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PHONEMIC AWARENESS AMONG MONO- AND BILINGUAL CHILDREN

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SUMMARY

Background:

Contemporary psycholinguistic research has shown that bilinguals have two differentiated linguistic systems, which interact with each other in different ways and in different domains, including phonology. The purpose of the present study was to determine whether the simultaneous acquisition by bilingual children of two languages with varying degrees of orthographic transparency significantly affects the tempo and dynamics of their development of phonemic awareness, in comparison to monolinguals.

Material/ Methods:

The development of phonemic awareness in Polish was analyzed in 150 Polish children (age 6;3 to 10;3) from two primary schools: one with English (opaque orthography) as the language of instruction, and the other with Polish (relatively transparent orthography). Phonemic awareness was tested using a trial based on removing a phoneme from a word, and a trial based on phonemic analysis of words and non-words.

Results:

The bilingual group had significantly lower scores in phonemic analysis, and a statistical tendency to lower scores in the missing phoneme trial; moreover, they acquired phonemic awareness later (beginning only in the second grade). In the older classes, these differences diminished. An “English” profile of phonemic awareness was observed in the bilingual children, even in relation to their native Polish.

Conclusions:

When training for reading is more intensive in an orthographically opaque language than in a transparent language, it is essential to support the development of phonemic skills. The specific nature of the languages should be taken into account when analyzing the achievements of bilingual children in terms of phonological awareness.

Key words: phonological awareness, bilingualism, orthographic consistency, psycholinguistics, language acquisition

INTRODUCTION

It can safely be said that about half of the Earth's population is bilingual or multilingual. Many countries have two or more official languages (for example India, Canada, Belgium, Paraguay or many African countries). Even given the size of the multilingual population, however, there has been relatively little scientific research on the phenomenon of bilingualism. Poland has a rich multilingual history, but presently it is a distinctly monolingual country, with Polish as its official language, one regional language (Kaszubian), and three auxiliary languages used in certain municipalities (German, Belarussian, and Lithuanian). With Poland's entrance to the European Union, the interest in bilingualism and multilingualism has increased significantly, and along with the sudden increase in emigration and immigration, a larger number of studies in this area has become necessary.

Most contemporary psycholinguistic research suggests that bilingual persons have two differentiated linguistic systems, including those who have acquired both languages since birth (Kovelman et al., 2008; Petitto & Kovelman, 2003; De Houwer, 1999; Pearson et al., 1993; Genesee, 1989). However, these systems are mutually interconnected, with an intermixed lexical and morphosyntactic organization (Golestani et al., 2006; Gollan et al., 2005; Paradis & Genesee, 1996). Paradis and Genesee distinguished three forms of the mutual interaction of language systems in bilingual and multilingual people: deceleration, acceleration, and transfer. Deceleration takes place when bilinguals demonstrate a slower rate of acquisition of a particular linguistic feature when compared to their monolingual peer. Acceleration occurs when bilinguals demonstrate a faster rate of acquisition when compared to their monolingual peers. Transfer takes place when elements acquired in one language appear in the other, which is referred to as a "cross-linguistic effect." Dulay et al., (1982) emphasized that cross-linguistic effects are automatic, subconscious and uncontrolled, and enable the speaker to use previously acquired behaviors to create new responses to a given stimulus.

These phenomena have been observed in various aspects of linguistic competence. The present study deals with the development of the phonological aspect, or more strictly phonemic awareness. This question is an important one, since phonological awareness (understood as the developmental cognitive ability to recognize and manipulate speech sounds (Kozminsky, 1993), and phonemic awareness, which is a part of it, are among the fundamental skills essential to learning to read (Bradley & Bryant, 1983; Adams, 1994; Ziegler & Goswami, 2005; Pachalska et al., 2007; Lipowska et al., 2008). Knowledge concerning the development of reading skills in bilinguals can help in our understanding of the specific nature of this phenomenon.

Much of the contemporary research on bilingualism points to the existence of transfer and acceleration in the domain of metalinguistic awareness, which has been shown to develop faster and more effectively in young bilinguals as compared to young monolinguals. These phenomena also take place in early bilingualism (when both languages are acquired simultaneously before age

three), and when the second language is only acquired in the fifth or sixth year of life; moreover, transfer and acceleration occur both from the first language to the second and vice versa, and can thus affect either language, or both (Fabiano-Smith & Goldstein, 2010; Kovelman et al., 2008; Bialystok et al., 2003; Evitar & Ibrahim, 2000).

The training of phonological skills in two languages stimulates thinking about linguistic form (Bialystok, 2002; Lundberg, 2002; García, 2000). Moreover, if by “phonological awareness” we understand the basic ability to analyze spoken and written words in any language, it is then highly likely that the level of awareness developed in the native language will contribute to the development of phonological awareness in any subsequent language or languages acquired later, regardless of the degree of phonetic affinity between the languages (Lundberg & Miller Guron, 2003; Mattingly, 1991). This view assumes, then, that phonological awareness is common for all languages. This is what enables the natural transfer of skills from one language to another (Helman, 2004; August, 2002; Lundberg, 2002; Muter & Diethelm, 2001; Bialystok, 2002; Cicero & Royer, 1995). These phenomena seem to imply that phonological awareness will develop more quickly on all levels in children who are learning to read in two languages.

On the other hand, research by Bialystok, Majumder & Martin (2003) regarding children from English-speaking homes attending French schools indicated somewhat differently, that the pattern of development of phonological awareness differs in such a situation, since these children showed a phonological awareness pattern that was typical for French children learning French, and not faster development. Thus the question arises: does the transfer of phonological awareness result from the acquisition of two linguistic systems in and of itself, unaffected by the types of the two systems, or is it modified (perhaps even conditioned) by the specific nature of the languages brought into contact?

One of the features of a language that can modify the development of phonological awareness is orthography, i.e. the system of writing used in a given language. Much of the research on the stages in the development of phonological awareness indicates that there is a fixed system, repetitive across languages, for the attainment of awareness in respect to particular phonological elements – from syllables through subsyllables (rhymes and alliterations), the awareness of which develops before the child learns to read – in the direction of discovering the smallest particles of words: phonemes (Treiman & Zukovski, 1991). However, the stages in the development of particular phonological skills, the duration of a given stage, and the need to develop the particular phonological skills on which reading depends are conditioned to a large degree by the distinctiveness of particular phonemes and their importance in the process of reading (Ziegler & Goswami, 2005; Goswami, 1999). This is affected in a given language more by orthography than phonology (Morais et al., 1986; Prakash et al., 1993), while an important feature of orthography is its “transparency”.

In orthographically “transparent” (sometimes “shallow”) languages there is considerable consistency between speech and writing, that is, certain letters al-

ways or almost always represent certain sounds and vice versa. This is a factor that facilitates learning to read and write, since for effective reading it is enough to master the connections between sounds and letters. Among the European languages with transparent orthography are Finnish, Italian, Spanish, Greek, and German (Seymour et al., 2003; Polish is relatively transparent). In such languages reading is based primarily on phonology and grapheme-phoneme relationships. In languages with opaque (i.e. non-transparent, sometimes “deep”) orthography, by contrast, there is little consistency between speech and writing, that is, sounds are written in several ways and/or letters are pronounced in different ways in different words. This makes it more difficult to learn to read and write, since it requires separate learning of the pattern of the written word and the pronunciation of that same word. Opacity supports a holistic strategy for reading, which consists in visual recognition of entire words or parts of words. The most opaque European language is English (Seymour et al., 2003). In languages of this type word recognition is significantly more effective when the entire visual orthographic structure of the word is used (Oney et al., 1997).

In languages with a transparent orthography, such as Greek or Spanish, phonemes are very essential to phonological awareness. In reading an orthographically opaque language, however, such as English or French, rhymes constitute important functional elements. The skill of recognizing rhymes is a significant predictor of reading in English, but in Portuguese no such dependency has been found, while in German this dependency appears at a later stage of reading than in English. It can be concluded, then, that although the overall sequence of stages in the development of phonological awareness is universal, the distinctiveness of particular elements and their meaning in the process of reading differ markedly from language to language (Ziegler & Goswami, 2005; Goswami, 1999).

The purpose of the present study was to determine whether or not the tempo and dynamics of the development of phonological awareness at the phoneme level is significantly modified in persons who acquire two languages, in comparison to monolinguals. It was important for the acquisition of the second language to include both phonology and orthography, since both factors influence the development of phonological awareness. Moreover, the possibility of relating the results to the specific character of multilingual education in Poland was an essential factor during the design of the experimental procedure. For this reason Polish was chosen for analysis, along with English (the most popular foreign language in Poland). The research was conducted with a group of children who were not yet fully bilingual, but were becoming bilingual as a result of intensive education in English.

A further aim of this research was to find out whether the effect of the specific nature of the languages and the existence of differences between them (here: the degree of transparency of the orthography) should be taken into account during the analysis of the academic achievements of bilingual children in respect to phonological awareness and learning to read.

MATERIAL AND METHODS

The development of phonological skills was analyzed in Polish children in early school age, who have been learning to read with similar intensity simultaneously in English and Polish, beginning in kindergarten. Their development in this respect was then compared with the development of Polish children who have been learning to read primarily in Polish. The research group included 150 children ranging in age from 6;3 to 10;3 (children from kindergarten, first, second, and third grades) from two primary schools in the Tri-city region of north-central Poland (Gdansk-Sopot-Gdynia). The schools were matched in such a way as not to differ in terms of the teaching system for reading and preparing to read in Polish, or the social status of the parents. The primary difference was the primary language of teaching. In the English (bilingual) school, all classes, with the exception of lessons in Polish, the history of Poland, religion, and foreign language lessons (German) were conducted in English, beginning in kindergarten. These children learned to read in Polish and English at the same time, and the goal was for them to become bilingual by the time they reached the sixth grade. In the Polish (monolingual) school, teaching was done in Polish (with the exception of lessons in foreign languages). English was offered beginning in kindergarten, for two hours a week. In this school, then, children learned to read in Polish, while reading in English was introduced as an additional subject during English lessons, beginning in first grade. All the children studied were of Polish nationality, their native language was Polish, which was the language used at home. No children were included in the study who had special difficulties in reading and writing (developmental dyslexia) or serious hearing impairments.

The focus in this research was on the analysis of the development of phonological awareness at the phoneme level in the children's native language, i.e. Polish. Polish and English differ from each other in respect to orthographical transparency (Ziegler & Goswami, 2005; Krasowicz-Kupis, 1999; Krasowicz & Bogdanowicz, 1996; Demont & Gombert, 1996; Caravolas & Bruck, 1993). Polish is a mostly transparent language; phonemes are relatively easy to distinguish, and are important elements in learning to read. In English, an opaque language, phonemes are not elements upon which reading can be based. Inter-syllabary elements, especially rhymes, are much more distinctive and important in learning to read English (Ziegler & Goswami, 2005).

Phonemic awareness in Polish was tested by means of two trials:

- phoneme deletion (Bogdanowicz & Krasowicz, 1996a), with an experimental trial added for purposes of the present study;
- phoneme segmentation in real words and non-words (Bogdanowicz, 1978; Bogdanowicz et al., 2008).

In its basic version, the phoneme deletion trial consisted of ten real words, from which the child's task was to remove a sound from the beginning, middle or end of the word, so that after its removal another real word was created. The additional trial contained two words requiring the removal of a sound from a con-

sonant-cluster in the middle of the word. The phoneme segmentation trial consisted of eight real words or non-words (from three to ten phonemes), which the child was asked to divide into its constituent sounds.

Both the phoneme deletion and phoneme segmentation tasks have been established to be reliable measures of children's phonological awareness and strong predictors of reading competence at later ages (Adams, 1994; Ziegler & Goswami, 2005; Krasowicz-Kupis, 1999; Bogdanowicz & Krasowicz, 1996b; Bradley & Bryant, 1983).

RESULTS

Both inter-school and inter-class comparisons were made. For phonemic segmentation three factor analysis of variance with repeated measure, $2 \times 4 \times (2)$, was performed, where school and class constituted inter-group factors, while the difficulty of the material (real words vs. non-words) was the intra-group factor. The results pointed to the existence of main effects for school and class, as well as interaction effects (see Table 1).

For the skill of phoneme analysis a main effect was observed for school ($F(1;128)=11.775$; $p<0.001$; $\text{Eta } 2=0.084$), in favor of the Polish-language school (the monolingual group). This means that the children from the English-language school (the bilingual group) had significantly lower scores in parcelling real words and non-words into sounds, as compared to the children from the Polish-language school.

The analysis also indicated a main effect for class ($F(3;128)=5.815$; $p<0.001$; $\text{Eta } 2=0.120$), which reflects the developmental nature of this skill. It was only the difference between kindergarten and the remaining classes, however, that

Table 1. Results of three-factor analysis of variance, school x class x (difficulty of material (real words vs. non-words) in terms of phonemic segmentation

source of effect	phonemic segmentation		
	F	p	Eta 2
school	11.775	<0.001***	0.084
class	5.815	<0.001***	0.120
difficulty (repeated measure)	3.723	0.056 ^a	0.028
school x class	3.080	0.03*	0.067
school x difficulty	0.721	0.397	0.006
class x difficulty	1.866	0.139	0.042
school x class x difficulty	0.395	0.757	0.009

* $p<0.05$, ** $p<0.005$, *** $p<0.001$

proved to be statistically significant ($p < 0.001$). The kindergarten children, regardless of school, had significantly lower scores on a task of dividing words and non-words into sounds. This confirms the results reported by Lipowska (2001). By the end of the first grade the children handled this task with the same results as the children in the second or third grade.

The main effects are limited by the interaction effect of school and class ($F(3;128)=3.080$; $p=0.03$; $\eta^2=0.067$). The differences between schools in terms of phoneme segmentation pertain only to kindergarten and first grade (see Fig. 1). In both these classes the children from the English-language school had significantly lower scores in this trial (in kindergarten, $p < 0.001$; in first grade, $p < 0.05$). In second grade the difference between schools is at the level of a tendency, while in the third grade the difference is statistically non-significant. The reason for the differences between schools in this respect (as was the case for the phoneme deletion trial), could be observed during the trial. The children from the English-language school had obvious difficulties with the analysis, resulting from interference in the methodology of teaching Polish and English. In English, the children intensively practice phonemic segmentation, due to the non-transparency of the language. However, when dividing words, they say the names of the letters (i.e., they do not sound the words out, but spell them), using the English names. That is why the children from this school, when performing phonemic analysis and synthesis, named the letters (and not the sounds), using their English names (not Polish), which caused them not to be able to repeat all the sounds correctly. They added sounds originating from the English pronunciation of particular letters, and in doing so, they did not name the sounds that actually occurred in the word. In the third grade the scores of the children from the Eng-

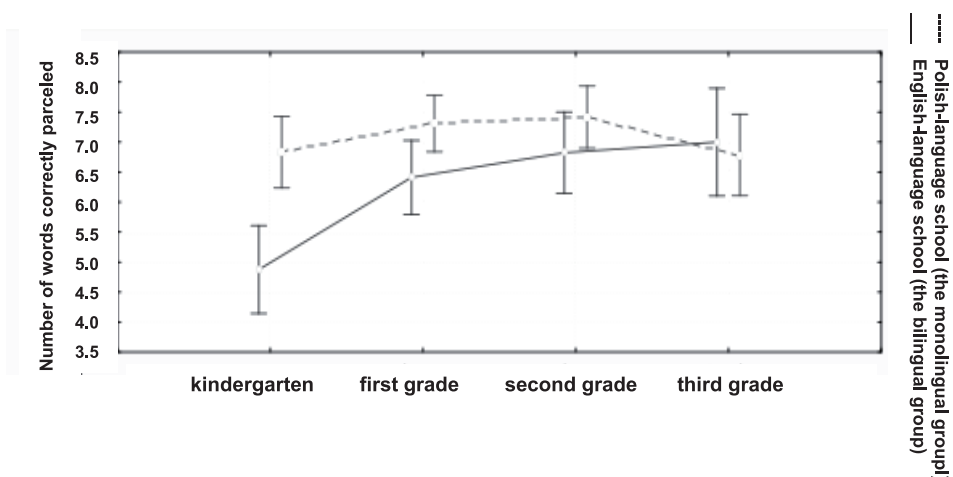


Fig. 1. Comparison of results from phonemic segmentation of real words and non-words, together between schools and classes (whiskers denote 95% confidence interval for means)

lish-language school were highly differentiated: some children performed segmentation of Polish words perfectly, while others still had problems with this task. The lack of difference between schools in the third grade also resulted from a slight lowering of scores for segmentation in the Polish-language school.

The results of the analysis of the variance also revealed a main effect at the tendency level for the difficulty of material in the segmentation trial ($F(1;128)=3.723$; $p=0.056$; $\text{Eta } 2=0.028$): regardless of school the children did somewhat better with parcelling real words into sounds than non-words. However, the strength of this effect is not large.

The results from the phoneme deletion trial made it possible to determine more precisely whether or not the observed lower scores for phoneme segmentation was associated with a deceleration in the overall development of phonemic competence in the bilingual group. A two-factor analysis of variance, school x class (2×4) for the phoneme deletion trial was done separately for each version of the trial. The results are presented in Table 2.

The analysis of variance for the phoneme deletion trials did not reveal any main effect for school, although there seemed to be a tendency towards a difference between schools in favor of the Polish-language school. In the additional trial an interaction effect was also observed ($F(3;87)=2.861$; $p=0.041$; $\text{Eta } 2=0.090$), so that within some classes the differences between schools were significant.

The schools differed from each other in the dynamics of the development of the skill of phoneme deletion (see Figs. 2 and 3), with much greater differences observable in the additional trial (requiring the deletion of a consonant that constitutes part of a consonant-cluster in an unfamiliar word). This task turned out to be much harder for all the children.

In the Polish-language school, the six-year-olds already demonstrated a high level of development of the skill of phoneme deletion in the basic trial (the average score was nearly 7.5 out of 10 possible correct). The six-year-olds from the English-language school, on the other hand, had significantly lower scores on this task ($p<0.05$). In the first grade these differences began to level out (the children from the English-language school were still less effective in performing this

Table 2. Results of two-factor analysis of variance, school x class, in terms of phoneme deletion (separately for each version of the trial)

Source of effect	phoneme deletion – basic trial			phoneme deletion – additional trial		
	F	p	Eta 2	F	p	Eta 2
school	2.917	0.090	0.020	3.792	0.055 ^a	0.042
class	12.895	<0.001***	0.216	13.300	<0.001***	0.314
school x class	1.304	0.275	0.027	2.861	0.041*	0.090

* $p<0.05$, ** $p<0.005$, *** $p<0.001$

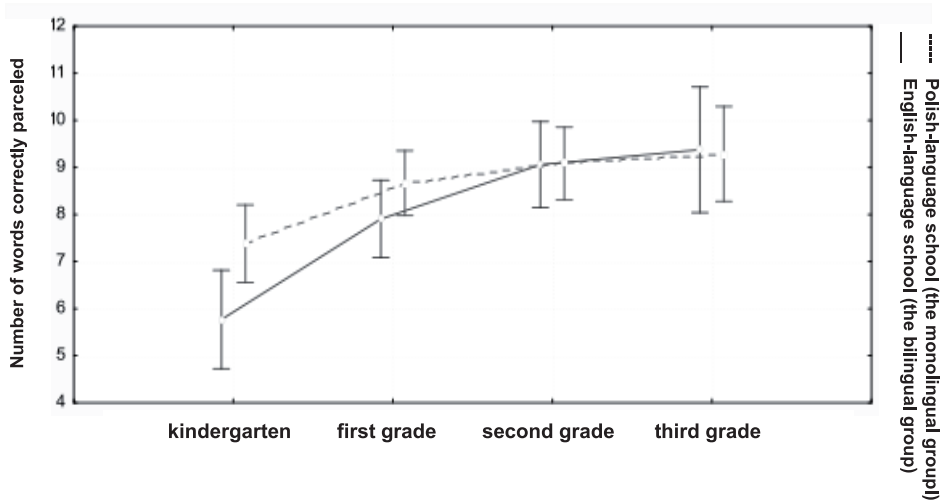


Fig. 2: Comparison of schools and classes in terms of results from the basic trial of phoneme de-

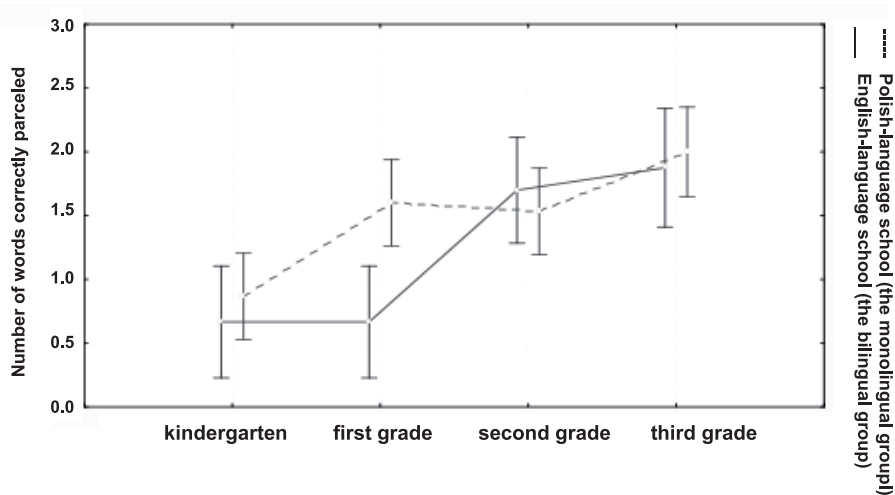


Fig. 3. Comparison of schools and classes in terms of results from the additional trial of phoneme deletion (whiskers denote 95% confidence interval for means)

task, but the difference was only at the level of a tendency), while the differences between schools in the second and third grades are not significant (see Fig. 2).

The results of the additional trial show that the skill of removing a phoneme from the middle of the word develops only in the second grade in the bilingual group ($p < 0.01$). In the first grade no progress was made in the development of this skill. Similarly, in the third grade, this skill did not display significant develop-

ment, and even towards the end of third grade it was not fully developed. In the Polish-language school, on the other hand, the most intense development of this skill took place in the first grade ($p < 0.01$); in the second grade there was no development, but in the third grade there was again improvement ($p < 0.05$). The differences between schools are significant only in the first grade ($p < 0.01$), while the differences between schools in the remaining classes are not statistically significant.

DISCUSSION

The goal of this research was to find an answer to the question as to whether or not the fact of acquiring two languages significantly modifies the development of phonemic awareness in comparison to the situation of monolinguals, and whether the specific nature of the languages being acquired has an effect on this.

It was assumed that if the very fact of acquiring two languages and learning to read in two languages brings a positive effect for the capability to manipulate phonemes, then the skill of manipulating phonemes in Polish would be comparable in both groups, or the children from the bilingual school would even surpass the children from the monolingual school in this respect. If, however, the inter-language differences resulting from a different level of orthographic transparency in the languages significantly modifies the development of phonemic competence, then it was anticipated that the children from the bilingual school would display a lower level of skill in manipulating phonemes in Polish (deceleration) in comparison to children from a monolingual school, due to the disruptive effect of the non-transparent English language: in English phonemes are pronounced differently and written differently, and there are no unambiguous connections between letters and sounds, which can also cause mistakes in Polish.

The results of this research suggest that the fact of intensive acquisition of a second language significantly modifies the development of phonological awareness in the first language. The children from monolingual Polish-speaking families attending a bilingual (English-Polish) school displayed a different tempo and dynamic of development in the ability to manipulate phonemes in Polish in comparison to Polish children attending a monolingual school.

The results point to delayed development of phonemic awareness in the children from the bilingual group, which is to say, deceleration in this respect. The children from the English-language school had significantly lower scores in phoneme segmentation than did the children from the monolingual group; they also had lower scores, at the level of a statistical tendency, on the harder version of the phoneme deletion trial. They also achieved competence in this skill later than children from the Polish-language school, since they only began to develop it in the second grade.

In reference to the skill of phonemic segmentation of words, the lower scores obtained by the children from the bilingual group probably result from interference by different patterns of pronunciation and naming of phonemes in Polish and English. When parceling Polish words into sounds (phonemes), these children

used the English names of the letters instead of sounding the words out. For that reason they added or dropped sounds (phonemes), thus committing mistakes (even in real words). The results of the phoneme deletion test confirmed lower competence in this respect in the children from the English-language school in kindergarten and first grade in comparison to children from the Polish-language school. The level of development of phonemic awareness leveled out in the second and third grades, which suggests that the deceleration is a transient effect.

The results also indicate that the dynamics of the development of particular aspects of phonological awareness in bilingual persons also reflect – besides the features of the languages that are important for the development of phonological awareness – the proportional role of the two languages in the process of education. The process of learning to read is particularly crucial, since reading helps one to understand the connections between letters and sounds, and to notice phonemes which are not always apparent in speech (Ziegler & Goswami, 2005; Adams, 1994). “Breaking the alphabetic code” takes from one to three years, depending on the level of orthographic transparency. In languages with a transparent orthography, such as German, this occurs more quickly than in languages with an opaque orthography, such as English. The research by Goswami et al., (2005) has shown that after a year of learning to read, phonemic awareness increased 40% in monolingual German-speaking children, while in monolingual English-speaking children, the increase was significantly lower.

The results presented here indicate that the children from the bilingual group had a distinctly English profile in the development of phonemic awareness, perhaps as a result of more intensive education in English than in Polish, and greater emphasis given to reading in English. The Polish language developing “all by itself” may not suffice for phonemic training. The lower score in phonemic segmentation and phoneme deletion would seem to indicate this.

However, the results of research on the development of phonological awareness at the level of alliteration, rhyme, and phonemic hearing in these same groups of children and in a group of preschoolers from a bilingual preschool (Petrus et al. 2007; Petrus & Bogdanowicz, 2005) suggest a transfer of competence developed in particular languages (a complementary effect). No deceleration has been observed in any other aspect of phonological awareness other than phonemic. The children from the English-language school (the bilingual group) displayed better sensitivity to differences in the sounds of phonemes and somewhat higher awareness of large phonological units (rhymes) in comparison to the children from the Polish-language school (the monolingual group). These skills are associated, however, not with orthography, but with phonology, and thus are more distinct and more intensively trained in both languages. Perhaps the disruptive effect only affects skills that require formal instruction and formal training, which are more difficult to develop naturally (see also Pachalska et al., 2009).

CONCLUSIONS

The results presented here indicate that the specific nature of the language being acquired significantly modifies the tempo and dynamics of the development of phonemic awareness, and should be taken into account in analyzing the academic achievements of bilingual and multilingual persons in respect to phonology.

The difference in the tempo and dynamics of the development of phonemic awareness between the monolingual and bilingual groups reflects the differences between the two languages in question in respect to phonology and orthography (transparency).

This research revealed a negative transfer effect (deceleration) from English to Polish in respect to phonemic awareness. The children from the bilingual group (the English-language school) had significantly lower scores on the phonemic segmentation task than did the children from the monolingual group (the Polish-language school); they achieved lower scores, too, at the level of a statistical tendency, in the more difficult version of the phoneme deletion trial. They also attained competence in this skill later than the children from the Polish-language school (they only began to develop it in second grade). In the older classes – second and third grades – the differences between the monolingual and bilingual children diminished.

It appears that in the earlier grades English was the dominant language in respect to the development of phonological awareness and competence in reading (the children formed the basis for developing these skills in English, even though they had been immersed in this language for such a short time). The dominance of this language may lead to interference, that is, the unconditioned transfer of skills developed in the dominant language (in this case English) to the weaker language (in this case, paradoxically, Polish), which produces negative consequences whenever the differences between the languages require different strategies or the development of different skills (Bialystok, 2002). Perhaps only towards the end of the second and third grades did the children reach the threshold of balanced competence in both languages, which allowed them to experience advantages from the equally intensive acquisition of both languages (Grosjean, 1988).

This research indicates that intensive teaching of reading in two different languages requires knowledge on the part of the teacher regarding the differences between the languages and the possible difficulties they may cause. Phonemic awareness did not develop to the same extent as in the Polish school.

It is especially important to support the development of phonemic skills in children who are learning to read in both Polish and English (probably in other languages also, especially those with opaque orthography, such as French). This may be significant for learning to read; for example, it may be associated with a greater number of phonological errors, which hinder the correct decoding and recognition of words.

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