

A Case Study of Learning Disabilities in an Arabic-Speaking Child: Using the Adapted School Competency Screening Test (ECSIII-A)

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Abstract:

The aim of this study was to examine written language disorders in an Arab pupil in Year 4 of primary school using the adapted Arabic version of the Educational Competence Screening Test for Stage 3 (ECSIII-A). The study adopted a descriptive-analytical design to examine a single case study involving Amin, a 9-year-old boy referred due to persistent difficulties with reading and spelling. The results revealed severe deficits in written word recognition and orthographic spelling, with total scores on the IME and CME tests falling below the 10th percentile, whilst reading comprehension was relatively weaker, at approximately the 25th percentile. In contrast, non-verbal reasoning, handwriting and general arithmetic performance remained within normal limits. Qualitative analysis revealed clear phonological, morphological and orthographic errors, including a complete failure in morphological disambiguation, suggesting deficits in both phonological decomposition and orthographic representations. In light of the dual-path model, this profile suggests the possibility of developmental dyslexia accompanied by dysorthographia, exacerbated by the orthographic characteristics of Arabic. The findings support the need for an in-depth diagnostic assessment and intensive, targeted orthophonics intervention.

Keywords: written language disorders, dyslexia, dysorthographia, dyscalculia, ECSIII-A test, dual-process model, Arabic language, phonological awareness.

Résumé

Cette étude vise à dépister les troubles du langage écrit chez un enfant scolarisé en cycle primaire, à travers l'application du test ECSIII-A (Examen des Compétences Scolaires - Cycle III, version arabe adaptée). L'étude porte sur un cas unique, l'enfant Amine, élève en 4e année primaire, âgé de 9 ans, orientés pour des difficultés en lecture et en dictée. Les résultats révèlent un déficit marqué en lecture et en écriture, les scores IME et CME se situant en deçà du 10e percentile par rapport aux normes de la 4e année. Ces résultats sont discutés à la lumière du modèle à double voie. L'étude recommande un diagnostic approfondi et une prise en charge orthophonique.

Mots-clés : troubles du langage écrit, dyslexie, dysorthographie, dyscalculie, test ECSIII-A, modèle à double voie, langue arabe, conscience phonologique.

1. Introduction

Written language disorders are among the most significant challenges faced by children during the primary school years, casting a long shadow over academic progress and psychosocial development. Dyslexia and dysorthographia rank among the most prevalent and impactful of these disorders in educational settings. International research has consistently documented a combined prevalence rate of 5-10% among school-age children (Snowling, 2000), placing their early identification among the foremost health and educational priorities. Dyscalculia is additionally recognised as a specific mathematics learning disorder that may co-occur with the two preceding conditions or manifest independently in some cases.

The Arabic language is characterised by distinctive linguistic and orthographic features - including diacritical vowel marks (tashkīl), the co-existence of Modern Standard Arabic and colloquial dialects (diglossia), and right-to-left directionality - all of which complicate the acquisition of reading and writing skills and necessitate assessment tools specifically designed for this linguistic context. Research has shown that the functional diglossia (Diglossie) between Modern Standard Arabic and the spoken vernacular in Maghrebi countries introduces an additional layer of complexity into the acquisition of spelling (Saiegh-Haddad, 2003), as the Algerian child experiences a daily tension between two distinct symbolic systems.

Several researchers have noted the scarcity of standardised diagnostic tools in the Arabic-speaking context, particularly those built upon local normative data (Boumaaraf et al., 2021). Against this backdrop, the Language and Cognition Disorders research team at the Scientific and Technical Research Centre for the Development of the Arabic Language undertook the cultural adaptation of the French School Competency Screening Test for Cycle III (ECSIII; Khomsi, 1998) into Arabic, creating a standardised screening instrument normed on an Algerian sample. This article presents a case study illustrating how the ECSIII-A test can be employed to detect written language disorders in a Grade 4 pupil, and analyses the results in light of contemporary theoretical models.

2. Theoretical Framework

2.1 Written Language Disorders: Definitions and Classification

Written language disorders encompass a broad spectrum of difficulties that impede the expected acquisition of reading and spelling skills relative to a child's chronological age, educational level, and cognitive ability. These disorders stem from dysfunction in the neurocognitive processing of complex symbolic operations requiring the integration of visual, auditory, and linguistic processing (Démonet et al., 2004). They are broadly classified within the category of Specific Learning Disorders in major international diagnostic references, including the DSM-5 (American Psychiatric Association, 2013) and the ICD-11.

2.1.1 Dyslexia

Dyslexia is classified as a specific learning difficulty in reading that is unrelated to low intelligence, sensory impairment, or inadequate educational opportunity (Snowling, 2000). The definition adopted by the International Dyslexia Association (IDA, 2002) characterises it as a neurological disorder manifesting as difficulties in accurate and fluent word recognition and in phonological decoding, resulting from a deficit in the phonological component of language. Recent neuroimaging studies have demonstrated that children with dyslexia exhibit reduced activation in the left posterior brain regions responsible for written word processing (Démonet et al., 2004).

Within the Arabic language context specifically, research has established that diacritical marks (tashkīl) play a pivotal role in word reading, and that their absence may exacerbate reading difficulties among poor readers. Furthermore, the morphological derivation characteristic of Arabic adds additional complexity to written word recognition (Saiegh-Haddad, 2003). Wydell and Butterworth (1999) demonstrated that the degree of phonological 'transparency' of an orthographic system influences the pattern and trajectory of reading acquisition; vowelised Arabic is closer to transparency, whereas unvowelised Arabic approaches opacity, creating a unique challenge without parallel in most other languages.

2.1.2 Dysorthographia

Dysorthographia is a specific learning disorder characterised by persistent difficulty in mastering the orthographic representation of words in writing, despite appropriate instruction and normal

intelligence (Fayol & Jaffré, 2008). It is estimated that 80% of children with dyslexia also present with dysorthographia (Snowling, 2000), although the latter may also manifest with relative independence. Its manifestations include frequent phonological errors (omissions, additions, substitutions), weak lexical orthographic representations, and difficulty applying morphosyntactic rules in writing.

In Arabic, these difficulties take a distinctive form linked to the spelling of the hamza (glottal stop), long vowel letters, the bound feminine marker (tā' marbūṭa), and nunation (tanwīn) - phenomena that cannot be managed by the phonological route alone but require firmly stored orthographic representations. Fayol and Jaffré (2008) have argued that spelling acquisition requires the construction of word-specific orthographic knowledge in what they termed the 'internal orthographic lexicon' (lexique orthographique interne), a construct rendered more complex in Arabic by the multiple positional forms of individual letters.

2.1.3 Dyscalculia

Dyscalculia is defined as a specific mathematics learning disorder manifesting as persistent difficulty in processing numerical information, performing arithmetic operations, and acquiring mathematical facts, despite normal intelligence and adequate instruction (Butterworth, 2003). Its prevalence is estimated at 3-7% of school-age children. The DSM-5 (American Psychiatric Association, 2013) classifies dyscalculia within 'Specific Learning Disorder with impairment in mathematics', encompassing difficulties in number fact mastery, numerical transcoding, problem solving, and understanding numerical concepts.

Dyscalculia is distinguished from transient arithmetic difficulties by its chronic nature and its independence from general intelligence. Within the ECSIII-A assessment framework, the Number and Arithmetic subtest (NA) permits the detection of three key components: numerical transcoding (TC) in both production and recognition modes, missing operations (OP), and arithmetic problem comprehension (PA). Numerical transcoding constitutes the primary entry point for evaluating the relationship between the phonological-verbal representation of numbers and their digital representation - a core component in the diagnosis of developmental dyscalculia (Seron, 1993). It is noteworthy that the absence of dyscalculia - as in the case of Amine - contributes to defining a pure clinical profile of written language disorder dissociated from mathematical abilities.

2.1.4 Interrelationship among the three disorders

The cognitive model affirms that both reading and spelling share a common knowledge base: the internal orthographic representations of words (Ehri, 1997). This accounts for the frequent co-occurrence of the two disorders in clinical practice. Moreover, the demands of writing exceed those of reading in terms of control and precision, rendering writing more revealing of gaps in orthographic representation (Share, 1995). The role of phonological short-term memory in consolidating representations during writing and dictation tasks is equally well established (Morais, 1994). Dyscalculia may co-occur with dyslexia in cases of multiple learning disabilities; however, the presence of intact arithmetic abilities - as will become evident in this case - constitutes a crucial diagnostic indicator that confines the disorder to the written linguistic channel.

2.2 The Dual-Route Model of Reading and Spelling

The Dual-Route Cascaded model (Coltheart et al., 2001) represents the most widely accepted theoretical framework for explaining the mechanisms of written word processing. Originally developed from the work of Marshall and Newcombe (1973), it has become the reference model for explaining normal reading acquisition and for classifying its disorders. Khomsi (1998) explicitly

applied this model in constructing the IME subtest, designing the four types of distractor stimuli accordingly.

2.2.1 The Lexical Route

This route enables the immediate retrieval of a word's stored visual form from the internal orthographic lexicon without the need for sequential phonological analysis. It is the dominant strategy employed by skilled readers when processing familiar words and orthographically irregular words. It is characterised by sensitivity to word frequency (frequency effect), the ability to read irregular words, and reliance on the holistic visual representation of words. The ECSIII-A instrument (Boumaraf et al., 2021) probes this route in the IME subtest through correct words (C) and diacritical distractors (HT); rejecting diacritical distractors may reflect the possession of orthographic representations that incorporate diacritical vowel marks.

2.2.2 The Phonological Route

This route operates through the sequential conversion of graphemic units (graphemes) into corresponding phonological units (phonemes) according to grapheme–phoneme correspondence rules, which are then assembled to arrive at pronunciation. It is characterised by sensitivity to orthographic regularity and by the ability to read novel words and pseudowords. It constitutes the primary mechanism in the early stages of reading acquisition and represents what Share (1995) described as the *sine qua non* self-teaching mechanism for reading acquisition. This route is sensitive to the quality of the child's phonological awareness, and Bradley and Bryant's (1983) seminal longitudinal study established the causal relationship between phonological awareness and success in learning to read.

2.2.3 Specificities of Arabic in light of the model

The dual-route framework acquires particular importance in Arabic due to several interrelated linguistic properties, all of which were systematically addressed in the adaptation of the ECSIII-A:

- **Diacritical marking system (*tashkīl*):** This adds a semantically distinctive dimension that cannot be processed efficiently except through the indirect route (phonological assembly), which is responsible for diacritical processing given that diacritical marking is governed by fixed rule application. This motivated the inclusion of diacritical distractors (HT) in the IME subtest of the Arabic version - an addition with no equivalent in the original French version. Example: a distractor with an incorrect vowel mark on the initial consonant of the word *jaras* ('bell') - the error is purely diacritical, undetectable except through the complete orthographic representation of the word.
- **Orthographic ambiguity:** Letters with multiple positional forms - such as the hamza in its various configurations and the bound feminine marker - increase the complexity of the lexical route and require precise lexical representations that cannot be derived from the phonological route alone. The CME subtest exploits this property through a three-level ambiguity classification system (Levels 0, 1, and 2). Example: the word *bi'r* ('well', Level 1 ambiguity due to the medial hamza) and the word *ḥamāma* ('pigeon', Level 2 ambiguity due to the long vowel and the bound feminine marker) - both are pronounced identically to their distractors, but their correct spelling requires independent lexical representations.
- **Morphological derivation:** The Arabic trilateral root system requires a level of morpho-lexical processing not present to the same degree in Latin-based languages, necessitating the parallel development of a morphological-lexical route alongside the two traditional routes.
- **Diglossia:** As Saiegh-Haddad (2003) has documented, the Algerian child acquires literacy in Modern Standard Arabic while communicating orally in a colloquial variety, which impedes

the construction of robust grapheme–phoneme correspondences and introduces cross-linguistic interference that manifests in spelling errors. The ECSIII-A incorporates this feature in the list of accepted responses for CME (Boumaraf et al., 2021).

2.3 Phonological Awareness and its Role in Reading Acquisition

Phonological awareness refers to the ability to perceive and manipulate the sound structure of spoken language independently of meaning, encompassing a developmental continuum from awareness of syllables and rhymes through to individual phonemes. Thousands of longitudinal and experimental studies have established phonological awareness as the strongest predictor of successful reading acquisition (Bradley & Bryant, 1983). In Arabic, this role acquires heightened importance, given that many orthographic forms do not directly and transparently reflect the spoken sound, particularly in unvowelled text, which constitutes the predominant form in school textbooks from Grade 3 onwards. Accordingly, phonological awareness does not play a direct role in reading texts; rather, it constitutes a competence associated with the reading process, contributing to it in an indirect capacity.

Morais (1994) emphasised that phonemic awareness specifically - the ability to segment words into their constituent phonemes - is the fundamental prerequisite for mastering the alphabetic principle, accounting for a substantial proportion of the difficulties experienced by children with dyslexia in phonological decoding.

2.4 Dysgraphia and its Relationship to Written Language Disorders

An important distinction must be drawn between dysgraphia and dysorthographia. Dysgraphia refers specifically to difficulties in the motor-executive dimension of handwriting - control of pen pressure, speed, and letter formation - assessed by the Handwriting (G) subtest of the ECSIII-A. Dysorthographia, by contrast, concerns the lexical and phonological processing of words in their written form. Thichanpiang et al. (2022), in their study of the cultural adaptation of the Handwriting Proficiency Screening Questionnaire (HPSQ) for Thai, demonstrated that writing disorders encompass multiple dimensions - legibility, performance time, and physical and emotional well-being - underscoring the necessity of precise differential diagnosis across these dimensions when planning appropriate intervention.

2.5 The ECSIII-A Test: Description and Psychometric Properties

The ECSIII-A is an Arabic-adapted version of the French ECSIII test (Khomsî, 1998), developed to detect learning difficulties in pupils in Grades 3, 4, and 5 of primary school (ages 8-12). The Language and Cognition Disorders research team at the CRSTDLA carried out the adaptation following the internationally recognised methodology for cross-cultural adaptation of assessment tools (Beaton et al., 2000), and normed it on a sample of 636 boys and girls across the three grade levels in schools in the Algiers metropolitan area (Boumaraf et al., 2021). The instrument comprises six subtests, summarised in Table 1.

Table 1
Structure and Components of the ECSIII-A School Competency Screening Test

Code	Subtest	Items	Competency Assessed
IME	Written Word Recognition	60	Reading mechanisms (direct and indirect routes)
CL	Reading Comprehension	17	Comprehension strategies (pictorial and inferential)

RP	Abstract Problem Solving	16	Non-verbal intelligence
G	Handwriting	60	Fine motor skill
CME	Written Word Completion	60	Lexical orthographic spelling
NA	Number and Arithmetic	50	Mathematical competencies and numerical transcoding

Description of the Subtests

Written Word Recognition (IME): This subtest aims to identify the reading strategies employed by the pupil (direct and indirect routes) through matching a picture to a written word, with the inclusion of varied distractors (semantic, visual, phonological, and diacritical). It is administered in approximately 8 minutes; the pupil is required to judge the accuracy of the word-picture relationship, and scoring awards one point per correct response (total: 63). Psychometrically, the subtest is distinguished by construct validity grounded in the dual-route model of reading, and permits qualitative error profile analysis, thereby enhancing its diagnostic validity. Standardisation results demonstrated significant differences across grade levels, alongside the availability of normative indicators (means and standard deviations) that enable performance interpretation.

Reading Comprehension (CL): This subtest measures the pupil's ability to understand written sentences by selecting the appropriate picture, across two levels: pictorial comprehension (IG) and inferential comprehension (IF). It is administered in approximately 8 minutes, with one point awarded per response (total: 11). Psychometrically, the subtest demonstrates clear content validity through its representation of two fundamental comprehension levels, and exhibits developmental sensitivity, with inferential competence progressing gradually across grade levels. It also provides qualitative diagnostic indicators through error pattern analysis, and standardisation results supported its discriminative validity across grade levels.

Abstract Problem Solving (RP): This is a non-verbal subtest measuring general cognitive abilities, particularly perceptual and analogical reasoning, through matrices requiring visual inference. It is administered in approximately 10 minutes, with one point awarded per correct response (total: 16). In terms of psychometric properties, it is characterised by construct validity linked to the concept of non-verbal intelligence and relative independence from linguistic factors, thereby enhancing its discriminative validity. Standardisation results demonstrated its capacity to detect individual differences in cognitive performance, particularly among pupils with learning difficulties.

Handwriting (G): This subtest measures fine motor skills through copying geometric shapes along prescribed paths, with a focus on two indicators: directionality and inhibition. It is administered in two brief parts, with a total score of 60. Psychometrically, it is distinguished by functional validity owing to its direct relationship with writing skills, and permits precise qualitative analysis of motor performance. It is sensitive to the detection of motor coordination disorders and executive control difficulties, with results supported by normative data derived from the standardisation sample.

Written Word Completion (CME): This subtest aims to assess orthographic competence through completing words from a picture and an initial letter, with controlled degrees of orthographic ambiguity. It is administered in approximately 15 minutes, with one point per response (total: 63). Psychometrically, it possesses strong content validity owing to its representation of the properties of

Arabic spelling (letter-level and word-level ambiguity), and enables differentiation across difficulty levels. Analysis and standardisation results supported its validity in detecting orthographic representation disorders among pupils.

Number and Arithmetic (NA): This subtest comprises several components (numerical transcoding, missing operations, and problem comprehension) designed to measure numerical and arithmetic competencies. Administration duration varies by component, and scoring awards one point per correct response. Psychometrically, it is distinguished by multidimensionality, which enhances its construct validity, as it measures distinct aspects of numerical processing (transcoding, comprehension, and problem solving). Standardisation results indicate that performance is influenced by factors such as school familiarity with exercise formats and problem phrasing, a consideration that is taken into account in the clinical interpretation of results.

Psychometric Properties of the Test

The following psychometric characteristics are drawn from the official test manual (Boumaraf et al., 2021):

- **Normative sample:** Standardisation was conducted on 636 pupils in Grades 3, 4, and 5 (208, 209, and 219 pupils respectively), distributed across 21 classrooms in seven primary schools in the Greater Algiers region.
- **Construct validity:** The test demonstrated acceptable construct validity through statistically significant differences between the three grade levels across all subtests. Significant differences were observed between Grades 3 and 4, and between Grades 4 and 5, in IME. Similarly, significant differences ($p \leq .001$) across all three levels were recorded in CL.
- **Reliability:** Consistent improvement in performance as a function of grade level was observed across all subtests, reinforcing confidence in measurement consistency. For example, CME mean scores increased from 40.93 (SD = 14.99) in Grade 3 to 47.76 (SD = 9.45) in Grade 4 and 48.54 (SD = 9.66) in Grade 5.
- **Inter-subtest correlations:** A statistically significant correlation was found between IME and CL ($r = .32, p < .001$), and a moderate significant correlation between IME and CME ($r = .52, p < .001$), confirming the shared cognitive underpinning of reading and spelling.
- **Discriminative properties of IME:** The four distractor types were designed according to the dual-route model to identify the reading strategy employed: semantic distractors (PS) probe lexical processing depth; visual distractors (PLE) probe the phonological route; phonological distractors (HP) probe the efficiency of the lexical route; and diacritical distractors (HT) - an Arabic-exclusive addition - probe the accuracy of diacritical orthographic representations.
- **Discriminative properties of CME:** The three-level orthographic ambiguity classification (Level 0: simple words such as jamal ['camel']; Level 1: single ambiguity such as bi'r ['well'] or nahla ['bee']; Level 2: double ambiguity such as hamāma ['pigeon'] or zarāfa ['giraffe']) enables qualitative analysis of the nature of the spelling deficit rather than mere quantitative measurement. A significant correlation between pupil performance on orthographically similar items in IME and CME was found ($r = .52, p < .001$).
- **Norms and percentiles:** Separate percentile tables for each of the three grade levels are provided, enabling comparison against a national Algerian reference framework across five principal percentile bands (P10, P25, P50, P75, P90) for each subtest and each component score.

3. Methodology

3.1 Research Design

This study adopts a descriptive-analytical approach within a single-case study design, the most appropriate design in clinical speech-language pathology contexts for exploring and diagnosing individual patterns of learning disorders in depth. The case study method is distinguished by its capacity to yield a comprehensive picture that extends beyond numerical scores to the qualitative patterns of errors and their clinical significance, thereby enabling the formulation of diagnostic hypotheses amenable to testing in subsequent in-depth evaluation.

3.2 Research Instrument

The research instrument employed in this study is the ECSIII-A (School Competency Screening Test for Cycle III - Arabic-adapted version), a standardised screening tool described in full in Section 2.5 above. All six subtests were administered, and results were interpreted with reference to the Grade 4 normative tables (Boumaraf et al., 2021).

3.3 Case Presentation

The participant is Amine, a male pupil aged 9 years, enrolled in Grade 4 of primary school. He was referred to the speech-language pathologist at his mother's request following reported difficulties in reading and dictation. He is the second of five children in a family with a good educational background. No organic illness, motor developmental delay, or language developmental delay was reported. A febrile episode at age two years necessitated a brief hospitalisation, after which his condition stabilised without apparent sequelae.

Amine displays a clear dissociation between good oral language skills and evident written language difficulties: he produces long, coherent spoken sentences, yet his written production consists of very short sentences containing numerous spelling errors. His classroom teacher reported an acceptable level of performance in mathematics. He is observed to avoid writing and oral reading and exhibits anxiety when requested to do so, a pattern consistent with the psychological symptoms described by Engel-Yeger et al. (2009) in children with writing disorders.

3.4 Administration Conditions

The ECSIII-A was administered in a quiet, suitable environment in accordance with the administration conditions specified in the manual (Boumaraf et al., 2021), including verification of visual and auditory acuity. Administration was conducted individually over approximately ninety minutes, with appropriate rest breaks. Results were evaluated with reference to the Grade 4 normative tables.

4. Results and Analysis

4.1 Written Word Recognition (IME)

4.1.1 Quantitative results

Amine obtained a total score of 26/60 on the IME subtest. With reference to the Grade 4 normative tables (Boumaraf et al., 2021), This score falls below the 10th percentile (whose threshold is 34), placing him within the zone of screening indicators warranting further investigation.

Table 2: Amine's Performance on the Written Word Recognition Subtest (IME) by Stimulus Type.

Stimulus Type	Code	Amine's Score	Max Score	Accuracy %	Percentile (Y4)	Significance
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Correct Words	C	18	20	90%	≥ P75	Within normal limits
Semantic Distractors	PS	4	10	40%	< P10	Below average
Visual Distractors	PLE	3	10	30%	< P10	Below average
Phonological Distractors	HP	1	10	10%	< P10	Very poor
Diacritical Distractors	HT	0	10	0%	< P10	Absent
Total Score	IME	26	60	43%	< P10	< 10th percentile

Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

Over all, Amine's IME total score of 26/60 (43%) falls well below the 10th percentile threshold of 34. The most diagnostically significant feature is the near-total failure on phonological distractors (HP: 1/10) and the complete failure on diacritical distractors (HT: 0/10), indicating dysfunction in both reading routes. By contrast, his performance on correct word identification (C: 18/20) remains within normal limits, highlighting the dissociated nature of his deficit.

4.1.2 Qualitative analysis in light of the Dual-Route model

A detailed analysis by stimulus type yields specific clinical inferences that extend well beyond the overall score:

- **Correct words (C: 18/20):** Amine possesses a minimal general discrimination competence; however, this level of success is insufficient to conclude that either reading route is intact, as correct words can be passed by partial visual recognition.
- **Semantic distractors (PS: 4/10):** Amine does not manage the semantic content of words efficiently during reading, indicating limited depth in the lexical-semantic processing of written words.
- **Visual distractors (PLE: 3/10):** The results of the visual distractors (PLE: 3/10) indicate a pattern of reduced efficiency in orthographic lexical processing, reflected in a diminished ability to activate stored orthographic lexical representations during the discrimination of visually similar words. This performance suggests limited reliance on direct lexical retrieval, with a greater tendency to engage phonological decoding mechanisms as an alternative route for orthographic decision-making. Overall, this pattern points to an instability in the integration between phonological and lexical pathways in written word processing.
- **Phonological distractors (HP: 1/10):** The most diagnostically significant indicator according to the model (Coltheart et al., 2001), demonstrating that Amine cannot employ phonological analysis to discriminate between written forms that are phonetically identical. Example: pseudoword distractor pronounced identically to a real word - rejecting it requires an intact internal orthographic lexicon.
- **Diacritical distractors (HT: 0/10):** This reveals clearly that Amine has not developed any orthographic representations encompassing the diacritical dimension of Arabic words. This

dimension cannot be accessed through the phonological route alone (Boumaraf et al., 2021), implying dysfunction in both routes simultaneously. Example: a distractor with an incorrect short vowel on the initial consonant of the target word - the difference is purely diacritical, detectable only via the lexical route.

4.2 Reading Comprehension (CL)

4.2.1 Quantitative results

Amine obtained 8/17 on the CL subtest. With reference to Grade 4 norms (Boumaraf et al., 2021), this score falls approximately at the 25th percentile, within the zone of cases experiencing notable reading comprehension difficulty.

Table 3: Amine's Performance on the Reading Comprehension Subtest (CL) by Strategy

Strategy	Code	Amine's Score	Max Score	Accuracy %	Percentile (Y4)	Significance
Pictorial Comprehension	IG	4	8	50%	≈ P25	average
Inferential Comprehension	IF	4	9	44%	≈ P25	Below average
Total Score	CL	8	17	47%	≈ P25	Below average

Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

Amine's total CL score of 8/17 (47%) places him at approximately the 25th percentile. Both comprehension strategies - pictorial (IG: 4/8) and inferential (IF: 4/9) - are equally affected. Although this score does not fall below the 10th percentile, it signals a functionally significant difficulty with reading comprehension that warrants clinical attention alongside the primary reading and spelling deficits.

4.2.2 Qualitative analysis

Performance reveals difficulty at both levels of comprehension. At the level of pictorial comprehension (IG: 4/8), this difficulty indicates that Amine's weak decoding automaticity consumes cognitive resources at the expense of meaning construction (the decoding-comprehension trade-off). Inferential comprehension (IF: 4/9) additionally requires processing beyond the literal text and drawing implicit relational inferences. Boumaraf et al. (2021) noted that pupils showing difficulty with the IG strategy occupy a zone of genuine risk requiring in-depth follow-up - all the more so for those experiencing difficulty with both strategies simultaneously.

4.3 Abstract Problem Solving (RP)

Amine obtained 6/16 (Pe: 3/5; An: 3/11), equivalent to approximately the 50th percentile within the normal range for Grade 4 norms. This result is diagnostically important: Amine's reading and writing difficulties cannot be attributed to a deficit in underlying intelligence or non-verbal perceptual abilities. This dissociation between normal general cognitive competence and clear failure in written language skills is strongly consistent with the diagnostic profile of developmental dyslexia as described in DSM-5 criteria (American Psychiatric Association, 2013), and warrants further in-depth assessment for confirmation.

Table 4: Amine's Performance on Abstract Problem Solving (RP).

Subtest	Code	Score	Max	Accuracy %	Percentile (Y4)	Significance
Perceptual Reasoning (Pe)	Pe	3	5	60%	≈ P50	Average
Analogical Reasoning (An)	An	3	11	27%	≈ P50	Average
Total RP	RP	6	16	38%	≈ P50	Within normal limits

Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

4.4 Handwriting (G)

Amine obtained 31/60 (Inhibition F: 18/30; Directionality D: 13/30), corresponding to approximately the 50th percentile within the normal range for Grade 4. This result demonstrates intact fine motor skills, excluding the possibility of attributing the spelling difficulties to a deficit in manual control. This represents a fundamental distinction between dysorthographia and motor dysgraphia, the latter requiring - as Thichanpiang et al. (2022) clarified - specialised instruments such as the HPSQ to analyse the dimensions of legibility and emotional well-being associated with handwriting.

Table 5: Amine's Performance on Handwriting (G)

Subtest	Code	Score	Max	Accuracy %	Percentile (Y4)	Significance
Inhibition	F	18	30	60%	≈ P50	Average
Directionality	D	13	30	43%	≈ P50	Average
Total Handwriting (G)	G	31	60	52%	≈ P50	Within normal limits

Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

4.5 Written Word Completion (CME)

4.5.1 Quantitative results.

This subtest constitutes the most diagnostically revealing component in this case. Amine obtained 24/60, which falls below the 10th percentile relative to Grade 4 norms (Boumaraf et al., 2021).

Table 6: Amine's Performance on the Written Word Completion Subtest (CME) by Orthographic Ambiguity Level

Word Type	Amine's Score	Max Score	Accuracy %	10th Percentile (Y4)	Significance
Simple words (no ambiguity)	8	14	57%	< 4	Below average
Ambiguous words – Level 1	14	35	40%	< 19	Very poor

Ambiguous words – Level 2	2	11	18%	< 6	Very poor
Total Score (CME)	24	60	40%	< 35	< 10th percentile

Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

Amine's CME total of 24/60 falls below the 10th percentile (threshold: 35). The most severe deficit appears on Level 2 ambiguous words (2/11), where correct spelling requires both phonological syllabic awareness and stable orthographic representations. Level 1 ambiguous words (14/35) also show marked difficulty, reflecting weak lexical storage of words involving hamza and phonetically similar letters. Only simple words approach a borderline performance (8/14).

4.5.2 Error pattern analysis

The errors produced reveal diagnostically significant patterns that enable a precise characterisation of the nature of the deficit, directly linked to the orthographic specificities of Arabic that informed the adaptation process:

- **Errors on simple words:** For example, anf → anfun(أنف ← أنفن) and maktab → maktabū (مكتبو ← مكتب) phonological additions reflecting a deficit in the phonological assembly process, whereby the child produces a written form reflecting an incomplete or distorted internal phonological representation rather than a stored orthographic representation. These errors fall within the category of phonological errors indicative of dysfunction in phoneme-to-grapheme conversion - a hallmark of phonological dysorthographia according to Boder's (1973) classification.
- **Errors on Level 1 ambiguous words:** For example, bi'r → bā'ir(بئر ← بائر) (substituting the medial hamza with a long alif) and miqaṣṣ → miqas (مقص ← مقص) (substituting ṣād with sīn) - reflecting the absence of precise orthographic representations for the various hamza forms and phonetically similar letters, which Fayol and Jaffré (2008) termed 'activated orthographic ambiguity'. It is noteworthy that the CME subtest of the ECSIII-A was specifically designed to elicit this type of error, which is sensitive to the orthographic structure of Arabic.
- **Errors on Level 2 ambiguous words:** For example, tuffāḥa → tufḥa(تفاحة ← تفحة), zarāfa → zarfa(زرافة ← زرافة), farāsha → farsha(فرشة ← فراشة) - omission of the medial long vowel in internal syllables. "These errors show an omission of the long vowel in internal syllables, which may indicate difficulties in phonological syllabic awareness as well as in the orthographic representation of words. However, this interpretation remains preliminary and requires confirmation through a more comprehensive assessment.

4.6 Number and Arithmetic (NA)

4.6.1 Numerical transcoding (TC)

Table 7: Amine's Numerical Transcoding Scores: Production vs. Recognition (TC)

Subtest	Score	Max	Accuracy %	Percentile (Y4)	Significance
Transcoding - Production (TcP)	15	15	100%	> P90	Excellent
Transcoding - Recognition (TcR)	5	15	33%	≈ P25	Below average

Total Transcoding (TC)	20	30	67%	≈ P50	Acceptable
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Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

The dissociation between production (TcP: 15/15) and recognition (TcR: 5/15) warrants careful analysis. Amine correctly writes dictated numbers but is unable to identify a written numeral from among four alternatives. This is interpreted as evidence that recognition distractors introduce confusion requiring more precise processing of numerical representations - a difficulty intersecting with his general challenges in discriminating between visually similar representations in reading tasks. It should be noted that this numerical transcoding performance remains within the normal range for Grade 4 norms, excluding a diagnosis of dyscalculia and reinforcing the clinical profile within the domain of dyslexia and dysorthographia.

4.6.2 Missing operations and problem solving.

Table 8: Amine's Performance on Arithmetic Operations and Problem Solving (NA).

Subtest	Score	Max	Accuracy %	Percentile (Y4)	Significance
Missing Operations (OP)	0	11	0%	< P10	Failure
Problem Solving (PA)	5	9	56%	≈ P90	Within normal limits
Total NA	6	20	30%	≈ P75	Within normal limits

Note. Scores compared against Grade 4 norms from Boumaraf et al. (2021).

The failure on missing operations (OP: 0/11), contrasting with good performance on problem comprehension (PA: 5/9), points to a weakness at the level of executive functions involved in processing arithmetic operations, rather than a deficit in core mathematical skills. In this regard, Khomsi (1998) noted that performance on this component is closely related to the degree of school practice with this type of exercise. Importantly, the overall total (NA: 75th percentile) falls within normal limits, confirming the integrity of Amine's arithmetic competencies and ruling out the presence of dyscalculia.

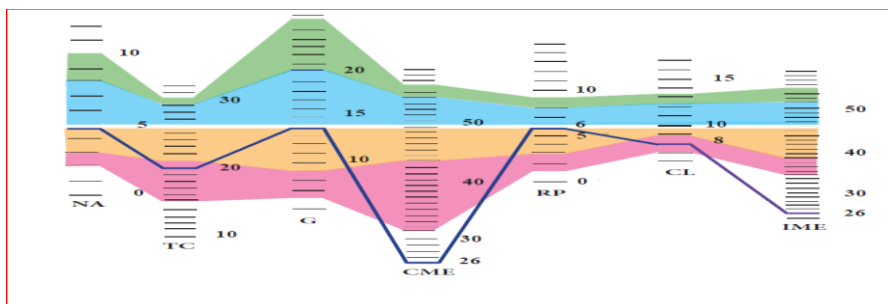


Figure 1 presents Amine's performance profile across all six ECSIII-A subtests in graphical form.

The figure presents Amine's performance profile across the six ECSIII-A subtests. The results reveal a clear intra-individual variability, characterized by a marked dissociation between reading and writing domains on the one hand, and preserved cognitive domains on the other. Performances in IME and CME are significantly below the 10th percentile, indicating substantial difficulties in reading and writing components relative to normative standards. In contrast, RP and G scores are situated

around the mean (approximately the 50th percentile), while NA exceeds the 75th percentile, reflecting preserved abilities in this domain.

This pattern is consistent with what is described in the clinical literature as a dissociated profile, reflecting uneven development of reading-related processes. Such profiles are observed in developmental learning disorders, including dyslexia, although they are not sufficient in themselves for diagnostic conclusion. The CL score at the 25th percentile may suggest reduced reading efficiency, potentially affecting the allocation of cognitive resources during meaning construction, particularly under increased processing demands.

5. Discussion

5.1 A Coherent Clinical Profile: Identifying Dyslexia and Dysorthographia

The overall results yield a coherent clinical picture. Amine's scores on IME and CME both fall below the 10th percentile, while his cognitive reasoning (RP: 50th percentile), handwriting (G: 50th percentile), and arithmetic (NA: 75th percentile) remain fully within normal limits. This clear dissociation - impaired written language skills with all other abilities intact - represents a predictive indicator of potential difficulties associated with dyslexia and dysorthographia, without constituting a definitive diagnosis at this stage.

The absence of dyscalculia indicators further narrows the clinical picture specifically to reading and writing disorders. Taken together, these findings strongly recommend referring this case for a comprehensive in-depth evaluation using standardized diagnostic tools specifically designed to assess dyslexia and dysorthographia in Arabic-speaking children, in order to confirm or rule out the presence of these specific learning difficulties.

5.2 Error Pattern Analysis in Light of the Dual-Route Model

5.2.1 Phonological route deficit.

The HP score on IME (1/10) demonstrates a severe weakness in discriminating between orthographically identical phonological forms. Similarly, the CME error patterns - omission of long vowel letters (e.g., zarāfa → zarfa) (زرافة ← زرفة), substitution of šād (ص) with sīn (س) (e.g., miqaṣṣ → miqas) (مقص ← مقس) - reflect dysfunction in phonological awareness at both syllabic and phonemic levels. These patterns are consistent with Share's (1995) self-teaching hypothesis: because Amine cannot reliably apply the phonological route to decode novel words, he is unable to build up stored orthographic representations through reading experience, creating a compounding deficit across both routes.

5.2.2 Lexical route deficit and weak orthographic representations.

The total failure on diacritical distractors (HT: 0/10) indicates that Amine has not developed stable orthographic representations encompassing the diacritical dimension of Arabic words. This interpretation is further reinforced by the CME error patterns involving omission of long vowels and misrepresentation of the hamza, all of which reflect a poverty of the orthographic-lexical store as classified by Fayol and Jaffré (2008).

5.3 Effectiveness of the ECSIII-A and its Significance in Speech-Language Diagnosis

This case illustrates the diagnostic value of the ECSIII-A across several dimensions.

Early detection: Within approximately ninety minutes, the ECSIII-A produced a clinical profile strongly consistent with a complex written language disorder in a child who had gone undiagnosed despite years of difficulty. This supports Snowling's (2000) argument that early identification is a prerequisite for effective intervention.

Diagnostic depth: The test goes beyond classifying a child as “at risk” or “within normal limits.” The combined interpretation of HP, HT, and CME scores allowed the clinician to localise the deficit to specific processing routes- something global screening or classroom observation cannot achieve.

Differential diagnosis: Systematic comparison across the six subtests supported the exclusion of dyscalculia, motor dysgraphia, and intellectual disability, giving coherence to the clinical picture.

Linguistic-cultural suitability: The diacritical distractors (HT) in IME and the three-level ambiguity classification in CME are exclusive to the Arabic adaptation. These features capture orthographic phenomena specific to Arabic that imported tools cannot detect. The inclusion of Algerian normative tables further provides a national reference framework absent from most Arabic-language assessment tools. These characteristics align with cross-cultural adaptation standards outlined by Beaton et al. (2000) and applied by Thichanpiang et al. (2022).

5.4 Limitations of the Study

It should be noted that this study has certain limitations. First, it is based on a single case, which limits the generalisability of the findings to other Arabic-speaking children with written language disorders. Second, the ECSIII-A is a screening tool rather than a diagnostic instrument; therefore, the results should be interpreted as preliminary indicators that require confirmation through more comprehensive diagnostic assessments.

6. Recommendations

6.1 Diagnostic Level

The study recommends conducting an in-depth assessment encompassing the following:

- Comprehensive phonological awareness batteries at all levels (syllabic, rhyme, and phonemic awareness), adapted for Algerian Arabic.
- Oral reading assessments using single words (regular, irregular, and pseudowords) to precisely differentiate the level of impairment between the two routes according to the cognitive model (Coltheart et al., 2001).
- Phonological short-term memory assessments, given their established role as a core cognitive component in contemporary reading models (Morais, 1994).
- Independent and detailed assessment of diacritical processing in reading and writing, given its central role in Arabic dyslexia.
- Assessment of morphological processing, given its centrality in Arabic word structure and its impact on lexical recognition.

6.2 Speech-Language Intervention

- Systematic development of phonological awareness at the syllabic and phonemic levels in Modern Standard Arabic. Given Amine's consistent omission of long vowels in internal syllables (e.g., zarāfa → zarfa; tuffāḥa → tufḥa), intervention should specifically target syllabic segmentation tasks and the auditory-orthographic mapping of long vowel letters (alif, wāw, yā').
- Reinforcing mastery of Arabic-specific phonological–orthographic correspondences: hamza configurations, long vowel letters, the bound feminine marker, and phonetically similar letters. Given Amine's errors on Level 1 ambiguous words (e.g., bi'r → bā'ir; miqāṣ → miqas), intervention should include structured drills contrasting phonetically similar letter pairs (ṣād/sīn, ḍād/dāl) and the various positional forms of the hamza.
- Building the orthographic-lexical store through structured repetition techniques and visual-orthographic practice procedures, in accordance with Share's (1995) self-teaching principles.

- Explicit work on distinguishing between Modern Standard Arabic and the colloquial variety at the written level, to counteract the cross-linguistic interference effects documented by Saiegh-Haddad (2003).
- Engaging the family and school in developing supportive adaptive strategies within the learning environment, while addressing the anxiety associated with writing difficulties.

6.3 Research Level

It is recommended that the ECSIII-A be more widely employed in field research on learning difficulties in Algerian schools, and that complementary diagnostic batteries covering phonological awareness and morphological processing in greater detail be developed. Extension of normative data to Algerian regions outside the capital is also recommended, as is a systematic longitudinal investigation of the effects of diglossia (Modern Standard Arabic/colloquial) on the trajectory of spelling acquisition.

7. Conclusion

This study has demonstrated the value of the ECSIII-A as a screening instrument suited to the Algerian clinical context. Analysis of Amine's profile (Grade 4, aged 9 years) produced findings strongly consistent with a written language disorder combining dyslexia and dysorthographia, in the absence of cognitive, motor, or arithmetic impairment. Dyscalculia was not indicated. These conclusions are screening-level; a formal diagnosis requires comprehensive multidisciplinary evaluation. Qualitative error analysis pointed to dysfunction in both reading routes (Coltheart et al., 2001), with a more pronounced deficit in the phonological route and in the diacritical orthographic representations specific to Arabic.

The case highlighted the methodological importance of the diacritical distractors (HT) in the IME subtest and the three-level orthographic ambiguity classification in the CME subtest - both exclusive features of the Arabic-adapted version, responsive to the orthographic specificities of the Arabic language. The psychometric properties of the instrument demonstrated acceptable validity and reliability, qualifying it for field clinical use in speech-language pathology.

Early detection of these disorders - achieved in this case in approximately ninety minutes of standardised test administration - is a necessary condition for the success of speech-language intervention and for averting the accumulation of academic failure and its psychological and social sequelae, as documented by Snowling (2000) and others. This study calls for the broader deployment of culturally adapted Arabic standardised tools in Algerian speech-language pathology practice.

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