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# The Dynamics of Mental Lexical Representations in Dyslexic Children

**Dr. Mayar Ghrieb [1], Dr.Chaima Boudiar [2], Ayoub Malaoui [3]**
[1] University 8 May 1945, Guelma, Algeria
Email :ghriebmayar@gmail.com
[2] University 8 May 1945, Guelma, Algeria
Email :chaimaboudiar13@gmail.com
[3] University Badji Mokhtar of Annaba , Algeria
Email : ayoubmalaoui519@gmail.com

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**Absract**
This study explores the cognitive dimensions of language processing within the framework of Cognitive Linguistics. Specifically, it investigates how functional deficits in the language-related nervous system and the lack of phonological awareness affect lexical organization in dyslexicchildren. Titled "The Dynamics of Mental Representations of the Lexicon in Dyslexic Children," the research aims to examine the core issues surrounding the structure, alignment, and retrieval of the mental lexicon, thereby identifying and pin-pointing the primary cognitive and linguisticdifficulties these childrenencounter. Employing a descriptive-analytical methodologytailored to the nature of the study, the research analyzes lexical representation patterns to reveal how neural-functional impairments affect language recall, providing valuabletheoretical and practical insights for targetedlinguistic interventions.
**Key words:** Language – Dynamics – Mental Representations – Mental Lexicon – Dyslexia.

## Introduction

The issue of mental representations of the lexicon stands as a pivotal topic within cognitive linguisticthought. This cognitive domain centers on exploring the mechanisms of language processing in the brain—how linguistic elements are modeled and organized into lexical units within the mind, and subsequentlyretrieved according to contextual and communicative demands.

However, this complex dynamic can be disrupted by functional disorders that directly impair linguistic performance, most notablydyslexia. This disorder is linked to deficits in phonological awareness and impairments in constructing the word's mental representation. These issues stem fundamentally from functional deficits in specific brain regions—particularly those responsible for language processing in the temporal and frontal lobes—which adversely affect working memory and its overallefficiency.

Based on these premises, this research addresses a central problem statement: How do the mental representations of the lexiconmanifest in dyslexicchildren through a cognitive lens? Where are the neurofunctionaldeficitslocated in the brain regions responsible for this representation?

To address this problem statement, the study is grounded in the following hypotheses:

- The mental lexicon in dyslexicchildrenforms through representationslackingphonologicalmaturity, thereby hindering lexical organization and retrieval speed.
- Impairment in mental representations relates to functional deficits in neural networks responsible for linkingphonological and semantic coding, alongsidereducedworking memory capacity.

Accordingly, this research aims to reveal the nature of lexical mental representations in dyslexicchildren, identify their patterns of arrangement and retrieval, and trace the cognitive and neurologicaldeficitsaffecting them. To achieve these objectives, we adopted a descriptive-analytical approach due to its suitability for tracking cognitive-linguisticphenomena and analyzing their perceptual and neurological dimensions.

The significance of this study lies in highlighting the lexical dimension of dyslexia from a cognitive-linguistic perspective. This contributes to enrichingArabicscholarship in this specialized field and opens practical horizons for developing educational practices and therapeutic strategies tailored to the dynamics of the mental lexicon in children with learning difficulties.

Prior to addressing the nature of mental lexical representations in children, it is necessary to first outline the nature of cognitive linguistics, followed by the concept of dyslexia and how the mental lexiconmanifests in children.

**1. Concept of Cognitive Linguistics**

Driven by the advancement of cognitive sciences, language has developed a new direction that contributes to illustrating the neurological stages of linguistic activity, starting from the mental image to its release from the responsiblebrain regions. Accordingly, cognitive linguistics can be defined as "the sciences concerned with describing and explaining the faculties and dispositions possessed by the human mind, and how they are stimulated..." (Ahmed, 2019, p. 19).

Abdelmajid Djahfa defines it as: "A science of the mind that seeks to establishexplanatory foundations for conceptualsystems and language within the general study of the brain and mind. Thus, cognitive sciences aim to understand perception, thought, memory function, language comprehension, learning, etc." (Ahmed, 2019, p. 20).

It is also defined as "the aggregate of sciences concerned with studying the mechanism of the mind's operation in particular, and intelligence in general, aiming to understand the structure and functioning of the human mind" (Kramich, 2019, p. 147).

Fundamentally, cognitive linguisticsrevolves around the operation of the mind and how language is processed and produced through the lexical store and its dynamics within the mental space.

**2. The Mental Lexicon: Concept and Operational Boundaries**

The term "Mental Lexicon" is among the most widelycirculated concepts, particularly at the cognitive intersection of lexicology, cognitive psychology, and neurolinguistics. Its significance stems from contrasting it with the conventionalprinteddictionary. The concept originated with the psychologist Treisman in 1960 (Amtouch, 2014, p. 08). It operates on two dimensions:

- Neuro-ontological Dimension (Internal Structure): A vast set of representations that a speaker possesses regarding the words of their language, including phonological, orthographical (graphological), morphological, and semantic representations.

- Linguistico-communicative Dimension: Represented by the minimal meaningful units within an individual'savailablerepertoire, whether utilized during language generation (expressive lexicon) or during analysis (receptivelexicon) (Touma, 2014, p. 25).

Accordingly, the concept of the mental lexicon was used to denote all linguistic components in the mind along with their governing rules and constraints. This has promptedrecent cognitive linguistics researchers to establish specialized, universallyaccepted concepts based on a preciseorganization. This operational process relies on a set of associations that enable identifyingappropriate concepts from auditory or visual inputs of lexical units.

This cognitive perspective aims to revise the theoretical foundations of linguistic and psycholinguistictheories regarding lexical issues as an integral component and level of language. The depth of the cognitive view of the mental lexiconderives its theoretical and operationallegitimacy from cognitive linguistics, which specializes in how the mind processes language—an inquiry that requires integrating disciplines such as neuroscience, psychology, biology, and computer science. Thus, the mental lexicon can be defined as a flexible, multi-dimensional integrated network serving as the foundation for an individual to manipulate and use language vocabulary across various contexts (Bouanani, 2021, pp. 13-14).

Furthermore, the mental lexicon consists of complex interconnections and lexical entries linked to mental components. Consequently, neurolinguistics works to explain how neuro-sensory mental activity, perception, attention, retrieval, and memory operate as a unified system for processing, analyzing, and synthesizing information in the mind. This process reflects the brain's immense capacity for modeling and representation, grounding the internalorganization of the mental lexicon in both neurological and linguisticepistemology.

**2.1. The Mental Lexicon in Children: Structure and Cognitive Function**

The construction of a child's mental lexicondoes not occur by chance; it is a complex process that begins in the early stages of native language acquisition. Humanslearnspoken language from childhood once an innatecapacity to acquire it is present, marking the intersection of language and thought. Gradually, the childbegins discovering the features of language, understanding its functions, and grasping its connection to the surroundingenvironment. In this view, language acquisition aligns with the laws of acquiring family and social habits within a framework of stimuli and responses, as posited by behaviorists such as Watson and Skinner (Alzawawi, 2005, p. 27).

Thus, the internallexiconundergoesprecise cognitive and proceduraloperations that can only be understood through empirical scientific study. Building the mental lexicon in childrenremains an open area of inquiry, prompting scholars to explore mental mechanisms and how language is produced, analyzed, and decoded via specialized neural energy in the brain.

Linguisticstorage in children is characterized by systematic organization and constructive hierarchy, enabling memory, retrieval, and application. When a child engages in language production and comprehension, lexical activation is not automatic; rather, it relies on processesexecuted by specific neural pathways that retrieve, synthesize, and articulate lexical items (Ramadani, 2019, p. 125).

**3. What Are Mental Representations?**

Mental representationsconstitute a core inquiry in cognitive sciences, which assignparamount importance to the concept of representation as a hidden structure that serves as a simplified, organizedexplanatory model linked to an individual's cognitive, cultural, and social background.

Accordingly, representationsreflect the cognitive paradigm at the level of actualbehavioral practice in society regarding mental activity processing. This highlights their significance in understanding the nature of children's cognitive activity and how it is stored and retrieved (Ramadani, 2019, p. 117). Internal relationships within the mental lexicon represent a central issue examined by psycholinguists and neurolinguists to understand mental lexical activity—specifically the processes of storing information, retrieving lexical units, measuring responselatency, and mapping meaning onto sound. Consequently, the mental lexicon must be viewed as a conceptual system composed of concepts along with their oral and written perceptions, rather than a merelist of lexical entries programmedstrictly according to linguisticlevels (Boutayeb, 2025, p. 70).

In this context, Hazim al-Qartajanni notes that "meanings are the mental images formed of existingexternalobjects. Whenever an objectoutside the mind is perceived, a mental image matching the perceivedobject is formed. When that mental image derived from perception is expressed, the expressing word establishes the form of that mental image in the minds and understanding of listeners; thus, meaning acquires another form of existence through word signification" (Touma, 2014, p. 21).

Researchers in cognitive sciences have viewed the mind as analogous to computer software programs. This aligns with the modular view of language, which posits that linguistic components and units are distinct and operatesequentially. Such modularity allows for the development of an artificial model that subjects mental language processes to applied neurophysiological principles, providing an instructional model aware of the language system through a chain of symbolicrepresentation within a parallel neuro-linguistic architecture (Touma, 2014, p. 24).

Regarding the modeling of the mental lexical repertoire, reading serves as a vital process that enhances a child's linguistic and cognitive capacities, as well as highlightingpotentialdeficits in this realm, such as dyslexia. Dyslexia primarily manifests as a deficit at the phonological level—given that sound is the raw material upon which any language is established—in addition to impactingperceptual and memory processes. What, then, is dyslexia? How can it be diagnosed? And which brain regions are responsible for perception and memory?

Before detailingdyslexia and mental representations in dyslexicchildren, it is essential to first address the definition of reading.

**4. The Concept of Reading**

Reading is an active process essential for individual development and the enhancement of linguistic and cognitive abilities from early educational stages. Proper diagnostic awareness—understanding what, how, and whom we diagnose—reveals the underlyingfoundation and residues of the reading process. This extendsbeyond merely defining reading, its types, and its levels to addressing the readingdeficits a dyslexicchild may encounter in early education, starting from phonological awareness to developing skills for healthy language acquisition through phonological formation and operationalprocesses.

Definitions of readingvary according to theoreticalapproaches. Adetailed definition by Abdelkader Ben Kaddour states: "The reading process begins when the eye captures linguistic stimuli (written text), which are transmitted via the angular gyrus to memory to link their visual form with storedauditory content (auditory memory). The brain then searches for meaning in Wernicke's area (responsible for comprehension), after which sounds are emitted through the vocal apparatus via

orders from Broca's area (responsible for production)" (Kaddour, 2012, p. 252). This perspective emphasizes the physiological and neurologicaloperationsinvolved in executing the reading process.

**5. Dyslexia**

Reading difficulty, or dyslexia, is one of the most critical issues a child can face during early education, particularly if not properlyaddressed. The word dyslexiaderives from Greek, meaning "difficulty with words." It stems from structural neurodevelopmental variations in brain regions involved in language sound analysis, directlyimpactingacademic learning skills, including reading. The prefix dys- denotesdifficulty or impairment, while -lexiarefers to words, yielding the Arabicequivalent (readingdifficulty) (Baltaji, 2010, p. 17).

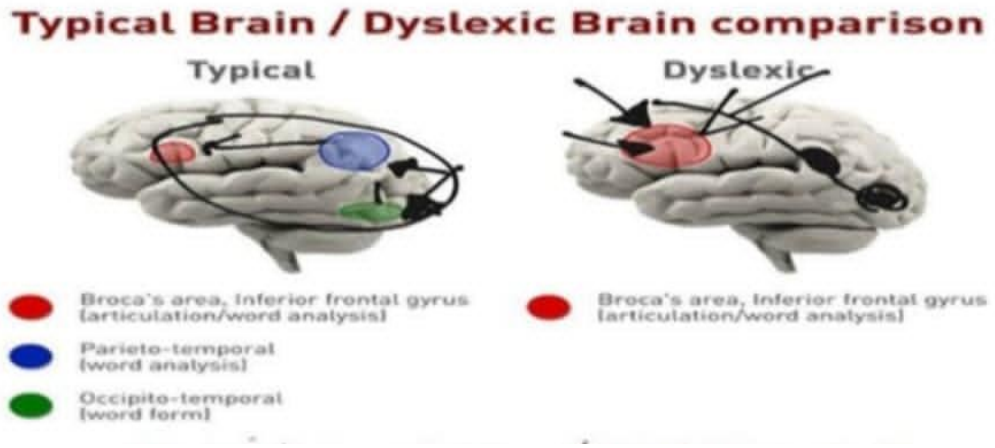
The World Federation of Neurologyissued the first definition of dyslexiain 1968, describing it as "a disorder in children who, despite conventionalclassroom instruction, fail to attain the language skills of reading, writing, and spellingcommensurate with their intellectualcapacities" (Baltaji, 2010, pp. 17–18).

The International Dyslexia Association defined it as "a specific learning difficulty of language origin characterized by difficulties in single-word decoding, information processing, and phonologicaldecoding. These difficulties are unexpected in relation to age and other cognitive and academicabilities; they are not the result of sensoryimpairment" (Baltaji, 2010, p. 18).

G. Pavlidis defined it as "a disability characterized by deficits in language communication skills, whether expressive or receptive, oral or written, manifestingclearly in reading, writing, spelling, speaking, or communicating with others" (Hamza, 2008, p. 54).

Thus, dyslexia is a neurophysiologicalimpairmentgoverned by specific brain regions, resulting in difficulties with phonological awareness, word formation, and comprehension. Because readingfundamentally relies on neurophysiological data utilizingvisual perception and auditory memory, the brainprocesses and converts neural impulses into spoken output. Consequently, readingencompasses complex cerebraloperations—including interpretation, comprehension, and phoneticexecution—highlighting the functional interaction among multiple brain regions responsible for reading.

Differences in Left-Hemisphere Brain Activity Between Dyslexic and Non-Dyslexic Readers




(Al-Manal Magazine)

6. PhonologicalSkills and Their Development in Children (Boutayeb, 2025; Kramich, 2019)

Children begindisplaying basic phonologicalskills when they demonstrate awareness of rhyme and alliteration. As childrengrow, their phonological awareness does not necessarily transition automatically into more complex phonemic awareness; this process is challenging for most children and extremelydifficult for others. However, phonemic awareness typicallybegins when a childentersschool and is directly linked to successfulreading acquisition. Children who exhibitdeficits in phonological awareness (Al-Diyar, p. 25) often experience language disorders. Consequently, the difficulty in constructing a stable phonetic network within the educationalenvironmentpersists, leading to loweracademicachievement.

Phonologicalprocesses and their components can be outlined as follows:

**6.1. Phonological Awareness**

The term "phonological awareness" has received significant attention in both Western and Arab academiccircles among researchers specializing in linguistics in general and phonetics in particular, as it serves as the primary and effective tool for uncovering the structural meanings of Arabic words, enablinglearners to recognizesounds, and developing their ability to manipulate them. Althoughdefinitions of this termvary in content, they all converge on the same core concept.

- Chard & Dickson define it as "the child's ability to segment spoken language in general, and words in particular, into their constituent sounds, alongside the ability to manipulate and handle those sounds" (Mohamed, 2008). This definition highlights the importance of understanding and analyzing speech into its fundamental components, thereby facilitating language comprehension and assimilation.
- Kirk & Chalfant define it as "the study of the basic sounds that combine to form words and sentences in a given language, as well as the rules governing the combination of sounds and basic phonetic units of the language" (Kirk & Chalfant, 1988, p. 31). This entails grasping the fundamentals of linguistic structure and its formation—startingfrom sound analysis and sequencing to assembling the linguistic matrix and reaching expressive meanings.

**6.2. Speed of Access to the Mental Lexicon**

This termrefers to the learner's ability to retrievestored words, sounds, and meanings from memory quickly and efficiently. When reading, a childretrievesphonological units associated with a single letter, units associated with letter strings, or the pronunciation linked to the overall letter-sound configuration of a familiar word all at once. This includes the capacity to retrieve both fine and coarsephonological units from long-term memory, reflecting the child's ability to recognizeprinted words effortlessly during reading due to the importance of lexical access speed (Al-Diyar, p. 31). Researcher Nicole Fiori emphasized this aspect when discussing the importance of both the right and left brainhemispheres in achievingneurological and functional integration (Bouanani, 2021, p. 19).

**6.3. Phonological Memory**

Phonological memory is the ability to temporarily encode phonological information in short-term or working memory, manifesting in the storage and retrieval of phonetic units. A strong phonological memory is a critical factor in enabling language, reading, and writingskills, whereas memory impairment can be a key cause of learning difficulties in language and cognitive domains (Al-Diyar, p. 32).

Accordingly, the phonologicalrepresentation of words stored in the mental lexicontakes various forms, which may includephonetic units, phonemes, or individual syllables. To access the mental lexicon, the learner must identify the word whose visualrepresentation matches its phonological form, relying on knowledge of grapheme-phonemecorrespondence rules to generate a phonologicalsequence that aligns with a corresponding entry in the mental lexicon.

**7. Mental Representations in Dyslexic Children**

Mental representationsconstitute the cognitive foundationunderlying language processing mechanisms, contributing to the perception, storage, and recall of linguistic units during reading and writing. However, dyslexicchildrenexperience disruptions in these representations, directlyaffecting their linguistic performance and leading to recurrenterrors in decoding and organizing linguisticsymbols. Grounded in this framework, this section examines mental representations in dyslexicchildren across three integrated levels—phonologicalrepresentations, syntacticrepresentations, and graphemicrepresentations—to uncover the nature of the cognitive deficitunderlying their reading and writingdifficulties.

**7.1. PhonologicalRepresentations in Dyslexic Children**

The recitation method provides a distinctive way to consolidate word sounds for learnersfacingcomprehensiondifficulties. For instance, a teacher might present soundsembedded in a text that is periodicallyrepeated through oral recitation (read-alouds), enabling the child's memory to retain these repeatedsounds in a simple, auditorilypleasing manner.

However, children with dyslexia often lack structural language perception or awareness, leaving them unable to blend or segment vocabulary (Metwally, 2015, p. 157) due to an inability to access the mental lexicon. This leads to difficulties in both memory storage and retrieval, as demonstrated below:

Target word: Sayyāra (Car) rightarrow Dyslexic child's production: Sayyāra

Samak (Fish) rightarrow Dyslexic child's production: Damak

Shams (Sun) rightarrow$ Dyslexic child's production: Sams

Madrasa (School) rightarrow Dyslexic child's production: Madlasa

Adyslexicchildfrequentlyexperiencesphonemic substitution disorder, rendering them unable to differentiate or discriminate between speech sounds. Consequently, they retrieve words based solely on proximity of place of articulation rather than their true representations from the mental lexicon—that is, through perceptualsimilarity alone. For instance, the phonemes /s/ (Seen) and /θ/ (Thaa) are mentally represented as if they were a single sound. Meanwhile, in the case of (samak → damak), a voicelesssound was substituted with a voicedsound based on the auditory memory store, indicating that the child's focus here was placed on the motor pathway rather than explicit phonological awareness.

In the case of (shams → sams), the absence of distinctive phoneticfeaturesprevents the child from recalling the sound and its visual form, despite perceptuallypreserving the syllabic structure. On the other hand, the sound /r/ in the word madrasa was substituted with /l/ due to proximity in place and manner of articulation, reflectingweakenedphonological linkages within the mental space and lexical overlap among dyslexicindividuals.

From this, we observe that the perceptual problem in this realm stems from Wernicke's area (comprehension) and Broca's area (production), alongside the absence of a well-consolidatedphonological awareness storedexplicitly within the mental lexicon.

Consequently, this disruptedlinguistic manifestation negatively reflects on mental spacerepresentations within the dyslexic child's physiologicallyunstable mental lexicon and neural brain pathways, which clearly points to impaired memory retrievalskills.

Furthermore, a dyslexicchild may confuse similar words during recall, such as mistaking cot for cat, or beg for big.

Inevitably, the dyslexicchildstruggles with memory storage and recall due to a lack of awareness of sounds and their forms. This hinderscomprehension as a result of underlying neural impairments in the circuits responsible for storingauditoryrepresentations in the brain. This defect can only be remediated through targeted programs that consolidate speech sounds and reinforce retention through structuredrepetition, thereby facilitatingsmootheraccess to an organized mental space.

SyntacticRepresentations in the Mental Lexicon:

The lexicon establishes a syntacticorganization that connects linguistic units across phonological, morphological, and semantic levels, given that linguistic structure forms an interconnected matrix. The brain stores syntactictemplates and root forms, granting the capacity to generate an infinite number of sentences. However, a child with dyslexia may encounterdifficultydecomposing a word into its constituent components, as illustratedbelow:

Target sentence: Kataba al-waladu ad-darsa (The boy wrote the lesson) $\rightarrow$ Dyslexic child's production: Al-waladu ad-darsakataba

In another example: Akala al-waladu at-tuffāḥata (The boy ate the apple) $\rightarrow$ Dyslexic child's production: At-tuffāḥatuakala al-waladu

In another example: Kharaja at-ṭifluilā al-ḥadīqatiyal‘ab (The child went out to the garden to play) rightarrow Dyslexic child's production: At-ṭiflu al-ḥadīqatayal‘ab

It appears that the dyslexicchildcannotfully control their mental syntacticlexicon due to confusion between similar or homorganic speech sounds. Consequently, they experiencedifficulty with recall and retrieval, alongsidepoor concentration. Furthermore, they struggle to rapidlyretrieve grammatical rules, leading to arbitraryfronting or postponing of sentence elements within compound structures. This learning difficulty carries a retroactive effect, indicating a disrupted mental map and impairedcerebralrepresentations. Therefore, lexical storage in the mental lexicon must be systematicallyreinforced through structuredrepetition and training.

The lexical disruption in poorreaders stems from an unstablephonologicalmap—specifically, a lack of solidphonological awareness, morphologicalrepresentations, and syntacticframeworks, given the neural dynamics and processing regions involved. As a result, words remain isolated and fragmented, rendering the lexicon slow, non-productive, and non-generative. Consequently, lexical and vocabulary interaction within the cognitive neural network breaks down, directlyimpairing active linguisticexecution.

Within cognitive linguistics, syntacticimpairment arises from a lack of synchronized activation across the neural networks specialized in language production and analysis. When the overallsyntactic structure remainsfragmented, disrupted, or partially absent, it degrades the lexical and generative

components within mental spaces. Thus, cognitive memory stores must be continuouslyupdated and re-consolidated to preventprocessing breakdown.

**3.7. GraphemicRepresentations in Dyslexic Children:**

Individuals with visualdyslexia display an inability to decode and analyze unfamiliar words, driven by underlyingphonologicalprocessingdeficits that directly disrupt grapheme-phoneme mapping. In reality, visualperceptualdifficulties stem primarily from challenges in interpretingvisualsensory inputs transmitted to the brain—specifically, converting visualsymbols or written letter strings into meaning. Consequently, these children struggle when reading a sentence or text from left to right or bottom to top, or when encounteringinverted letters. Regarding spatial orientation, the childfinds it difficult to distinguishshapes, symbols, mirror images, and letter sequences (Metwally, 2015, p. 169). The childexperiencesdifficultyrecallingvisually similar letters, confusing them during both oral and silent reading. The contrast between target words and the dyslexic child's production manifests as follows:

Target word: Bayt (House) \rightarrow$ Dyslexic child's production: Nayt
Warda (Rose/Flower) \rightarrow Dyslexic child's production: Darwa
Harb (War) rightarrow Dyslexic child's production: Aḥabb or Raḥḥab
Miftāḥ (Key) \rightarrow Dyslexic child's production: Tāḥ
D rightarrow$ Dyslexic child's production: B
3 or W rightarrow Dyslexic child's production: M

We observe that the child with dyslexia is unable to retrieve the correct reading of speech sounds due to a lack of functional phonological awareness; thus, they read "nayt" instead of "bayt", and "darwa" instead of "warda".

These examples highlight a series of readingerrors in dyslexicchildren that reflectunderlyingphonologicalprocessingdeficits in the brain. The childreads the word "bayt" as "nayt", substituting the sound $/b/$ with $/n/$, despite their differences in both place and manner of articulation. This demonstrates weak grapheme-phoneme mapping and, consequently, impairedphonologicalrepresentations within the mental lexicon.

Regarding the reading of "darwa" instead of "warda", a clear metathesis (spatial inversion) emerges from a failure to recall the sound and integrate it into the structure. As a result, the childcannotremember the letter'sshape or position it within a normal phonologicalsequence.

Reading "warda" as "darwa" reveals a letter inversion (metathesis), where the childrearranges the sounds within the word. This is a common error among dyslexicchildrenstemming from a disruption in the sequential perception of linguistic elements.

We observe a similar phenomenon when the word "ḥarb" is read as "’aḥabb" or "raḥḥab", where deletion and disorderedsequencing alter both the word structure and its semantic meaning due to the absence of phonological awareness.

Similarly, reading the word "miftāḥ" as "tāḥ" involves the deletion of the phoneme /f/, which compromises the structural integrity of the word.

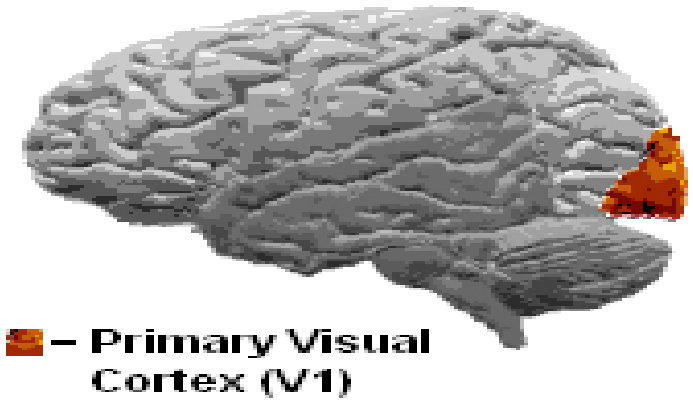
Adyslexicchild may also confuse visually similar letters such as (d / b) and (p / q)—letters characterized by symmetry and visualreflection—indicatingdifficulty in spatial-visual discrimination and letter orientation. Confusion also appears between the number (3) and the letters (W) or (M),

reflecting a disruption in perceiving the structural properties of symbols and their mental representation.

These graphemicerrors stem from dysfunction in the angular gyrus, the region responsible for converting writtenvisualforms into spokenphonological units. When dysfunctionoccurshere, the target word vanishes, and only a similar form is retrieved, leading the brain to resort to substitution, deletion, or transposition.

Ultimately, these errorsconfirm that dyslexicchildrensuffer from weak functional phonological awareness and impairedvisual-information processing related to writing. This renders them unable to retrieve the accurate reading of words and letters, forcing them to rely on substitution, deletion, metathesis, or visual confusion. They are unable to trulyrecall the visual form because the image has faded due to disrupted cross-domain projection across mental spaces and phonologicallayers within the mental lexicon, alongsideimpairedrepresentationsaffecting the explicit graphemic form.

Image illustrating the visual cortex




(Marefa Encyclopedia, 2026)

**7.4 Semantic Representations in Dyslexic Children:**

Semantic mental representationsconstitute a primary axis within the mental lexicon, as they are concerned with representing word meanings and the conceptual relationships that link them, thereby allowing the reader to transition from word recognition to comprehending its meaning within its linguistic context. From a cognitive linguistics perspective, these meanings are organized within the brain in interconnected networks that facilitateconceptualretrieval and processing.

However, a child with dyslexiasuffers from a disruption in organizing or accessing these networks, which negatively impacts their comprehension of words and texts and leads to difficulties in retrieving the appropriate meaning—even when they are occasionally able to read the word correctly. Consequently, studying semantic mental representationshelpsexplain a crucial aspect of the linguistic and cognitive difficulties associated with dyslexia, as demonstrated through the following models:

Target word: The person who sells medicine $\rightarrow$ Dyslexic child's interpretation: The doctor (Al-ṭabīb)

We observe from the example that the dyslexicchild was unable to retrieve the precise semantic representation of the word "pharmacist" (the target concept describing the seller of medicine), but insteadrecalled a closely related concept within the same semantic field—namely, the doctor (al-

ṭabīb). This reflects a disruption in the organization of conceptual relationships within the mental lexicon. The child did not fail to identify the medical domainaltogether, but rather failed to distinguish the distinctive semantic features between its constituent elements, reducing the doctor's role to the function associated with dispensing medicine.

From a cognitive linguistics perspective, this indicates that the child's semantic network lacks the hierarchical connectivity necessary for selecting the most precise concept. Neurobiologically, this impairment is linked to reducedefficiency in integration between the left temporal lobe—responsible for representinglinguisticmeanings—and the left inferior frontal gyrus, which plays a pivotal role in selecting the appropriate meaning and suppressingcompeting semantic alternatives. Consequently, this causes the child to retrieve a neighboring concept instead of the correct target concept.

Target phrase: (The moon came out) rightarrow Dyslexic child's interpretation: (The sun rose)

This pattern demonstrates a deficit in representing semantic relations among lexical items: the childfailed to grasp the conceptuallink between the verb shone and the sun, retrievinginstead another concept from the same cosmicdomain (the moon) based on thematic proximity rather than precise semantic association. This reflects an impairment in organizing distinctive conceptualfeatures within the mental lexicon, causingneighboring concepts to interfere with one another during retrieval and compromising text comprehension despite intact primarydecodingprocesses. Neurobiologically, this dysfunction is explained by reduced functional connectivity between the middle temporal cortex (which stores semantic memory) and the angular gyrus (responsible for integratinglinguistic input with conceptual knowledge), rendering semantic processingslower and less accurate in dyslexicchildren.

**7.5 Pragmatic Mental Representations in Dyslexic Children:**

Impairment of mental representations in dyslexicchildren is not restricted to phonological, graphemic, and syntacticlevels; it also extends to the pragmatic dimension due to its critical role in achieving effective communication, enablingindividuals to deduce and comprehend the underlying communicative intentions of speech. However, a child with dyslexiaencounters notable difficulties in this realm because of functional deficits in the responsiblebrain regions. Below, we present two models illustrating this pragmatic level:

**First Model:**

- Context: The teacherasks the student to open the reading book to page twenty, and then place their pen on the first word of the second paragraph.
- Dyslexic Child's Response: The child places the pen on the closed book first, opens a different page, or merely opens the book without executing the rest of the instructions.

We observe a clear breakdown in the child's responsehere. Although basic language comprehensionoccurred, the child fails to construct a functional and temporal mental representation. Pragmaticprocessingdoes not end with simplyrecognizing the words "open," "book," and "page"; rather, it requires integrating them into a coherent cognitive model while fulfilling the intended communicative goals.

From a neurobiological standpoint, this process requires seamlessintegration between the linguistic networks in the left hemisphere (particularly regions associated with language comprehension) and the working memory networks and executive functions located in the prefrontal cortex, which are responsible for retaining, organizing, and sequencing information prior to execution. When the

cognitive load increases due to the effort required for decodingwrittensymbols, working memory resources become exhausted. Consequently, the brain loses the capacity to maintain the pragmaticsequence of the message. Thus, the errordoes not stem from weak linguisticcomprehension per se, but rather from a disruption in the neural integrationrequired to transform an utterance into a cohesiveexecution plan.

**Second Model:**

- Context: The motherasks her child to bring her the notebook as soon as he finishessolving the exercise.
- Dyslexic Child's Response: Bringing the notebook immediately before finishing the homework.

This model reveals a marked disruption in constructing a pragmaticrepresentation of temporal sequence. Although the childcomprehends the core message, he fails to execute the organizedsequential process. The conditional temporal connector ("as soon as") is not merely a linguistic unit; it functions as a pragmaticcue that structures the actions within the message, requiring the listener to construct a mental representation in their lexicon that preserves temporal order.

From a cognitive linguistics perspective, this type of processing relies on generating a mental simulation of future events and mapping them within their temporal context. However, due to limitedworking memory capacity, the dyslexicchildprocesses actions as isolated units without retaining the temporal relationship linking them. Neuroscientific studies further indicate that executing such instructions requires coordination between the prefrontal cortex—responsible for planning and organization—and parietal regions that contribute to sequential attention and order processing. When this integration breaks down, the linguistic message degrades into disconnectedpieces of information that fail to translate into organizedbehavior, explaining the immediateexecution of the final action while ignoring the governing temporal constraint.

Accordingly, these two models demonstrate that pragmaticrepresentations in dyslexicchildren are not impaired due to a lack of vocabulary or grammatical knowledge, but rather as a result of a breakdown in the integration of neural networks coordinating language comprehension, working memory, attention, and executive functions. This breakdown hinders the construction of a cohesive mental model of the communicative situation, the inference of speaker intent, and the contextualgrounding of instructions within their temporal and social frames. Therefore, pragmaticimpairmentrepresents a natural extension of the broader disruption in mental representations that originates at the phonological and graphemiclevels and subsequentlyreverberates across syntactic, semantic, and pragmaticdomains. This rendersreading, comprehension, and communication interconnected cognitive processes affected by the brain's performance as an integrated system, rather than isolatedflaws at a single linguistic level.

**Conclusion**

This study reveals that the dynamics of lexical mental representations in dyslexicchildrentranscend a simple, localizedreadingdisorder or an isolatedphonologicaldeficit. Instead, they reflect a complex cognitive system whereinphonological, graphemic, semantic, syntactic, and pragmaticlevelscloselyintertwine within an interactive network of cognitive and neural processes. The findings demonstrate that mental lexicon disruption extendsbeyond weak representations of speech sounds or writtensymbols to encompass the organization of meanings, sentence construction,

and the comprehension of communicative intent, negatively impactingreadingfluency, text comprehension, and language production.

Furthermore, the study highlights that these representations do not operateindependently; rather, they maintaincomplementary relationships within the mental lexicon. An impairment at one level inevitablydisrupts the remaining levels, confirming that dyslexiarepresents a breakdown in the overalldynamics of language processing rather than a merereadingdifficulty. This stems from impaired functional integration among the neural networks responsible for linguistic perception, working memory, attention, and executive functions—all of which are essential components for constructing mental representations, retrieving lexical entries, and deploying them effectively across varied communicative contexts.

From a cognitive perspective, understanding dyslexia requires moving beyond the surface description of linguisticerrorstowardexplaining the underlying mental and neurobiological mechanisms. This approach facilitates the development of more preciseexplanatory models and opens new horizons for refining diagnostic techniques and therapeutic interventions. Grounded in this framework, enhancing the efficiency of the mental lexicon in dyslexicchildrennecessitates designing educational and remedial programs based on the integration of cognitive linguistics, neurolinguistics, cognitive psychology, and speech-language pathology (orthophony), while leveraging artificial intelligence applications and computationallinguistic analysis tools to build intelligent instruments for early diagnosis and therapeutic monitoring.

**Recommendations**

In light of the findings of this study, the following recommendations are presented:

- Expand Cognitive Linguistic Research: Broaden the scope of cognitive linguistic studies to cover all levels of language processing in children with learning difficulties, contributing to the formulation of more comprehensive and preciseexplanatory models.
- Develop Standardized Diagnostic Tools: Createstandardized diagnostic instruments grounded in the analysis of phonological, graphemic, semantic, syntactic, and pragmaticrepresentations to support the early detection of dyslexia.
- Leverage Cognitive and Neurological Insights: Utilize findings from cognitive linguistics and neurolinguistics to design educational and therapeutic interventions aimed at building mental lexical efficiency and improving language retrieval mechanisms.
- Promote InterdisciplinaryIntegration: Foster collaboration across linguistics, cognitive psychology, speech-language pathology, and neuroscience to establishmultidisciplinaryapproaches for understanding, diagnosing, and treating language disorders.
- Encourage Field Studies: Conduct empirical studies utilizinglarger samples across diverse age groups to track the development of lexical mental representations relative to variables such as age, disorderseverity, and linguisticenvironment.
- Utilize AI and ComputationalLinguistics: Deploy artificial intelligence applications and computationallinguistic analysis to build digital tools for diagnosinglinguisticerrors, analyzingerror patterns, and recommendingtailoredtherapeutic interventions for eachchild.

- Direct Future Research towardExecutive Functions: Focus future research on investigating the relationship between mental lexicondynamics and working memory, attention, and executive functions, highlighting their impact on reading acquisition and language processing.
- Conduct Comparative Studies: Execute comparative studies between neurotypicalchildren and dyslexicchildren to identify differences in mental lexiconorganization and vocabularyretrieval strategies, thereby enhancing the efficacy of intervention programs.

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**ORCID**

Mayar ghrieb3608-9038-0006-ttps://orcid.org/0009h

Chaima boudiar7067-3008-0009-https://orcid.org/0009

Ayoub Malaoui758X-8525-0001-https://orcid.org/0009

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