

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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Abstract

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 dyslexic children. 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 linguistic difficulties these children encounter. Employing a descriptive-analytical methodology tailored to the nature of the study, the research analyzes lexical representation patterns to reveal how neural-functional impairments affect language recall, providing valuable theoretical and practical insights for targeted linguistic 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 linguistic thought. 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 subsequently retrieved according to contextual and communicative demands.

However, this complex dynamic can be disrupted by functional disorders that directly impair linguistic performance, most notably dyslexia. 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 overall efficiency.

Based on these premises, this research addresses a central problem statement: How do the mental representations of the lexicon manifest in dyslexic children through a cognitive lens? Where are the neurofunctional deficits located 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 dyslexic children forms through representations lacking phonological maturity, thereby hindering lexical organization and retrieval speed.

- Impairment in mental representations relates to functional deficits in neural networks responsible for linking phonological and semantic coding, along with reduced working memory capacity.

Accordingly, this research aims to reveal the nature of lexical mental representations in dyslexic children, identify their patterns of arrangement and retrieval, and trace the cognitive and neurological deficits affecting them. To achieve these objectives, we adopted a descriptive-analytical approach due to its suitability for tracking cognitive-linguistic phenomena 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 enriching Arabic scholarship 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 lexicon manifests 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 responsible brain 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 establish explanatory foundations for conceptual systems 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 linguistics revolves 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 widely circulated concepts, particularly at the cognitive intersection of lexicology, cognitive psychology, and neurolinguistics. Its significance stems from contrasting it with the conventional printed dictionary. 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's available repertoire, whether utilized during language generation (expressive lexicon) or during analysis (receptive lexicon) (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 prompted recent cognitive linguistics researchers to establish specialized, universally accepted concepts based on a precise organization. This operational process relies on a set of associations that enable identifying appropriate concepts from auditory or visual inputs of lexical units.

This cognitive perspective aims to revise the theoretical foundations of linguistic and psycholinguistic theories regarding lexical issues as an integral component and level of language. The depth of the cognitive view of the mental lexicon derives its theoretical and operational legitimacy 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 internal organization of the mental lexicon in both neurological and linguistic epistemology.

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

The construction of a child's mental lexicon does not occur by chance; it is a complex process that begins in the early stages of native language acquisition. Humans learn spoken language from childhood once an innate capacity to acquire it is present, marking the intersection of language and thought. Gradually, the child begins discovering the features of language, understanding its functions, and grasping its connection to the surrounding environment. 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 internal lexicon undergoes precise cognitive and procedural operations that can only be understood through empirical scientific study. Building the mental lexicon in children remains 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.

Linguistic storage 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 processes executed by specific neural pathways that retrieve, synthesize, and articulate lexical items (Ramadani, 2019, p. 125).

3. What Are Mental Representations?

Mental representations constitute a core inquiry in cognitive sciences, which assign paramount importance to the concept of representation as a hidden structure that serves as a simplified, organized explanatory model linked to an individual's cognitive, cultural, and social background. Accordingly, representations reflect the cognitive paradigm at the level of actual behavioral 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 response latency, 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 mere list of lexical entries programmed strictly according to linguistic levels (Boutayeb, 2025, p. 70).

In this context, Hazim al-Qartajanni notes that "meanings are the mental images formed of existing external objects. Whenever an object outside the mind is perceived, a mental image matching the perceived object 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 operate sequentially. 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 symbolic representation 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 highlighting potential deficits 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 impacting perceptual and memory processes. What, then, is dyslexia? How can it be diagnosed? And which brain regions are responsible for perception and memory?

Before detailing dyslexia and mental representations in dyslexic children, 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 underlying foundation and residues of the reading process. This extends beyond merely defining reading, its types, and its levels to addressing the reading deficits a dyslexic child may encounter in early education, starting from phonological awareness to developing skills for healthy language acquisition through phonological formation and operational processes.

Definitions of reading vary according to theoretical approaches. A detailed 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 stored auditory 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 neurological operations involved 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 properly addressed. The word dyslexia derives from Greek, meaning "difficulty with words." It stems from structural neurodevelopmental variations in brain regions involved in language sound analysis, directly impacting academic learning skills, including reading. The prefix dys- denotes difficulty or impairment, while -lexia refers to words, yielding the Arabic equivalent (reading difficulty) (Baltaji, 2010, p. 17).

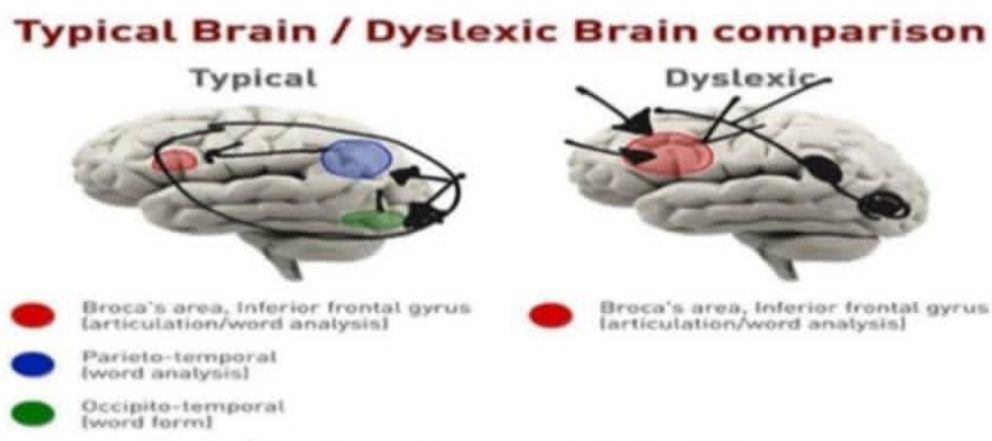
The World Federation of Neurology issued the first definition of dyslexia in 1968, describing it as "a disorder in children who, despite conventional classroom instruction, fail to attain the language skills of reading, writing, and spelling commensurate with their intellectual capacities" (Baltaji, 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 phonological decoding. These difficulties are unexpected in relation to age and other cognitive and academic abilities; they are not the result of sensory impairment" (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, manifesting clearly in reading, writing, spelling, speaking, or communicating with others" (Hamza, 2008, p. 54).

Thus, dyslexia is a neurophysiological impairment governed by specific brain regions, resulting in difficulties with phonological awareness, word formation, and comprehension. Because reading fundamentally relies on neurophysiological data utilizing visual perception and auditory memory, the brain processes and converts neural impulses into spoken output. Consequently, reading encompasses complex cerebral operations—including interpretation, comprehension, and phonetic execution—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. Phonological Skills and Their Development in Children (Boutayeb, 2025; Kramich, 2019)

Children begin displaying basic phonological skills when they demonstrate awareness of rhyme and alliteration. As children grow, their phonological awareness does not necessarily transition automatically into more complex phonemic awareness; this process is challenging for most children

and extremely difficult for others. However, phonemic awareness typically begins when a child enters school and is directly linked to successful reading acquisition. Children who exhibit deficits in phonological awareness (Al-Diyar, p. 25) often experience language disorders. Consequently, the difficulty in constructing a stable phonetic network within the educational environment persists, leading to lower academic achievement.

Phonological processes 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 academic circles 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, enabling learners to recognize sounds, and developing their ability to manipulate them. Although definitions of this term vary 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—starting from sound analysis and sequencing to assembling the linguistic matrix and reaching expressive meanings.

6.2. Speed of Access to the Mental Lexicon

This term refers to the learner's ability to retrieve stored words, sounds, and meanings from memory quickly and efficiently. When reading, a child retrieves phonological 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 coarse phonological units from long-term memory, reflecting the child's ability to recognize printed 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 brain hemispheres in achieving neurological 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 writing skills, whereas memory impairment can be a key cause of learning difficulties in language and cognitive domains (Al-Diyar, p. 32).

Accordingly, the phonological representation of words stored in the mental lexicon takes various forms, which may include phonetic units, phonemes, or individual syllables. To access the mental lexicon, the learner must identify the word whose visual representation matches its phonological form, relying on knowledge of grapheme-phoneme correspondence rules to generate a phonological sequence that aligns with a corresponding entry in the mental lexicon.

7. Mental Representations in Dyslexic Children

Mental representations constitute the cognitive foundation underlying language processing mechanisms, contributing to the perception, storage, and recall of linguistic units during reading and writing. However, dyslexic children experience disruptions in these representations, directly affecting their linguistic performance and leading to recurrent errors in decoding and organizing linguistic symbols. Grounded in this framework, this section examines mental representations in dyslexic children across three integrated levels—phonological representations, syntactic representations, and graphemic representations—to uncover the nature of the cognitive deficit underlying their reading and writing difficulties.

7.1. Phonological Representations in Dyslexic Children

The recitation method provides a distinctive way to consolidate word sounds for learners facing comprehension difficulties. For instance, a teacher might present sound embedded in a text that is periodically repeated through oral recitation (read-alouds), enabling the child's memory to retain these repeated sounds in a simple, auditorily pleasing 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) → Dyslexic child's production: Sayyāra

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

Shams (Sun) → Dyslexic child's production: Sams

Madrassa (School) → Dyslexic child's production: Madlassa

A dyslexic child frequently experiences phonemic 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 perceptual similarity 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 voiceless sound was substituted with a voiced sound 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 phonetic features prevents the child from recalling the sound and its visual form, despite perceptually preserving the syllabic structure. On the other hand, the sound /r/ in the word madrassa was substituted with /l/ due to proximity in place and manner of articulation, reflecting weakened phonological linkages within the mental space and lexical overlap among dyslexic individuals.

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-consolidated phonological awareness stored explicitly within the mental lexicon.

Consequently, this disrupted linguistic manifestation negatively reflects on mental space representations within the dyslexic child's physiologically unstable mental lexicon and neural brain pathways, which clearly points to impaired memory retrieval skills.

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

Inevitably, the dyslexic child struggles with memory storage and recall due to a lack of awareness of sounds and their forms. This hinders comprehension as a result of underlying neural impairments in the circuits responsible for storing auditory representations in the brain. This defect can only be remediated through targeted programs that consolidate speech sounds and reinforce retention through structured repetition, thereby facilitating smoother access to an organized mental space.

Syntactic Representations in the Mental Lexicon:

The lexicon establishes a syntactic organization that connects linguistic units across phonological, morphological, and semantic levels, given that linguistic structure forms an interconnected matrix. The brain stores syntactic templates and root forms, granting the capacity to generate an infinite number of sentences. However, a child with dyslexia may encounter difficulty decomposing a word into its constituent components, as illustrated below:

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

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

In another example: Kharaja at-tiflū ilā al-ḥadīqatīyal'ab (The child went out to the garden to play) $\rightarrow$ Dyslexic child's production: At-tiflu al-ḥadīqatayal'ab

It appears that the dyslexic child cannot fully control their mental syntactic lexicon due to confusion between similar or homorganic speech sounds. Consequently, they experienced difficulty with recall and retrieval, alongside poor concentration. Furthermore, they struggle to rapidly retrieve grammatical rules, leading to arbitrary fronting or postponing of sentence elements within compound structures. This learning difficulty carries a retroactive effect, indicating a disrupted mental map and impaired cerebral representations. Therefore, lexical storage in the mental lexicon must be systematically reinforced through structured repetition and training.

The lexical disruption in poor readers stems from an unstable phonological map—specifically, a lack of solid phonological awareness, morphological representations, and syntactic frameworks, 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, directly impairing active linguistic execution.

Within cognitive linguistics, syntactic impairment arises from a lack of synchronized activation across the neural networks specialized in language production and analysis. When the overall syntactic structure remains fragmented, disrupted, or partially absent, it degrades the lexical and generative components within mental spaces. Thus, cognitive memory stores must be continuously updated and re-consolidated to prevent processing breakdown.

3.7. Graphemic Representations in Dyslexic Children:

Individuals with visual dyslexia display an inability to decode and analyze unfamiliar words, driven by underlying phonological processing deficits that directly disrupt grapheme-phoneme mapping. In reality, visual perceptual difficulties stem primarily from challenges in interpreting visual sensory inputs transmitted to the brain—specifically, converting visual symbols 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 encountering inverted letters. Regarding spatial orientation, the child finds it difficult to distinguish shapes, symbols, mirror images, and letter sequences (Metwally, 2015, p. 169). The child experiences difficulty recalling visually 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) → Dyslexic child's production: Nayt

Warda (Rose/Flower) → Dyslexic child's production: Darwa

Harb (War) → Dyslexic child's production: Aḥabb or Raḥḥab

Miftāḥ (Key) → Dyslexic child's production: Tāḥ

D → Dyslexic child's production: B

3 or W → 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 reading errors in dyslexic children that reflect underlying phonological processing deficits in the brain. The child reads 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, impaired phonological representations 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 child cannot remember the letter's shape or position it within a normal phonological sequence.

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

We observe a similar phenomenon when the word "ḥarb" is read as "ʾaḥabb" or "raḥḥab", where deletion and disordered sequencing 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.

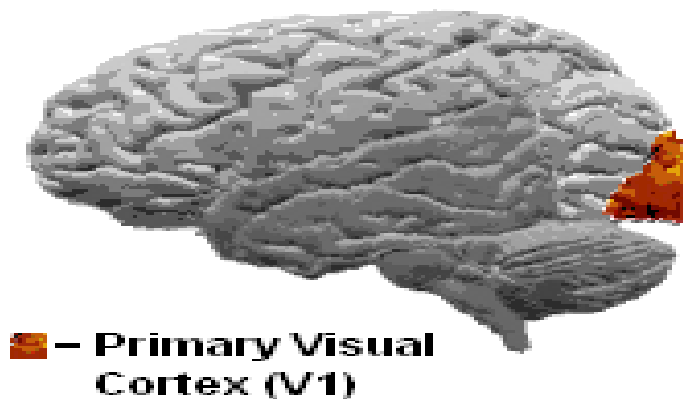
A dyslexic child may also confuse visually similar letters such as (d / b) and (p / q)—letters characterized by symmetry and visual reflection—indicating difficulty in spatial-visual discrimination and letter orientation. Confusion also appears between the number (3) and the letters (W) or (M), reflecting a disruption in perceiving the structural properties of symbols and their mental representation.

These graphemic errors stem from dysfunction in the angular gyrus, the region responsible for converting written visual forms into spoken phonological units. When dysfunction occurs here, the target word vanishes, and only a similar form is retrieved, leading the brain to resort to substitution, deletion, or transposition.

Ultimately, these errors confirm that dyslexic children suffer from weak functional phonological awareness and impaired visual-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 truly recall the visual form because the image has faded due to disrupted cross-domain projection across mental spaces and phonological layers within the mental lexicon, alongside impaired representations affecting the explicit graphemic form.

Image illustrating the visual cortex



(Marefa Encyclopedia, 2026)

7.4 Semantic Representations in Dyslexic Children:

Semantic mental representations constitute 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 facilitate conceptual retrieval and processing.

However, a child with dyslexia suffers 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 representations help explain 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 → Dyslexic child's interpretation: The doctor (Al-ṭabīb)

We observe from the example that the dyslexic child was unable to retrieve the precise semantic representation of the word "pharmacist" (the target concept describing the seller of medicine), but instead recalled 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 domain altogether, 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 reduced efficiency in integration between the left temporal lobe—responsible for representing linguistic meanings—and the left inferior frontal gyrus, which plays a pivotal role in

selecting the appropriate meaning and suppressing competing semantic alternatives. Consequently, this causes the child to retrieve a neighboring concept instead of the correct target concept.

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

This pattern demonstrates a deficit in representing semantic relations among lexical items: the child failed to grasp the conceptual link between the verb shone and the sun, retrieving instead another concept from the same cosmic domain (the moon) based on thematic proximity rather than precise semantic association. This reflects an impairment in organizing distinctive conceptual features within the mental lexicon, causing neighboring concepts to interfere with one another during retrieval and compromising text comprehension despite intact primary decoding processes. Neurobiologically, this dysfunction is explained by reduced functional connectivity between the middle temporal cortex (which stores semantic memory) and the angular gyrus (responsible for integrating linguistic input with conceptual knowledge), rendering semantic processing slower and less accurate in dyslexic children.

7.5 Pragmatic Mental Representations in Dyslexic Children:

Impairment of mental representations in dyslexic children is not restricted to phonological, graphemic, and syntactic levels; it also extends to the pragmatic dimension due to its critical role in achieving effective communication, enabling individuals to deduce and comprehend the underlying communicative intentions of speech. However, a child with dyslexia encounters notable difficulties in this realm because of functional deficits in the responsible brain regions. Below, we present two models illustrating this pragmatic level:

First Model:

- Context: The teacher asks 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 response here. Although basic language comprehension occurred, the child fails to construct a functional and temporal mental representation. Pragmatic processing does not end with simply recognizing 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 seamless integration 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 decoding written symbols, working memory resources become exhausted. Consequently, the brain loses the capacity to maintain the pragmatic sequence of the message. Thus, the error does not stem from weak linguistic comprehension per se, but rather from a disruption in the neural integration required to transform an utterance into a cohesive execution plan.

Second Model:

- Context: The mother asks her child to bring her the notebook as soon as he finishes solving the exercise.

- **Dyslexic Child's Response:** Bringing the notebook immediately before finishing the homework. This model reveals a marked disruption in constructing a pragmatic representation of temporal sequence. Although the child comprehends the core message, he fails to execute the organized sequential process. The conditional temporal connector ("as soon as") is not merely a linguistic unit; it functions as a pragmatic cue 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 limited working memory capacity, the dyslexic child processes 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 disconnected pieces of information that fail to translate into organized behavior, explaining the immediate execution of the final action while ignoring the governing temporal constraint.

Accordingly, these two models demonstrate that pragmatic representations in dyslexic children 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 contextual grounding of instructions within their temporal and social frames. Therefore, pragmatic impairment represents a natural extension of the broader disruption in mental representations that originates at the phonological and graphemic levels and subsequently reverberates across syntactic, semantic, and pragmatic domains. This renders reading, comprehension, and communication interconnected cognitive processes affected by the brain's performance as an integrated system, rather than isolated flaws at a single linguistic level.

Conclusion

This study reveals that the dynamics of lexical mental representations in dyslexic children transcend a simple, localized reading disorder or an isolated phonological deficit. Instead, they reflect a complex cognitive system wherein phonological, graphemic, semantic, syntactic, and pragmatic levels closely intertwine within an interactive network of cognitive and neural processes. The findings demonstrate that mental lexicon disruption extends beyond weak representations of speech sounds or written symbols to encompass the organization of meanings, sentence construction, and the comprehension of communicative intent, negatively impacting reading fluency, text comprehension, and language production.

Furthermore, the study highlights that these representations do not operate independently; rather, they maintain complementary relationships within the mental lexicon. An impairment at one level inevitably disrupts the remaining levels, confirming that dyslexia represents a breakdown in the overall dynamics of language processing rather than a mere reading difficulty. 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 linguistic error toward explaining the underlying mental and neurobiological mechanisms. This approach facilitates the development of more precise explanatory models and opens new horizons for refining diagnostic techniques and therapeutic interventions. Grounded in this framework, enhancing the efficiency of the mental lexicon in dyslexic children necessitates 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 computational linguistic 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 precise explanatory models.
- **Develop Standardized Diagnostic Tools:** Create standardized diagnostic instruments grounded in the analysis of phonological, graphemic, semantic, syntactic, and pragmatic representations 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 Interdisciplinary Integration:** Foster collaboration across linguistics, cognitive psychology, speech-language pathology, and neuroscience to establish multidisciplinary approaches for understanding, diagnosing, and treating language disorders.
- **Encourage Field Studies:** Conduct empirical studies utilizing larger samples across diverse age groups to track the development of lexical mental representations relative to variables such as age, disorder severity, and linguistic environment.
- **Utilize AI and Computational Linguistics:** Deploy artificial intelligence applications and computational linguistic analysis to build digital tools for diagnosing linguistic errors, analyzing error patterns, and recommending tailored therapeutic interventions for each child.
- **Direct Future Research toward Executive Functions:** Focus future research on investigating the relationship between mental lexicon dynamics and working memory, attention, and executive functions, highlighting their impact on reading acquisition and language processing.
- **Conduct Comparative Studies:** Execute comparative studies between neurotypical children and dyslexic children to identify differences in mental lexicon organization and vocabulary retrieval strategies, thereby enhancing the efficacy of intervention programs.

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ORCID

Mayar ghrieb [3608-9038-0006-https://orcid.org/0009h](https://orcid.org/0009h) 

Chaima boudiar [7067-3008-0009-https://orcid.org/0009](https://orcid.org/0009) 

Ayoub Malaoui [758X-8525-0001-https://orcid.org/0009](https://orcid.org/0009) 

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