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## A Comparative Study About Speech and Language Characteristics of 6–8-Year-Old Turkish Children with Dyslexia and Children with Typical Development

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### Summary

**Purpose:** Dyslexia is a neurodevelopmental learning disability characterized by difficulties in word recognition, spelling, and decoding abilities which are often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Most individuals with dyslexia exhibit language difficulties. The aim of this study is to investigate speech and language profiles of children with dyslexia (CWD) among Turkish children with using standardized speech and language tests in Turkish. **Method:** Participants of this study consists of 29 children with dyslexia (13 boys, 16 girls) aged between 6.7-8.11 (M=96 months, SD= 9 months) and their age and gender matched peers with typical development (M=95 months, SD=8 months). For language assessment, TODİL, Turkish Articulation and Phonology Test and Turkish Nonword Repetition Tests were used. **Results:** There was a significant difference between the scores of two groups on Turkish Nonword Repetition Test (T-NRT) of two subtests Q-NRT and T-NRT ( $t(56) = 5.98, p = 0.001$ ). The difference between groups was significant on all SSI and TODİL except Word Discrimination subtest ( $U = 337.00, p < .05$ ). Children with typical development outperformed children with dyslexia. **Conclusion:** CWD had lower speech and language performance than their typically developing peers on all tasks. Assessing speech and language characteristics is crucial in diagnosis and intervention phases of dyslexia.

**Keywords:** dyslexia, speech disorder, language disorder, speech assessment, language assessment.

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## **6-8 Yaş Arası Disleksisi Olan ve Tipik Gelişim Gösteren Türk Çocukların Dil ve Konuşma Özelliklerinin Karşılaştırılması**

### **Özet**

**Amaç:** Nörolojik temelli bir öğrenme güçlüğü olan disleksi; sözcük çözümleme, heceleme ve/veya akıcı olarak sözcük okumada yaşanan güçlükler ile kendini göstermektedir. Dil ve konuşma bozukluklarının sıklıkla disleksiye eşlik ettiği görülmektedir. Disleksi tanılı pek çok birey, kelime dağarcığı, konuşmanın algılanması, morfoloji, sentaks, fonoloji ve semantik alanlarını kapsayan alıcı dilde ve ifade edici dilde zorluk yaşamaktadır. Bu çalışmanın amacı, Türkçe konuşan ve disleksisi olan çocukların dil ve konuşma profillerini, standardize dil ve konuşma testleri kullanarak incelemektir. **Yöntem:** Çalışmanın katılımcıları yaşları 6;7-8;11 arasında olan (*Ort.*= 96 ay, *SS*= 9 ay) ve disleksi tanısı almış 29 çocuk (13 erkek, 16 kız) ve bu çocuklar ile yaş ve cinsiyete göre eşleştirilmiş 29 tipik gelişim gösteren (*Ort.*= 95 ay, *SS*= 8 ay) 29 olmak üzere toplam 58 kişiden oluşmaktadır. Katılımcılara dil ve konuşma terapisi alanında kullanılan standardize testler uygulanmıştır. Katılımcıların dil ve konuşma becerilerinin değerlendirilmesinde TODİL, Sesletim ve Sesbilgisi Alt Testleri ve Türkçe Anlamsız Sözcük Tekrar Testi kullanılmıştır. Herhangi bir psikiyatrik bozukluğu (dikkat eksikliği ve hiperaktivite bozukluğu, yıkıcı davranış bozukluğu, anksiyete bozukluğu vb.) ve nörolojik hastalığı (epilepsi vb.) olan ve Wechsler Çocuklar İçin Zekâ Ölçeği Revize-IV' ten (WISC-R-IV) 85 puan ve daha düşük puan alan çocuklar çalışmanın dışında tutulmuştur. Elde edilen veriler “Windows 23,00 için SPSS yazılımı” ile değerlendirilmiştir. Tanımlayıcı analizler yapılmış ve örneklemin normal dağılımı Kolmogorov Smirnov testi ile test edildikten sonra konuşma ve dil testlerinde gruplar arasındaki fark Student-T Testi ve Mann-Whitney-U testi ile analiz edilmiştir. **Bulgular:** İki grup arasında, Türkçe anlamsız Sözcük Tekrar testinde, Q-NRT ve T-NRT iki alt testinde de disleksi tanısı alan grup ile tipik gelişim gösteren katılımcılar arasında anlamlı farklılık bulunmuştur ( $t(56) = 5,98, p = 0,001$ ). Türkçe Sesletim ve Sesbilgisi alt testleri ve Sözcük Ayırt Etme alt testi hariç TODİL açısından istatistiksel olarak anlamlı düzeyde farklılık bulunmuştur ( $U=337,00, p<,05$ ). TODİL alt testleri ve Türkçe Sesletim ve Sesbilgisi alt testleri arasında anlamlı olarak farklılık bulunmamıştır ( $U=337,00, p>,05$ ). Tüm testlerde tipik gelişim gösteren grup, disleksisi olan gruptan daha yüksek performans göstermiştir. **Sonuç:** Grup olarak incelendiğinde, disleksisi olan çocukların dil ve konuşma becerileri yaşları düzeyinin altındadır. Disleksi sadece okuma bozukluğu değildir. Dil bozuklukları, konuşma sesi bozuklukları genellikle disleksiye eşlik eder. Klinik bir karar vermek amacıyla disleksisi olan çocuklara, çok boyutlu bir değerlendirme yapılmalıdır. Dil becerileri, fonolojik ve artikülasyon yetkinliği, anlamsız kelime tekrarı değerlendirme prosedürlerine dahil edilmelidir. Çocuğun konuşma ve dil özelliklerinin belirlenmesi disleksinin tanı ve

dolayısıyla müdahale aşamalarında çok önemlidir. Disleksi tanılama ve müdahale süreçlerinde dil ve konuşma değerlendirmelerinin de yer almasının yararlı olacağı düşünülmektedir.

**Anahtar sözcükler:** disleksi, dil bozukluğu, konuşma bozukluğu, dil değerlendirmesi, konuşma değerlendirmesi.

## **Introduction**

Learning disorders are among most frequently diagnosed developmental disorders in childhood. Dyslexia is a learning disability characterized by difficulties in word recognition, spelling and decoding abilities which are often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction (Joannisse et al., 2000). Most individuals with dyslexia exhibit difficulties on both receptive and expressive language and the profiles of these deficits vary widely including speech perception, vocabulary, morphology, syntax, phonology, and semantics (Adolf & Hogan, 2018; Siegel, 2006).

Several investigators examined the relationship between dyslexia and phonology since majority of the CWD exhibit phonological difficulties as a common feature and continue to use phonological processes for longer periods compared to children with typical development (Knoop-van Campen et al., 2018; Bortlini & Leonard, 2000; Miles & Miles, 1991; Snowling, 1981; Gathercole & Baddeley, 1990). However, number of studies examining the link between dyslexia and other aspects of language are limited.

Studies related to the link between morphosyntactic components and dyslexia revealed lack of sensitivity to subject-verb agreement morphology, impaired inflectional morphology, and weakness in morphological awareness tasks in CWD (Snowling, 1997; Ramus & Szenkovits, 2008; Jiménez et al., 2004). Other researchers have also investigated the role of working memory load in CWD with using syntactic complexity tasks (Altmann et al., 2008). Findings of the study revealed decreased performance with the increasing complexity in children with dyslexia.

Although morphosyntactic development processes have been examined by numerous researchers in cases with dyslexia, known facts are still very restricted regarding the other aspects of language (e.g., semantic, oral vocabulary, relational vocabulary, auditory discrimination, articulation) which are usually thought to be by-products of phonological, orthographic representations and working memory deficits (Leikin & Hagit, 2006; Robertson & Joanisse, 2010). Bishop et al. (2009) investigated speech and language skills of children who met criteria for dyslexia and/or developmental language disorder (DLD) at nine years of age. Although CWD did not meet the criteria for DLD, they still showed significantly poorer vocabulary, sentence repetition, and syntactic comprehension performance than typically developing children. In another study Alt et al. (2017) examined word-learning abilities in second grade CWD by using standardized receptive and expressive language tests. They found that, although participants in their sample had strong oral language and expressive language scores, they had difficulty about learning novel words compared to children with typical development. Moreover, CWD have also been found to produce more consonantal errors (Lambrecht Smith et al., 2010; Scarborough, 1990), have problems with phonetic accuracy (Bertucci et al., 2003), have less articulatory speed (Duranovic & Sehic, 2013) and use slower speaking rates and speech motor planning (Smith et al., 2006; Peter et al., 2017) than their typically developing peers. Phonological working memory play a crucial role in learning new words as children need to create, retain, and retrieve a phonological code that is not yet associated with a semantic representation. So, phonological encoding deficit hypothesis for CWD may be the underlying cause which interacts with other aspects of language and have negative implications for reading.

The number of studies about speech and language characteristics of Turkish-speaking CWD is limited. Kesikçi and Amado (2005) compared the performances of Turkish speaking CWD with their age, gender and socioeconomic status matched peers on non-word

phonological memory measurements and Turkish speaking CWD were found to have poorer phonological memories. In another study the performance of primary school third grade students with and without learning difficulties in reading comprehension, vocabulary knowledge, and verbal working memory were compared. The participants of the study consisted of a total of 44 students, 22 of whom were in the third grade of primary school and diagnosed with learning disability and 22 with typical development. In order to collect data on reading, a narrative text and reading comprehension questions suitable for class level, vocabulary knowledge subtests of Turkish School Age Language Development Test, and verbal short-term memory and verbal working memory subtests of working memory scales were used. The results showed that students with learning difficulties had significantly lower scores in their reading comprehension, reading speed, vocabulary, and verbal working memory assessments than their peers with typical development. Significant relationships were found between variables in both groups (Seçkin Yılmaz & Yaşaroğlu, 2020).

The aim of this study is to compare speech and language characteristics of CWD and their age and gender matched peers with typical development with using standardized assessment tools in Turkish.

## **Method**

### **Participants**

The participants of this study consisted of 29 CWD (13 boys, 16 girls) aged between 6.7-8.11 (M=96 months, SD= 9 months) and their age and gender matched peers with typical development (M=95 months, SD=8 months). Experimental group of the study included CWD who were evaluated and diagnosed with Diagnostic and Statistical Manual of Mental Disorders DSM-V (1) by a child psychiatrist at Eskişehir Osmangazi University and whose parents volunteered for their child to participate in the study. The control group participants included children with typical development whose age ages ( $\pm 3$ months) and gender were

matched by the CWD attending a local school at Anadolu University. Children having any psychiatric disorders (attention deficit and hyperactivity disorder, disruptive behavioral disorder, anxiety disorder etc.) and neurological disease (epilepsy etc.) and scored 85 points and lower at Wechsler Intelligence Scale for Children Revised-IV (WISC-R) were excluded from the study.

The study received ethical approval from the Anadolu University Research Ethics Committee (No=1501S008). Parents of the children were informed about the aim and methods of the research and their written consent was received. This research is conducted in accordance with the principles set forth in the Helsinki Declaration 2008.

### **Instruments**

Test of Language Development Test-Turkish version (TODİL), Turkish nonword repetition test and Turkish Articulation and Phonology Test were used to assess participants' language abilities, phonological verbal memory, and speech sound characteristics respectively.

#### ***Wechsler Intelligence Scale for Children Revised-IV (WISC-R)***

It is an individual intelligence test developed by American psychologist David Wechsler in 1939 to determine the mental performance of individuals. The WISC-R Intelligence Test is for children and youth in the 6-16 age group. Since it is an individual test, it can only be applied to one person in a session. The test takes approximately 1 hour.

#### ***Test of Language Development Test-Turkish Version (Topbaş & Güven, 2017)***

The Test of Language Development is a language test appropriate for children between 4:00 through 8:11 years. This test basically aims to determine the strengths and weaknesses of language development in children by measuring language development in different dimensions and distinguish children with developmental language disorders. It consists of 9 subtests:

**Picture-vocabulary:** This subtest measures the child's ability to understand spoken Turkish. Subtest consists of 34 items. It includes naming task that measures how well child understands words used in Turkish.

**Relational vocabulary:** This subtest measures the child's ability to understand and orally express relationships between two spoken stimulus words. It consists of 34 items. It measures ability to understand two words given as a stimulus in the semantic dimension of language and to verbalize the relationship between them. This subtest does not include pictures.

**Oral vocabulary:** This subtest measures the child's ability to give oral definitions to common Turkish words spoken by the examiner. It measures semantic dimension of the language and includes 38 items.

**Syntactic understanding:** Measures the child's ability to comprehend the meaning of sentences. This 30-item subtest measures syntactic dimension of the language and measure's ability to comprehend the meaning of the sentence. The child is told a sentence and shown three pictures. It is expected to choose the picture that expresses the closest meaning to the sentence among three options.

**Sentence imitation:** Measures the child's ability to imitate Turkish sentence forms. This 36-item subtest measures syntactic dimension of language with sentence repetition. Success in the subtest indicates that child uses similar word order and similar morphological structure in a certain extent.

**Morphological completion:** Measures the child's ability to recognize, understand and use common Turkish morphological forms. This 38-item subtest measures grammar (morphology and syntax relationship) dimension of the language. This subtest measures child's ability to recognize, understand and use morphological structures. The method is like a closed test method. The practitioner reads the sentences with spaces that the child has to complete using morphological forms and waits for the child to complete them.

**Word discrimination:** This 28-item subtest is a phonological subtest that measures ability to distinguish between speech sounds. The child should distinguish whether the pairs of words spoken to him/her by the practitioner are the same or different.

**Phonemic analysis:** This 22-item subtest measures child's ability to divide words into smaller phonemic units.

**Word articulation:** This 25-item subtest measures child's ability to produce certain speech sounds in Turkish. It is expected to call stimulus pictures contains the target sound.

***Turkish Nonword Repetition Test (Topbaş et al., 2011)***

Turkish Nonword Repetition Test includes a total of 30 words including 15 language-like and 15 language-unlike items. In the quasi-universal part (language-unlike items), phonological content is selected to be compatible with phonologies of diverse languages. The number of syllables increase from one-syllable to five syllable and include 3 words for each syllable groups (Topbaş et al., 2011). It is one of the frequently used assessment tools for measuring phonological working memory and can be used in children between the ages of 3-9 (Akoğlu & Acarlar, 2014).

***Turkish Articulation and Phonology Test (Topbaş, 2005)***

Turkish Articulation and Phonology Test is developed to identify and diagnose children who have articulation and phonological disorders and includes three subtests: Articulation, Phonology and Auditory Discrimination. It measures the articulation (pronunciation) adequacy of phonemes in a structured condition based on picture naming. This test is appropriate for 2-8 years old children.

It includes three subtests:

***Articulation test:*** Measures the articulation (pronunciation) proficiency of phonemes in a structured condition based on picture naming. There are 93 picture-words in the subtest.



**Phonology test:** Measures the ability to use phonemes in accordance with the phonological rules of the spoken language. 13 thematic compositions representing the words to be used in phonological analysis were illustrated. It is expected to articulate phonemes in spontaneous speech.

**Auditory discrimination test:** Measures articulation and/or phonological disorder whether children can visually distinguish phonemes that they cannot produce through picture recognition. 21 consonants are included in a total of 48 pictograms-words, 24 pairs of them located according to phonetic location, phonetic form and voiced-voiceless characteristics among the smallest single-distinction word pairs.

### **Procedures**

Test of Language Development-Turkish version (TOLD), Turkish nonword repetition test and Wechsler Intelligence Scale for Children Revised-IV (WISC-R) were used by a speech and language therapist and an experienced psychologist. Two Speech and Language Therapists and research assistants implemented the tests. The tests were conducted in therapy rooms at Osmangazi University Child and Adolescent Psychiatry Unit and Anadolu University Research and Training Center For Speech and Language Pathology (DILKOM). The sessions' duration was about an hour. After TODİL and Articulation test were conducted, the participants had a break for 15 minutes.

### **Statistical Analysis**

The data obtained were evaluated by the "SPSS software for Windows 23.00". Descriptive analyses were performed and the difference between groups on speech and language tests was analyzed by student-T Test and Mann-Whitney-U test after testing for the normal distribution of the sample by Kolmogorov Smirnov test.

Cohen's d statistic is a type of effect size that a specific numerical nonzero value used to represent the extent to which a null hypothesis is false. As an effect size, Cohen's d is

typically used to represent the magnitude of differences between two (or more) groups on a given variable, with larger values representing a greater differentiation between two groups on that variable. When comparing means in scientific study, the reporting of an effect size such as Cohen’s *d* is considered complementary to the reporting of results from a test of statistical significance. A commonly used interpretation is to refer effect sizes as small ( $d=0.2$ ), medium ( $d=0.5$ ), and large ( $d=0.8$ ) (Cohen, 1988).

## **Results**

### **Differences Between Groups on T-NRT**

There was a significant difference in the scores of T-NRT between CWD ( $M=6.82$ ,  $SD=3.31$ ) and children with typical development ( $M=12.20$ ,  $SD=2.70$ );  $t(56) = -6.78$ ,  $p = 0.001$  (Cohen  $d= 1.78$ ). The difference between groups was also significant on Q-NRT task. CWD ( $M=7.00$ ,  $SD=3.62$ ) scored lower on this task compared to their age and gender matched peers with typical development ( $M=12.17$ ,  $SD=2.91$ );  $t(56) = 5.98$ ,  $p = 0.001$  (Cohen  $d= 3.49$ ) as shown in Table 1.

**Table 1**

*The T-Test Results of The Two Groups on Nonword Repetition Tests*

<b>Group</b>	<b>N</b>	<b>X</b>	<b>S</b>	<b>Sd</b>	<b>T</b>	<b>P</b>	<b>Cohen’s d</b>
<b>T-NRT Dyslexia</b>	29	6.82	3.31	56	6.78	.001*	1.78
<b>TD</b>	29	12.20	2.70				
<b>Q-NRT Dyslexia</b>	29	7.00	3.62	56	5.98	.001*	3.49
<b>TD</b>	29	12.17	2.91				

\* $p < .05$

T-Q-NRT: Nonword Repetition; Q-NRT: Quasi-universal nonword repetition test

### **Differences Between Groups on Turkish Articulation and Phonology Test**

Mann-Whitney U test was used to find out whether there was a significant difference in relation to TODİL subtest and Turkish Articulation and Phonology Test. Although the scores of CWD was lower than those of children with typical development, no significant difference was found between groups regarding to T-WD ( $U=337.00$ ,  $p>.05$ ) (Table 2 and Table 3).

**Table 2**

*The Results of Mann Whitney- U Results of The Groups on Turkish Articulation and Phonology Test Scores*

Test	Group	N	Mean Rank	Sum of Ranks	Z	U	p
TAPT-AD	CWD	29	20.00	580.00	-5.13	145	.00
	CWTD	29	39.00	1131.00			
	Total	58					
TAPT-AT	CWD	29	22.88	663.50	-3.88	228	.00
	CWTD	29	36.12	1047.50			
	Total	58					
TAPT-PDT	CWD	29	26.50	768.50	-2.56	333	.01

\* TAPT AD: Turkish Articulation and Phonology Test Auditory Discrimination; TAPT AT: Turkish Articulation and Phonology Test, Articulation Subtest; TAPT PDT: Turkish Articulation and Phonology Subtest, Phonetic Decoding Subtest

### **Differences Between Groups on TODİL**

On all other test tasks, the difference between groups was significant and children with typical development outperformed children with dyslexia. The scores of CWD were within normal limits although lower than their peers on all TODİL subtests. None of the children in the study had any speech sound disorders.

**Table 3**

*The Results of Mann Whitney- U Results of The Groups TODİL Scores*

Test	Group	N	Mean Rank	Sum of Ranks	Z	U	p
<b>T-PV</b>	CWD	29	21.02	609.50			
	CWTD	29	31.98	1101.50	-3.71	174	.00
	Total	58					
<b>T-RV</b>	CWD	29	19.93	578.00	-4.20	143	.00
	CWTD	29	39.07	1133.00			
	Total	58					
<b>T-OV</b>	CWD	29	21.59	626.00			
	CWTD	29	37.41	1085.00	-3.47	188	.00
<b>T-SU</b>	CWD	29	24.00	696.00			
	CWTD	29	35.00	1015.00	-2.3	261	.02
	Total	58					
<b>T-SI</b>	CWD	29	20.41	592.00			
	CWTD	29	38,59	1119.00	-3.98	157	.00
	Total	58					
<b>T-MC</b>	CWD	29	21.16	613.50			
	CWTD	29	37.84	1097.50	-3.70	174	.00
	Total	58					
<b>T-WD</b>	CWD	29	26.83	778.00			
	CWTD	29	32.17	933.00	-1.5	337	.25
	Total	58					
<b>T-FA</b>	CWD	29	20.79	603.00			
	CWTD	29	38.21	1108.00	-3.94	162	.00
	Total	58					
<b>T-WA</b>	CWD	29	25.50	739.50			
	CWTD	29	33.50	971.50	-3.06	290	.00
	Total	58					

\*T- PV: Test of Language Development Test Picture- Vocabulary; T-RV: Test of Language Development Test; Relational Vocabulary; T-OV: Test of Language Development Test Oral Vocabulary; T-SU: Test of Language Development Test, Syntactic Understanding; T-SI: Test of Language Development Test, Sentence Imitation; T- MC: Test of Language Development Test Morphological Completion; T-WD: Test of Language Development Word Discrimination; T-FA: Test of Language Development Test, Phonemic Analyses; T-WA: Test of Language Development Test, Word Articulation.

TOLD's alpha co-efficient of T-RV is (r) 28; T-SI (r) 28; T-FA (r) 25.

### Discussion

In the present study, phonological and language skills of children aged between 6.7-8.11 years-old and diagnosed with dyslexia were compared with those of control group. It was observed that CWD and their age and gender matched peers have different language features. Although the standard language scores of the CWD were within normal limits, they still

showed poorer performance on all speech and language tests used in the study. These findings are also consistent with related research findings (Betjemann & Keenan, 2008) claiming that although dyslexia and language disorders are two separate dimensions that frequently co-occur, CWD who do not have language disorders may still present with relatively weak language skills. It is suggested that language acquisition may slow down because of reduced reading experience since most of the world knowledge are gained by texts after reading (Adolf & Hogan, 2018). Another crucial element of language is nonword repetition which is also known to be an early indicator of reading. However, there is disagreement among researchers about the degree of the nonword repetition deficit among CWD: some studies have shown small differences between children with dyslexia and control children (Boada & Pennington, 2006; Landerl, 2001), while others have found substantial differences (Marshall et al., 2001; Mauer & Kamhi, 1996). In a recent study, CWD scored lower on nonword repetition tasks compared to their age and gender matched peers with typical development. The findings of this study are consistent with the research findings claiming that CWD perform more poorly on nonword repetition tasks compared to their TD peers (Szenkovits & Gayaneh, 2016).

Phonological processing difficulties may also be seen in the speech production of individuals with dyslexia. In particular, individuals with dyslexia often have hasarticulation problems in their speech. In this study, the results are consistent with findings of the studies claiming that individuals with dyslexia have poorer performance than their peers on articulation subtests (Catts, 1989). In some studies, CWD are also found to perform less well than peers with typically development on tasks involving manipulation of the sound segments (i.e., syllables, phonemes) in words (Doehring et al., 1981; Bradley & Bryant, 1978). However, in this study, CWD showed similar performance with their peers in words discrimination tasks.

Although dyslexia has been considered to be a “language based” disorder for many years, language aspects other than phonology have not been studied extensively although reading comprehension relies on knowledge of word meanings, syntactic processing, and inferencing skills (McLeod, 2019). For instance, words contain a set of mappings between phonology and semantics and syntax, morphological, and pragmatic features that contribute to meaning. So, vocabulary knowledge also needs decoding of the word allowing access to the meaning of that word. The reciprocal and dynamic relationship between all aspects of language is a prerequisite for reading decoding and comprehension (Cadillo & Garcia, 2018; Seçkin Yılmaz & Yaşaroğlu, 2020).

To identify underlying language characteristics is also of great importance in determination of treatment approach of dyslexia. While some children diagnosed with dyslexia show above average standardized language scores (Tercan et al., 2012; McLeod, 2019), those CWD who do not have language disorders can still have lower scores on language tests although being within normal limits (Betjemann & Keenan, 2008). So there can be individual differences and subgroups of dyslexia. Although language development begins after or even before birth, dyslexia diagnosis is usually made after 6 years of age (1st grade) in Turkey. Thus, studies concerned with language development should be directed to children diagnosed with language disorders especially the ones with phonological deficits with the possibilities of being at high risk for dyslexia. Preschoolers with language disorders and at high risk should be examined in terms of early precursors of dyslexia and with which symptoms they are diagnosed with dyslexia in the future.

There are some limitations and strengths of our study. Firstly, the number of dyslexia cases involved in the study is not so much, but we have a case-control design so that all p values had a large effect size ( $d= 0.8$ ) and we calculated and gave also the Cohen d index for controlling the power of the p value. Although the comorbid mental disorder rates (ADHD,

anxiety, depression) were high, we selected a pure dyslexic group without mental comorbid. Even though dyslexia is diagnosed according to DSM-5 by child psychiatrist, structured interviews and observations of cases and controls would enrich the study. Future research should continue to clarify the language profiles of individuals with dyslexia. It will be important to examine whether findings for expressive and receptive language relate to differences in method of assessment, ages of participants, or performances of children on nonverbal tasks. Future analyses should also follow children longitudinally taking into consideration of the dynamic changes in brain development; examining whether language skills change over time and which factors predict change.

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### **Conclusion**

The differences between groups were significant on standardized speech and language tasks used in this study. CWD showed poorer performance than children with typical development although their scores are within normal limits.

Dyslexia is not only reading disorder. Language disorders, speech sound disorders generally accompany dyslexia. For the purpose of making a clinic decision, CWD should be given a multi-dimensional assessment. Language skills, phonological and articulation competence, nonword repetition should be included in the assessment procedures. Identifying the speech and language characteristics of the child is crucial in the diagnosis and therefore intervention phases of dyslexia.

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