

RESEARCH ARTICLE

# Dyslexia in The Context of Transparent Uzbek Orthography Neuropsycholinguistic Analysis

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## Abstract

This article presents a theoretical analysis of dyslexia in relation to the characteristics of Uzbek writing in the Latin script. It examines the relationship between orthographic transparency and reading acquisition, the phonological mechanisms of decoding, the automatization of word recognition, and the possible role of morphological processing. Drawing on international research, the article argues for the joint assessment of reading accuracy and fluency. It proposes directions for analysing Uzbek-language material, including graphemic structure, word length, syllabic complexity, and affix composition. Statements concerning Uzbek are presented as theoretical hypotheses and methodological proposals requiring empirical verification. The article concludes that reading assessment must be grounded in the characteristics of the language and must distinguish general mechanisms of dyslexia from their manifestations in a particular writing system.

## KEYWORDS

Dyslexia, Uzbek language, orthographic transparency, phonological processing, decoding, reading fluency, morphological awareness.

## INTRODUCTION

Research on dyslexia requires consideration of the language in which a child acquires literacy. Reading involves establishing connections between graphic forms, sound units, and meaning. The demands of these operations vary with the consistency of letter–sound correspondences and the structure of words. Descriptions of difficulties established for one orthography therefore require verification when applied to another language system.

The International Dyslexia Association's updated 2025 definition characterizes dyslexia as persistent difficulties in word reading and/or spelling that affect accuracy, speed, or both. It emphasizes that manifestations depend on orthography and reflect a complex interaction of genetic, neurobiological, and environmental influences [1]. This

understanding allows language-specific characteristics to be treated as an essential condition of analysis without attributing the disorder solely to features of the writing system.

For Uzbek, a relevant question is how relatively consistent grapheme–phoneme correspondences relate to difficulties in reading acquisition. Straightforward decoding rules do not, by themselves, guarantee rapid word recognition or consistent text comprehension. In this article, the transparency of Uzbek orthography is treated as a working characterization of the writing system rather than a quantitatively established measure of complete regularity.

The aim of this article is to provide a theoretical rationale for directions in the neuropsycholinguistic analysis of dyslexia in Uzbek writing. The methods comprise comparative theoretical

analysis and critical comparison of scientific publications. The study is a narrative review with conceptual analysis; it does not report original experimental data or a systematic search with an assessment of risk of bias. The analysis is primarily limited to reading Uzbek in the Latin script.

### **Theoretical Approaches to the Mechanisms of Dyslexia**

The phonological approach links reading difficulties to the processing of the sound structure of speech. To acquire the alphabetic principle, a child must learn to identify phonemes, establish their order, and associate them with graphemes. M. Snowling, C. Hulme, and K. Nation consider phonological difficulties an important explanatory dimension of dyslexia while emphasizing the heterogeneity of reading and language profiles [2]. A phonological measure should therefore be interpreted within a broader assessment.

Phonemic perception must be distinguished from phonemic awareness. The former concerns the discrimination of speech sounds, whereas the latter involves the conscious identification and manipulation of phonemes. Recognizing a spoken word and removing its initial sound impose different demands. Performance on a segmentation task also depends on understanding the instructions and experience with similar exercises. Errors in one task therefore do not automatically justify the conclusion that all components of the phonological system are impaired.

Phonological short-term memory temporarily retains a sequence of sounds. When reading an unfamiliar word, a reader must retain the elements already decoded until they can be blended. In theory, increasing length may place greater demands on this operation. However, pseudoword repetition and pseudoword reading are not interchangeable procedures: the latter additionally involves grapheme recognition and the conversion of written forms into sounds. Using these tasks separately helps clarify the source of difficulty.

Another aspect concerns the speed of access to familiar names. Rapid automatized naming is usually assessed by timing the naming of sequences of familiar objects, colours, letters, or digits. In the multilingual study by K. Landerl and colleagues, phonological awareness and rapid naming were associated with dyslexia across European orthographies of varying complexity [3]. This finding supports interest in these measures but does not establish diagnostic thresholds for Uzbek-speaking children.

A multifactorial understanding of dyslexia requires analysis of

combinations of characteristics. One child may predominantly experience difficulties in phoneme analysis, another may show insufficient automatization of reading, and a third may exhibit a combination of reading difficulties and broader language difficulties. The 2025 definition identifies phonological and morphological difficulties as common but not universal [1]. A single deficit should therefore not be regarded as a necessary condition in every case, nor should its absence be considered sufficient grounds for ruling out dyslexia.

### **Orthographic Transparency and Reading Acquisition**

Orthographic transparency refers to the consistency of correspondences between written and sound units. The direction of conversion must be considered: the predictability of pronunciation from spelling may differ from the predictability of spelling from pronunciation. The degree of regularity also depends on the unit of analysis. A correspondence may be consistent for a letter combination but less apparent when individual letters are considered. Transparency is therefore a graded rather than an absolute characteristic.

P. Seymour, M. Aro, and J. Erskine compared early reading acquisition in English and twelve other European orthographies. They identified differences in the rate at which foundational skills developed and related these differences to orthographic depth and syllabic complexity [4]. These findings show that language structure affects the demands placed on beginning readers. However, research on typical reading acquisition does not directly establish the prevalence of dyslexia or its criteria in another country.

The comparison of German-speaking and English-speaking children conducted by K. Landerl, H. Wimmer, and U. Frith demonstrated the influence of orthographic consistency on the manifestations of reading difficulties [5]. A more regular writing system may facilitate accurate pronunciation while difficulties in rapid reading persist. Relatively high accuracy therefore does not always indicate that the skill is fully developed: it is necessary to determine how much time and effort a correct response requires.

In the psycholinguistic grain size theory developed by J. Ziegler and U. Goswami, the choice of reading strategy is explained by the availability of phonological units and the reliability of correspondences between print and speech [6]. Readers may rely on phonemes, larger sound sequences, and whole forms. Sequential decoding is productive when

correspondences are regular, but further reading development requires efficient recognition of familiar sequences. For Uzbek, this theory generates questions to be tested rather than a ready-made account of individual strategies.

This implies a methodological distinction between decoding accuracy and automatization. A child may read a word correctly while repeatedly returning to its beginning or blending syllables after pauses. Such features are lost if assessment considers only the final response. Analysis of timing, repetitions, and self-corrections can characterize how the task is performed. Slow reading must nevertheless be interpreted in relation to age and the duration of instruction, since at an early stage it may reflect ordinary skill development.

### **Characteristics of Uzbek-Language Material**

The rules of Latin-based Uzbek orthography cover the spelling of vowels and consonants, letter combinations, stems and affixes, as well as cases in which spelling and pronunciation diverge [7]. The formula “one letter–one sound” is therefore insufficient to characterize the entire system. Analysis of its transparency requires identifying specific correspondences and examining their frequency. In this study, relative consistency does not imply the absence of contextual conditions, borrowed forms, or morphological rules.

When selecting material, graphic length must be distinguished from phonological length. The combinations *sh* and *ch* each occupy two letter positions but represent the corresponding consonant sounds; *ng* requires consideration of the particular word and its structure. The letters *oʻ* and *gʻ* contain an additional graphic element. If only printed characters are counted, the words being compared may differ in the number of phonemes. Research should therefore record letters, graphemes, phonemes, and syllables separately.

Recognition processes can be studied using words containing individual letters and multicomponent graphemes, matched for frequency and length. The theoretical question is whether a combination is perceived as a single unit or requires sequential processing. A possible increase in processing time does not, in itself, indicate dyslexia: it may depend on familiarity with a particular grapheme. Relating such an effect to reading difficulties requires group comparisons and control of educational experience.

Differences represented by the letters *q* and *k*, *x* and *h*, and *g* and *gʻ* are of interest for phonological analysis. Their study

must consider the child’s pronunciation environment and differences between colloquial speech and the standard language. An unfamiliar pronunciation variant can affect task performance without indicating impaired phonological processing. Material should therefore be pretested for comprehensibility, and oral responses should be assessed according to predetermined rules governing acceptable variation.

Morphological structure warrants separate attention. In Uzbek, affixation makes it possible to form extended word forms. For example, the sequence *kitob* — *kitoblar* — *kitoblarimiz* — *kitoblarimizdan* increases length while retaining a recognizable stem. Such a sequence permits investigation of the interaction between decoding and morpheme recognition. It is not, however, a ready-made test: the forms differ in frequency and familiarity in communication, so these parameters must be controlled.

Familiar morphemes may facilitate the reading of long word forms, whereas insufficiently mastered affixes may increase processing demands. Testing this hypothesis requires comparing morphologically transparent words with material matched for length and syllabic structure. Agglutination cannot be assumed in advance to cause dyslexia or to provide a guaranteed means of compensation. Its role should be established through observable differences in accuracy, timing, and error patterns.

### **Directions for Assessment and Interpretation**

The theoretical analysis suggests several interconnected directions for studying reading. Reading familiar words reveals the efficiency of processing learned written forms. Pseudowords limit reliance on whole-word recognition and allow investigation of the decoding of novel sequences. Reading connected text reveals how the skill operates within syntactic and semantic context. These procedures complement one another, since successful performance on one does not guarantee comparable performance on the others.

Uzbek pseudowords should conform to permissible combinations of sounds and graphemes without coinciding with real words. They must be checked against dialectal forms, names, and words from other languages familiar to the child. Similarity to familiar vocabulary and the presence of recognizable affixes should be controlled. Otherwise, performance may reflect the unusual nature of the material or

opportunities for guessing rather than decoding characteristics. This requirement concerns the content-based rationale for a task before its properties are examined statistically.

Reading time must be interpreted alongside accuracy. Fast performance with numerous errors and slow, accurate reading characterize different ways of performing the task. For connected text, the number of words read correctly per minute can be recorded and supplemented with descriptions of pauses and self-corrections. For individual stimuli, it is important to distinguish the latency before response onset from the duration of pronunciation: the latter also depends on the word's articulatory length.

Reading comprehension requires separate assessment. If a child responds more successfully after listening to the same material than after reading it independently, there are grounds for investigating the contribution of decoding. If difficulties persist in both presentation conditions, vocabulary and spoken language comprehension need to be examined. This comparison has explanatory value but does not establish a diagnosis on its own. It helps identify which component requires further analysis.

A neuropsycholinguistic approach links behavioural manifestations to language-processing mechanisms while respecting the limits of the available evidence. Errors and slowing do not directly identify the location of changes in the brain. O. Ozernov-Palchik and N. Gaab discuss the potential of early neurobiological markers while noting questions concerning their sensitivity, specificity, and practical effectiveness [8]. Research on Uzbek-speaking children should therefore not replace reading assessment with an assumption about a specific brain deficit.

The language of instruction, the age at which literacy instruction began, attendance, and reading experience must also be considered. Insufficient proficiency in the language of a task can affect understanding of the instructions and familiarity with the words. Educational or language-related difficulties may nevertheless coexist with dyslexia. Interpretation should draw on the full range of evidence and changes observed during targeted support. Neither a single error nor a low reading-speed score is sufficient to explain persistent difficulties.

## **CONCLUSION**

Orthographic transparency is an important condition of

reading acquisition, but it cannot be used as grounds for ruling out dyslexia. International research supports the joint analysis of accuracy, speed, and decoding strategies. For Uzbek, a productive approach is to examine the interaction of grapheme–phoneme correspondences with syllabic and morphological structure while also considering the child's educational and speech environment.

The theoretical contribution of this article lies in identifying parameters of Uzbek-language material that should be controlled when testing hypotheses about reading: graphemic and phonological length, the complexity of letter combinations, frequency, and affix composition. The proposed directions are not established diagnostic criteria. Their experimental examination in age-defined samples will help clarify the manifestations of dyslexia and provide a basis for reading assessment instruments in Uzbek.

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