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BILINGUAL ADVANTAGE? LITERACY AND PHONOLOGICAL AWARENESS IN POLISH-SPEAKING EARLY ELEMENTARY SCHOOL CHILDREN LEARNING ENGLISH SIMULTANEOUSLY

Paulina Pawlicka^(A,B,C,D,E,F,G), Małgorzata Lipowska^(A,D,E,G),
Paweł Jurek^(C,D,E)

Institute of Psychology, University of Gdansk, Gdansk, Poland

SUMMARY

Background:

In most studies, paired bilingual programs turned out to be more effective in L2 (usually English) literacy acquisition than other types of programs. L1 reading proficiency was shown to foster second language reading acquisition across many languages. However, little is known about L1 reading acquisition in bilingual programs. The study examines the effect of a paired-bilingual education program conducted in Polish (L1) and English (L2) on word reading fluency in Polish as L1 after an average of 1 and 2.5 years of literacy training.

Material/ Methods:

61 Polish children obtaining Polish-only literacy training and 54 children obtaining the paired-bilingual Polish-English literacy training completed word and pseudoword reading and onset-rhyme (rhyme production) and phoneme awareness (phoneme deletion and phonemic differentiation) tasks in Polish. Also Rapid Automatized Naming (RAN) and English (L2) word fluency were tested.

Results:

A strong main effect of the literacy level was observed, pointing to a progressive tendency in reading efficiency in both groups of children. Moreover, a significant interaction between the group and literacy level was documented. Beginner readers (after one year of literacy instruction) from the monolingual literacy group showed a higher word reading proficiency than students from the paired-bilingual. However, after two and a half years of literacy training children from the paired-bilingual group achieved significantly higher results in Polish word reading than their peers from the monolingual group. Phonological awareness predicted reading fluency in both groups, but no significant differences between the groups were found suggesting other predictors to be responsible for the bilingual group's advantage.

Conclusions:

This study showed that in a longer perspective, extensive literacy training in two different languages not only does not cause a delay in literacy development but may also be beneficial for reading efficiency. The paired-bilingual literacy training proved to be beneficial in terms of reading efficiency in L1, with the advantage found only in the older group of children.

Key words: bilingual education, extensive literacy training, reading efficiency

INTRODUCTION

Bilingual education programs implemented in many schools worldwide are gaining increasing attention also in monocultural countries, such as Poland. This approach has been included in Content and Language Integrated Learning (CLIL) and is supported from European Union funds (European Eurydice Bureau, 2006). As reading proficiency is one of the crucial skills in education, research on literacy development in dual-language/bilingual programs, where literacy instruction in L1 is usually more limited than in the case of monolingual education, becomes of special interest. This research question arises usually with regard to the literacy development of foreign language learners. Most popular approaches to early literacy instruction in bilingual context include: 1) L2 immersion and teaching reading solely in L2, 2) beginning literacy instruction and development in L1, gradually replaced by instruction in L2 (transitional bilingual model), and 3) simultaneous literacy instruction in L1 and L2 (paired bilingual programs) (Baker et al., 2012). In most studies, paired bilingual programs turned out to be more effective in L2 (usually English) literacy acquisition than other types of programs (Baker et al.; 2012; Langdon; 2015; Slavin & Cheung, 2005).

L1 reading proficiency was shown to foster second language reading acquisition across many languages (e.g., Lemhöfer et al., 2008; Pasquarella, Chen, Gottardo, & Geva, 2014; Slavin & Cheung, 2005). Previous studies documented a significant moderate to high relationship between reading fluency in acquired languages (studies with English and Spanish – de Ramírez & Shapiro, 2007; English and Hebrew – Geva & Siegel; 2000; English and German – Gebauer, Zaunbauer, & Möller, 2013). However, little is known about L1 reading acquisition and proficiency in bilingual programs as compared to L1 only literacy acquisition. Usually, less time is spent to master reading in L1 at school in paired-bilingual programs than in the case of monolingual education approach. Moreover, acquired languages may differ substantially, which may affect literacy development in L1. Therefore, research on reading acquisition and competence in the primary language in such programs seems both justified and useful.

Dual-language reading acquisition

Cross-language transfer and (dual-language) metalinguistic awareness development exert an established impact on fostering L2 reading acquisition. The simultaneous training of reading in two languages is generally more intensive than the training in one language only (Bialystok, 2002; Lundberg, 2002). Moreover, more a harmonic and continuous development of functions related to reading skills (e.g., phonological awareness) in two languages, usually differing in terms of their phonological and orthographic characteristics, likely promotes also the development of bilingual reading itself (Gottardo, Yan, Siegel, & Wade-Woolley, 2001). This is consistent with the linguistic interdependence hypothesis (Cummins, 1981) emphasizing the role of a dual-language literacy instruction in developing not only language-specific skills, but also a deeper conceptual and

cognitive proficiency which is language-independent and transferable across languages (common underlying proficiency). A meta-analysis conducted by Melby-Lervåg and Lervåg (2011) demonstrated moderate to strong correlations between L1 and L2 phonological awareness and decoding. These findings are consistent with the results of the meta-analyses conducted by Branum-Martin, Tao and Garnaat (2015), suggesting that phonological awareness in alphabetic languages can be considered a unitary and language-general construct. However, a comparative study conducted by Gottardo, Pasquarella, Chen and Ramirez (2015) documented differences in the power of the relationship between specific skills related to phonological awareness and word reading fluency. This points to the likely presence of language-specific reading predictors dependent on orthography (grain-size theory).

Consequently, contact with two languages of different orthographic transparency may stimulate children to discover the linguistic structure of words, thus improving their reading skills (Bialystok, 2002; García, 2000; Gottardo et al., 2015; Lundberg, 2002). Furthermore, practicing phonological skills in two languages may stimulate thinking about a linguistic form (Bialystok, 2002; García, 2000; Kaczmarek & Pączalska, 2014; Lundberg, 2002) and enable the interlinguistic transfer of these skills (Bialystok, 2002; Melby-Lervåg & Lervåg, 2011). However, according to Cummins (1981), the prerequisites of such a transfer include adequate exposure to each language and adequate motivation to learn these languages.

Specificity of Polish and English languages

Polish and English differ from each other (despite both being alphabetic languages) in terms of their orthographic and phonological characteristics.

English is a language with many irregular letter-sound mappings (opaque alphabetic orthography). Vowel sound-symbol relations are inconsistent at the grapheme-phoneme level, but significantly consistent at the rhyme level. English is also rich in monosyllabic words. Consonants tend to have more consistent grapheme-phoneme correspondences than vowels (Gottardo et al., 2015). English orthography does not allow one to rely on syllable level, as boundaries between the syllables are unclear and difficult to perceive (Álvarez, Carreiras, & Taft, 2001; Gottardo et al., 2015). More consistencies remain within the morphological aspect of the language (reflected at the level of larger word particles), sometimes at the expense of letter-to-sound consistency (e.g., sign, signal; Gottardo et al., 2015; Seymour, Aro, & Erskine, 2003). Therefore, English speakers are more sensitive to onset-rhyme units (De Cara & Goswami, 2003). In terms of the psycholinguistic grain size theory (Ziegler & Goswami, 2005), English can be described as a language with moderate availability and low consistency (Gottardo et al., 2015).

Polish on the other hand is described as a morphophonemic, inflectional and consonantal language (Awramiuk & Krasowicz-Kupis, 2014). It is predominated by words composed of several syllables, usually accented on a penultimate syllable; also consonant clusters are markedly more frequent in Polish than in Eng-

lish. This consonantal character of Polish language, as well as the variety of syllable structures, contribute to difficulties in phonological segmentation. A relation between grapheme and phoneme becomes consistent at the morphological level, whereby morphemes may sometimes represent a one-syllable word. In terms of the psycholinguistic grain size theory, Polish is characterized by moderate availability and moderate consistency. Polish orthography is transparent in terms of reading, and significantly less transparent in terms of spelling (although in both aspects it is still much more transparent than the English one). The lack of transparency creates problems mainly in writing, as in many cases the written representation of a given word is not compatible with its pronunciation (for detailed description of the properties of Polish refer to: Awramiuk & Krasowicz-Kupis, 2014).

These interlinguistic differences result in a different development of phonological competencies in Polish and English at the syllable (Krasowicz-Kupis, 1999; Ziegler & Goswami, 2005), intrasyllabic (Krasowicz-Kupis, 1999; Lipowska, 2001; Martensen, Maris, & Dijkstra, 2000; Petrus, Chojnacka, & Konopacka-Rzepiak, 2007) and phoneme level (Caravolas & Landerl, 2010; Krasowicz-Kupis, 1999; Pawlicka, 2012; Ziegler & Goswami, 2005).

Reading development in Polish and English and its predictors

The language differences mentioned above are reflected by differences in the duration and pace of acquiring subsequent stages of literacy development, especially the initial ones (Caravolas, Lervag, Defior, Seidlova Malkova, & Hulme, 2013). Furthermore, they determine methods of reading instruction. The global language method of literacy training, subsequently replaced by the mixed method (e.g., analogy phonics), predominates at the early stages of English literacy development in English speaking countries (Lloyd, 1992). Most techniques of English literacy training available at Polish schools refer to association between the appearance of a given word, its sound representation and meaning (thus promoting the global language method) (Szpotowicz & Szulc-Kurpaska, 2009). Research on the efficiency of various methods and approaches to English literacy training has shown that direct and systematic instruction in phonics, implemented simultaneously to the literacy training, is necessary and the most efficient method at its early stages (see: Callinan & Zee Der Van, 2010; National Reading Panel, 2000; Walsh, Glaser, & Wilcox, 2006; Wilson & Colmar, 2008). Therefore, phonics instruction, not only at the level of phonemes but also at the onset-rhyme level, is introduced. While both phonemic awareness and onset-rhyme awareness are strong predictors of reading accuracy in English at the early stages of literacy acquisition (since phonological tips are needed at many levels to read English words efficiently), only phonemic awareness is important at the further stages (Gottardo et al., 2015; Hulme, 2002; Jianfeng, Hua, Mccandliss, & Zevin, 2013).

The global method is not very effective at the initial stages of reading acquisition in Polish. It is literacy training based on transparent grapheme-phoneme relationships which is much more effective, and analytical-synthetic methods are preferred in Polish schools. Although, the most evident progress in reading takes

place during the first and the second year of literacy training, most children show significant progress in reading ability development even after a few months. The techniques of reading in Polish proposed in methodological programs for grades 0-3 include sounding, various exercises based on the identification of sounds in the onset, rhyme, and body of words, the gradual introduction of the alphabet (limited to 22, the so-called phonetically-pure, letters) in a defined order, i.e., vowels followed by consonants (Szpotowicz & Szulc-Kurpaska, 2009).

A model for reading acquisition in Polish has been introduced by Krasowicz-Kupis (1999). She has described three stages that take place during early formal education: 1) the analytical and phonological stage (initial months of reading instruction) during which children rely mainly on letter-sound correspondences, and phonemic awareness together with letter knowledge play a major role, 2) the interim stage between phonological and global word-based reading (after approximately one year of instruction), when a child acquires the ability to rely on units larger than phonemes (mainly syllables and onset-rhyme units), and 3) the stage during which global word and phrase-based strategies predominate (after approximately two years of instruction), children take contextual information into account and rely on syntactic and semantic input at the phrase level (Awramiuk & Krasowicz-Kupis, 2014; Krasowicz-Kupis, 1999; Sochacka, 2004). A study conducted by Krasowicz-Kupis (1999) demonstrated that phonemic and syllable awareness are significant predictors of reading in Polish at all three grades of early education. Although phonological awareness, mostly at a meta-phonological level, turned out to be vital for reading in Polish, the predictive level of phonological skills decreased gradually between grades 0 and 2 (Krasowicz-Kupis, 1999; Lipowska, 2001; Sochacka, 2004). These findings are consistent with the results of previous studies dealing with other, more or less transparent and non-transparent, languages (e.g., Caravolas et al. 2013; Taylor, Plankett & Nation, 2011; Ziegler, 2010).

Knowledge of language-specific differences and similarities in the development of phonological awareness becomes of vital importance in the case of bilingual literacy training taking place in bilingual education programs. Aside from phonological awareness in L1, important predictors of non-native speakers' proficiency in English literacy include also phonological awareness in English (as L2), reading skills in L1 and English (L2) vocabulary (Gottardo, 2002).

The aim of the study

The principal aim of this exploratory study was to analyze the role of intensive literacy training in a paired-bilingual education program, with languages differing from each other in terms of phonological and orthographic characteristics, in reading fluency in L1 (Polish) at two stages of early education: after one, two and three years of literacy training. Reading fluency has been defined as the ability to read rapidly, accurately and with correct expression (National Reading Panel, 2000).

We assumed that the implementation of simultaneous English and Polish literacy training would enable children to develop their reading competencies faster

than in the case of Polish literacy training alone. We also hypothesized that children participating in the paired-bilingual program would present a higher word reading fluency than those participating in the Polish-only program. These developmental advantages would be due to the complementary character of teaching methodology pathways for these two languages, resulting from their linguistic differences, cross-linguistic transfer and development of metalinguistic awareness. The advantage would be observable only at the second level of an early education program (second and third grade), when literacy development in Polish reaches the global (word-and-phrase based) strategy level (Awramiuk & Krasowicz-Kupis, 2014; Krasowicz-Kupis, 1999) (Hypothesis 1). We also assumed that children from the monolingual literacy group may differ from those from the paired-bilingual group in terms of their pseudoword reading fluency at the analytical-phonological stage of reading acquisition, since the former more intensively practice letter-sound correspondences, easily accessible in the Polish language; however, we did not expect such intergroup differences at the skilled readers level (Hypothesis 2). Pseudoword reading relies on letter-sound correspondences and phonemic awareness skills to a greater extent than the word reading (Krasowicz-Kupis, 1999; Sochacka, 2004).

We also searched predictors of reading fluency. Based on the psycholinguistic grain size theory (Ziegler & Goswami, 2005), children acquiring English develop their awareness of phonological units at different grain sizes (both larger ones, e.g., syllables and onset-rhyme units initially, and smaller ones, i.e., phonemes (Gottardo et al., 2015). In contrast, the awareness of smaller phonological units (phonemes) may be expected at early stages of reading in Polish, and the awareness of larger particles (onset-rhyme, syllable) is likely a significant predictor of fast and efficient reading in Polish in higher grades (Krasowicz-Kupis, 1999). Therefore, we hypothesized that after one year of literacy instruction, children participating in the Polish-only literacy training program would attain a higher awareness of phonemes and a lower awareness of rhymes than those participating in the paired-bilingual English-Polish program. However, we also expected that children involved in the paired-bilingual and monolingual education programs would achieve similar results in phonemic and rhyme awareness tasks in higher grades (Hypothesis 3). We also assumed that these phonological awareness skills at the onset-rhyme and phonemic level would explain the differences in word and pseudoword reading (Hypothesis 4).

MATERIAL AND METHODS

Participants

The study included 115 children attending two elementary schools in Poland. All participants have Polish nationality, and Polish was their first language and the only language spoken at home.

Schools participating in the study did not differ in terms of their Polish literacy training systems (the same textbook and teaching methodology were used), social and economic status of parents – high SES (both schools were small, privately-held institutions offering education from grade 0 of elementary level to grade 3 of gymnasium level, with education at early levels conducted in a separate part of the school). However, they differed in terms of the predominant language taught, which constituted the basis for the identification of the two analyzed groups.

Paired-bilingual literacy training group. This group included 54 children, 25 girls and 29 boys, who attended an English immersion school in a large Polish city. Aside from Polish language, religion, and foreign language (German) classes, all the other subjects in this school are taught in English from the very beginning of education. Students receive a simultaneous literacy training in Polish and English, and are expected to become bilingual at the end of their elementary education (i.e., after six or seven, if grade 0 was included, years of education). During early education, six hours of Polish language classes are included in the weekly curriculum, and reading instruction is provided at that time. Beginning from grade 1 of elementary school, children attend phonics classes.

Monolingual literacy training group. The group included 61 children, 27 girls and 34 boys, who attended a small private school in a large Polish city. Four hours of weekly English classes are offered from the beginning of education in the school (in state schools in Poland two hours per week are typically offered). Aside from the foreign language classes, all other subjects in this school are taught in Polish. Therefore, children attending this school receive literacy training in Polish. English literacy training is introduced at a very limited level.

Beginning and skilled readers. Children from both groups were divided into beginner readers – after one year of literacy acquisition ($n = 60$; age in months $M = 85.2$, $SD = 20.8$), and skilled readers – after two and a half years of literacy acquisition ($n = 55$; age in months $M = 107.4$, $SD = 16.4$). The beginner readers group consisted of 29 children (12 girls and 17 boys) from the paired-bilingual training group and 31 children (13 girls and 18 boys) from the monolingual literacy training group. The skilled readers group consisted of 25 children (13 girls and 12 boys) from the paired-bilingual training group and 30 children (14 girls and 16 boys) from the monolingual literacy training group.

Children at risk of developmental dyslexia and/or with a hearing dysfunction were excluded from the study.

Methods

Reading fluency measures. Reading fluency was tested in Polish as L1. We focused on reading skills at the word level. Both word and pseudoword reading were assessed. The word reading test used in the study consisted of monosyllabic high frequency words, that in Polish can be read both with reliance on letter-sound correspondences and with reliance on larger units (mainly syllables and onset-rhyme units). Efficient pseudoword reading requires a well-developed

phoneme awareness, especially when presented pseudowords resemble, but in fact are not, real Polish words. This test is often considered to be the most accurate measure of phonological awareness, as the subject cannot rely on semantic tips (Krasowicz-Kupis, 1999; Sochacka, 2004).

Polish word reading was assessed with the Test for Reading Aloud Meaningful Monosyllabic Words (Puślecki, 2003). The test consists of 140 monosyllabic words grouped into fourteen rows of 10, printed in gradually decreasing font size. Participants were asked to read correctly as many words as they can within one minute. If they were able to read all the words within the specified testing time, they were instructed to read them again until the time was over. The reference values of reading speed (number of words read correctly within one minute) are available for children aged between 7 and 12 years (grades 1-6). The investigator recorded the number of words read correctly and those read incorrectly.

Polish pseudoword reading was assessed with the Test for Reading Pseudowords (Bogdanowicz & Pawlicka, 2009). The test consists of 50 words included in the *Łatysz* pseudoword reading test derived from the *Battery of methods for diagnosing the reasons for school failure in 8-year-old children (Battery 8)* (Bogdanowicz, Kalka, Sajewicz-Radtke, Radtke, & Gedutiene, 2008). The words differ in their length, from monosyllabic (e.g., *sem*, *ni*) to five-syllable words (e.g., *strzępidłuskanom*), and the degree of their similarity to real words (orthographically legal and pronounceable pseudowords), both in terms of graphical and phonetic form (e.g., *łós* being similar to *łoś* [Eng. moose], *seść* to *sześć* [Eng. six], *przeszeł* to *przeszedł* [Eng. passed]). The participants were given a sheet with a list of pseudowords arranged in rows with the same distance in between (five words per row), and asked to read correctly as many words as they could during one minute. The investigator registered the time and marked incorrectly read words on an evaluation sheet. Moreover, each reading test was recorded on a tape recorder for the purpose of a further analysis of reading quality. Reading fluency rate was defined as the number of pseudowords read correctly during one minute.

Phonological awareness measures. Phonological awareness, specifically onset-rhyme and phoneme awareness, was determined in Polish as L1.

Onset-rhyme awareness was assessed with the rhyme production task. The task consisted of five model, high frequency words (two single-syllable words: *sok* [Eng. juice] and *mak* [Eng. poppy] and three two-syllable words: *mama* [Eng. mother], *domek* [Eng. little house] and *sowa* [Eng. owl]). Participants were asked to create as many rhyming words to the model words as they could. There was no time limit. When they said *enough*, they were given another model word. The task can be also considered a measure of word fluency. The test is included in the panel of diagnostic tools developed by Bogdanowicz and Krasowicz (1996).

Phonemic awareness was assessed based on two measures: a phoneme deletion task and a phonemic differentiation task. The phonemic differentiation task consisted of 25 pairs of pseudowords that differed with one sound and were adjusted for the specificity of Polish language. If the participant decided that two

pseudowords from a given pair differed from each other, the investigator asked him or her about the exact nature of the difference. Thus, the participant should identify the sound that distinguished between both of the presented pseudowords. The articulation of all presented pseudowords was similar to that of Polish high-frequency words. The task is included in the *Battery of methods diagnosing reasons of school underachievements for 10-12 year-old children (Battery 10-12)* (Bogdanowicz, Kalka, Karpińska, Sajewicz-Radtke, & Radtke, 2010).

During the phoneme deletion test, participants were presented with a given word (e.g., *mrok* [Eng. darkness]), asked to delete a specific sound (*m*) in their mind and to say aloud the remaining sequence (*rok* [Eng. year]). The removal of the given sound resulted in the formation of another meaningful Polish word. Participants were not provided with a written representation of the analyzed words, but could ask for them to be repeated. The test consisted of ten words: four monosyllabic and six disyllabic, including three that required deletion of the first sound (initial phoneme; e.g., *mrok* [Eng. darkness], *mewa* [Eng. seagull], and *klódka* [Eng. padlock]), four requiring the deletion of a middle sound (middle phoneme; e.g., *klasa* [Eng. class], *kura* [Eng. hen], *pieśń* [Eng. song], and *karta* [Eng. card]), and three requiring deletion of the last sound (final phoneme, e.g., *list* [Eng. letter], *port* [Eng. port], and *buty* [Eng. shoes]). The test is included in the panel of diagnostic tools developed by Bogdanowicz and Krasowicz (1996).

Controlled variables. Aside from gender and the duration of literacy training (beginner or skilled readers), two additional measures were analyzed during the study as potential significant predictors of word reading fluency: Rapid Automated Naming (RAN) (see: Georgiou, Aro, Liao, & Parrila, 2016; Wolf, Bowers, & Biddle, 2000) and English (L2) word fluency. The letter naming task assessing the RAN of letters required the naming of separate letters presented in a random order in 10 rows of 5 items. Participants were asked (the task was administered in Polish) to name the items as quickly and accurately as possible from left to right, row by row, within one minute. When they had read all the letters in all the rows and there was still time left, they were instructed to start from the beginning of the first row and continue until the time was over. The result was expressed as the number of correctly named letters within one minute.

English word fluency was assessed with Smythe's (1999) test included in the International Dyslexia Test.

Procedure

The tests were conducted at the participants' schools. Each child participated in two individual sessions, each ca. 20 min long. The first session included the word reading, RAN and phonemic differentiation tasks, whereas the pseudoword reading, phoneme deletion and rhyme production tasks took place during the second session. The two sessions were scheduled with a 1-2 week interval in between.

RESULTS

Fluency of Polish word and pseudoword reading proved to correlate strongly with the fluency of English word reading regardless of the group. Additional correlation analysis revealed that the relationship between Polish and English word reading in the paired-bilingual group ($r=.87$; $p<.001$) was stronger than in the monolingual one ($r=.71$; $p<.001$). Correlations between English word reading and Polish pseudoword reading fluency were weaker in the abovementioned associations ($r=.59$; $p<.001$ for the paired-bilingual group and $r=.64$; $p<.001$ for the monolingual one).

To verify the hypothesis about differences in Polish word reading fluency by children participating in the monolingual and paired-bilingual literacy training programs, a 2 x 2 ANOVA (literacy training group: monolingual vs. paired-bilingual x literacy training level: beginning vs. skilled readers) was conducted. The results are presented in Table 3 and on Figure 1.

No significant main effect of the group was revealed. However, a strong main effect in the literacy level was observed, pointing to a progressive tendency in reading efficiency in both groups of children. Moreover, a significant interaction effect between the group and literacy level was documented. Beginner readers (after one year of literacy instruction) from the monolingual literacy training group showed a higher word reading proficiency (approx. 40 words per minute) than students from the paired-bilingual group (approx. 25 words per minute). However, an opposite pattern was observed in the case of readers at a later stage of reading proficiency (after about two and a half years of literacy training). Specifically, children from the paired-bilingual group achieved significantly higher results in Polish word reading fluency than their peers from the monolingual group. Consequently, children from the paired-bilingual group not only reached the level presented by their monolingual peers, but even scored higher. Hypothesis 1 has been partially confirmed. However, a considerable variance in reading fluency was reported for both groups (beginner and skilled readers), which likely contributed to a lack of significant intergroup differences. Consequently, variance in reading fluency seems to be determined also by other variables (e.g., some in-

Table 1. Descriptive statistics and correlation matrix between the measured variables

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1 Age (in months)	115	95.82	21.80	-						
2 RAN	113	103.38	28.79	.42**	-					
3 Rhyming	113	15.80	11.29	.34**	.24*	-				
4 Phonemic differentiation	85	12.80	4.64	.16	-.06	.23*	-			
5 Phoneme deletion	113	8.49	1.97	.32**	.38**	.14	.38**	-		
6 Polish word reading	84	56.49	31.55	.48**	.55**	.45**	.48**	.58**	-	
7 Polish pseudoword reading	111	29.24	15.06	.44**	.51**	.35**	.39**	.57**	.83**	-
8 English word reading	94	21.50	15.30	.40**	.42**	.42**	.40**	.38**	.75**	.60**

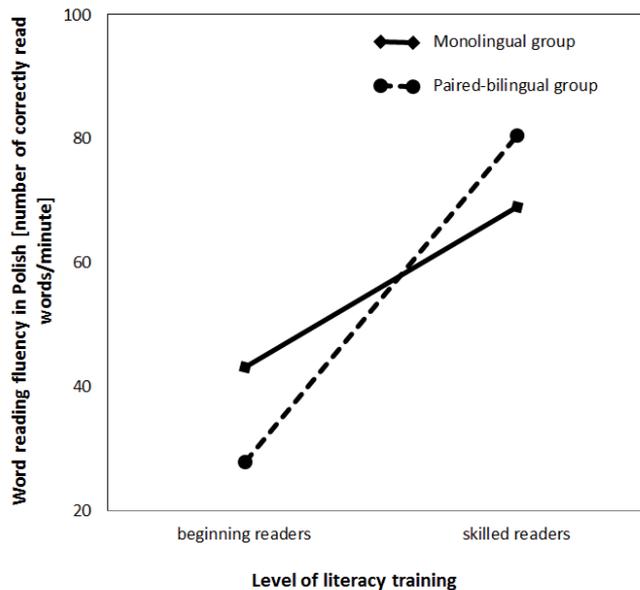


Figure 1. Mean scores for Polish word reading fluency: literacy training group (monolingual vs. paired-bilingual) and literacy level (beginner readers vs. skilled readers)

dividual traits) important for literacy acquisition, rather than solely by the literacy training program.

To verify if both groups of children differed in terms of their pseudoword reading fluency (Hypothesis 2), a 2 x 2 ANOVA (literacy training group: monolingual vs. paired-bilingual x literacy training level: beginning vs. skilled readers) was conducted. Similar to the previous analysis, the main effect of the literacy training level and the lack of a similar effect in the group were demonstrated, but without the interaction effect. The main effect of reading level reflected progress in the reading ability of children from both groups, resulting from literacy training. No significant intergroup differences in pseudoword reading fluency were found at any level of literacy training. Consequently, Hypothesis 2 regarding differences in pseudoword reading fluency of children from monolingual and paired-bilingual group was confirmed only in part.

Table 2. Tests of between-subjects effects (word reading fluency)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	28539.20 ^a	3	9513.07	14.07	.00
Intercept	226903.70	1	226903.70	335.67	.00
Group	70.05	1	70.05	.10	.75
Level	28531.13	1	28531.13	42.21	.00
Group* Level	3392.19	1	3392.19	5.02	.03

Note. Dependent variable: Polish word reading fluency, a. $R^2 = .35$ (Adjusted $R^2 = .32$).

Table 3. Tests of between-subjects effects (pseudoword reading fluency)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6069.94 ^a	3	2023.31	11.47	.00
Intercept	97799.95	1	97799.95	554.37	.00
School	86.13	1	86.13	.49	.49
Level	5764.35	1	5764.35	32.68	.00
School* Level	408.53	1	408.53	2.32	.13

Note. Dependent variable: pseudoword reading fluency, a. $R^2 = .24$ (*Adjusted R*² = .22).

Regression analysis

Since different results were obtained for word and pseudoword reading, we verified to what extent they were explained by phonological awareness skills at phonemic and onset-rhyme level, and RAN. Due to the small sample size, the analysis included the whole study population, rather than each of the two groups separately.

Regression analysis revealed that higher levels of rhyming ($\beta = .37, p < .05$), phonemic differentiation ($\beta = .27, p < .05$) and phoneme deleting ($\beta = .29, p < .05$) skills were associated with a larger number of Polish words being read correctly within one minute; these three variables explained 40% of the variance in word reading (*Adjusted R*² = .40, $F = 13.97, p < .00$). Also pseudoword reading fluency turned out to be predicted by rhyming ($\beta = .22, p < .05$), phonemic differentiation ($\beta = .21, p < .05$) and phoneme deletion ($\beta = .33, p < .05$) skills, which altogether explained 25% of the reading variance (*Adjusted R*² = .25, $F = 10.17, p < .00$). These results confirm Hypothesis 4.

The results of hierarchical regression analysis point to the potential role of these three skills as mediators in the relationship between the literacy training program and word reading fluency level (Table 4). When all these three explanatory variables were included in the hierarchical regression model, the level of literacy training no longer explained the variance in word reading fluency.

Table 4. Results of hierarchical regression analysis with word reading fluency and pseudoword reading fluency as dependent variables

Model		B	SE	β	Sig.	F (Sig.)
<i>word reading fluency</i>						
1	(Intercept)	65.22	3.46		.00	7.04 (.01)
	Level of literacy training	9.17	3.46	.33	.01	
2	(Intercept)	1.75	15.05		.91	10.53 (.00) $\Delta R^2 = .33$
	Level of literacy training	2.34	3.12	.09	.46	
	Rhyming	.79	.23	.36	.00	
	Phonemic differentiation	1.33	.61	.25	.03	
	Phoneme deletion	3.93	1.79	.26	.03	
<i>pseudoword reading fluency</i>						
1	(Intercept)	32.90	1.48		.00	7.53 (.01)
	Level of literacy training	4.06	1.48	.29	.01	
2	(Intercept)	-.56	7.82		.94	7.79 (.00) $\Delta R^2 = .20$
	Level of literacy training	1.25	1.46	.09	.85	
	Rhyming	.24	.12	.21	.04	
	Phonemic differentiation	.57	.32	.20	.08	
	Phoneme deletion	2.53	.87	.31	.01	

A similar effect was also observed for pseudoword reading fluency. However, only two exploratory variables, rhyming and phoneme deletion skills, were identified as potential mediators; the level of literacy training was no longer relevant when these two variables were included in the hierarchical regression model (Table 4).

Neither the main effect of the group nor the interaction effects were documented on ANOVA with rhyming, phonemic differentiation and phoneme deletion as dependent variables, and the literacy training group (monolingual vs. paired-bilingual) and literacy training level (beginning vs. skilled readers) as independent variables. Similarly, no significant effects were observed during further hierarchical regression analysis verifying potential variable-to-variable interactions. These findings only partially confirm Hypothesis 3 according to which children from both groups differ in their phonological awareness skills at the first but not at the second level of literacy acquisition.

DISCUSSION

This study showed that Polish children acquiring literacy within the framework of a paired-bilingual English-Polish program had an advantage in word reading fluency in Polish (their first language) over the children taught mainly in Polish. However, this advantage could be observed no earlier than after two and a half years of literacy training on average. After the first year of literacy training, children participating in the paired-bilingual program achieved significantly worse results in Polish word reading fluency than their peers from the monolingual literacy training group.

This phenomenon may be associated with the fact that while reading in English was practiced intensively in the paired-bilingual literacy training group, Polish literacy training was somehow neglected. Another potential explanation is an interference between the languages (reading strategies that proved effective in the case of English turned out to be ineffective in the case of Polish). Simultaneous bilingual literacy training may also lead to delayed acquisition of reading proficiency in both languages. However, comparison of our findings with reference values for the Test for Reading Aloud Meaningful Monosyllable Words (Puślecki, 2003) revealed that the word reading fluency of beginner readers from the paired-bilingual group was still adequate for their age (27 words per min on average; the reference value for first-graders: 30). Furthermore, skilled readers from the paired-bilingual program achieved results corresponding to the reference values for fourth-graders (82 words per min on average; the reference value for fourth-graders: 77), while the reading fluency of skilled readers from the monolingual literacy training group remained at the normative level typical for third-graders (67 words per min on average; the reference value for third-graders: 65).

Our results are consistent with the findings reported by Baker et al. (2012). These authors analyzed L2 reading fluency gain in paired-bilingual literacy instruction programs and L2-only reading instruction programs, and showed that English language learners from the former group achieved consistently higher

rates of reading fluency growth than children in the English-only instructional group. The difference turned out to be statistically significant for the second and third graders, but not for the first grade. Also the relative contribution of the instructional group to between-student variance in the reading fluency growth rate increased with grade, from 3% for the second grade to 7% for the third grade (Baker et al., 2012). Similar findings were also reported by Parsons and Lyddy (2009), who examined Irish children attending schools offering simultaneous literacy training in English and Irish (which, despite not being transparent, is more consistent than English), and Lesaux, Rupp and Siegel (2007), who analyzed a group of children representing 33 various languages characterized by different consistency, all offered simultaneous English literacy training.

The results obtained by Krasowicz-Kupis (1999) in a group of Polish children at the early stages of literacy acquisition document significant inter-individual variance in reading competence. The same study identified analytical strategy as the main reading strategy of the Polish children at this stage of literacy acquisition. Another study conducted by the same authors showed that a global (word-and-phrase based) strategy becomes dominant in the third year of education (Awramiuk & Krasowicz-Kupis, 2014). Perhaps our hereby presented findings were also moderated by the level of proficiency in both languages, as stated by Cummins (1981) in his common underlying proficiency hypothesis. According to this author, interlinguistic transfer requires proficiency in both languages, inter alia vocabulary knowledge (see also Pačhalska, Lipowska & Łukaszewska (2007) for the Microgenetic Theory perspective regarding this aspect).

The lack of a similar pattern in the case of pseudoword reading fluency, both for beginners and for skilled readers, probably reflects the different reading strategies necessary for the fast and accurate reading of one-syllable, high frequency Polish words and pseudowords. Furthermore, this observation implies that while reading pseudowords, children from both groups were able to apply letter-sound correspondences at a similar level. Perhaps systematic phonics instruction in English provided for the paired-bilingual literacy training group added also to the phonics instruction in Polish, and they both promoted a building of these correspondences. A meta-analysis conducted by researchers from the National Reading Panel (2000) showed that systematic phonics instruction is significantly more effective in promoting substantial growth in reading than non-phonics approaches (e.g., global language approach focused on meaning-based-reading and whole word programs).

Also weaker correlations between reading Polish pseudowords and English words may reflect the different strategies required to read both types of words. Reading pseudowords presented during the course of this study required an analytical reading strategy, as a word-based global strategy would result in the misinterpretation of the pseudowords as similarly looking words. On the other hand, reading English words requires a word-based strategy, since all the presented words were high-frequency ones. Consequently, one can assume that a strong correlation between Polish and English word reading fluency reflects the use of

similar reading strategies. This hypothesis is supported by the fact that the test included high-frequency, monosyllabic Polish words requiring well-developed word-based strategies for fast and accurate decoding.

Our study confirmed that the word reading fluency of children acquiring literacy instruction within the language immersion program displays significant moderate to strong interlinguistic correlations. Irrespective of the group, children with a high reading fluency in Polish achieved better results in reading English words and vice versa, children reading slowly and less accurately in Polish achieved worse results in English word reading. This observation is consistent with the results published by Comeau, Cormier, Grandmaison and Lacroix (1999), Deacon, Wade-Woolley and Kirby (2007) and Melby-Lervåg and Lervåg (2011).

Children from both groups did not differ significantly in terms of phonemic differentiation, phoneme deletion and rhyming skills. Consequently, our hypothesis that differences observed at the early stages of reading are linked to different methodologies of literacy training and differences between languages, has not been confirmed. Our findings remain in opposition to those reported by Pawlicka, Lipowska and Gajdzińska (2015) who compared the results achieved by Polish children attending Polish monolingual and English immersion schools after one year of education (the immersion group performed better than the monolingual one on the phonemic discrimination and phoneme deletion tasks).

In our study, phonological awareness skills explained 40% of variance in word reading fluency and 25% of variance in pseudoword reading fluency. Furthermore, we identified phonological awareness skills as a potential mediator of a relationship between the level of literacy training and word and pseudoword reading fluency. However, we observed a considerable variance in Polish word reading fluency, significantly higher than in the case of phonological awareness tasks. Perhaps, this variance reflected the influence of other variables than those linked to phonological awareness. Despite its established role in reading acquisition (Bialystok et al., 2005; Genesee & Geva, 2006), RAN did not turn out to be a predictor of the word and pseudoword reading fluency of our participants. Perhaps, also other explanatory variables should be included in the model. For example, morphological awareness is known to account for significant variance in word and pseudoword reading fluency (Deacon et al., 2007; Kirby et al., 2012; Ramirez, Chen, Geva & Luo, 2011), also after controlling for phonological awareness, especially at the later stages of reading proficiency. Perhaps, also this variable should be considered, especially that it was shown to speed up word reading fluency through recognizing morphemes both in words and pseudowords resembling real words (Deacon, Kieffer & Laroche, 2014).

Our findings suggest that in a longer perspective, combining orthographies with more or less consistent phoneme-letter mappings not only does not impair reading proficiency in a language with more consistent orthography (see also: Cummins, 2001), but may also improve the level of literacy skills. Perhaps, this results from acquiring a mature reading strategy and the ability to adjust it to a given type of material. Contact with two languages with different transparency

levels may stimulate children to analyze the linguistic structure of words and promote their ability to manipulate words at various levels (Bialystok, 2002; García, 2000; Lundberg, 2002). As a result, children would be able “to switch” between smaller and larger parts of words. Combining two different systems of literacy training may also result in the earlier acquisition of a mature reading strategy by children participating in a paired-bilingual literacy program, i.e., the use of both smaller and larger parts of words, visual analysis of whole words and the contexts of sentences. The skills acquired within a given language seem to be transferred into another language (bidirectionally, i.e., from L1 to L2 and vice versa), making the process of reading more efficient.

Finally, the results of the study emphasize the possible advantages of bilingual literacy acquisition for the development of literacy in L1, while the majority of studies focus on the benefits of L1 literacy for L2 (usually English) reading proficiency (August, Shanahan, & Escamilla, 2009).

CONCLUSIONS

This study showed that in a longer perspective, extensive literacy training in two different languages not only does not cause a delay in literacy development but may also be beneficial for reading efficiency. We demonstrated that children acquiring simultaneously literacy skills in Polish (L1) and English (L2) within the framework of a paired-bilingual literacy training differ from those acquiring L1 literacy in a monolingual context in terms of literacy development dynamics: although the former group may show an initial delay in reading proficiency development, it is usually compensated for at later stages of education, and bilingual children may even overtake their monolingual peers in this matter.

Children from both groups did not differ significantly in terms of their phonemic differentiation, phoneme deletion and rhyming skills. Nevertheless, these skills were identified as potential mediators of a relationship between the level of literacy training and word and pseudoword reading fluency. This implies that other variables may contribute to differences in reading Polish words by skilled readers.

LIMITATIONS

Some potential limitations of this study should be considered while interpreting its results and planning further research. First, we did not analyze the amount of time spent on reading in Polish and English outside school (e.g., at home or during additional classes) and literacy training in languages other than Polish and English. Secondly, we did not find a significant relationship between nonverbal intelligence determined with Raven’s Progressive Matrices Test (Polish adaptation: Jaworowska & Szustrowa, 2000) and word/pseudoword reading fluency, although such a relationship has been unequivocally documented in previous studies of monolingual and bilingual students (e.g., Jared et al., 2011). Since the mean IQ for both groups approximated 80, which was inconsistent with the level

of functioning of our participants, we did not consider the results of the Raven Matrices test in our study. The lack of any significant association between non-verbal intelligence and reading fluency was most likely associated with the testing procedure: The Raven Matrices test was the only test that was not conducted under individual supervision.

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Address for correspondence:

Małgorzata Lipowska
Institute of Psychology, University of Gdansk,
Jana Bażyńskiego 4, 80-309 Gdansk, Poland
e-mail: psyml@ug.edu.pl