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Early risk factors of dyslexia

Abstract: *Background:* Dyslexia, as one of causes of learning disabilities, is sometimes diagnosed too late to find effective solutions to improve the situation. On the one hand, dyslexia is a lifelong condition, but on the other hand, there exist improvement strategies with the basic principle: the earlier you start, the better are the results. Some warning signs are to be noticed while a child is not accustomed to letters, other signs appear with the first steps of reading acquisition. *Methods:* An analysis of scientific literature to reinforce the theoretical basis of the research was conducted. Observation of pre-school children at the age of 4-6 and evaluation of their language skills were applied, as well as some interviews with parents. *Results:* The theoretical substantiation is based on scientific findings of European, Russian, American and other authors to reveal the significance of early recognition of warning signs and early intervention of dyslexia. Observation of pre-school children has demonstrated the presence of warning signs in many cases and these data have been compared with the data of oral language skills' evaluation by a speech therapist. High correlation between these factors has been revealed. To compare the data with parental concepts, some interviews were carried out and a degree of correlation has been detected. Close contact with parents is needed to provide early intervention in the most effective way. Some intervention methods have also been presented to provide deeper insight into this problem. *Conclusions:* It is necessary to state early risk factors of dyslexia in order to start intervention as early as possible. One of the main areas of intervention is focused on the development of phonological awareness. Co-operation with parents is crucial at early stages and also at pre-school age to diminish the manifestations of dyslexia. Appropriate methods of intervention are recommended.

Key words: risk factors, dyslexia, intervention.

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Wczesne czynniki ryzyka dysleksji

Abstrakt: *Tło.* Dysleksja, jako jeden z powodów występowania trudności w uczeniu się, jest czasem diagnozowana zbyt późno, co utrudnia skuteczne rozwiązanie problemu. Z jednej strony dysleksja jest nieuleczalna, z drugiej istnieją strategie pozwalające uzyskanie poprawy i ich wczesne zastosowanie skutkuje lepszymi wynikami. Pewne sygnały ostrzegawcze pojawiają się w okresie, gdy dziecko nie zna liter, inne gdy zaczyna uczyć się czytać. *Metody.* Przeprowadzono kwerendę literatury dotyczącej analizowanej tematyki. Zastosowano obserwację dzieci przedszkolnych w wieku 4-6 lat, oceniono ich umiejętności językowe, przeprowadzono rozmowy z rodzicami dzieci. *Wyniki.* Uzasadnienie teoretyczne jest oparte na badaniach autorów

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europijskich, rosyjskich, amerykańskich oraz innych i uzasadnia konieczność wczesnej diagnozy dysleksji. Obserwacja dzieci przedszkolnych wykazała obecność sygnałów ostrzegawczych w wielu przypadkach, dane zostały porównane z danymi dotyczącymi oceny umiejętności językowych w zakresie mówienia dokonanej przez terapeutę mowy. Zaobserwowano wysoką korelację pomiędzy czynnikami. W celu zweryfikowania wyników przeprowadzono rozmowy z rodzicami i tutaj także zauważono wysoką korelację. Kontakt z rodzicami jest niezbędny w przypadku zastosowania wczesnej i skutecznej interwencji. Zaprezentowano niektóre metody interwencji, co pozwala na lepsze zrozumienie problemu. *Konkluzje.* Niezbędne jest wczesne określenie czynników ryzyka, gdyż umożliwia to wczesną interwencję. Głównym obszarem interwencji jest rozwój świadomości fonologicznej. Współpraca z rodzicami jest niezbędna na etapie wstępnym, co dotyczy zredukowania objawów dysleksji na poziomie przedszkolnym. Konieczne jest wybranie odpowiednich metod interwencji.

Słowa kluczowe: czynniki ryzyka, interwencja.

1. Introduction

Dyslexia, which one of learning disabilities, is sometimes diagnosed too late to find effective solutions to improve the situation. On the one hand, it is a lifelong condition, but on the other hand, there are numerous strategies for improvement with the basic principle: the earlier you start the better the results are. Some warning signs may be noticed while a child is not accustomed to letters, while other signs appear together with the first steps of reading acquisition.

Reading is a highly valued skill in society, and as such, it constitutes the key to knowledge. Furthermore, the ability to read is available only to humans. It is not natural, but it is formed in the process of teaching/learning (Sousa, 2005). The rate of development is different in children due to specific circumstances (genetic factors, trauma, illnesses, unfavourable social environment etc.). Reading skills are essential because the educational process at school (also in Latvia) is based on reading abilities (history, geography, language, literature etc.).

Reading disabilities are complex problems due to disorders of spoken language, motor and spatial skills etc. (Корнев, 2003; Reid, 2003; Tūbele, 2008). Visual perception, visual analysis and synthesis, as well as memory are also essential (Ахутина, Пылаева, 2008; Sousa, 2007; Schachl, 2006). Early screening tests for reading disabilities are not yet available in Latvia. Therefore, speech therapists are using their own methods. If early intervention is not provided, problems in child's development are not only obvious in reading abilities, but also in some cognitive areas and social adaptation (Frank, Livingston, 2003; Klicpera et al., 2003).

Our society is still using such categories as acceptable social behaviour, adequate achievements in school, appropriate self-esteem etc., which constitute factors for appropriate lifestyle. As every child is an individual, we may use different intervention methods, as things which are good for one, may not be good for another child (Ott, 1997; Miltiņa, 2008).

2. Methodology

An analysis of scientific literature to reinforce the theoretical basis of the research was conducted. Observation of pre-school children at the age of 4-6 and evaluation of their language skills (phonemic perception), spatial cognition, motor skills and coordination, visual functions and visual and aural memory were applied together with interviews with parents. Some intervention was carried out to improve the situation.

3. Results

Theoretical substantiation is based on scientific findings of European, Russian, American and other authors in order to reveal the significance of early recognition and warning signs and in consequence of early intervention of dyslexia.

On the basis of the theories, criteria and indicators were selected in order to be observed in children. There were five large groups of criteria which are relevant to risk factors in dyslexia (Līdaka, 2009). Every criterion meets five indicators. Of course, there are more indicators, but only five are taken into account in this research. This is shown in table 1.

Table 1. Criteria and Indicators of Risk Factors of Dyslexia

Criteria	Indicators
Phonemic perception	Repeating rows of syllables Differentiation between short and long vowels Differentiation between voiced and unvoiced consonants Pronunciation of words with complicated syllable structure Recognition of word paronyms (<i>coat – goat</i>)
Spatial cognition	Spatial relations (distance, proportions) Determination of the right and left side Spatial relations regarding the child Grouping geometrical figures by shape, colour, size Creating a model from a sample
Visual functions	Recognition of subjects Visual analysis, synthesis Visual perception Visual attention Motor function of vision
Motor skills/coordination	Construction of two pieces with both hands Drawing a rainbow by sample Joining a dotted silhouette Jumping on one leg with raised arms Demonstrating a finger game from a sample

Visual memory / aural Memory	Remembering multi-step instructions Repeating a row of sounds (5 sounds) Repeating a word row (5 words) Naming subjects after hiding them Finding three letters among other from a sample
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All criteria and indicators were tested by means of Cronbach's alpha coefficient of reliability for specific environment; phonological awareness $\alpha=0,64$; spatial cognition $\alpha = 0,84$; visual functions $\alpha = 0,91$; motor skills/ coordination $\alpha = 0,87$; memory processes $\alpha = 0,76$. This means that all criteria and indicators are adequate for specific environment and the Latvian context (Līdaka, 2009).

Observation of pre-school children demonstrated the presence of warning signs in many cases and the data were compared with that of evaluation of oral language skills by a speech therapist. High correlation of these factors was revealed. To compare the data with the concepts of parents, some interviews were carried out and also there, some correlation was found.

3.1. Criteria observed in children

In figures 1-5, the status of five criteria, observed and tested in 15 children aged 4-6, is presented (names have been changed for ethical reasons). The total number of points amounted to 20, but no one reached it even after intervention. There have been some changes after the intervention (including specific exercises (Hellwig, 2007) during 8 months and it is also presented in the same figures 1-5.

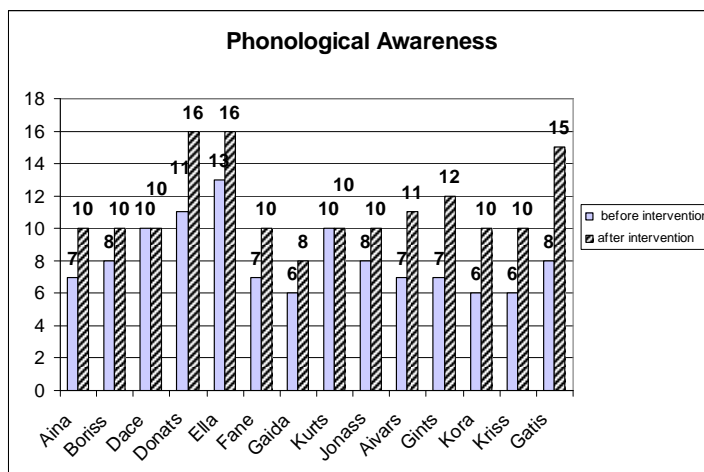


Figure 1. Phonemic perception of children before and after intervention

The total number of points available amounted to 20, so none of the children reached this level even after intervention. Three children obtained 6 points, four children 7 points and four children 8 points before the intervention, which means that the level of phonemic perception was rather low. After intervention, only one child obtained 8 points, the second lowest rate was 10, but there was also some change. Only two children remained at the same position, but one of them (Kurts) had been ill for a long time, the second one (Dace) had problems with concentration of attention. She had also missed more than ten sessions of intervention.

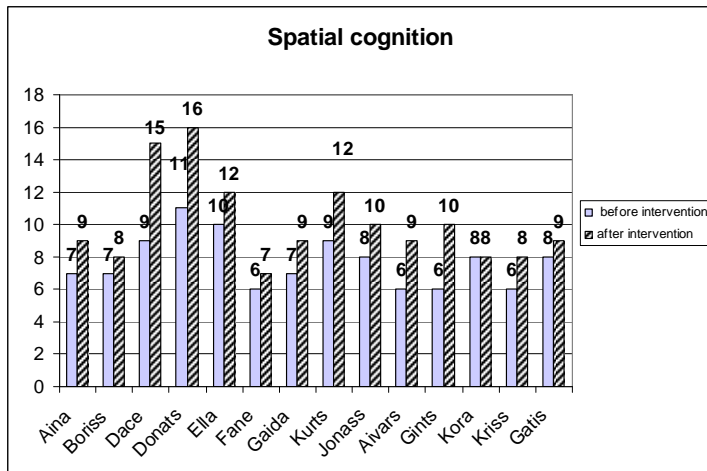


Figure 2. Spatial cognition of children before and after intervention

The situation in spatial cognition was poor. Four children reached 6 points, four 7 points and three children obtained 8 points. Even after intervention, one child (Fane) obtained only 7 points, three children 8 points and four children 9 points, which is less than a half of the possible maximum. Most problematic were tasks meant to state spatial relations regarding the child and creating a model from a sample.

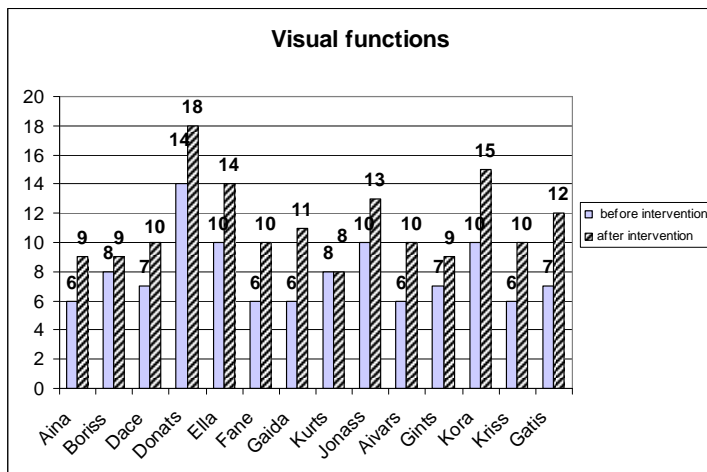


Figure 3. Visual functions of children before and after intervention

There were also great difficulties discernible in visual functions, such as visual analysis, synthesis and visual attention. Before intervention, five children obtained 6 points, three 7 points and two 8 points. The situation after intervention improved, but not significantly.

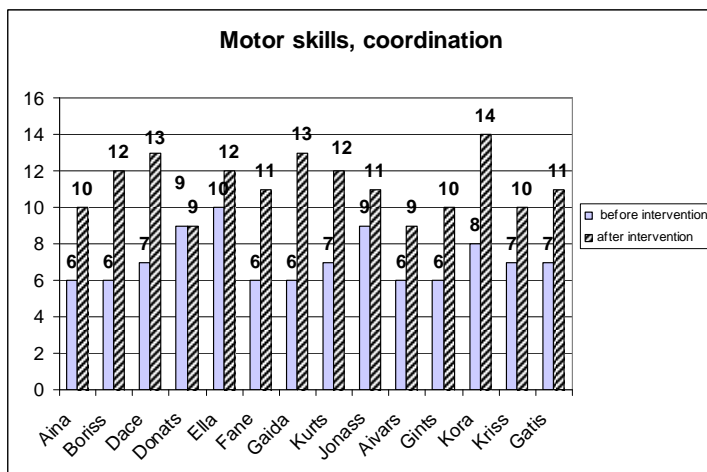


Figure 4. Motor skills and coordination of children before and after intervention

Motor skills develop very slowly, especially in children with speech and language disabilities. Observation in this area revealed such a situation that six children obtained merely 6 points out of 20 available before the intervention and four children 7 points. The situation after intervention is different. Skills are evaluated with more points attesting to suitability of applied exercises, even if the maximum of points was never reached.

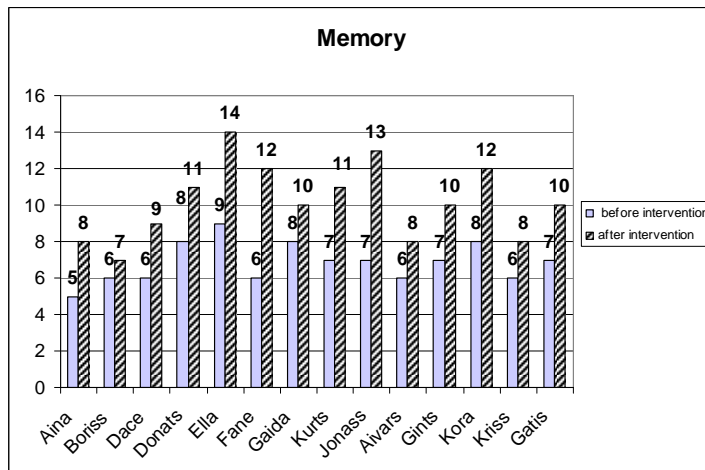


Figure 5. Visual and aural memory of children before and after intervention

5 points for one child (Aina) and 6 points for five children reveal a low level of visual and aural memory, but after intervention the situation changed, although the highest number of points was not reached.

All or almost all indicators of the 5 criteria change positively after the intervention, which allows us to presume that these children will have fewer problems in reading acquisition and also later in the process of learning.

3.2. Parental concepts

Close contact with parents is needed to provide early and effective intervention. Sometimes parents think about their children differently, but problems are the same in all main findings. In figures 6-10, some parents' answers are demonstrated, which reveal great congruency of difficulties in children, regarding their speech, motor skills and the other previously mentioned criteria.

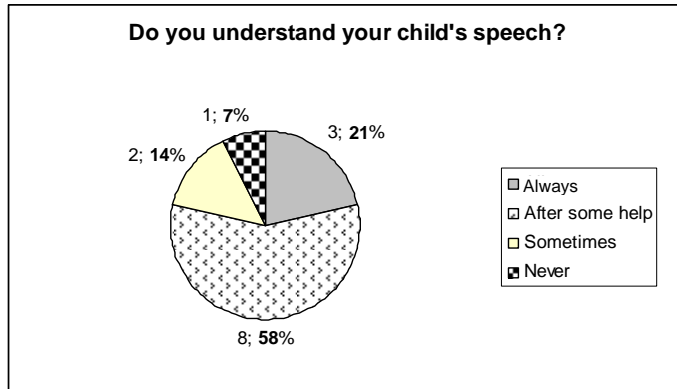


Figure 6. Do you understand your child's speech?

Almost a half of parents have difficulties in understanding their own child's speech. One mother stated that she never understood her child's speech.

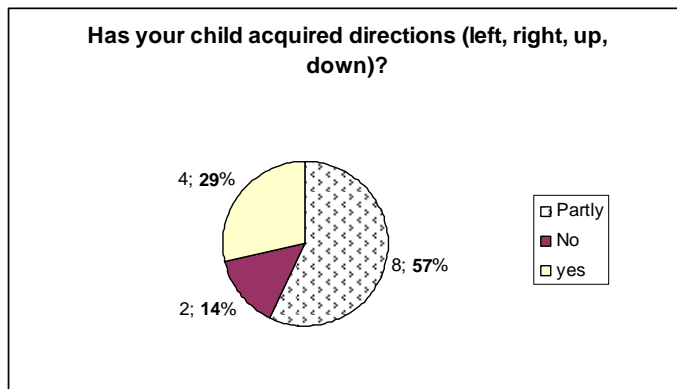


Figure 7. Has your child acquired directions (left, right, up, down)?

The four children who have acquired directions are at the age of 6, but the two who have not are 5 years old. Only two children in this group are 4 years old.

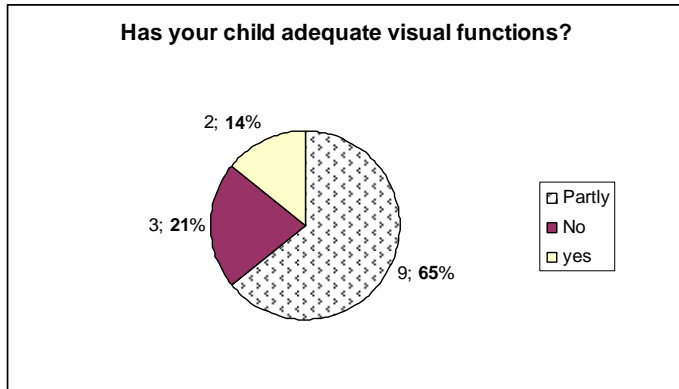


Figure 8. Has your child adequate visual functions?

Parents were asked to think about visual recognition of subjects and visual attention. Parents of three children said that their children were poor in attention, especially in visual attention.

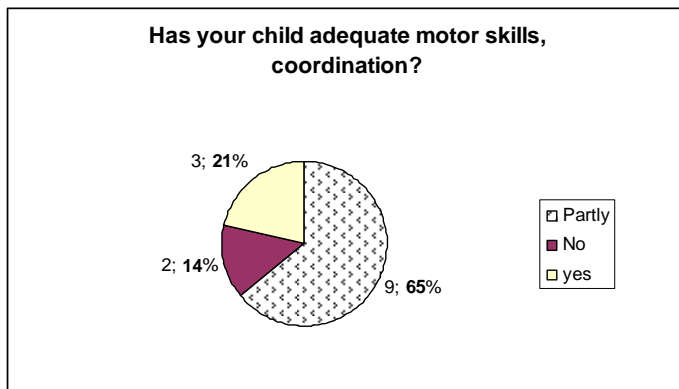


Figure 9. Does your child like to perform fine, coordinated motor actions?

Parents were asked to recall some activities which needed precise motor skills (both – fine and great) and again – parents of two children mentioned difficulties and problems.

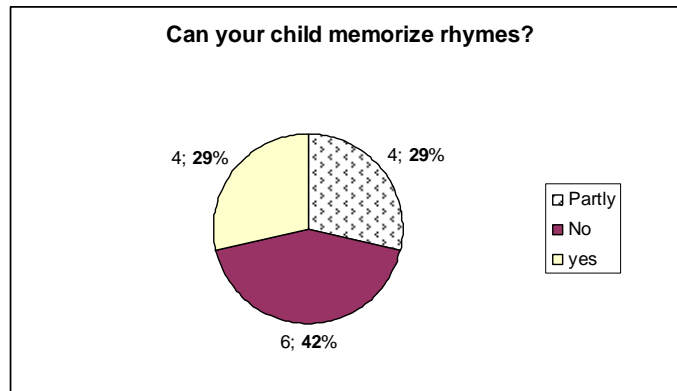


Figure 10. Can your child memorize rhymes, remember the way etc?

Parents mentioned fewer activities in memorizing rhymes and poems in comparison with their own childhood. Only some parents consider these activities important and find them well-developed in their children.

Parents also see some problems in children which can lead to difficulties when acquiring reading skills. With early screening and intervention, these problems may be diminished, which may serve as prevention of learning disabilities.

4. Discussion

Is it possible to state some risk factors for dyslexia in children before they start to learn letters, syllables and reading as such?

Is it possible to undertake some intervention to promote skills needed for successful reading?

5. Conclusions

- It is necessary to state early risk factors of dyslexia to start intervention as early as possible.
- One of the main areas of intervention focuses on the development of phonological awareness.
- Cooperation with parents is crucial at early stages and also at pre-school age to diminish manifestations of dyslexia.
- Appropriate methods of intervention are to be used.

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