Early Predictors for Kindergarten Students at Risk for Dyslexia: A Two-Year Longitudinal Study*

Emine Balcı[i]
Alanya Alaaddin Keykubat University

Abstract

This study aim to determine early clues that can be seen in kindergarten students at risk of dyslexia. The sample consisted of 27 students selected from two kindergartens through purposeful sampling. The Kindergarten Dyslexia Pre-Determination Observation Form was developed by researcher, Personal Information Form and Colorado Learning Disability Questionnaire-Reading Sub-Scale (CLDQ-R) were used as a data collection tool. Firstly, the students were observed by the kindergarten teachers during the education period through the scale that was developed by researcher and in the following next year, the classroom teachers in the schools where these students started the first year and the researcher identified the students who were thought to be at risk dyslexia. Finally the early clues in the kindergarten were tried to be reached by following the last measurements. The data were analyzed using Mann Whitney U test and descriptive analysis techniques. As a result of this study, it can be said that kindergarten students at risk of dyslexia have problems to recall the informations (songs, rhymes, words, names and names), phonologic development, rapid automatic naming skills, simple sequencing and arithmetic skills, experienced in time and spatial skills and have less vocabulary than their peers and this situation is reflected in their speeches.

Keywords: Dyslexia, Kindergarten, Dyslexic, Early Symptoms.

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**Corresponding Author

[i] **Emine Balcı,** Assoc. Prof. Dr., Classroom Teacher, Alanya Alaaddin Keykubat University

Correspondence: emine.balci@alanya.edu.tr

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INTRODUCTION

Dyslexia is generally defined as the difficulty in reading and writing skills, so it can be detected by educators and families around the age of six to seven years when reading instruction is started. However, dyslexia is a neurobiological difficulty, as soon as an individual begins to speak and express himself / herself, it is possible to identify early by regular monitoring some skills (Gür, 2013; Doğan, 2012; Balcı, 2015).

Early diagnosis of dyslexia is important in terms of achieving a high rate of effect from educational treatment methods, early determination of educational goals, individualized planning, and minimizing both academic and psychological effects of dyslexia (Hutchinson, Whiteley, Smith ve Connors; 2004; Schneider, Ennemoser, Roth & Küspert; 1999). As Hogan and Thomson (2010) stated, if the individual is diagnosed early, the problems they have with reading difficulties can be minimized without prolonging. If individuals are diagnosed late, they will have to cope with reading difficulties that affect their future educational life. Family and educators are important in early diagnosis.

Therefore, social awareness should be increased and educators should be trained in the early signs of dyslexia. An evaluation system based on the observations of kindergarten teachers should be emphasized and early symptoms should not be missed (Snowling, 2012).

One of the earliest signs of dyslexia is the delay in the onset of speech. In general, the child is expected to be able to say his/her first words after the age of one and up to the eighteenth month. However, in children with dyslexia, this process may be delayed and prolong from the fifteenth month to the age of two years (Lyytinen, Eklund ve Lyytinen, 2005; Rescorla, 2000; Shaywitz, 2003). All individuals with dyslexia may not have a history of late speaking, but difficulties in early language acquisition may be predictive of future language problems.

One of the first steps that can be taken in kindergarten is to search for the presence of dyslexia in the family. Research has shown that after early diagnosis of dyslexic individuals with hereditary predisposition, they have made more progress in reading and writing (Caroll, Mundy ve Cunningham, 2014; Lorna, 2013; Regtvoort, 2007). Therefore, it is important to know each student's genetic predisposition to dyslexia before literacy education.

We can catch early clues by watching children' conversation. If the child has problems in pronunciation with the onset of speech it should be closely examined. These children may have difficulty speaking certain words, especially until the age of five to six. He may forget the initial letter of the word or change the position of the word and say a different word. Especially pre-school children enjoy songs and games related to rhyming words However, children with dyslexia have difficulty in repeating and distinguishing these rhythms. If the child is around 4 years old but still has trouble singing simple nursery songs and rhymes, this may be a sign of early dyslexia (Shaywitz, 2003).

Difficulties in simple arithmetic skills may also be a clue to dyslexia. According to Joffe (1981), 60% of dyslexic students experience difficulties in mathematical activities at school. Although the remaining 40% do not have any mathematical problems, about 11% of them have advanced skills in mathematics. It was seen that individuals with dyslexia had difficulty in counting backwards and forwards, and therefore had difficulty in counting money, changing money, measuring distance and performing simple arithmetic skills (Houssart, 2001).

Most children learn to tie their own shoes before starting primary school and begin using expressions that may indicate time. In 90% of children with dyslexia, these skills can be prolonged until the age of ten years or later. These children are not able to use expressions which provide direction correctly such as up / down, left / right, under / over. They suffer from skills based on direction such as opening the door (Gooddy ve Reinhold, 1961; Hornsby, 2011).

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One of the early clues of children with dyslexia is low self-perception and low self-confidence. Research has shown that individuals with dyslexia can develop low self-perception and feel inadequate after disturbing experiences especially in early childhood and at school age (Edwards, 1994; Humphrey, 2003; McNulty, 2013; Owen, 2014).

The purpose of this research is to determine early clues that can be seen in kindergarten students at risk of dyslexia. In response to this objective, answers to the following question was sought:

- What kind of symptoms do the students at risk of dyslexia show in the kindergarten?
- What skills can be associated with these symptoms?

METHOD

The study was structured with the screening technique which is one of the quantitative research methods since it aims to reveal an existing situation.

Study Group

The study group consists of 27 students selected through purposeful sampling. These students were selected from two pre-schools and two primary schools in Ankara, the capital city of Turkey.

Table 1. Frequency and percentage ratios of the gender of students in the sample group

	Frequency (f)	Percentage (%)
Girl	13	48,1
Boy	14	51,8
Total	27	100

Data Collection Tools

In order to determine the early clues that can be seen in kindergarten students at risk of dyslexia, Kindergarten Dyslexia Pre-Determination Observation Form that is developed by researcher, Personal Information Form and Colorado Learning Disability Questionnaire-Reading Sub-Scale (CLDQ-R) were used. While creating the scale, the kindergarten dyslexia studies in the world were investigated in depth and the characteristics of dyslexia in kindergarten children were determined. Expert opinions were received for scope and language proficiency during the preparation phase.

Kindergarten Dyslexia Pretreatment Scale is a 3 Likert-type measuring instrument consisting of 21 items. The scores that can be obtained from the scale are between 63 and 21 points. The Colorado Learning Difficulty Questionnaire-Reading Sub-Scale is a form used by educators in screening dyslexia for students aged 6-18 years. The scale consists of 6 items of 5 likert type. The points that can be obtained are between 30 and 6 points.

Data Collection

The 27 kindergarten students in two selected kindergartens were followed up at certain times within two years. First of all, the students were observed by the kindergarten teachers during the education period through The Kindergarten Dyslexia Pre Determination Observation Form that was developed by the researcher.

In the following year, the classroom teachers in the schools where these students started the first year were informed about the study. In the second term when reading instruction was completed

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to a great extent, studies were conducted on whether the students were at risk of dyslexia. Firstly the teachers and then the researcher identified the students who were thought to be at risk.

The observation forms of these students who were found to be at risk of dyslexia were examined and the early clues in the kindergarten were tried to be reached by following the last measurements.

Analysis of Data

Early clues that can be seen in kindergarten students at risk of dyslexia were measured by Mann Whithney U test.

The relationship of each item in the Kindergarten Dyslexia Pre-Determination Observation Form to individuals with dyslexia determined using the Colorado Learning Difficulty Questionnaire-Reading Subscale was examined.

Colorado Learning Difficulty Questionnaire-Reading Subscale was analyzed by using descriptive statistical methods.

FINDINGS

This study was conducted to examine early clues that can be seen in kindergarten students at risk of dyslexia. The findings of each sub-problem are given below.

Predictive Characteristics of Kindergarten Students Related to Dyslexia

The Kindergarten Dyslexia Observation Form was analyzed to determine the predictive characteristics of kindergarten students regarding dyslexia. In this context, the predictive characteristics of the kindergarten students are expressed as shown in Figure 1.

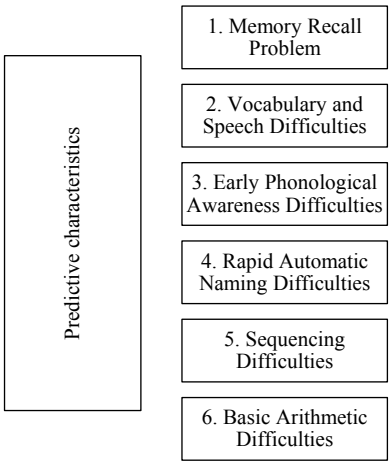

Figure 1. Predictive characteristics of the kindergarten students

Items 4, 6 and 13 related to the first predictive characteristics, item 7 related to the second predictive characteristics, item 8 related to the third predictive characteristics, item 11 related to the forth predictive characteristics, items 15 and 16 related to the fifth predictive characteristics, items 18 and 19 related to the sixth predictive characteristics.

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One of the sub-goals of the study is to determine whether the difficulties of recalling the memory in kindergarten are predictive of dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 2.

Table 2. Mann-Whitney U Test Results related to memory recall difficulties of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Memory Recall Difficulties	Dys.	6	22,75	136,5	10,5	0,001
	Nor.	21	11,50	241,5		

According to the result of the analysis, the average ranks of the group in the dyslexia (22,75) is higher than the average rank of the group in the normal students (11,50). This difference is statistically meaningful ($U=10,5$, $p<0,05$). According to these results, it is possible to say that the ability to recall from memory is a predictor of dyslexia for kindergarten students.

Another sub-goals of the study is to determine whether having low vocabulary in kindergarten and having speech difficulties compared to peers are predictive of dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 3.

Table 3. Mann Whitney U Test Results related to vocabulary and speech difficulties of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Vocabulary and Speech Difficulties	Dys.	6	21	126	21	0,001
	Nor.	21	12	252		

When Table 3 is examined, there is a statistically significant difference test scores of students in the groups are compared ($U=21$, $p<0,05$).

In addition, the average ranks of vocabulary and speech level were higher in the group of dyslexia (21) than the normal students (12). Accordingly, it is possible to say that vocabulary and speaking skills are predictors of dyslexia for kindergarten students.

It is one of the goals of the study whether the Early Phonological Awareness Difficulties in kindergarten has a predictive feature for dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 4.

Table 4. Mann Whitney U Test Results for early phonological awareness difficulties of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Early Phonological Awareness Difficulties	Dys.	6	22,75	136,5	10,5	0,001
	Nor.	21	11,5	241,5		

According to Table 4, there is a significant difference between early phonological awareness skills of students with dyslexia and normal students ($U=10,5$ $p<0,05$). When the average ranks of the students were examined, it was seen that dyslexia students (22.75) were higher than normal students (11.5). In this case, it can be said that the problems of early phonological awareness skills are predictors of dyslexia for kindergarten students.

The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 4.

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One of the goals of this study is to determine whether having rapid automatic naming difficulties of kindergarten students are predictive of dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 5.

Table 5. Mann-Whitney U Test Results for rapid automatic naming problems of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Rapid Automatic Naming Difficulties	Dys.	6	17,5	105	42	0,007
	Nor.	21	13	273		

Considering this finding, it has been discovered that there is a meaningful difference between rapid automatic naming difficulties of students with dyslexia and normal students (U=42 p<0,05). When the average ranks of the students were examined, it was seen that dyslexia students (17.5) were higher than normal students (13). In this case, it is possible to say that the rapid automatic naming difficulties in kindergarten are one of the predictors of dyslexia.

In this study, it was investigated whether the sequencing difficulties seen in kindergarten was predictive for dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 6.

Table 6. Mann-Whitney U Test Results for sequencing difficulties of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Sequencing Difficulties	Dys.	6	21	126	21	0,001
	Nor.	21	12	252		

According to the result of the analysis, the average rank of the group in the dyslexia (21) is higher than the average rank the group in the normal students (12). This difference is statistically meaningful (U=21, p<0,05).

The another aim of the study is whether the having basic aritmetic difficulties are predictive the dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 7.

Table 7. Mann Whitney U Test Results on basic arithmetic difficulties of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Basic Arithmetic Difficulties	Dys.	6	19,25	115,5	31,5	0,001
	Nor.	21	12,5	262,5		

When Table 7 is examined, there is a significant difference test scores of students in the groups are compared (U=31,5 p<0,05).

In addition, the average ranks of basic aritmetic difficulties were higher in the group of dyslexia (19,25) than the normal students (12,5). Accordingly, it is possible to say that basic aritmetic difficulties are predictors of dyslexia for kindergarten students.

One of the goals of this study is to reveal whether having time and spatial difficulties of kindergarten students are predictive of dyslexia. The results of the analysis of Mann-Whitney U Test regarding this sub-goal have been presented in Table 8.

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Table 8. Mann Whitney U Test Results on time and spatial difficulties of kindergarten students at risk of dyslexia

Subtest	Group	N	Mean Rank	Rank Sum	U	p
Time and Spatial Difficulties	Dys.	6	24,5	147	0	0,001
	Nor.	21	11	231		

According to Table 8, there is a significant difference between dyslexia and normal students (U=0 p<0,05). When the average ranks of the students were examined, it was seen that dyslexia students (24.5) were higher than normal students (11). In this case, it can be said that time and spatial difficulties are predictors of dyslexia for kindergarten students.

CONCLUSIONS AND DISCUSSION

As a result of this study conducted to determine the skills and behaviors that are seen as predictors of dyslexia in kindergarten students; it can be said that kindergarten students at risk of dyslexia have problems to recall the informations (songs, rhymes, words, names and names). Szalkowski (2012), in his genetic studies on individuals with dyslexia, thinks that a particular gene plays a role in problems related to short-term memory of dyslexic. According to Shaywitz (2003), if the child is 4 years old, but still cannot sing a simple child song or rhyme, it can be a sign of dyslexia.

In the study, it is seen that kindergarten students who are at risk of dyslexia have less vocabulary than their peers and this situation is reflected in their speeches. As Goulandris and Snowling (1991) point out, the vocabulary of individuals with dyslexia is weak and this situation is also seen as difficulty in recognizing words during reading.

As a result of the study, it is seen that the kindergarten students at risk of dyslexia have problems in activities requiring phonological skills. Many studies have shown that individuals with dyslexia have problems in phonological skills (Scheffel, Shaw ve Shaw, 2008; Akhtar, 2008; Lyon, 1995; International Dyslexia Association, 2003).

According to Frith (1985), individuals with dyslexia often have difficulty completing the alphabetical process. Waldvogel (2010), mentioned the importance of phonological awareness skills for kindergarten students at risk of dyslexia.

As a result of the study, kindergarten students at risk of dyslexia also have problems in rapid automatic naming skills. Shaywitz and Shaywitz (2008) also mention that the rapid and automatic naming process is a symptom for dyslexia. Norton (2012) studied with 43 kindergarten students at risk of dyslexia using brain imaging methods and emphasized that dyslexic students can be identified before having difficulty with rapid automatic naming and phonological awareness studies.

According to the another result of the study, kindergaten students at risk of dyslexia have problems in simple sequencing and arithmetic skills. IDA (2009) reported that problems with simple sequencing skills are appropriate to the characteristics of dyslexia. Turgut, Erden and Karakaş (2010) concluded that the ranking skill scores of students with learning difficulties differed from those of normal students. Morganise (1896), who conducted one of the first dyslexia studies, also mentioned the difficulty in simple mathematical problems while describing dyslexia.

Another result of the study is that the difficulties experienced in time and spatial skills can be considered as risk of dyslexia for kindergarten. The child is expected to be able to use his / her language skills well to tell the time and direction skills will be improved in order to tie shoes or to wear the shoe to the right foot. However, 90% of children with dyslexia develop these skills after the age of ten (Gooddy & Reinhold, 1961; Hornsby, 2011).

Within the scope of the study, the following recommendations are presented for practitioners and researchers.

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- Educators, especially kindergarten teachers, and families should be informed about dyslexia can be diagnosed in kindergarten before acquainting with the reading experience.

- The frequency of the problems seen in the skills identified as dyslexia predictor should be determined and monitored.

- Students with suspected dyslexia should receive a preventive educational program immediately upon starting primary school.

- It is needed more medical and educational studies in Turkey about dyslexia.

- The kindergarten dyslexia screening scale should be developed with more comprehensive studies.

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