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Parents' literacy skills, reading preferences, and the risk of dyslexia in Year 1 students

Abstract: *The aim of our study was to examine the familial risk of dyslexia in Year 1 school beginners, whose parents had been diagnosed as dyslexic or exhibited symptoms of the specific difficulties in reading and writing without a formal opinion issued by a counselling centre. We found that both a dyslexia report and specific reading and writing difficulties with no formal diagnosis manifested by a family member, and parents' reading preferences, predicted the risk of dyslexia in Year 1 children. Moreover, the children at familiar risk of dyslexia, as compared with their peers at no risk, later began to babble, were less apt at self-help and liked drawing less at the age of 2–3 years, and experienced more problems with drawing a circle at the age of 3. Additionally, during Year 1 of education, they performed poorer in fine motor skills, linguistic perception and sound deletion, visual functions and attention. Such symptoms can be observed by parents and teachers during the child's play and educational activities. Early intervention can enhance the child's readiness to school entry, and facilitate effective and satisfactory learning, increasing their further educational opportunities and the quality of life.*

Key words: *familial risk of dyslexia, reading preferences, early learners, early intervention*

Introduction

Literacy constitutes a prerequisite for academic success. During early education period, children achieve new developmental tasks, including: increased world knowledge and learning to read and write (Harwas-Napierała & Trempała, 2006), as learning replaces play to become a main form of activity (Becelewska, 2006).

Proper physical and cognitive (particularly linguistic) development influences the achievement of school maturity, which, in turn, affects academic performance in Year 1.

Children mature enough for school entry: are developed physically (especially in terms of precise digital movements) on their age level, have a certain amount of world knowledge, communicate with others, act intentionally, are socialized and friendly towards their peers, and control their emotions (Przetacznik-Gierowska & Makiełło-Jarża, 1985). Within language competence, their language awareness (the awareness of linguistic symbols and language rules) manifests most often in games and activities requiring the linguistic analysis of the language (M. Bogdanowicz & Lipowska, 2008). In Year 1, a child should properly pronounce and differentiate auditorily (phonemic hearing) all Polish sounds, create and distinguish rhymes, categorize and create words using their first sound, segment words into syllables, and recognize the first and the last letter of a word (Krasowicz-Kupis, 2001). The degree of maturity decides if school entry is a temporary difficult situation, or rather a crisis (Harwas-Napierała & Trempała, 2006).

School education is particularly challenging for children with dyslexia, a disorder *characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities* (Lyon Reid, Shaywitz, & Shaywitz, 2003, p. 2). Since dyslexic symptoms manifest primarily in reading and spelling deficits, dyslexia can be diagnosed only after children have received appropriate literacy instruction. By then, however, their academic failures would have likely increased (M. Bogdanowicz, 2005), without the stimulation of impaired capacities and development support following early recognition. However, the deficits in psychomotor development which can predict specific difficulties in reading and writing can be observed as early as in infants,

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toddlers, and pre-schoolers. The term: risk of dyslexia also applies to students in the Reception Year and Year 1, who experience early learning difficulties (M. Bogdanowicz, 2005). According to Brzezińska (2004a), a child at risk of dyslexia is characterized by an average IQ and specific cognitive deficits underlying reading skills. The symptoms include: poor mobility, self-help difficulties, delayed lateralization and orientation in the body and space scheme, difficulties with: drawing, differentiating elements and blending them into the whole, the use of prepositional phrases, memory, time management, learning to read and write, pronunciation (M. Bogdanowicz, 2014; Krasowicz-Kupis, 2006; Rudzińska-Rogoża & Sinica, 2005). Risk factors also include: complicated pregnancy and childbirth (M. Bogdanowicz, 2014), and familial risk (Hallgren, 1950; Pennington & Olson, 2004), which is 50% (±11%) risk for reading problems (Fisher & Smith, 2001). Human Gene Nomenclature Committee have identified so far 9 susceptibility loci: DYX1, 15q21; DYX2, 6p21; DYX3, 2p16–p15; DYX4, 6q13–q16; DYX5, 3p12–q12; DYX6, 18p11; DYX7, 11p15; DYX8, 1p34–p36; and DYX9, Xp27 (Williams & O'Donovan, 2006). Wysocka, Lipowska and Kilikowska (2010) report that DYX1C1, KIAA0319, DCDC2, and ROBO1 genes have been suggested as linked to dyslexia. Adults with dyslexia manifest difficulties with: spelling, nonwords reading, phonological processing (K. M. Bogdanowicz, Łockiewicz, M. Bogdanowicz, & Pachalska, 2014; Hatcher, Snowling, & Griffiths, 2002), phonological working memory (K. M. Bogdanowicz et al., 2014; Hanley, 1997; Smith-Spark, Fisk, Fawcett, & Nicolson, 2003; Swanson & Sáez, 2003), rapid automatized naming (RAN) (K. M. Bogdanowicz et al., 2014; Jones, Branigan, & Kelly, 2009; Reid, Szczerbinski, Iskierka-Kasperek, & Hansen, 2007), and attention (Smith-Spark, Fawcett, Nicolson, & Fisk, 2004; Swanson & Sáez, 2003). A secondary consequence might be reduced reading experience (M. Bogdanowicz, Łockiewicz, & K. M. Bogdanowicz, 2007; Lyon Reid et al., 2003; Muter & Snowling, 2009).

The aim of our study was to demonstrate the familial risk of dyslexia in school beginners, attending Year 1 in a primary school in Poland, whose parents had been diagnosed as dyslexic or exhibited symptoms of the specific difficulties in reading and writing without a formal opinion issued by a counselling centre. We assumed that children of such parents would manifest symptoms of the risk of dyslexia, including: poor fine and gross motor skills, delay in the orientation in spatial relations, poor visual-spatial functions, language and attention problems. We also expected that certain risk factors occurred in as early as perinatal period. In our study, we assessed the parents' literacy skills with a questionnaire, so that we would be able to compare the difficulties experienced by the parents' and their children, and we examined the parents' reading preferences, as adults with dyslexia tend to have limited print exposure.

Materials and method

85 children (M = 7 years 4 months, Min = 6 years 5 months, Max = 8 years and 3 months) participated in our study. All children attended Year 1 in an elementary school, and, prior to the assessment, their parents expressed informed consent for their own and their children's participation.

The preschoolers were allocated to the experimental and control groups based on: 1. their parents' scores in *The Questionnaire of the Symptoms of Dyslexia in Adults* (KODD), and the presence of dyslexic symptoms in the family, and 2. their parents' reading preferences.

In the first case, the experimental group consisted of the children of parents who scored lower than 75% of the entire group did (a lower quartile) in the KODD, and the control group consisted of the children of parents who scored better than 75% of the group did (an upper quartile). In addition, we removed from the control group the scores of those children who had a family history of dyslexia (whose parents, grandparents, or siblings had a formal report of dyslexia issued by a counselling centre). Finally, the experimental group included 26 children: 17 (34%) girls and 9 (18%) boys, M_{age} = 7 years 5 months, and the control group included 24 children: 11 (22%) girls and 13 (26%) boys, M_{age} = 7 years 6 months. They did not differ in terms of gender, $\chi^2 = 1.94$, $p = 164$ and age, $t(48) = 0.67$, $p = .504$. The children's parents did not differ in terms of reading preferences: the number of books read last year ($U = 263.5$; $Z = 0.70$, $p = .481$; $Mdn = 6$ for the experimental group, $Mdn = 10$ for the control group), the number of books owned ($U = 235$; $Z = 1.49$, $p = .136$; $Mdn = 100$ for the experimental group, $Mdn = 50$ for the control group), reading to the child ($U = 259$; $Z = 1.11$, $p = .269$; $Mdn = 2$ (I read often) for the experimental group, $Mdn = 3$ (I read sometimes, but not often) for the control group).

In the second case, the experimental group consisted of the children of parents who reported that they definitely liked to read, and the control group consisted of the children of the parents who reported that they either liked, could not say, or did not like reading. Thus, the experimental group included 45 children: 20 (24%) girls and 25 (29%) boys, M_{age} = 7 years 4 months, and the control group included 40 children: 25 (29%) girls and 15 (18%) boys, M_{age} = 7 years 5 months. They did not differ in terms of gender, $\chi^2 = 2.77$, $p = .096$ and age, $t(83) = 0.80$, $p = 0.427$. The children's parents did differ in terms of reading preferences; the parents who declared stronger reading preferences: had read more books last year ($U = 263.5$; $Z = 0.70$, $p = .481$, $r = 0.08$; $Mdn = 5$ for the experimental group, $Mdn = 13$ for the control group), owned more books (($U = 235$; $Z = 1.49$, $p = .136$, $r = 0.16$; $Mdn = 50$ for the experimental group, $Mdn = 100$ for the control group), and more often read to their child ($U = 259$; $Z = 1.11$, $p = .269$, $r = 0.12$; $Mdn = 2$, $M = 2.36$ (I read often) for the experimental group, $Mdn = 2$, $M = 1.98$, for the control group).

We administered the following tests:

The Scale of Risk of Dyslexia (SRD: Skala Ryzyka Dysleksji) (M. Bogdanowicz, 2011): a screening tool. The questionnaire consists of 21 statements which describe different symptoms of the risk of dyslexia rated on a scale from 1 (when the behaviour never occurs) to 4 (when the behaviour always occurs). It includes 6 subscales: fine motor skills, gross motor skills, visual functions, linguistic functions: perception, linguistic functions: expression, and attention. Higher score signifies poorer performance, as questions denote manifested symptoms. The scale is to be completed by a teacher or a parent.

The Questionnaire of the Symptoms of Dyslexia in Adults (KODD) by Vinegrad, Polish adaptation (M. Bogdanowicz & Krasowicz-Kupis, 2003): a self-assessment screening tool. The questionnaire consists of 20 dichotomous statements which describe different symptoms of dyslexia in terms of everyday functioning situations.

The test battery diagnosing the psychomotor development of 5- and 6 year-old children (5/6S Battery) (M. Bogdanowicz, Kalka, Sajewicz-Radtke, & Radtke, 2010). In the present study we used the selected subtests (with no ceiling effect in both groups) which examine: orientation in spatial relations (task: 3); linguistic skills: sound deletion (task 11); fine motor skills: drawing borders (task 8), connecting points (task 10), threading beads (task 13). We decided to use this Battery as the age range for our Year 1 participants was quite wide, following changes in the educational system: Year 1 students were born in 2007 (obligatory school entry) and 2008 (school entry based on parental decision). The next available test battery was designed for 8 year old children, who have received formal literacy instruction. Therefore, these tasks would be too difficult for our group, especially as we focused on children experiencing difficulties.

Survey. It consisted of several open questions and 21 statements about the child's development prior to schooling rated on a scale from 1 (when the behaviour never occurs) to 5 (when the behaviour always occurs): language development, motor development, and perinatal period, as well as parents' reading preferences: liking to read (self-rated on a scale from 1 = definitely yes to 5 = definitely no), the number of books read last year (open question), number of books owned (open question), the frequency of reading to their child (self-rated on a scale from 1 = yes, very often to 5 = no, never).

Results

Risk of dyslexia and dyslexic symptoms in the family

In the subsequent analyses, the group with familial risk (experimental) included the children of parents who scored lower than 75% of the entire group did in the KODD, and the group with no risk (control) included the children of parents who scored better than 75% of the group did (and there was no family history of dyslexia).

To check the extent to which the family risk of dyslexia constitutes a significant factor of the risk of dyslexia in children, we conducted multiple regression analysis where the independent variables were the parent's score in *The Questionnaire of the Symptoms of Dyslexia in Adults (KODD)* and either having a report of dyslexia or manifesting specific reading and writing difficulties with no formal diagnosis by a family member, and dependent variables were the overall score in *The Scale of Risk of Dyslexia (SRD)* and scores of each of its subscales. In the entire group a significant predictor of the risk of dyslexia (as measured with the overall score in the *SRD*) was having a report of dyslexia or manifesting specific reading and writing difficulties with no formal diagnosis by a family member, which explained 11% of variance ($\beta = 0.333$, $R^2 = 0.111$, $F(1, 48) = 5.977$; $p = .018$). Dyslexic symptoms in a family also predicted poorer scores of Year 1 students in: fine motor skills: $\beta = 0.505$; $p \leq .001$, $R^2 = 0.240$, $F(1, 48) = 16.448$, which explained 24% of variance.

We found that the children with familial risk were born from pregnancies with more complications ($U = 208.5$, $Z = 2.36$, $p = .018$; $r = 0.33$, $Mdn = 1.5$ for the experimental group, $Mdn = 1$ for the control group), though in both groups the parents reported no complications (as measured with question 1 in the survey).

In the assessment of their parents, in their early development the children with familial risk of dyslexia, as compared with their peers with no risk, later began to babble (as measured with question 9 in the survey, $U = 204$; $Z = 2.28$, $p = .022$; $r = 0.32$, $Mdn = 2$ for the experimental group, $Mdn = 1$ for the control group), and were less skilled at self-help at the age of 2–3 years (as measured with question 5 in the survey, $U = 216.5$, $Z = 2$, $p = .044$; $r = 0.28$, $Mdn = 4$ for the experimental group, $Mdn = 5$ for the control group). We noticed no intergroup differences in other aspects of language development: age at which the children began to utter their first words (as measured with question 10 in the survey), first sentences (as measured with question 11 in the survey), first complex sentences (as measured with question 12 in the survey).

During their Year 1 education, the children with familial risk of dyslexia scored lower (which means a better performance) in attention subscale of the SRD ($U = 206.5$, $Z = 2.25$; $p = .024$; $r = 0.32$, $Mdn = 1$ for the experimental group, $Mdn = 2$ for the control group), and in linguistic functions: language expression subscale of the SRD ($U = 216.5$, $Z = 2$, $p = .045$, $r = 0.28$, $Mdn = 3$ for the experimental group, $Mdn = 4$ for the control group). No differences were observed between the two groups in: sound deletion (as measured with task 11, Battery 5/6S).

Moreover, the children with familial risk of dyslexia ($Mdn = 2$), as compared with their peers at no risk, ($Mdn = 4$), coped better with the use of scissors and tying shoelaces (as measured with subscale fine motor skills, SRD, $U = 201$; $Z = 2.23$; $p = .025$, $r = 0.32$); also scored higher in connecting points (as measured with task 10, Battery 5/6S, $U = 204.5$, $Z = 2.14$, $p = .032$; $r = 0.3$, $Mdn = 5$ for the experimental group, $Mdn = 4$ for the control group). No differences were observed between groups in terms of other fine motor skills: drawing borders (as measured with task 8, Battery 5/6S) and threading beads (as measured with task 13, Battery 5/6S), gross motor skills (as measured with SRD subscale) and orientation in the

scheme of the body and space (as measured with task 3 of Battery 5/6S).

Risk of dyslexia and parents' reading preferences

In the subsequent analyses, the group with familial risk (experimental) included the children of parents who reported that they definitely liked to read, and the control group consisted of the children of parents who reported that they either liked, could not say, or did not like reading.

We found that the parents' reading preference was correlated negatively with the risk of dyslexia in their children (as measured with the SRD): total score (r = -0.32, moderate correlation), fine motor skills (r = -0.31, moderate correlation), visual functions (r = -0.36, moderate correlation), linguistic perception (r = -0.22, weak correlation), linguistic expression (r = -0.22, weak correlation), and attention (r = -0.32, moderate correlation).

To check the extent to which the parents' reading preferences constitute a significant factor of the risk of dyslexia in children, we conducted multiple regression analysis where the independent variable was the parent's score in the survey questions: Do you like reading? (rated on a 5-point Likert scale, where 1 meant: definitely yes, and 5: definitely not), and dependent variables were the overall score in *The Scale of Risk of Dyslexia (SRD)*, and scores of each of its subscales. In the entire group a significant predictor of the risk of dyslexia (as measured with the overall score in the SRD) were the parent's reading preferences, which explained 7% of variance ($\beta = 0.279$, $p = .010$, $R^2 = 0.067$, $F(1, 83) = 7.001$). The parent's reading preferences also predict poorer scores of Year 1 students in: fine motor skills: $\beta = 0.273$; $p = .011$, $R^2 = 0.063$, $F(1, 83) = 6.694$, which explained 6% of variance, visual functions: $\beta = 0.289$; $p = .007$, $R^2 = 0.073$, $F(1, 83) = 7.584$, which explained 7% of variance, linguistic functions: perception: $\beta = 0.228$; $p = .036$, $R^2 = 0.041$, $F(1, 83) = 4.546$, which explained 4% of variance, and attention: $\beta = 0.290$; $p = .007$, $R^2 = 0.073$, $F(1, 83) = 7.642$, which explained 7% of variance.

We found that in the assessment of their parents, the children with the familial risk of dyslexia, as compared with their peers at no risk, liked drawing less at age 2 and 3 (as measured with question 7 in the survey, $U = 636$; $Z = 2.51$, $p = .012$; $r = 0.27$, $Mdn = 4$ for the experimental group, $Mdn = 5$ for the control group), and had more problems with drawing a circle at age of 3 (as measured with question 8 in the survey, $U = 565$; $Z = 3.16$, $p = .002$; $r = 0.34$, $Mdn = 4$ for the experimental group, $Mdn = 5$ for the control group). They were also less interested in books (as measured with question 13 in the Survey, $U = 599.5$; $Z = 2.94$, $p = .003$; $r = 0.32$, $Mdn = 2$ for the experimental group, $Mdn = 1$ for the control group), and tried to read on their own in a lesser degree (as measured with question 14 in the survey, $U = 543.5$; $Z = 3.69$, $p \leq .001$; $r = 0.40$, $Mdn = 2$ for the experimental group, $Mdn = 1$ for the control group).

In our study, the children with familial risk of dyslexia scored higher in (as measured with SRD subscales; table 1): fine motor skills ($U = 598.5$, $Z = 2.75$, $p = .006$; $r = 0.30$, $Mdn = 4$ for the experimental group, $Mdn = 2$ for the control group); visual functions ($U = 556.5$, $Z = 3.12$, $p = .002$; $r = 0.34$, $Mdn = 11$ for the experimental group, $Mdn = 7$ for the control group); linguistic perception ($U = 706.5$, $Z = 1.99$, $p = .046$; $r = 0.22$, $Mdn = 5$, $M = 7.29$, for the experimental group, $Mdn = 5$, $M = 5.8$ for the control group), attention ($U = 578.5$, $Z = 3.05$, $p = .002$; $r = 0.33$, $Mdn = 2$, for the experimental group, $Mdn = 1$ for the control group), and in total score, symptoms of the risk of dyslexia ($U = 591$, $Z = 2.73$, $p = .006$; $r = 0.30$, $Mdn = 31$ for the experimental group, $Mdn = 25$ for the control group).

The children at the risk of dyslexia, as compared with the children at no risk, scored lower in linguistic functions: sound deletion (as measured with task 11, Battery 5/6S, $U = 620$, $Z = 2.51$, $p = .012$, $r = 0.27$, $Mdn = 4$ for the experimental group, $Mdn = 5$ for the control group), and in fine motor skills: drawing borders (as measured with task 8, Battery 5/6S, $U = 589.5$; $Z = 3.03$; $p = 0.002$, $r = 0.33$, $Mdn = 3$ for the experimental group, $Mdn = 4$ for the

Table 1. The symptoms of dyslexia (as measured with the SRD) in the compared groups

	Risk group	No risk group	*U*	*Z*	*p*	*r*
	Mdn	*Mdn*				
risk of dyslexia (total score)	31	25	591.0	2.73	.006**	0.30
fine motor skills	4	2	598.5	2.75	.006**	0.30
gross motor skills	4	4	877.5	0.20	.839	0.02
visual functions	11	7	556.5	3.12	.002**	0.34
linguistic perception	5	5	706.5	1.99	.046*	0.22
linguistic expression	4	3	724.5	1.69	.091	0.18
attention	2	1	578.5	3.05	.002**	0.33

* $p \leq .05$, ** $p \leq .01$

Higher score signifies poorer performance.

control group). No differences were observed between the groups in terms of: connecting points (as measured with task 10, Battery 5/6S), and orientation in spatial relations (as measured with task 3, Battery 5/6S).

Discussion

When examining the performance of the children whose parents scored in the lower and the upper quartile in literacy self-assessment we found that the children with familial risk of dyslexia (whose parent scored in the lower quartile in the KODD, and family member could additionally have a report of dyslexia or manifest specific reading and writing difficulties with no formal diagnosis) were more vulnerable to the risk of dyslexia than the children in the control group. The result is consistent with research on heredity and familial risk of dyslexia (Fisher & Smith, 2001; Hallgren, 1950; Lyytinen et al., 2004; Pennington & Olson, 2004; Williams & O'Donovan, 2006; Wysocka & Lipowska, 2010).

In our study, the parents of children in the experimental group more often complained about the difficulties that occurred during pregnancy than the parents in the control group did. This corroborates reports from the literature that children born from complicated pregnancy and childbirth are more exposed to the risk of dyslexia (M. Bogdanowicz, 2014).

We found that the children with familial risk of dyslexia, in the assessment of their parents, later began to babble than their peers with no risk; they did not differ in the age at which they began to utter their first words, sentences, and complex sentences which does not fully confirm symptomatology including delayed speech development in infancy and toddlers in children with familial risk for dyslexia (Krasowicz-Kupis, 2006). Krasowicz-Kupis (2008, 2010) suggests that a delay in speech development in the first 3 years of life is the most important symptom of the risk of dyslexia. Muter and Snowling (2009) reported vocabulary development, expressive language, grammatical skills, and letter knowledge deficits in 3-year-olds at risk, Koster et al. (2005) a delayed word production in 17-month-year-olds at risk, and Puolakanaho et el. (2004) poorer phonological awareness in 3.5 year-olds at risk, as compared with controls. However, in our study the parents assessed their children's speech development retrospectively; moreover, they could not consider simplified telegraphic utterances to be sentences.

The parents also reported that the children with familial risk of dyslexia, as compared with their peers at no risk, were less skilled at self-help at the age of 2–3 years, which was confirmed by the fact that dyslexic symptoms in the family also predicted poorer scores of Year 1 students in fine motor skills. Efficient digital manipulation is essential for learning to write. Bogdanowicz (2000) advocates that the perceptual-motor integration contributes to success in learning to read. Thus, the impaired ability to synthesize perceptual functions and coordinate them with motor functions leads to specific difficulties in reading.

However, the children with familial risk of dyslexia scored better in attention, language expression, and coped better with the use of scissors, tying shoelaces, and connecting points. No differences were observed between the two groups in: sound deletion, other fine motor skills: threading beads, gross motor skills, and orientation in spatial relations. We believe that these results, which are in contrast to the symptomatology of the risk of dyslexia in early education (M. Bogdanowicz, 2005, 2011, 2014; Krasowicz-Kupis, 2008), might be due to the insufficient differentiation of the compared groups with the KODD. This questionnaire is only a screening tool, and might be not sensitive enough to identify adults with deeper literacy problems. We recommend future studies use an actual words and nonword reading test to better select parents with literacy difficulties. As for now, there is no full, standardised and normed diagnostic tool to assess dyslexia, or reading difficulties, in adults that could be used.

When comparing the performance of children whose parents declared different liking of reading, we found that the parent's reading preference was correlated negatively with the risk of dyslexia in their children, including: fine motor skills, visual functions, linguistic perception, linguistic expression, and attention. This was confirmed as the parents' reading preferences predicted the general risk of dyslexia, and poorer performances of Year 1 students in: fine motor skills, visual functions, linguistic functions: perception, and attention. Dyslexia in adults leads to reduced reading experience (Lyon Reid et al., 2003), and a typical symptom reported in the literature is slow, arduous reading (Łockiewicz & Bogdanowicz, 2015). Therefore, reading reluctance could be treated as an indicator of possible literacy difficulties.

We found that in the assessment of their parents, the children with familial risk of dyslexia, as compared with their peers at no risk, liked drawing less at age 2 and 3, and had more problems with drawing a circle at age of 3. Moreover, during their Year 1 of education, they performed poorer in fine motor skills and in drawing borders task, though no differences were observed between groups in: connecting points and threading beads. This results is consistent with the literature (M. Bogdanowicz, 2011).

In our study, the children with familial risk of dyslexia, as compared with the children at no risk, scored lower in linguistic functions: linguistic perception and sound deletion. Impaired phonological awareness (including the recognition of individual speech sounds) underlies language disturbances (M. Bogdanowicz, 2000; Krasowicz-Kupis, 2008). According to the phonological deficit theory of dyslexia, reading and spelling problems are caused by phonological processing and working memory deficits (Hatcher & Snowling, 2008), including impaired phonological representations (Snowling, 2000). Difficulties with manipulating phonemes indicate phonological processing deficits (Lundberg & Hoien, 2001). Longitudinal studies demonstrated that children with familial risk and dyslexia manifested deficits in reading speed, reading accuracy, and spelling, as compared to children with familial risk and no dyslexia, and children

with no risk (Eklund, Torppa, Aro, Leppänen, & Lyytinen, 2015). Phonology related deficits in children at risk were observed in both alphabetic (Muter & Snowling, 2009) and nonalphabetic languages (Ho, Leung, & Cheung, 2011).

We found that the children with familial risk of dyslexia manifested more symptoms in visual functions and attention, which are reported as typical deficits in the risk of dyslexia (M. Bogdanowicz, 2004, 2011; M. Bogdanowicz & Adryjanek, 2004). Moreover, dyslexia co-occurs with ADHD (Krasowicz-Kupis, 2008; Lipowska, 2011; Wysocka & Lipowska, 2010).

In our study, no differences were observed between groups in terms of: gross motor skills and orientation in spatial relations, which we expected to appear (M. Bogdanowicz, 2004, 2011). Nicolson and Fawcett (1995; 2008; Nicolson, Fawcett, Brookes, & Needle, 2010) claim that the cause of the specific difficulties in reading and writing are problems with procedural learning, relating in particular to problems with mobility and balance (for which the cerebellum is specialised). However, other leading causal theories of dyslexia, for example, phonological deficit theory (Snowling, 2000) or the double deficit theory (Wolf & Bowers, 1999) do not suggest any mobility or spatial orientation disorders as relevant to the pathomechanism of dyslexia, focusing on linguistic factors: phonological processing, working memory, and RAN. Moreover, Brzezińska (2004a) assessed Polish pre-schoolers as at a low (in motor skills) risk of dyslexia.

We observed that the parents in the compared groups did differ in terms of reading habits; the parents who declared stronger reading preferences had read more books last year, owned more books, and more often read to their child as compared with the parents who liked reading less. They also reported that their children were more interested in reading, and more often tried to read on their own. This result shows the impact of parental reading habits on their children' early literacy attempts. Bogdanowicz (2004) emphasizes that one of the reasons for the increasing number of children assessed as dyslexic is the lack of appropriate stimulation and development support, especially of children with developmental disharmonies. Parents, and later teachers, should observe the children's functioning to identify potential deficits. This may be a difficult task, as Brzezińska (2004) found a 9–10% discrepancy between parental and teacher assessment of the risk of dyslexia. We believe that our results will help to reduce this gap. An informative action should be implemented to instruct the teachers and the parents about the early symptoms of the risk of dyslexia, so that the children's psychomotor development can be comprehensively supported as early as possible, for example, with the Good Start Method (M. Bogdanowicz, 2014; Łockiewicz & Kalka, 2008).

A risk factor in the literacy development of the children is their parents' literacy level. Children's reading skills correlate with their parents' reading skills; notably, more stronger with the mothers', who are usually more involved in parenting (van Bergen, de Jong, Plakas, Maassen, & van der Leij, 2012). However, the parents' literacy skills may be difficult to assess, as our studies demonstrated: the used questionnaire proved not to be reliable enough to compare between the two groups created on the basis of parents' reading and spelling skills. We recommend that future studies include only the children of parents with a formal report obtained while at school, or assess parents' reading skills using words and nonwords reading tasks. These tasks could not be referred, though, to the general population, as there are no standardized and normed tests in Poland for reading and spelling dedicated to the adult group. There is an urgent need for constructing such tests. We also suggest a longitudinal research project, following the children at familiar risk from kindergarten to elementary and high-school level of education.

Conclusions

Our results confirm the familial risk of dyslexia, the symptoms of which can be observed years before the child begins formal education. We found that both a dyslexia report and specific reading and writing difficulties with no formal diagnosis manifested by a family member, and parents' reading preferences, predicted the risk of dyslexia in Year 1 children. Moreover, the children at familiar risk of dyslexia, as compared with their peers at no risk, later began to babble, were less apt at self-help and liked drawing less at the age of 2–3 years, and experienced more problems with drawing a circle at the age of 3. In addition, they performed poorer in fine motor skills, linguistic perception and sound deletion, visual functions and attention, while their parents reported more difficulties during pregnancy. Such symptoms can be observed by parents and teachers during the child's play and educational activities. Prereading skills relate to reading performace (Pennala et al., 2013), and the lack of early support and intervention may lead to deepening of the disturbances, and the occurrence of secondary deficits (M. Bogdanowicz, 2011). Therefore, early support should involve activities that provide the children at risk with the opportunity to practice literacy skills, taking into account: the fact that pre-schoolers learn in a spontaneous or spontaneity-reactive manner (Jaszczyn, 2008), and their attitude and motivation to learn, to avoid limited print exposure. These actions could decrease cognitive deficits in the children at risk, as a child at risk does not have to become a child with dyslexia (M. Bogdanowicz, 2011). Early intervention can enhance the child's readiness to school entry, and facilitate effective and satisfactory learning, increasing their further educational opportunities and the quality of life.

References

Becelewska, D. (2006). *Repetytorium z rozwoju człowieka*. Jelenia Góra: Kolegium Karkonowskie.

Bogdanowicz, K. M., Łockiewicz, M., Bogdanowicz, M., & Pachalska, M. (2014). Characteristics of cognitive deficits and writing skills of Polish adults with developmental dyslexia. *International Journal of Psychophysiology, 93*(1), 78–83. doi: 10.1016/j.ijpsycho.2013.03.005

Bogdanowicz, M. (2000). *Integracja percepcyjno-motoryczna. Teoria – diagnoza – terapia*. Warszawa: Centrum Metodyczne Pomocy Psychologiczno-Pedagogicznej Ministerstwa Edukacji Narodowej.

Bogdanowicz, M. (2004). Co należy wiedzieć o dysleksji rozwojowej? Wprowadzenie teoretyczne. In M. Bogdanowicz & A. Adryjanek (Eds.), *Uczeń z dysleksją w szkole. Poradnik nie tylko dla polonistów.* (pp. 7–92). Gdynia: Wydawnictwo OPERON.

Bogdanowicz, M. (2005). *Ryzyko dysleksji. Problem i diagnozowanie.* Gdańsk: Wydawnictwo Harmonia.

Bogdanowicz, M. (2011). *Ryzyko specyficznych trudności w czytaniu i pisaniu: dysleksji, dysortografii i dysgrafii. Skala Ryzyka Dysleksji wraz z normami dla klas I i II.* Gdańsk: Harmonia Universalis.

Bogdanowicz, M. (2014). *Metoda Dobrego Startu we wspomaganiu rozwoju, edukacji i terapii pedagogicznej*. Gdańsk: Harmonia Universalis.

Bogdanowicz, M., & Adryjanek, A. (2004). *Uczeń z dysleksją w szkole. Poradnik nie tylko dla polonistów*. Gdynia: Wydawnictwo OPERON.

Bogdanowicz, M., Kalka, D., Sajewicz-Radtke, U., & Radtke, B. (2010). *Bateria metod diagnozy rozwoju psychomotorycznego dzieci pięcio- i sześcioletnich. Bateria 5/6S*. Gdańsk: Pracownia Testów Psychologicznych i Pedagogicznych.

Bogdanowicz, M., & Krasowicz-Kupis, G. (2003). Kwestionariusz Objawów Dysleksji u Dorosłych Michaela Vinegrada. In W. Turewicz (Ed.), *Jak pomóc dziecku z dysortografią* (pp. 25–27). Zielona Góra: ODN.

Bogdanowicz, M., & Lipowska, M. (2008). *Rodzinne, edukacyjne i psychologiczne wyznaczniki rozwoju.* Kraków: Oficyna Wydawnicza "Impuls".

Bogdanowicz, M., Łockiewicz, M., & Bogdanowicz, K. M. (2007). Life skills. In I. Smythe (Ed.), *Dyslexia: A Guide for adults* (pp. 54–73). Sofia: Project Include. A EU Funded Pan-European Project.

Brzezińska, A. (2004). Ryzyko dysleksji u dzieci w wieku przedszkolnym według oceny matki, ojca i nauczycielki przedszkola. *Edukacja,* (3), 23–35.

Brzezińska, A. (2004). Ryzyko dysleksji u dzieci w wieku przedszkolnym według oceny nauczycielki. *Edukacja,* (2), 64–76.

Eklund, K., Torppa, M., Aro, M., Leppänen, P. H. T., & Lyytinen, H. (2015). Literacy skill development of children with familial risk for dyslexia through grades 2, 3, and 8. *Journal of Educational Psychology, 107*(1), 126–140. doi: 10.1037/a0037121

Fisher, S. E., & Smith, S. D. (2001). Progress Towards the Identification of Genes Influencing Developmental Dyslexia. In A. Fawcett (Ed.), *Dyslexia. Theory and Good Practice* (pp. 39–64). London: Whurr Publishers.

Hallgren, B. (1950). Specific dyslexia ('congenital word-blindness'): a clinical and genetic study. *Acta Psychiatrica et Neurologica (KjøBenhavn), Suppl. 65*, xiii.

Hanley, J. R. (1997). Reading and spelling impairments in undergraduate students with developmental dyslexia. *Journal of Research in Reading, 20*(1), 22–30. doi: 10.1111/1467-9817.00017

Harwas-Napierała, B., & Trempała, J. (2006). *Psychologia rozwoju człowieka. Charakterystyka okresów życia człowieka.* Warszawa: Wydawnictwo Naukowe PWN.

Hatcher, J., & Snowling, M. J. (2008). Hipoteza reprezentacji fonologicznych jako sposób rozumienia dysleksji: od teorii do praktyki. In G. Reid & J. Wearmouth (Eds.), *Dysleksja. Teoria i praktyka* (pp. 103–120). Gdańsk: Gdańskie Wydawnictwo Psychologiczne.

Hatcher, J., Snowling, M. J., & Griffiths, Y. M. (2002). Cognitive assessment of dyslexic students in higher education. *The British Journal Of Educational Psychology, 72*(Pt 1), 119–133.

Ho, C. S.-H., Leung, M.-T., & Cheung, H. (2011). Early difficulties of Chinese preschoolers at familial risk for dyslexia: Deficits in oral language, phonological processing skills, and print-related skills. *Dyslexia: An International Journal of Research and Practice, 17*(2), 143–164. doi: 10.1002/dys.429

Jaszczyn, E. (2008). Wspieranie nauki czytania. *Wychowanie dziecka w przedszkolu* (9), 5–10.

Jones, M. W., Branigan, H. P., & Kelly, M. L. (2009). Dyslexic and nondyslexic reading fluency: Rapid automatized naming and the importance of continuous lists. *Psychonomic Bulletin & Review, 16*(3), 567–572. doi: 10.3758/PBR.16.3.567

Koster, C., Been, P. H., Krikhaar, E. M., Zwarts, F., Diepstra, H. D., & Van Leeuwen, T. H. (2005). Differences at 17 Months: Productive Language Patterns in Infants at Familial Risk for Dyslexia and Typically Developing Infants. *Journal of Speech, Language & Hearing Research, 48*(2), 426–438. doi: 10.1044/1092-4388(2005/029)

Krasowicz-Kupis, G. (2001). *Język, czytanie i dysleksja*. Lublin: Agencja Wydawniczo-Handlowa Antoni Dudek.

Krasowicz-Kupis, G. (2006). *Dysleksja rozwojowa*. Gdańsk: Wydawnictwo Harmonia.

Krasowicz-Kupis, G. (2008). *Psychologia dysleksji*. Warszawa: Wyd. Nauk. PWN.

Krasowicz-Kupis, G. (2010). Zaburzenie rozwoju językowego a dysleksja. *Psychologia w szkole,* (2), 85–94.

Lipowska, M. (2011). *Dysleksja i ADHD. Współwystępujące zaburzenia rozwoju. Neuropsychologiczna analiza deficytów pamięci*. Warszawa: Scholar.

Łockiewicz, M., & Kalka, D. (2008). Efektywność Metody Dobrego Startu Marty Bogdanowicz, we wspomaganiu rozwoju psychomotorycznego dzieci, w okresie wczesnego dzieciństwa. In M. Bogdanowicz & M. Lipowska (Eds.), *Rodzinne, edukacyjne i psychologiczne wyznaczniki rozwoju* (pp. 231–235). Kraków: Oficyna Wydawnicza Impuls.

Lundberg, I., & Hoien, T. (2001). Dyslexia and Phonology. In A. Fawcett (Ed.), *Dyslexia. Theory and Good Practice* (pp. 109–123). London: Whurr Publishers.

Lyon Reid, G., Shaywitz, S. E., & Shaywitz, B. A. (2003). A Definition of Dyslexia. Defining Dyslexia, Comorbidity, Teachers' Knowledge of Language and Reading. *Annals of Dyslexia, 53*, 1–14.

Lyytinen, H., Ahonen, T., Eklund, K., Guttorm, T., Kulju, P., Laakso, M. L., … Viholainen, H. (2004). Early development of children at familial risk for dyslexia--follow-up from birth to school age. *Dyslexia: An International Journal of Research and Practice, 10*(3), 146–178. doi: 10.1002/dys.274

Łockiewicz, M., & Bogdanowicz, K. M. (2015). *Dysleksja u osób dorosłych*. Kraków: Oficyna Wydawnicza Impuls.

Muter, V., & Snowling, M. J. (2009). Children at familial risk of dyslexia: Practical implications from an at-risk study. *Child and Adolescent Mental Health, 14*(1), 37–41. doi: 10.1111/j.1475-3588.2007.00480.x

Nicolson, R. I., & Fawcett, A. J. (1995). Dyslexia is More than a Phonological Disability. *Dyslexia (10769242), 1*(1), 19–36.

Nicolson, R. I., & Fawcett, A. J. (2008). *Dyslexia, learning, and the brain*. Cambridge, Mass.; London: MIT.

Nicolson, R. I., Fawcett, A. J., Brookes, R. L., & Needle, J. (2010). Procedural Learning and Dyslexia. *Dyslexia, 16*(3). doi: 10.1002/dys.408

Pennala, R., Eklund, K., Hämäläinen, J., Martin, M., Richardson, U., Leppänen, P. H. T., & Lyytinen, H. (2013). Precursors and Consequences of Phonemic Length Discrimination Ability Problems in Children With Reading Disabilities and Familial Risk for Dyslexia. *Journal of Speech, Language & Hearing Research, 56*(5), 1462–1475. doi: 10.1044/1092-4388(2013/12-0072)

Pennington, B. F., & Olson, R. K. (2004). Genetyka dysleksji. In A. Grabowska & K. Rymarczyk (Eds.), *Dysleksja: od badań mózgu do praktyki* (pp. 453–472). Warszawa: Instytut Biologii Doświadczalnej im. M. Nenckiego PAN.

Przetacznik-Gierowska, M., & Makiełło-Jarża, G. (1985). *Psychologia rozwojowa i wychowawcza wieku dziecięcego*. Warszawa: Wydawnictwa Szkolne i Pedagogiczne.

Puolakanaho, A., Poikkeus, A.-M., Ahonen, T., Tolvanen, A., & Lyytinen, H. (2004). Emerging Phonological Awareness Differentiates Children with and without Familial Risk for Dyslexia after Controlling for General Language Skills. *Annals of Dyslexia, 54*(2), 221–243. doi: 10.1007/s11881-004-0011-2

Reid, A. A., Szczerbinski, M., Iskierka-Kasperek, E., & Hansen, P. (2007). Cognitive profiles of adult developmental dyslexics: theoretical implications. *Dyslexia (10769242), 13*(1), 1–24. doi: 10.1002/dys.321

Rudzińska-Rogoża, A., & Sinica, M. (2005). *W kręgu specyficznych trudności w uczeniu się czytania i pisania*. Zielona Góra: Oficyna Wydawnicza Uniwersytetu Zielonogórskiego.

Smith-Spark, J. H., Fawcett, A. J., Nicolson, R. I., & Fisk, J. E. (2004). Dyslexic students have more everyday cognitive lapses. *Memory, 12*(2), 174–182. doi: 10.1080/09658210244000450

Smith-Spark, J. H., Fisk, J. E., Fawcett, A. J., & Nicolson, R. I. (2003). Investigating the central executive in adult dyslexics: Evidence from phonological and visuospatial working memory performance. *European Journal of Cognitive Psychology, 15*(4), 567–587. doi: 10.1080/09541440340000024

Snowling, M. J. (2000). *Dyslexia*. Oxford: Blackwell Publishers.

Swanson, H. L., & Sáez, L. (2003). Memory difficulties in children and adults with learning disabilities. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 182–198). New York-London: Guilford Press.

van Bergen, E., de Jong, P. F., Plakas, A., Maassen, B., & van der Leij, A. (2012). Child and parental literacy levels within families with a history of dyslexia. *Journal of Child Psychology and Psychiatry, 53*(1), 28–36. doi: 10.1111/j.1469-7610.2011.02418.x

Williams, J., & O'Donovan, M. C. (2006). The genetics of developmental dyslexia. *European Journal of Human Genetics, 14*(6), 681–689. doi: 10.1038/sj.ejhg.5201575

Wolf, M., & Bowers, P. G. (1999). The double-deficit hypothesis for the developmental dyslexias. *Journal of Educational Psychology, 91*(3), 415–438. doi: 10.1037/0022-0663.91.3.415

Wysocka, A., & Lipowska, M. (2010). Genetyczne podłoże współwystępowania ADHD i dysleksji rozwojowej. *Psychiatria i Psychologia Kliniczna, 10*(3), 189–194.

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