

| Descriptives      | Group | N  | Missing | Mean   | Median | SD    | Variance | Minimum | Maximum | Skewness |       | Kurtosis |       | Shapiro-Wilk |       |
|-------------------|-------|----|---------|--------|--------|-------|----------|---------|---------|----------|-------|----------|-------|--------------|-------|
|                   |       |    |         |        |        |       |          |         |         | Skewness | SE    | Kurtosis | SE    | W            | p     |
| WordRead_U        | 1     | 36 | 3       | 20.611 | 18.500 | 6.006 | 36.073   | 12.000  | 39.000  | 1.405    | 0.393 | 1.785    | 0.768 | 0.865        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 22.857 | 22.000 | 8.481 | 71.929   | 12.000  | 53.000  | 2.441    | 0.501 | 7.842    | 0.972 | 0.757        | <.001 |
| PseudoRead_U      | 1     | 36 | 3       | 17.361 | 15.500 | 5.473 | 29.952   | 11.000  | 38.000  | 2.077    | 0.393 | 5.171    | 0.768 | 0.786        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 21.905 | 21.000 | 8.074 | 65.190   | 12.000  | 47.000  | 1.865    | 0.501 | 4.193    | 0.972 | 0.823        | 0.002 |
| PA_Deletion_U40   | 1     | 14 | 25      | 33.143 | 34.000 | 4.276 | 18.286   | 26.000  | 38.000  | -0.555   | 0.597 | -0.958   | 1.154 | 0.898        | 0.105 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 16 | 5       | 32.813 | 32.500 | 3.391 | 11.496   | 25.000  | 38.000  | -0.731   | 0.564 | 0.525    | 1.091 | 0.930        | 0.243 |
| PA_isolation_UR64 | 1     | 39 | 0       | 49.487 | 53.000 | 9.259 | 85.730   | 30.000  | 60.000  | -0.867   | 0.378 | -0.483   | 0.741 | 0.874        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 57.952 | 60.000 | 4.965 | 24.648   | 48.000  | 64.000  | -0.584   | 0.501 | -0.908   | 0.972 | 0.912        | 0.061 |
| PA_blending_UR24  | 1     | 39 | 0       | 20.026 | 20.000 | 2.590 | 6.710    | 12.000  | 24.000  | -1.035   | 0.378 | 1.362    | 0.741 | 0.927        | 0.014 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 21.714 | 22.000 | 1.978 | 3.914    | 16.000  | 24.000  | -1.187   | 0.501 | 2.078    | 0.972 | 0.894        | 0.027 |
| LK_UC_U33         | 1     | 39 | 0       | 29.821 | 31.000 | 2.742 | 7.520    | 22.000  | 33.000  | -1.416   | 0.378 | 1.381    | 0.741 | 0.830        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 30.762 | 31.000 | 1.814 | 3.290    | 26.000  | 33.000  | -1.108   | 0.501 | 0.924    | 0.972 | 0.877        | 0.013 |
| LK_LC_U33         | 1     | 39 | 0       | 29.538 | 30.000 | 2.999 | 8.992    | 20.000  | 33.000  | -1.670   | 0.378 | 2.813    | 0.741 | 0.824        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 31.095 | 31.000 | 1.700 | 2.890    | 27.000  | 33.000  | -1.108   | 0.501 | 0.731    | 0.972 | 0.862        | 0.007 |
| ListeningCom_U    | 1     | 39 | 0       | 19.026 | 21.000 | 5.204 | 27.078   | 8.000   | 26.000  | -0.721   | 0.378 | -0.526   | 0.741 | 0.910        | 0.004 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 23.952 | 24.000 | 2.765 | 7.648    | 18.000  | 28.000  | -0.792   | 0.501 | 0.147    | 0.972 | 0.911        | 0.056 |
| Vocabulary_U_25   | 1     | 39 | 0       | 18.000 | 18.000 | 4.046 | 16.368   | 9.000   | 25.000  | -0.141   | 0.378 | -0.852   | 0.741 | 0.967        | 0.313 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 18.190 | 18.000 | 1.537 | 2.362    | 15.000  | 21.000  | -0.261   | 0.501 | -0.424   | 0.972 | 0.959        | 0.490 |
| PseuWordRep_27ur  | 1     | 39 | 0       | 25.256 | 26.000 | 1.568 | 2.459    | 20.000  | 27.000  | -1.658   | 0.378 | 2.780    | 0.741 | 0.787        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 25.429 | 26.000 | 1.720 | 2.957    | 22.000  | 27.000  | -1.007   | 0.501 | 0.106    | 0.972 | 0.809        | <.001 |
| Sentrep_U34       | 1     | 39 | 0       | 28.359 | 30.000 | 4.463 | 19.920   | 13.000  | 33.000  | -1.870   | 0.378 | 3.940    | 0.741 | 0.785        | <.001 |
|                   | 2     | 0  | 25      | NaN    | NaN    | NaN   | NaN      | NaN     | NaN     | NaN      | NaN   | NaN      | NaN   | NaN          | NaN   |
|                   | 3     | 21 | 0       | 31.810 | 32.000 | 1.569 | 2.462    | 28.000  | 34.000  | -0.683   | 0.501 | 0.535    | 0.972 | 0.928        | 0.126 |

|                  |   |    |    |        |        |        |         |        |         |        |       |        |       |       |       |
|------------------|---|----|----|--------|--------|--------|---------|--------|---------|--------|-------|--------|-------|-------|-------|
| RAN_O_U          | 1 | 38 | 1  | 49.912 | 48.310 | 8.763  | 76.784  | 34.180 | 75.910  | 0.949  | 0.383 | 1.473  | 0.750 | 0.930 | 0.020 |
|                  | 2 | 0  | 25 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|                  | 3 | 21 | 0  | 48.767 | 48.000 | 9.283  | 86.173  | 33.685 | 69.000  | 0.447  | 0.501 | -0.276 | 0.972 | 0.969 | 0.713 |
| RAN_N_U          | 1 | 39 | 0  | 41.816 | 41.500 | 11.311 | 127.929 | 26.230 | 87.095  | 2.000  | 0.378 | 6.354  | 0.741 | 0.824 | <.001 |
|                  | 2 | 0  | 25 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|                  | 3 | 21 | 0  | 33.422 | 31.500 | 7.717  | 59.560  | 18.300 | 52.230  | 0.725  | 0.501 | 1.316  | 0.972 | 0.940 | 0.219 |
| RAN_C_U          | 1 | 39 | 0  | 52.434 | 53.500 | 12.325 | 151.899 | 37.500 | 114.980 | 3.470  | 0.378 | 17.439 | 0.741 | 0.675 | <.001 |
|                  | 2 | 0  | 25 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|                  | 3 | 21 | 0  | 54.125 | 54.500 | 6.987  | 48.824  | 39.620 | 65.560  | -0.238 | 0.501 | -0.552 | 0.972 | 0.977 | 0.870 |
| RAN_L_U          | 1 | 38 | 1  | 41.802 | 41.825 | 10.620 | 112.787 | 22.795 | 92.965  | 2.856  | 0.383 | 14.504 | 0.750 | 0.730 | <.001 |
|                  | 2 | 0  | 25 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|                  | 3 | 21 | 0  | 31.469 | 31.000 | 8.217  | 67.522  | 16.845 | 46.500  | 0.351  | 0.501 | -0.707 | 0.972 | 0.953 | 0.385 |
| WordRead_P       | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| PseudoRead_P     | 2 | 25 | 0  | 21.200 | 21.000 | 3.240  | 10.500  | 15.000 | 27.000  | 0.045  | 0.464 | -0.515 | 0.902 | 0.976 | 0.794 |
|                  | 3 | 20 | 1  | 21.350 | 19.500 | 7.066  | 49.924  | 14.000 | 42.000  | 1.913  | 0.512 | 3.731  | 0.992 | 0.791 | <.001 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| PA_Deletion_P40  | 2 | 25 | 0  | 17.120 | 17.000 | 2.619  | 6.860   | 14.000 | 24.000  | 0.902  | 0.464 | 0.560  | 0.902 | 0.919 | 0.048 |
|                  | 3 | 20 | 1  | 18.900 | 16.500 | 6.488  | 42.095  | 12.000 | 36.000  | 1.658  | 0.512 | 2.412  | 0.992 | 0.810 | 0.001 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| PA_isolation_P64 | 2 | 19 | 6  | 34.789 | 35.000 | 2.226  | 4.953   | 30.000 | 38.000  | -0.380 | 0.524 | -0.279 | 1.014 | 0.928 | 0.159 |
|                  | 3 | 16 | 5  | 31.813 | 32.000 | 3.970  | 15.762  | 23.000 | 38.000  | -0.404 | 0.564 | 0.516  | 1.091 | 0.942 | 0.372 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| PA_Blending_P24  | 2 | 25 | 0  | 57.320 | 59.000 | 3.976  | 15.810  | 50.000 | 63.000  | -0.629 | 0.464 | -0.872 | 0.902 | 0.899 | 0.017 |
|                  | 3 | 21 | 0  | 56.857 | 58.000 | 5.369  | 28.829  | 45.000 | 64.000  | -0.669 | 0.501 | -0.565 | 0.972 | 0.923 | 0.101 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| LK_UC_P32        | 2 | 25 | 0  | 22.200 | 22.000 | 1.155  | 1.333   | 20.000 | 24.000  | -0.247 | 0.464 | -0.645 | 0.902 | 0.919 | 0.049 |
|                  | 3 | 21 | 0  | 21.667 | 22.000 | 2.415  | 5.833   | 15.000 | 24.000  | -1.520 | 0.501 | 2.002  | 0.972 | 0.825 | 0.002 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| LL_LC_P32        | 2 | 25 | 0  | 29.640 | 30.000 | 1.221  | 1.490   | 27.000 | 32.000  | -0.578 | 0.464 | 0.378  | 0.902 | 0.907 | 0.027 |
|                  | 3 | 21 | 0  | 28.857 | 30.000 | 2.726  | 7.429   | 22.000 | 33.000  | -0.915 | 0.501 | 0.500  | 0.972 | 0.915 | 0.071 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| ListeningCom_P   | 2 | 25 | 0  | 29.360 | 29.000 | 1.254  | 1.573   | 27.000 | 32.000  | -0.205 | 0.464 | 0.220  | 0.902 | 0.912 | 0.034 |
|                  | 3 | 21 | 0  | 28.619 | 30.000 | 2.729  | 7.448   | 21.000 | 31.000  | -1.464 | 0.501 | 1.700  | 0.972 | 0.809 | <.001 |
|                  | 1 | 0  | 39 | NaN    | NaN    | NaN    | NaN     | NaN    | NaN     | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|                  | 2 | 25 | 0  | 24.720 | 24.000 | 1.904  | 3.627   | 22.000 | 28.000  | 0.280  | 0.464 | -0.779 | 0.902 | 0.927 | 0.073 |



## Testing session 2: Dataset T2

| Descriptives  | Group     | N  | Missing | Mean   | SE    | Median | SD     | Minimum | Maximum | Skewness |       |         | Kurtosis |       |       | Shapiro-Wilk |  |  |
|---------------|-----------|----|---------|--------|-------|--------|--------|---------|---------|----------|-------|---------|----------|-------|-------|--------------|--|--|
|               |           |    |         |        |       |        |        |         |         | Skewness | SE    | Maximum | Kurtosis | SE    | W     | p            |  |  |
|               |           |    |         |        |       |        |        |         |         |          |       |         |          |       |       |              |  |  |
| T2PA_DeIU     | bilingual | 17 | 0       | 34.529 | 1.160 | 35.000 | 4.784  | 20.000  | 40.000  | -2.169   | 0.550 | 40.000  | 5.267    | 1.063 | 0.721 | <.001        |  |  |
|               | monoU     | 25 | 1       | 33.400 | 0.772 | 34.000 | 3.862  | 24.000  | 39.000  | -0.798   | 0.464 | 39.000  | 0.089    | 0.902 | 0.926 | 0.072        |  |  |
|               | monoP     | 0  | 22      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
| T2PA_DeIP     | bilingual | 17 | 0       | 32.412 | 0.932 | 33.000 | 3.842  | 22.000  | 38.000  | -1.227   | 0.550 | 38.000  | 2.187    | 1.063 | 0.911 | 0.102        |  |  |
|               | monoU     | 0  | 26      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
|               | monoP     | 22 | 0       | 35.636 | 0.408 | 36.000 | 1.916  | 32.000  | 39.000  | -0.408   | 0.491 | 39.000  | -0.495   | 0.953 | 0.940 | 0.200        |  |  |
| T2PA_isoU     | bilingual | 17 | 0       | 57.412 | 1.435 | 60.000 | 5.917  | 42.000  | 64.000  | -1.655   | 0.550 | 64.000  | 2.640    | 1.063 | 0.802 | 0.002        |  |  |
|               | monoU     | 26 | 0       | 53.308 | 1.019 | 54.500 | 5.198  | 40.000  | 61.000  | -0.636   | 0.456 | 61.000  | 0.172    | 0.887 | 0.952 | 0.264        |  |  |
|               | monoP     | 0  | 22      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
| T2PA_isoP     | bilingual | 17 | 0       | 55.941 | 1.610 | 57.000 | 6.638  | 40.000  | 64.000  | -1.686   | 0.550 | 64.000  | 2.759    | 1.063 | 0.789 | 0.001        |  |  |
|               | monoU     | 0  | 26      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
|               | monoP     | 22 | 0       | 59.045 | 0.568 | 60.000 | 2.663  | 52.000  | 62.000  | -1.018   | 0.491 | 62.000  | 0.781    | 0.953 | 0.868 | 0.007        |  |  |
| T2PA_blenU    | bilingual | 17 | 0       | 23.353 | 0.270 | 24.000 | 1.115  | 20.000  | 24.000  | -2.035   | 0.550 | 24.000  | 4.309    | 1.063 | 0.656 | <.001        |  |  |
|               | monoU     | 26 | 0       | 21.500 | 0.356 | 21.500 | 1.817  | 18.000  | 24.000  | -0.217   | 0.456 | 24.000  | -0.708   | 0.887 | 0.933 | 0.093        |  |  |
|               | monoP     | 0  | 22      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
| T2PA_BlendP   | bilingual | 17 | 0       | 23.059 | 0.290 | 23.000 | 1.197  | 20.000  | 24.000  | -1.364   | 0.550 | 24.000  | 1.406    | 1.063 | 0.786 | 0.001        |  |  |
|               | monoU     | 0  | 26      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
|               | monoP     | 22 | 0       | 23.273 | 0.199 | 24.000 | 0.935  | 21.000  | 24.000  | -0.991   | 0.491 | 24.000  | -0.118   | 0.953 | 0.764 | <.001        |  |  |
| T2ListenComU  | bilingual | 17 | 0       | 13.529 | 0.229 | 14.000 | 0.943  | 12.000  | 15.000  | -0.349   | 0.550 | 15.000  | -0.611   | 1.063 | 0.868 | 0.020        |  |  |
|               | monoU     | 26 | 0       | 11.038 | 0.498 | 11.000 | 2.537  | 6.000   | 15.000  | -0.174   | 0.456 | 15.000  | -1.186   | 0.887 | 0.929 | 0.072        |  |  |
|               | monoP     | 0  | 22      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
| T2ListenCompP | bilingual | 17 | 0       | 13.588 | 0.243 | 14.000 | 1.004  | 12.000  | 15.000  | -0.273   | 0.550 | 15.000  | -0.813   | 1.063 | 0.881 | 0.033        |  |  |
|               | monoU     | 0  | 26      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
|               | monoP     | 22 | 0       | 11.727 | 0.303 | 12.000 | 1.420  | 9.000   | 14.000  | -0.016   | 0.491 | 14.000  | -0.677   | 0.953 | 0.938 | 0.183        |  |  |
| T2SentRepU    | bilingual | 17 | 0       | 32.412 | 0.446 | 33.000 | 1.839  | 28.000  | 34.000  | -1.720   | 0.550 | 34.000  | 2.634    | 1.063 | 0.743 | <.001        |  |  |
|               | monoU     | 26 | 0       | 30.000 | 0.959 | 32.000 | 4.891  | 16.000  | 35.000  | -1.876   | 0.456 | 35.000  | 2.925    | 0.887 | 0.745 | <.001        |  |  |
|               | monoP     | 0  | 22      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
| T2SentRepP    | bilingual | 17 | 0       | 32.294 | 0.427 | 32.000 | 1.759  | 29.000  | 34.000  | -0.509   | 0.550 | 34.000  | -1.156   | 1.063 | 0.844 | 0.009        |  |  |
|               | monoU     | 0  | 26      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |
|               | monoP     | 22 | 0       | 30.091 | 0.873 | 31.500 | 4.093  | 18.000  | 34.000  | -1.965   | 0.491 | 34.000  | 3.927    | 0.953 | 0.767 | <.001        |  |  |
| T2RAN_N_U     | bilingual | 17 | 0       | 27.706 | 1.742 | 27.000 | 7.183  | 15.000  | 45.000  | 0.897    | 0.550 | 45.000  | 1.240    | 1.063 | 0.920 | 0.150        |  |  |
|               | monoU     | 26 | 0       | 37.231 | 2.856 | 34.000 | 14.565 | 23.000  | 97.500  | 3.007    | 0.456 | 97.500  | 11.757   | 0.887 | 0.701 | <.001        |  |  |
|               | monoP     | 0  | 22      | NaN    | NaN   | NaN    | NaN    | NaN     | NaN     | NaN      | NaN   | NaN     | NaN      | NaN   | NaN   | NaN          |  |  |

|             |    |    |        |       |        |        |        |        |        |       |        |       |       |       |
|-------------|----|----|--------|-------|--------|--------|--------|--------|--------|-------|--------|-------|-------|-------|
| T2RAN_L_P   | 17 | 0  | 22.118 | 0.923 | 21.000 | 3.806  | 16.000 | 30.000 | 0.275  | 0.550 | -0.666 | 1.063 | 0.938 | 0.298 |
|             | 0  | 26 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|             | 22 | 0  | 24.864 | 1.324 | 25.000 | 6.211  | 16.500 | 40.000 | 0.723  | 0.491 | 0.136  | 0.953 | 0.938 | 0.176 |
| T2RAN_L_U   | 17 | 0  | 21.412 | 0.853 | 22.000 | 3.519  | 16.000 | 28.000 | 0.197  | 0.550 | -0.697 | 1.063 | 0.962 | 0.673 |
|             | 26 | 0  | 38.303 | 2.649 | 38.250 | 13.508 | 22.500 | 84.500 | 1.491  | 0.456 | 4.215  | 0.887 | 0.865 | 0.003 |
|             | 0  | 22 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| T2Vocab_U   | 17 | 0  | 22.118 | 0.419 | 23.000 | 1.728  | 19.000 | 24.000 | -0.699 | 0.550 | -0.755 | 1.063 | 0.872 | 0.024 |
|             | 26 | 0  | 19.269 | 0.573 | 19.500 | 2.920  | 15.000 | 24.000 | 0.067  | 0.456 | -1.173 | 0.887 | 0.935 | 0.101 |
|             | 0  | 22 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| T2Vocab_P   | 17 | 0  | 22.118 | 0.419 | 23.000 | 1.728  | 19.000 | 24.000 | -0.699 | 0.550 | -0.755 | 1.063 | 0.872 | 0.024 |
|             | 0  | 26 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|             | 22 | 0  | 22.955 | 0.250 | 23.000 | 1.174  | 20.000 | 24.000 | -1.069 | 0.491 | 0.475  | 0.953 | 0.824 | 0.001 |
| T2ReadWordU | 17 | 0  | 54.765 | 2.697 | 54.000 | 11.122 | 33.000 | 84.000 | 1.177  | 0.550 | 3.308  | 1.063 | 0.812 | 0.003 |
|             | 26 | 0  | 38.038 | 1.996 | 39.000 | 10.176 | 22.000 | 56.000 | 0.040  | 0.456 | -1.182 | 0.887 | 0.951 | 0.242 |
|             | 0  | 22 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| T2ReadWordP | 17 | 0  | 52.176 | 2.267 | 52.000 | 9.349  | 30.000 | 80.000 | 0.894  | 0.550 | 6.415  | 1.063 | 0.764 | <.001 |
|             | 0  | 26 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|             | 22 | 0  | 45.955 | 1.517 | 47.000 | 7.115  | 30.000 | 57.000 | -0.750 | 0.491 | 0.272  | 0.953 | 0.940 | 0.201 |
| T2ReadPseuU | 17 | 0  | 51.412 | 2.331 | 50.000 | 9.612  | 32.000 | 76.000 | 1.059  | 0.550 | 3.081  | 1.063 | 0.822 | 0.004 |
|             | 26 | 0  | 34.192 | 1.856 | 36.000 | 9.462  | 18.000 | 51.000 | -0.155 | 0.456 | -1.153 | 0.887 | 0.951 | 0.241 |
|             | 0  | 22 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
| T2ReadPseuP | 17 | 0  | 47.059 | 2.035 | 47.000 | 8.392  | 23.000 | 65.000 | -0.895 | 0.550 | 4.559  | 1.063 | 0.870 | 0.022 |
|             | 0  | 26 | NaN    | NaN   | NaN    | NaN    | NaN    | NaN    | NaN    | NaN   | NaN    | NaN   | NaN   | NaN   |
|             | 22 | 0  | 41.318 | 1.344 | 43.000 | 6.305  | 28.000 | 52.000 | -0.728 | 0.491 | 0.203  | 0.953 | 0.932 | 0.137 |

## Appendix N: R code for computing $R^2$ significance of differences

### Text

```
1 # Define values of interest
2 SE1 <- .207          # Standard Error 1
3 SE2 <- -.074         # Standard Error 2
4 beta1 <- .217        # Standardised estimate 1
5 beta2 <- .234        # Standardised estimate 2
6 n1 <- 30             # no of observation
7 n2 <- 40
8 k <- 6              # no of predictors in model
9
10 # Calculate standard error of the difference between two beta weights
11 SE_diff = sqrt(1/(n1-3) + 1/(n2-3))
12
13 # Calculate t-statistic
14 t_stat <- (beta1 - beta2) / SE_diff
15
16 # Calculate degrees of freedom
17 df <- max(n1,n2) - k
18
19 # Calculate p-value
20 p_value <- 2 * pt(-abs(t_stat), df)
21
22 # Print result
23 cat(paste0("p-value = ", round(p_value, 3)))
```

## Appendix O: Regression analyses (T1, T2)

Testing session 1.

Table 18.1. Predictors of reading efficiency: Results of hierarchical multiple regression within languages.

| Entered first            |       | Entered last           |             |               |                |         |          |          |                       | Entered first |             | Entered last  |                |         |          |          |             |       |      |
|--------------------------|-------|------------------------|-------------|---------------|----------------|---------|----------|----------|-----------------------|---------------|-------------|---------------|----------------|---------|----------|----------|-------------|-------|------|
| Predictors               |       | Ukrainian/Russian (L1) |             |               |                |         |          |          |                       | Polish (L2)   |             |               |                |         |          |          |             |       |      |
| R <sup>2</sup> change    |       | <i>B</i>               | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | $\beta$ | <i>t</i> | <i>p</i> | R <sup>2</sup> change | <i>B</i>      | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | $\beta$ | <i>t</i> | <i>p</i> | <i>p(d)</i> |       |      |
| PA                       | .625* | .216*                  | .844        | .252          | .308           | 1.381   | .741     | .926     | .004                  | .775**        | .252*       | .995          | .224           | .515    | 1.474    | .465     | 4.446       | <.001 | .605 |
| PWM                      | .120  | .009                   | .145        | .207          | -.588          | .297    | .118     | .701     | .494                  | .498*         | .030        | .206          | -.348          | .538    | .079     | .462     | .652        | .563  |      |
| OL                       | .212* | .003                   | .088        | .207          | -.530          | .354    | .074     | .423     | .678                  | .236*         | .020        | .299          | .238           | -.809   | .211     | .207     | 1.256       | .230  | .396 |
| RAN                      | .204* | .044                   | -.152       | .100          | -.364          | .061    | -.224    | 1.52     | .149                  | .103          | .000        | .002          | .093           | -.198   | .201     | .002     | .461        | .652  | .507 |
| LK                       | .401* | .023                   | .192        | .175          | -.182          | .565    | .179     | 1.09     | .291                  | .117          | .021        | .188          | .148           | -.130   | .506     | .174     | 1.267       | .226  | .988 |
| Adjusted R <sup>2</sup>  |       | .712**                 |             |               |                |         |          |          |                       | .821**        |             |               |                |         |          |          |             |       |      |
| final model (all blocks) |       |                        |             |               |                |         |          |          |                       |               |             |               |                |         |          |          |             |       |      |

Note: *p*-value of *t*-statistic is the significance of differences between two  $\beta$  weights (in L1 and L2) for each composite variable; \*\* *p* < .001, \* *p* < .05

Table 18.2. Predictors of reading efficiency: Results of hierarchical multiple regression across languages.

| Entered first            |                       | Entered last |                        |             |               |                |          | Entered first |          | Entered last          |       |          |             |               |                |          |          |          |             |
|--------------------------|-----------------------|--------------|------------------------|-------------|---------------|----------------|----------|---------------|----------|-----------------------|-------|----------|-------------|---------------|----------------|----------|----------|----------|-------------|
| Predictors               |                       |              | Ukrainian/Russian (L1) |             |               |                |          |               |          | Polish (L2)           |       |          |             |               |                |          |          |          |             |
|                          | R <sup>2</sup> change |              | <i>B</i>               | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | <i>β</i> | <i>t</i>      | <i>p</i> | R <sup>2</sup> change |       | <i>B</i> | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | <i>β</i> | <i>t</i> | <i>p</i> | <i>p(d)</i> |
| PA                       | .710*                 | .261*        | .933                   | .218        | .465          | 1.402          | .933     | 4.272         | <.001    | .733*                 | .260* | .942     | .248        | -.291         | .671           | .931     | 3.795    | .002     | .741        |
| PWM                      | .220*                 | .005         | -.092                  | .178        | -.473         | .290           | .092     | -.515         | .615     | .392*                 | .000  | .003     | .164        | -.271         | .435           | .003     | .462     | .626     | .825        |
| OL                       | .224*                 | .007         | -.158                  | .175        | -.533         | .217           | .158     | -.905         | .381     | .229*                 | .012  | .219     | .264        | -.784         | .347           | -.162    | 1.256    | .421     | .948        |
| RAN                      | .152                  | .041         | -.141                  | .083        | -.320         | .038           | -        | -             | .113     | .128*                 | .001  | -        | .229        | -.495         | .488           | --.003   | .461     | .988     | .595        |
| LK                       | .328*                 | .042         | .247                   | .147        | -.070         | .563           | .141     | 1.692         | .117     | .056                  | .004  | .020     | .082        | .103          | -.241          | .201     | -.030    | 1.267    | .850        |
|                          |                       |              |                        |             |               |                | .247     | 1.672         |          |                       |       |          |             |               |                |          |          |          |             |
| Adjusted R <sup>2</sup>  |                       |              | .728**                 |             |               |                |          |               |          | .657**                |       |          |             |               |                |          |          |          |             |
| final model (all blocks) |                       |              |                        |             |               |                |          |               |          |                       |       |          |             |               |                |          |          |          |             |

Note: *p*-value of *t*-statistic is the significance of differences between two  $\beta$  weights (in L1 and L2) for each composite variable; \*\* *p* < .001, \* *p* < .05

Testing session 2.

Table 27.1. Predictors of reading comprehension: Longitudinal results of hierarchical multiple regression analyses within languages ( $n = 17$ ).

| Predictors                                             | Entered first Entered last |       | Entered first Entered last |             |               |                |         |          |          |                       |             |          |             |               |                |         |          |          |             |
|--------------------------------------------------------|----------------------------|-------|----------------------------|-------------|---------------|----------------|---------|----------|----------|-----------------------|-------------|----------|-------------|---------------|----------------|---------|----------|----------|-------------|
|                                                        |                            |       | Ukrainian/Russian (L1)     |             |               |                |         |          |          |                       | Polish (L2) |          |             |               |                |         |          |          |             |
|                                                        | R <sup>2</sup> change      |       | <i>B</i>                   | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | $\beta$ | <i>t</i> | <i>p</i> | R <sup>2</sup> change |             | <i>B</i> | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | $\beta$ | <i>t</i> | <i>p</i> | <i>p(d)</i> |
| RE                                                     | .465*                      | .045* | .409                       | .269        | -.190         | 1.007          | .451    | 1.522    | .049     | .438*                 | .035*       | .370     | .401        | -.930         | .856           | .379    | 1.192    | .004     | .852        |
| PA                                                     | .352*                      | .117* | .627                       | .256        | -.198         | 1.056          | .625    | 2.445    | .035     | .429*                 | .019        | .214     | .224        | -.286         | .713           | .219    | .952     | .002     | .741        |
| PWM                                                    | .381*                      | .088  | .435                       | .205        | -.021         | .891           | .419    | 2.125    | .060     | .333*                 | .025        | .502     | .460        | -.526         | .522           | .499    | 1.092    | .300     | .825        |
| OL                                                     | .411*                      | .016  | .240                       | .268        | -.357         | .837           | .245    | .897     | .391     | .618*                 | .162*       | .935     | .338        | .183          | 1.687          | .645    | 1.256    | .421     | .948        |
| RAN                                                    | .472*                      | .060  | -.378                      | .217        | -.862         | .105           | -       | -        | .112     | .599*                 | .053        | -        | .269        | -             | .174           | -.415   | 1.580    | .145     | .595        |
| LK                                                     | .237*                      | .007  | .112                       | .190        | -.312         | .535           | .117    | .586     | .571     | .037                  | .000        | .156     | .021        | -.326         | .268           | .023    | .135     | .895     | .665        |
| Adjusted R <sup>2</sup><br>final model (all<br>blocks) |                            |       |                            |             |               | .687*          |         |          |          |                       |             |          |             |               | .663**         |         |          |          |             |

Note:  $p$ -value of  $t$ -statistic is the significance of differences between two  $\beta$  weights (in L1 and L2) for each composite variable; \*\*  $p < .001$ , \*  $p < .05$

Table 27.2. Predictors of reading efficiency: Longitudinal results of hierarchical multiple regression within languages ( $n = 17$ ).

| Entered first                                                 |                       | Entered last |                        | Entered first |               |                |         |            |          |                       |       | Entered last |             |               |                |         |          |          |             |
|---------------------------------------------------------------|-----------------------|--------------|------------------------|---------------|---------------|----------------|---------|------------|----------|-----------------------|-------|--------------|-------------|---------------|----------------|---------|----------|----------|-------------|
| Predictors                                                    |                       |              | Ukrainian/Russian (L1) |               |               |                |         |            |          | Polish (L2)           |       |              |             |               |                |         |          |          |             |
|                                                               | R <sup>2</sup> change |              | <i>B</i>               | <i>SE B</i>   | <i>Low CI</i> | <i>High CI</i> | $\beta$ | <i>t</i>   | <i>p</i> | R <sup>2</sup> change |       | <i>B</i>     | <i>SE B</i> | <i>Low CI</i> | <i>High CI</i> | $\beta$ | <i>t</i> | <i>p</i> | <i>p(d)</i> |
| AR                                                            | .789<br>**            | .078*        | .588                   | .187          | .172          | 1.004          | .591    | 3.148      | .010     | .641<br>**            | .052* | .650         | .401        | .330          | .856           | .721    | .992     | .004     | .737        |
| PA                                                            | .001                  | .000         | .025                   | .178          | -.372         | .422           | .023    | .139       | .892     | .000                  | .002  | .072         | .224        | .286          | .713           | .075    | .921     | .002     | .645        |
| RAN                                                           | .004                  | .023         | -.598                  | .151          | -.934         | -.262          | -.561   | 3.963      | .003     | .005                  | .015  | .398         | .460        | .526          | .522           | .369    | 1.112    | .300     | .745        |
| OL                                                            | .001                  | .013         | .238                   | .186          | -.653         | .178           | .221    | -<br>1.274 | .231     | .001                  | .001  | .088         | .338        | .183          | 1.687          | .093    | 1.256    | .421     | .865        |
| PWM                                                           | .103<br>*             | .124*        | .246                   | .142          | -.071         | .563           | .216    | -<br>1.727 | .115     | .046                  | .026  | .308         | .269        | .523          | .174           | .315    | 1.580    | .145     | .665        |
| LK                                                            | .003                  | .005         | .106                   | .132          | -.401         | .188           | .102    | .806       | .439     | .168<br>*             | .176* | .463         | .021        | .326          | .268           | .481    | .135     | .895     | .865        |
| Adjusted <i>R</i> <sup>2</sup><br>final model<br>(all blocks) |                       |              | .874**                 |               |               |                |         |            |          | .797**                |       |              |             |               |                |         |          |          |             |