



People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
University of Saida, Dr Moulay Tahar
Faculty of Letters, Languages and Arts
Department of English Language and Literature



**Investigating the Impact of Bilingualism on the Cognitive and
Linguistic Development of Middle School Students with
Developmental Language Disorder: A Case Study in Saida,**

A thesis submitted as partial fulfilment of the requirements for the degree of *Master's* in Didactics.

Presented by:

Miss. K NADRI

Supervised by:

Dr. H HICHOIR

Board of Examiners

Dr. A. ZEMRI	(MCA) Chairperson	University of Saida
Dr. H. HICHOIR	(MCA) Supervisor	University of Saida
Dr. K. Belasakri	(MCA) Examiner	University of Saida

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Declaration of Originality

I hereby declare that this submission is my work and that it contains no material previously published or written by another person nor material that has been accepted for the qualification of any other degree or diploma of a university or other institution.

Date:

Name:

Signature:.....

Dedication

I dedicate this thesis to my family and friends for their encouragement and support,
and to my cats Luna and Lily for their companionship.

I also dedicate it to my grandparents, who passed away in recent months, and remain
deeply missed.

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My thanks go to my supervisor, Dr Hadjira Hichour, for her help in completing this research work.

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ABSTRACT

Developmental language disorder (DLD) is a persistent neurodevelopmental condition that influences language acquisition and academic trajectory. It is particularly challenging in a multilingual context such as the Algerian educational environment, in which students navigate multiple languages across educational and social settings. This additional demand imposes a further strain on students with Developmental Language Disorder, a population that already lacks a reliable body of research. This study investigated the impact of bilingualism on the linguistic and cognitive development of middle school students with DLD within Algerian public schools. Using a sequential explanatory mixed method design, this study combined quantitative assessments and qualitative classroom observation. A purposive sample that includes 18 students from two public middle schools in Saida, Algeria, was selected. This sample was categorised into limited, emerging, and balanced bilingual groups. The findings of the present study demonstrated that all linguistic and cognitive domains were impaired, with morphology and syntax emerging as the most impaired in linguistic domains, while higher-order cognitive functions were the most severely impaired domains. Balanced bilinguals frequently outperformed other bilinguals, except for some specific domains. Classroom observation findings supported the quantitative findings that emphasised the limitations that did not appear under controlled testing conditions. The findings concluded that variation in performance may be related to bilingual proficiency, but the influence is not uniform across all domains. These findings highlighted a need for specialised standard assessment practices and strengthened support for early identification and intervention within the Algerian educational system.

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LIST OF ACRONYMS

ANS Approximate Number System

ASJP Algerian Scientific Journal Platform

ASHA American Speech-Language-Hearing Association

BESA Bilingual English-Spanish Assessment

CATALISE Criteria and Terminology Applied to Language Impairments: Synthesising the Evidence

CUP Common Underlying Proficiency

DLD Developmental Language Disorder

EF Executive Functioning

EFL English as a Foreign Language

IQ Intelligence Quotient

LPM Letters Per Minute

NEPSY-II Developmental Neuropsychological Assessment (Second Edition)

NIDCD National Institute on Deafness and Other Communication Disorders

SLI Specific Language Impairment

TDL Trouble Développementale du Langage

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General Introduction

Linguistic diversity has become a defining feature of contemporary educational systems worldwide, with a prominent proportion of students receiving instruction in a language other than their native language. Algeria represents a uniquely complex multilingual educational system, where students interact with standard Arabic as the language of instruction, French and English as foreign subjects taught at all levels. This linguistic diversity places a considerable demand on the linguistic and cognitive systems of learners.

Language learning, either in monolingual or multilingual backgrounds, places a substantial importance on various linguistic and cognitive systems. At the linguistic level, it requires learners to develop phonological representations, acquire morphological and syntactic structures, build a semantically organised mental lexicon, and acquire functional competence in pragmatic language use. At the cognitive level language learning relies heavily on working memory, which allows the temporary storage and manipulation of linguistic information, processing speed which determines the efficiency of a decoding and encoding phonological and lexical information, it also requires sustained attention which enables following extended discourse and completing tasks depend on language, language learning also rely on executive functions including cognitive flexibility and inhibitory control, and updating which responsible for regulating the management of competing cognitive and linguistic demands (Baddeley, 2003a; Diamond, 2013).

The demands are specifically more important within middle school years, a developmental stage during which the educational academic context shifts substantially in complexity and abstraction. Students are required to interact with explicit academic language across different subjects, to demonstrate higher-order cognition such as critical thinking and inference analysis, and produce extended written discourse (Cummins, 1979; 2000).

The complication of navigating a multi-lingual environment relies on the interaction and cooperation of the linguistic and cognitive systems. For a certain group of students, the linguistic and cognitive mechanisms that enable language learning do not develop as expected, an example of that would be students with Developmental Language Disorder (DLD), which is defined by emergence in childhood, where language difficulties are prominent and persistent, and it's not explained by other Biomedical conditions such as intellectual disabilities, hearing impairment or neurological damage. (Bishop et al., 2017). The most obvious markers are difficulties in using words and sentences to express meanings, but for many children, understanding of Receptive Language is also a challenge. This may not be evident unless the child is given a formal assessment.

The relationship between Bilingualism and Language development Disorder has been a serious subject among scholars for decades. Early perspectives stated bilingualism as a risk factor for language delay; contemporary research has contradicted this view, demonstrating that bilingualism does not cause language disorders, but in certain cognitive domains, confers advantages related to executive functioning (Bialystok, 2011; Cummins, 1979). The specific relationship between bilingualism and DLD remains lacking and unexplored, particularly in populations where exposure to multiple languages occurs within formal educational systems.

For Students with Developmental Language Disorder (DLD) who live in a multilingual environment, these demands can be even more difficult to combine with the challenge of using more than one language. Therefore, understanding how bilingualism affects the language and cognitive abilities of these students is important for creating effective educational and clinical support. The unique challenges that face students with DLD in the Algerian educational environment remain largely unexplored. The intersection of the underlying cognitive and linguistic vulnerabilities with the constant demands of the educational system presents a critical area of inquiry. Addressing this gap is important not only for advancing theoretical understanding of DLD but also for developing targeted pedagogical strategies.

Consequently, understanding how bilingualism shapes the linguistic and cognitive development of middle school students with DLD in this context represents both a theoretical gap and a matter of urgency for the Algerian educational system.

The main aim of this study is to investigate how bilingualism can affect the linguistic and cognitive development of middle school students presenting high risks of Developmental Language Disorder (DLD) in Algerian public schools. The study also seeks to provide a clearer understanding of how a multilingual environment may influence the development of these students. To achieve this aim, the study focuses on several objectives:

1. To investigate how bilingualism influences the specific linguistic skills of middle school students with DLD. to assess the impact of bilingualism on cognitive abilities in the same group of students with DLD.
2. To determine which linguistic and cognitive skills are most affected by bilingualism among students with Developmental Language Disorder, identifying which specific areas are the most impaired or preserved across the participants.
3. To explore how different types of bilingual profiles moderate linguistic and cognitive outcomes.
4. To triangulate findings and produce better identification, assessment, and educational support for students with Developmental Language Disorder in bilingual educational settings.

Guided by the objectives outlined above, this present study is framed around two main research questions and two sub-questions:

1. What is the impact of bilingualism on the linguistic domains, specifically morphology, syntax, phonology, and semantics, of middle school students with Developmental Language Disorder?
Research Question.

2. What is the impact of bilingualism on the cognitive skills, specifically working memory, processing speed, attention, executive functioning, critical thinking, and problem-solving of middle school students with Developmental Language Disorder?

From these questions, two sub-questions emerged:

1. Which linguistic and cognitive skills are most and least affected in middle school students with DLD?
2. How does the bilingual profile moderate linguistic and cognitive outcomes in middle school students with DLD?

In response to the research questions stated above, the following hypotheses and sub-hypotheses are proposed. Each addresses the research questions and sub-questions and is grounded in existing theoretical frameworks and empirical evidence on DLD and bilingualism.

1. Bilingual Middle school students with DLD will demonstrate measurable difficulties across all four linguistic domains assessed, with greater difficulties with complex structural processing.
2. Bilingual Middle school students with DLD will showcase measurable deficits across all cognitive domains assessed, with higher-order domains demonstrating severe impairment.

Sub-Hypothesis for sub-questions are:

1. The impact on linguistic and cognitive domains assessed will not be uniform, resulting in various levels of severity, with complex demanding structures and higher-order cognitive skills being most impacted.
2. Bilingual profiling moderates cognitive and linguistic outcomes within students with DLD; students with higher proficiency will outperform those with limited bilingual profiles.

Despite the growing body of literature around the relationship between bilingualism and language impairment, limited empirical attention has been given towards

multilingual North African contexts, particularly within the Algerian education system. Consequently, this study holds a theoretical, educational, and methodological significance in addressing these gaps within the research community.

From a theoretical perspective, this study contributes to the ongoing efforts investigating the interaction between bilingualism and language developmental disorder, since existing theoretical frames have been primarily conducted in Western monolingual or bilingual populations. Therefore, this research contributes to preliminary evidence that may support future efforts toward this topic.

The study also carries educational and clinical significance. By identifying which linguistic and cognitive domains are severely impacted among bilingual students, the study may contribute to improving early identification and intervention processes, promoting a more informal education system.

Finally, the study carries a societal importance by addressing an underrecognized developmental and educational issue within the Algerian context. Consequently, this research contributes to normalising the perception of language disorders and the importance of clinical and educational support.

This addresses the research questions, hypotheses and aims. This thesis is organised into three main chapters. The first chapter provides a comprehensive literature review related to the cognitive frameworks, developmental language disorders, and bilingualism. The second chapter outlines the methodology used to conduct this study, describing the mixed-methods research design, participant criteria, and the specific instruments used. Finally, the third chapter presents the findings, discussion, concluding pedagogical implications, study limitations, and recommendations for future research.

Chapter One

Literature Review

1.1 Introduction

This chapter presents the contextual foundations and theoretical frameworks regarding the underlying study on bilingualism and Developmental language disorder (DLD) within the Algerian educational setting. The chapter contains the literature review; it examines major theoretical perspectives on bilingualism, cognitive development, and Developmental Language Disorder, including Cummins's Threshold Hypothesis, the Interdependence Hypothesis, the Bilingual Advantage Hypothesis, and models of dual language activation and cognitive load. In addition, it reviews linguistic and cognitive characteristics of DLD, diagnostic obstacles with multilingual populations, and existing research involving Arabic-speaking participants.

Overall, this chapter establishes the theoretical and empirical framework necessary for investigating how bilingualism impacts the linguistic and cognitive development of Algerian middle school students with Developmental Language Disorder.

1.2 Definition of bilingualism

The concept of bilingualism has surpassed a single, universally accepted definition. Mainly because it incorporates a wide range of linguistic competencies, early definitions tended to adopt a maximalist view, requiring near-native fluency in both languages. Bloomfield (1933) explained bilingualism as the "native like control of two languages", a standard that set a very strict benchmark for bilingualism, which meant most people who spoke more than one language did not qualify as bilinguals. This view has since been substantially challenged and replaced by more flexible ways of understanding what it means to be bilingual.

Haugen (1953) moved from a strict native-like idea, arguing that bilingualism begins when a speaker can produce complete and meaningful utterances in a language other than their own, shifting the focus from absolute fluency to communicative functionality. This view laid the groundwork for more socially focused views. Grosjean (1982, 2010) broadened this further by proposing that bilinguals are not just two monolinguals in one person; instead, he explained that bilinguals have a unique, integrated linguistic system. Emphasising that their abilities cannot just be broken down into two separate parts.

A more recent framework acknowledged that bilingual skills are flexible and depend on the situation. Mackey (1968) proposed that bilingualism must be understood across multiple dimensions: the level of use, function, pattern of switching, and cross-language influence. Recognising that the nature of bilingualism differs depending on both social settings and individuals. Correspondingly, Wei (2000) emphasised the need to separate societal bilingualism and individual bilingualism because the use of two languages within a group is not the same as the linguistic capacity of a single individual. An important distinction that impacts the design of language assessments, educational policies, and clinical evaluations.

In applied linguistics and speech-language pathology, definitions of bilingualism have been operationalised to account for clinical realities. The American Speech-Language-Hearing Association (n.d) describes bilingualism in practice as a functional concept; individuals who use two or more languages or dialects in real life are considered bilinguals. As it focuses on language use, not idealised fluency.

Crucially for this study, the Algerian community requires a detailed definition of bilingualism. The Algerian student navigates Arabic (Modern Standard Arabic and Algerian Dialectal Arabic), Tamazight (Berber), French, and increasingly English, all within varying communicative domains. This reality places many Algerians students within what is referred to as multilingualism rather than strict bilingualism. Though this distinction is mostly about degree. For the purposes of this study, bilingualism is understood in its broad functional sense: the use of two or more languages in various educational settings regardless of formal proficiency levels.

1.2.1 Types of bilingualism

The literature offers various ways of classifying bilinguals, each focusing on a different dimension of the bilingual concept. Understanding these types is crucial for the present study, as they directly influence how language develops, how disorders manifest, and how assessment must be designed.

One of the most widely used classifications is based on age of acquisition. Simultaneous bilingualism refers to the acquisition of two languages from birth or

before the age of two, most commonly in homes where both languages are present consistently (De Houwer, 1990).

In contrast, Sequential bilingualism occurs when a person acquires their language, and only after the foundation is set, they begin to acquire the second language. McLaughlin (1984) placed age three as the threshold for Sequential bilingualism; after this point, any additional language is considered sequentially acquired. This distinction is crucial in clinical settings, as sequential bilinguals may show patterns that can be mistaken for language impairment when, in fact, they are a normal developmental trajectory.

Another way to classify bilinguals is by cognitive representation. Weinreich (1953) proposed three types according to how bilinguals organise their two languages mentally: Compound bilinguals who develop both languages in the same shared environment and share one conceptual system, Coordinate bilinguals who, in different concepts, form two separate conceptual and linguistic systems, and Subordinate bilinguals who access their second language through the first one. Although this framework has been refined since it was introduced, it still remains influential for understanding how bilinguals store and retrieve lexical information.

Social context is another key category that distinguishes between bilinguals. Valdés and Figueroa (1994) highlighted two types of elective bilinguals, who learn a second language in informal academic settings, and circumstantial bilinguals who acquire an additional language out of social or economic necessity. Algerian students fit into the elective bilingual category, as they begin learning their second language as part of formal schooling

Lambert (1955) introduced the concept of balanced bilinguals, which describes individuals who demonstrate comparable competence across both languages. However, truly balanced bilingualism is rare; most bilinguals lean into one language more than the other due to differences in exposure, frequency of use and language of instruction. In contrast to balanced bilinguals, Limited bilingualism, as explained by Cummins (1976), refers to individuals who have not yet reached a functional proficiency in either

language. Cummins argued that if individuals do not reach a critical proficiency threshold in both languages, they may face negative cognitive and academic consequences. This insight has direct implications for DLD, whose language learning deficiencies may prevent them from reaching functional thresholds in either language. In addition, the concept of emerging bilinguals was introduced by García (2008), who described bilinguals as learners still in the process of developing their second language. Their growth is simultaneous in both languages, but it is not yet proficient. These frameworks are essential for analysing the language trajectories of the participants in this study.

1.2.2 Theoretical Perspectives on Bilingual Language Development

Understanding how bilingualism interacts with language and cognitive development requires several theoretical frameworks that attempt to account for the relationship between language proficiency, cognition, and academic performance. These frameworks are particularly relevant to investigating the impact of bilingualism on cognitive and linguistic development because they provide a conceptual foundation for understanding how different types of bilingualism may influence linguistic and cognitive outcomes of bilingual students with Developmental Language Disorder (DLD).

Cummins's Threshold Hypothesis

The threshold hypothesis is one of the most influential theories in bilingual education and cognitive development. Jim Cummins (1976) proposed that bilingual individuals need to have a certain level of competence in both languages to attain the potential cognitive benefits that come along with bilingualism. Cummins suggested the existence of two linguistic thresholds; according to this concept, children who fail to meet the adequate proficiency in either language may experience a negative impact on cognitive and academic domains. whereas children who reach higher levels of

competence may experience advantages, especially in areas related to metalinguistic awareness and executive functioning.



Adapted from Cummins (1976, 1979) — Threshold Hypothesis

Figure 1. 1: The threshold hypotheses

This hypothesis is particularly relevant to this study because it offers a theoretical groundwork for possible differences among balanced, emerging and limited bilinguals. Students with a stronger bilingual profile may demonstrate higher linguistic and cognitive outcomes, while students with weaker bilingual proficiency may showcase deficiencies in communicative and academic settings. Although the hypotheses have been highly influential, later scholars have claimed that bilingual development is

influenced not only by linguistic proficiency but also by social, educational, and environmental factors.

Cummins's Interdependence Hypothesis

Jim Cummins (1979) further developed bilingual development theory through the Interdependence Hypothesis, also referred to as the Common Underlying Proficiency (CUP) model. This hypothesis argues that both languages share a Common Underlying Proficiency, which allows literacy and cognitive skills transfer from the first language to the second one.

Cummins (1981) later demonstrated this relationship through the “Dual Iceberg “. According to this framework, in the visible surface, each language appears to be separated much like two separated icebergs. However, beneath the surface, they emerge into one shared foundation. Consequently, cognitive and academic skills developed in one language may support performance in another language. Figure 1.2 showcases the dual iceberg framework.

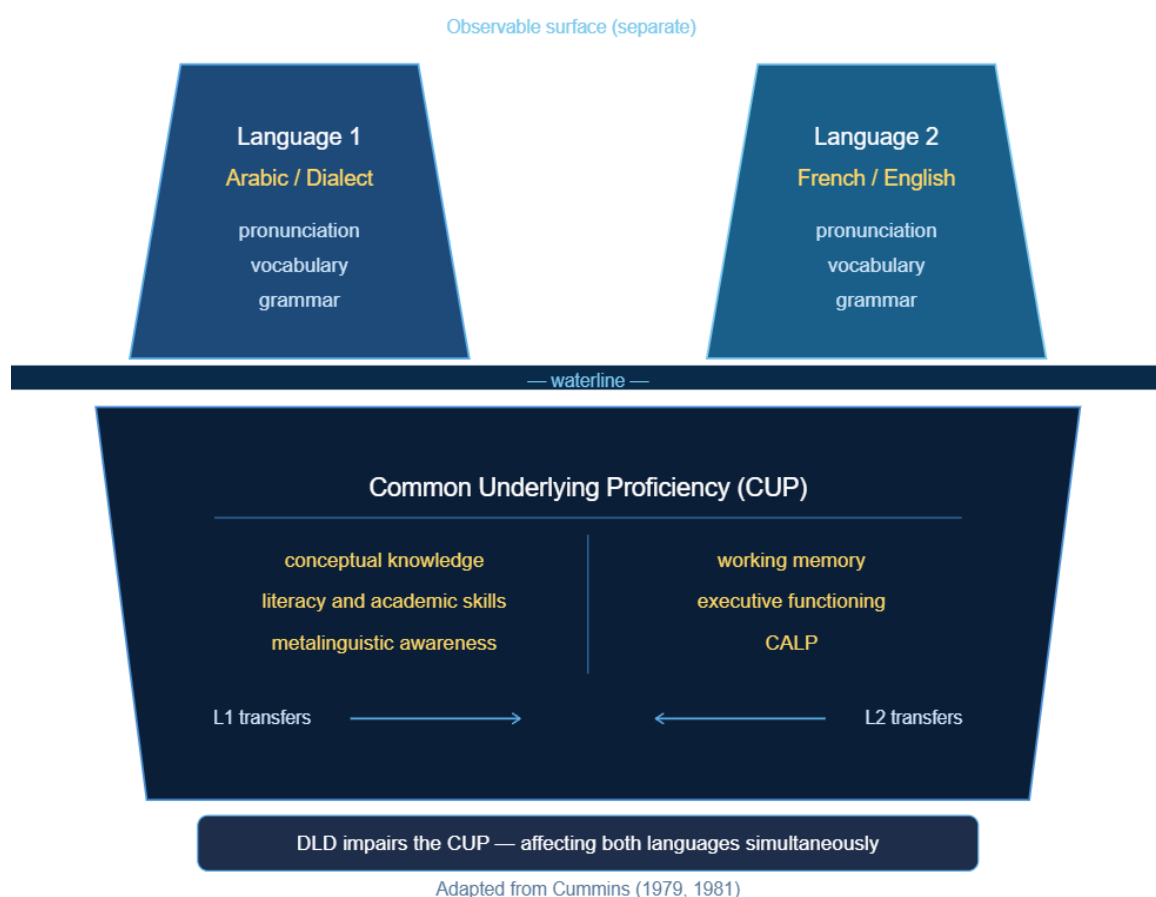


Figure 1. 2: Cummins's Interdependence Hypothesis

This framework suggests that strong development in the first language facilitates the acquisition of additional languages. Whereas, weaknesses in the first language may negatively impact second language development. This perspective is highly significant for research involving bilingual children with developmental language disorder because language impairment affecting first language acquisition may also cause a deficit in second language development. Therefore, this hypothesis challenges the assumption that bilingualism causes language delay; instead, it focuses on the underlying linguistic competence across both languages. Although this hypothesis has been highly influential in psycholinguistics, some researchers emphasise that language transfer is also shaped by sociocultural and educational factors.

The Bilingual Advantage Hypothesis

The bilingual Advantage Hypothesis is strongly associated with Ellen Bialystok (2001). It suggests that two linguistic systems may enhance certain cognitive abilities such as task shifting, flexibility, inhibitory control, working memory, abstract thinking and problem solving. This framework proposes that the co-activation of two languages in the brain gives the brain a constant “mental workout “resulting in strengthened executive control mechanisms over time.

Several studies have further supported this framework, claiming that bilinguals constantly engage in the process of suppressing one language while activating another; this regulation may contribute to better mental flexibility and metalinguistic awareness.

However, the Bilingual Advantage Hypothesis remains highly debated within the research community. Other researchers failed to replicate findings that prove this bilingual advantage; for example, Kenneth Paap et al. (2014) argue that evidence supporting the bilingual advantage hypothesis remains inconsistent across different tasks and populations. Similarly, De Bruin et al. (2015) suggested that the widespread off positive findings supporting bilingual advantage compared to studies reporting contradictory findings was due to publication bias. These criticisms have led many researchers to adopt a more cautious interpretation of the hypothesis.

The debate surrounding the bilingual advantage hypothesis is relevant to the present study because it suggests that bilingualism may influence cognitive development differently. However, this study does not assume that bilingualism automatically results in cognitive advantages; it investigates whether bilingualism impacts the linguistic and cognitive performance of students with developmental language disorder.

Dual Language Activation and Cognitive Load

Kroll and Stewart (1994) proposed that bilingual processing requires both languages to remain active simultaneously, even when only one language is being used. It suggests that bilingual lexical processing includes the continuous interaction between the two-language system. Therefore, during language comprehension and production, bilinguals constantly manage activation across both languages.

This simultaneous interaction requires the use of cognitive control mechanisms to regulate interference between competing systems. David W. Green (1998) introduced the Inhibitory Control Model, which argues that bilinguals are required to suppress the non-target language and select the intended one. This process relies heavily on executive functions. Consequently, bilinguals' processing is viewed not just as the use of separate languages, but as an ongoing process of cognitive management and linguistic regulation.

It is suggested that this dual activation enhances executive control abilities. However, other scholars suggest that maintaining two active systems may also result in increased cognitive and processing demands, especially in tasks involving rapid lexical access, attention shifting, and verbal working memory. These conflicting ideas indicate that the cognitive effects of bilingualism may differ depending on factors such as proficiency, frequency of use, and individual differences.

This framework is relevant to the present study regarding students with Developmental Language Disorder because these students may already experience difficulties related to language processing, working memory, and executive functioning. The overlapping cognitive demands related to managing multiple linguistic systems may impact students with DLD differently depending on their level of bilingual proficiency. Consequently, these dual language activation hypotheses provide an important insight for understanding the interaction between bilingualism, cognition and language impairment.

1.3 Developmental Language Disorder

1.3.1 Definitions and Terminology of Developmental Language Disorder

Developmental language disorder (DLD), according to the National Institute on Deafness and Other Communication Disorders (NIDCD, 2021), is a communication disorder that influences the acquisition, comprehension, and production of language. These deficiencies cannot be explained by hearing impairment, autism spectrum disorder, neurological damage, or limited exposure to language. DLD may impact speaking, listening, reading and writing abilities as well. Approximately 1 in 4 children in kindergarten are affected by DLD, and it often continues into adolescence and adulthood.

For much of the late twentieth century, the most used term within clinical and research literature was Specific Language Impairment (SLI), which is defined as the significant deficits in language development independent of non-verbal IQ or sensory impairments (Leonard,1998). The term was intended to indicate that the impairment impacts language independently of cognitive or developmental difficulties. Laurence B. Leonard (2014) provided one of the most significant findings of SLI, documenting its cognitive and linguistic neurodevelopmental characteristics within different languages and establishing it as a clinically recognised diagnostic category.

Over time, the term SLI became particularly controversial as research demonstrated that many children diagnosed with SLI also showcased deficits within working memory, processing speed, attention, and executive functioning (Bishop, 2014a). Furthermore, children presenting with co-occurring cognitive or attentional difficulties were consistently excluded from the diagnosis despite their language impairment. As a result, many children had limited access to necessary intervention and educational support; in addition, the term was difficult for families, teachers and policymakers to interpret.

With growing concerns, the CATALISE consortium (Criteria and Terminology Applied to Language Impairments), led by Dorothy Bishop and peers, undertook an international effort to adjust and establish guidelines regarding the terminology and diagnostic criteria. The consultation involved researchers, speech-language pathologists, psychologists, educators, and parent representatives across different countries. The consortium offered two influential publications (Bishop et al., 2016,

2017) recommending that the term Developmental Language Disorder (DLD) be the replacement of the SLI term. Scientifically, the DLD term was considered more accurate for the disorders' heterogeneous nature, understanding that language difficulties form a part of the neurodevelopmental profile rather than isolated deficits. Practically, the term was clearer and more comprehensible to a non-specialist.

Bishop et al. (2017) explained the term as a disorder that causes everyday communicative difficulties and struggles with academic performance. These difficulties often continue into adulthood. The disorder is also not associated with a known biomedical condition. Importantly, the CATALISE framework departed from earlier SLI models in several significant ways. First, children no longer needed to showcase a marked gap between language ability and nonverbal intelligence in order to be diagnosed. Second, the framework recognised that DLD may present alongside disorders such as attention-deficit/hyperactivity disorder and developmental coordination disorder.

For the purpose of the study, the CATALISE definition of Developmental Language Disorder was adopted throughout the identification process. Participants were selected based on persistent language difficulties causing impairment within an educational context.

In addition, consultation with a multidisciplinary speech-language therapy clinic specializing language and communication disorders, speech delay, learning difficulties, Down syndrome, cerebral palsy, and attention-deficit/hyperactivity disorder was conducted to gather further insights into the identification and diagnostic characteristics of Developmental Language Disorder.

1.3.2 Linguistic and Cognitive Characteristics of Developmental Language Disorder

Developmental Language Disorder is characterised by its highly heterogeneous nature, which means that linguistic and cognitive profiles differ according to individual differences (Bishop et al., 2016, 2017). Linguistically, the disorder is related to difficulties affecting both expressive and receptive language abilities. Students with

DLD showcase limited vocabulary development, omission of grammatical markers, and struggles in tense marking and sentence formulation. Researchers have also reported that it impacts narrative organisation, discourse coherence, and reading comprehension, all of which may negatively hinder the development of Cognitive Academic language proficiency.

Earlier work, such as Leonard (1998), rejected the assumption that language impairment exists independently of broader cognitive functioning. However, many studies have reported interaction between language processing difficulties and cognitive vulnerabilities such as working memory, processing speed, attentional regulation, and executive functioning (Bishop, 2014b).

Researchers have suggested that cognitive limitations may contribute directly to the linguistic difficulties within Developmental Language Disorder (Baddeley, 1986; Gathercole & Baddeley, 1990; Leonard, 2014). For example, limitations in verbal working memory may hinder the child's capacity to temporarily retain linguistic information long enough to process it grammatically. Similarly, deficiencies regarding attention and processing efficiency may impact vocabulary acquisition and classroom participation. Language and cognition are increasingly viewed as dynamically interconnected during development.

This interconnectedness becomes particularly significant in bilingual and multilingual contexts. Bilinguals with DLD may face additional struggles with managing their linguistic systems and simultaneously coping with language processing difficulties. Therefore, differentiating between limitations regarding bilingual language development and those reflecting language impairment remains one of the central challenges within bilingual assessment research.

Working Memory and Developmental Language Disorder

Working memory is one of the most crucial cognitive systems underpinning language acquisition and processing. Baddeley (2000) suggested a multi-component model of working memory consisting of four components: the phonological loop, which

is responsible for storing verbal sounds and sound-based items; the visuospatial sketchpad for visual data; the central executive, which controls attention; and the episodic buffer for synthesising diverse data sources into cohesive representations. As it is illustrated in Figure 1.3

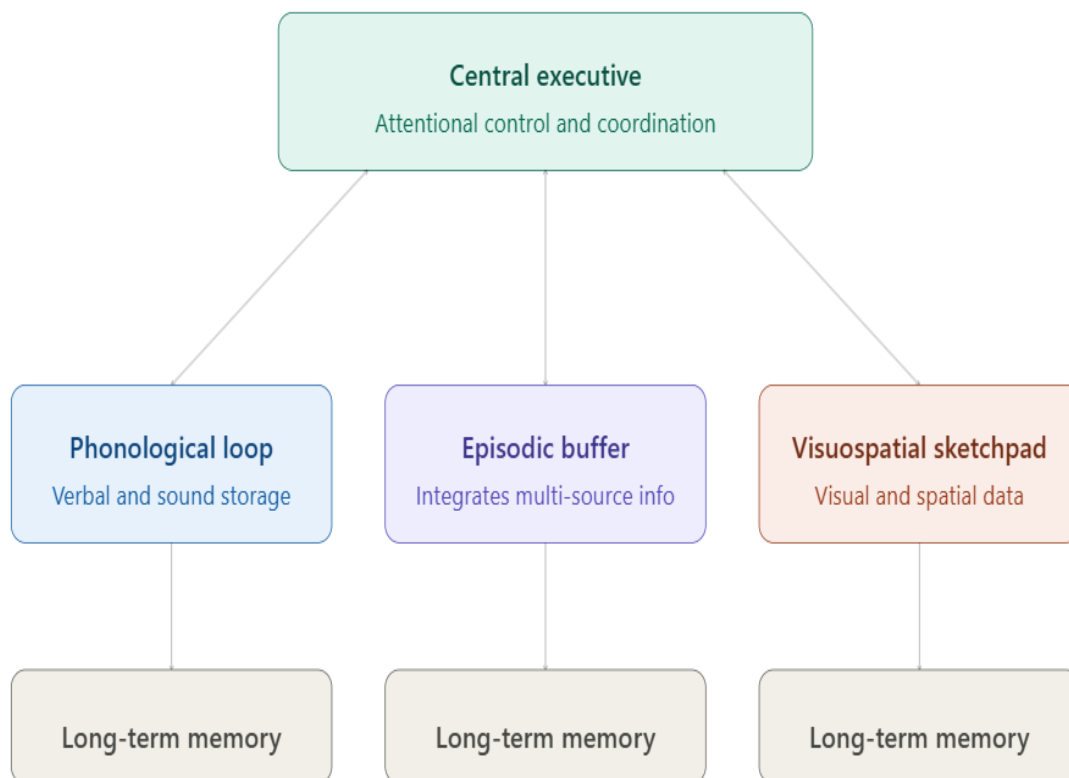


Figure 1. 3: Baddeley's (2000) Multicomponent Model of Working Memory

This model has become the main theoretical framework in cognitive psychology and language acquisition, as it offers a precise view of how temporary storage and active processing interact in language comprehension and production.

Empirical findings frequently identify working memory deficits as one of the main characteristics of Developmental Language Disorder. Gathercole and Baddeley (1990) provided crucial evidence that children with language impairment showcase notably limited capacity in phonological looping, suggesting that the ability to temporarily hold

unfamiliar sound sequences is fundamentally impaired in this population. Archibald and Gathercole (2006) further explained that working memory limitations in DLD not only co-occur with language deficits but, in some cases, exceed them in the level of impairment, meaning that working memory deficits may act as a core constraint of language development rather than a secondary effect. These deficits do not include just verbal tasks but also reflect a broader limitation in the capacity of the executive system.

However, it should be taken into consideration that both Gathercole and Baddeley (1990) and Archibald and Gathercole (2006) drew their findings from monolingual English-speaking children, which limited the reliability of their data to bilingual students such as those examined in the present study. This is relevant for bilingual students with DLD who must manage two languages simultaneously while operating with limited cognitive resources.

Processing Speed and Developmental Language Disorder

Closely related to the working memory limitations is the role of processing speed, defined as the efficiency with which a person can perceive, interpret, and respond to the received information. As a fundamental cognitive capacity, processing speed supports high-order academic and linguistic functioning. Kail and Salthouse (1994) conceptualised processing speed as a domain-general mental capacity, arguing that deficits in this capacity impact performance across multiple cognitive domains simultaneously rather than in isolation.

Empirical evidence has constantly reinforced this position within DLD studies. Kail (1994) found that children with DLD were 33% slower than typically developing peers across all cognitive and linguistic tasks. Miller et al. (2001) further reported a generalised slowing of approximately 14% in children with DLD, and longitudinal data later confirmed that the 14% deficits persisted stably into adolescence (Miller et al., 2006). Recently, a meta-analysis by Zapparrata et al. (2023) acknowledged that slower processing, delayed processing across time-based domains, is a universal and reliable characteristic of DLD, confirming that the speed limitations act as a domain-general indicator of the disorder rather than a task-specific aspect.

However, the reported degree of the delay varies considerably across the studies, ranging from 14% to 33%, which may question the consistency of measurement approaches and whether different task types capture similar findings. Furthermore, the majority of these findings are gathered from a monolingual population through a time laboratory task, which cannot accurately simulate a naturalistic educational setting. The findings suggest that processing speed in DLD reflects a larger cognitive deficit impacting language, memory, and attention simultaneously. However, the degree of the severity of the delay is dependent on the activity and on individual differences.

Executive Functioning and Developmental Language Disorder

Executive functioning is defined as higher-order cognitive processes that are responsible for regulating inhibitory control, cognitive flexibility, and managing. These processes are critical for managing language comprehension and production. Vissers et al. (2015) recognised that pre-schoolers with DLD demonstrated significantly reduced EF performance compared to their peers, while Henry et al. (2012) reported a consistent limitation in cognitive flexibility among students with DLD. Im-Bolter et al. (2006) further demonstrated that inhibitory control was considerably weaker in children with DLD, with performance considerably weaker than that of typical developing peers on tasks demanding suppression of competing responses. Vissers et al. (2015) findings, drawn from 40 studies and over 3,000 participants, reinforced the idea that verbal working memory deficits function as a reliable EF marker in DLD across different populations and languages.

The degree and scope of EF deficits differ across studies depending on the domain assessed and individual differences, making it more complex to establish a uniform EF profile for the disorder. Taken together, these findings suggest that EF deficits in DLD

are consistent yet heterogeneous, and particularly prominent in bilinguals who must regulate two linguistic systems with impaired executive resources.

Morphosyntax and Developmental Language Disorder

Morphosyntax limitations are widely considered one of the most consistent and across-linguistically robust indicators of DLD. Rice and Wexler (1996) proposed that children with DLD consider tense marking as an option, which results in frequent omissions of verb tenses and subject-verb agreement. Leonard (2014) argued that although error patterns differ across languages, morphosyntactic deficits reflect a broader limitation in language processing and grammatical acquisition.

Arabic relies on a non-linear root-and-pattern morphological system, making morphosyntactic processing much more complex compared to many Indo-European languages. More recent findings from Language Impairment Testing in Multilingual Settings (**European COST Action research initiative**) have further confirmed the value of morphosyntax measurement across diverse linguistic populations. Sentence repetition tasks consistently proved that children with DLD experience broader difficulties in complex grammatical structures, suggesting that morphosyntactic limitations are a reliable indicator of DLD. However, studies have noted that the outcomes of these difficulties are influenced by the structural properties of individual languages, but the consistency with which morphosyntactic deficits appear strengthens it as one of the most prominent markers of Developmental Language Disorder.

1.3.3 Causes and Diagnostic Challenges of Developmental Language Disorder

The causes of Developmental Language Disorder remain incomplete, though current evidence points toward a multifactorial neurodevelopmental origin with genetics among the most reported contributors. Studies indicated that DLD run in families; children with first-degree relatives with DLD are most likely to have it themselves (Bishop, 2006). Studies regarding twins have further supported a strong genetic

component, estimating heritability rates of between 50% and 70%(Bishop et al., 2016). Importantly, no singular genetic variant or neurological marker has been recognised as a universal cause for DLD, reinforcing the concept of the disorder as a heterogeneous condition influenced by the interaction of multiple genetic, neurological, and environmental risk factors.

Developmental Language Disorder diagnosis in clinical and educational practice presents considerable challenges. The disorder does not manifest through a singular identifiable marker but through an overlapping profile of linguistic and cognitive difficulties that vary based on individual differences (Bishop et al., 2017). Students from diverse linguistic backgrounds may omit grammatical structures, use limited vocabulary, and reduce sentence complexity that superficially mimic DLD markers without actually having it (Paradis et al., 2011). Conversely, those diagnosed with DLD from minority linguistic backgrounds may have issues related to language exposure rather than a disorder, which results in denied intervention (Kohnert, 2010). Both result in serious consequences for the child's educational trajectory.

Most standardised assessment tools were designed and normed for monolingual Western populations, making them impractical for bilingual or multilingual children (Bedore & Peña, 2008). In the Algerian context, foreign assessment tools are often used where foreign norms cannot be applied meaningfully.

1.4 Bilingualism and Developmental Language Disorder

The relationship between Developmental Language Disorder and bilingualism represents a critical area of inquiry in modern clinical linguistics. Earlier studies assumed that exposure to multiple languages may intensify language difficulties in children with DLD, potentially creating more cognitive demands. However, recent research has challenged these assumptions. Current findings propose that bilingualism is not the cause of DLD nor that it worsens its impairments (Paradis et al., 2011). Rather, children with DLD are capable of acquiring more than one language when they receive the appropriate exposure, meaning full interaction and educational support. Critically,

Paradis et al. demonstrated an important distinction between language differences, which showcase normal bilingual acquisition patterns such as code-switching, uneven proficiency and language disorder. Confusing the two may result in two major issues: a bilingual individual being labelled as impaired, while those with genuine disorders are unseen because their struggles are mistakenly associated with bilingualism.

Similarly, Laurence B. Leonard (2014) argued that bilingual children with DLD demonstrate comparable impairment to monolinguals with DLD across domains including morphosyntax, phonological processing, and verbal working memory, supporting that bilingualism itself does not create additional difficulties. However, Leonard's cross-linguistic findings are limited in their coverage of Arabic-speaking populations, and it does not include formal instruction in a non-native language variety, as in the case of Algerian schools.

It is also suggested that bilinguals with different levels of proficiency may demonstrate different linguistic and cognitive outcomes despite sharing similar developmental profiles. According to the Threshold Hypothesis theory proposed by Jim Cummins (1976), lower bilingual profiles may be related to greater linguistic and academic difficulties, whereas stronger bilingual profiles may support better cognitive and communicative functioning. Consequently, some studies suggested that bilingual children with developmental language disorder may show slightly stronger performance in certain cognitive domains than monolingual peers with DLD. However, findings remain inconsistent across studies, and it appears to be influenced by factors such as proficiency level, language exposure, and socioeconomic background (Bialystok, 2001; Paradis et al., 2011).

Kohnert (2010) suggested that bilingual children with language impairments form a unique clinical group whose outcomes cannot be predicted by monolingual DLD studies or other bilingual development research. Highlighting that both bilingual profile and language impairment must be taken into consideration in assessment and intervention.

1.4.1 Assessment and Identification of DLD in Bilinguals

Standardised language assessments have historically been developed for monolingual populations, which makes them poorly suited for bilingual individuals whose linguistic background differs from that of those whose tools were validated. When applying these tools to bilinguals, it systematically mistakes language difference with language disorder, resulting in elevated rates of misidentifications (Bedore & Peña, 2008). A bilingual individual may perform below that normal level on a standardised test, and that's not due to an underlying disorder but because the test does not consider unequal language exposure, code-switching, or language transfer from one language to another, all of which are common aspects of bilingual development.

In response to the limitations of standardised tools, researchers have frequently advocated for context-sensitive approaches to DLD assessment in bilingual populations. Bedore and Peña (2008) argued that assessment for bilinguals must include language samples, observational data, and activities that incorporate both languages. Similarly, Kohnert (2010) highlighted that accurate identification of DLD in bilingual students requires consideration of the full bilingual profile, including exposure pattern, language history and dominance. Thordardottir (2010) further emphasised that the quality of the input the child receives in each language significantly impacts the performance on language tasks, which means that low performance on language tasks may be due to limited exposure rather than genuine impairment. Thus, these frameworks suggest that reliable DLD assessments in bilingual populations must rely on direct performance and contextual information of each student's linguistic profile. These perspectives highlight the importance of reliable DLD assessment in bilingual contexts, which must go beyond single-language measures towards approaches that are suited to each student's linguistic profiles.

1.5 Existing Research on DLD in the Algerian and Arabic-Speaking Context

Within the Arabic-speaking context, studies on Developmental Language Disorder (DLD) remain limited and less developed methodologically compared to the extensive body of work in other languages. Existing studies tend to focus on specific linguistic domains rather than offering comprehensive diagnostic profiles. Taha, Stojanovik, and Pagnamenta (2021) demonstrate that sentence repetition is a robust diagnostic marker in Arabic-speaking children with DLD, since they tend to simplify syntactic structures under processing demands.

Arabic DLD research has also highlighted the impact of diglossia on processing language demands, suggesting that children with DLD are required to navigate the gap between spoken varieties of Arabic and standard Arabic, which increases linguistic load, especially in formal language-driven tasks (Asadi et al., 2022).

Saiegh-Haddad (2003, 2007) further demonstrated that this diglossic distance presents a challenge for phonological awareness in Arabic-speaking children. Since phonological deficits are among the main characteristics of DLD, the additional demands of diglossia may impose compounded processing needs for Arabic-speaking children with DLD.

At a morphological level, Boudelaa and Marslen-Wilson (2005) argued that Arabic morphological processing depends on a root-and-pattern system very distinct from concatenative morphology investigated in most research related to DLD. Because morphosyntactic difficulty is a consistent indicator of DLD across languages, this structural complexity portrays a gap that existing frameworks have not explored.

However, despite these contributions, research on DLD in Arabic-speaking contexts, particularly in Algeria, remains limited in scope and fragmented, with most studies focusing on isolated linguistic or cognitive domains rather than integrated diagnostic profiles.

The Algerian context introduces a degree of multilingual complexity that goes beyond what has been investigated even within the broader Arabic DLD research base, involving not only diglossia within Arabic but continuous formal exposure to French and English in the educational system. A close examination of the local database, such as the Algerian Scientific Journal Platform (ASJP), reveals that empirical studies on DLD within the Algerian community remain exceptionally limited and restricted by institutional boundaries. First, an age barrier exists; local literature is centred around early childhood (ages 3-6) or early primary school settings, leaving middle school students relatively neglected. Second, a terminology barrier in which most prominent Algerian universities utilise a traditional French clinical framework, usually labelling it under the “dysphasie” or “Trouble Développementale du Langage” (TDL) rather than international DLD parameters. Finally, local literature faces significant topical restrictions, influenced by dyslexia bias. In which when language learning difficulties in Algerian middle school are investigated, the emphasis is almost entirely on dyslexia and reading acquisition within French or English as a Foreign Language (EFL) classrooms. This lack of context-specific findings represents the gap that the present research seeks to address.

1.6 Conclusion

This chapter established the foundational framework for investigating the impact of bilingualism on the cognitive and linguistic development of middle school students with Developmental Language Disorder (DLD).

The literature reviews highlighted a framework including Cummins’s Threshold and Interdependence Hypotheses to explain how multiple languages interact in the mind. It also provides a distinct marker for DLD, demonstrating how the disorder affects individuals. Furthermore, this chapter revealed a gap in research regarding Arabic-speaking populations and the lack of suitable assessment tools.

By combining these theoretical frameworks, this chapter establishes that examining bilingualism alongside DLD is both a theoretical and an urgent educational priority. To address these issues, the next chapter will outline the exact research methods, design, and instruments used to gather data and analyse this study.

CHAPTER TWO

RESEARCH METHODOLOGY

2.1 Introduction

This chapter outlines the methodological framework of the study, examining the impact of bilingualism on the linguistic and cognitive development of middle school students with Developmental Language Disorder (DLD). The chapter provides a full account of the framework. It begins with the research paradigm and its underlying philosophical assumptions, then presents and justifies the choice of research design. This is followed by the participant section, research settings, and tools used in the study. It concludes with analytical procedures and the measures taken to ensure the validity and ethical integrity of the study.

2.2 Research paradigm

This section aims to clarify the overall research paradigm that guides this study. It outlines the methodological framework and explains how it aligns with the research

questions and instruments. Presenting the paradigm in a structured manner ensures that the study's methods, instruments, and procedures are coherent, justified, and replicable

This study adopts a pragmatic paradigm. It was selected because it places a strong emphasis on the practical application of research methods to address real-world problems. This study aims to investigate how bilingualism affects middle school students with developmental language disorder (DLD) in terms of their linguistic and cognitive development.

This paradigm integrates both quantitative and qualitative approaches. The quantitative approach provides objective, measurable data through screening tests and cognitive and linguistic assessments. These data offer the needed information to identify students with high risks of developmental language disorders, as well as identify patterns of performance, and evaluate the impact and severity of DLD in the middle school environment.

The qualitative approach balances the quantitative component by capturing students' cognitive and linguistic behaviour, their classroom interactions in educational settings. Observational data provides a contextual insight into how developmental language disorders manifest in real-life situations, which cannot be measured through tests alone.

2.3 Philosophical Assumptions

Philosophical assumptions form the base of any research paradigm by defining the study's beliefs about reality and the nature of knowledge. In this research, the philosophical assumptions guide the integration of quantitative and qualitative methods to investigate and comprehend the impact of bilingualism on middle school students with developmental language disorder (DLD).

This study adopts a pragmatic, pluralistic view of reality. It assumes that developmental language disorder is a real and observable condition. However, it is

comprehended through various types of evidence rather than one singular viewpoint. Developmental language disorder can be identified through screening tests that were designed with the approval of specialists to spot students with high risks of DLD, as well as linguistic and cognitive assessments to measure the severity of the impact. On the other hand, it is also identified through observing students' behaviour and interactions within classroom contexts.

Therefore, reality in this study is not purely objective or subjective; it is something that can be accessed through measurement and descriptive observation. This pluralistic view offers a more comprehensive understanding of how bilingualism impacts students with developmental language disorder in the educational environment.

From an epistemological perspective, this study adopts a pragmatic approach. In which Knowledge is generated through the combination of qualitative and quantitative methods, each contributing complementary forms of insight. Quantitative data generated through screening tools, cognitive and linguistic assessments, provide numerical evidence for students' performance, enabling the identification of patterns, level of risks and the severity of the impairment. In contrast, qualitative data gathered through classroom observations offers a complementary insight to the numerical data.

By combining these two forms of data, the study enhances the validity of its findings through triangulation, ensuring that results are empirically supported and contextually meaningful.

2.4 Research design

This study adopts a mixed-methods approach to investigate the impact of bilingualism on the linguistic and cognitive development of middle school students with developmental language disorder (DLD). This approach was selected to combine quantitative measurements

with qualitative descriptions, thereby providing a comprehensive understanding of the research problem. More specifically, the study employs a sequential explanatory mixed methods design, in which there are two phases. This design is most suited for this study, as it allows for linguistic and cognitive measurements, followed by an in-depth exploration of DLD within a classroom context.

The first phase is the quantitative stage, which involves a screening process that includes two tests guided by experts. These tests were utilised to identify students at high risk for developmental language disorder, followed by cognitive and linguistic assessments designed to gather objective, replicable data. Complementing these measures, the study incorporates a bilingualism profiling tool to identify each participant's type of bilingualism, varying aspects such as dominant language, exposure level, and the severity of DLD's impact.

The assessment stage centres on evaluating crucial linguistic domains, including morphology, syntax, phonology, and semantics, all fundamental to language competence. Concurrently, the study assesses a range of cognitive functions intimately linked to language processing, such as working memory, processing speed, attention control, executive functioning, and both verbal and non-verbal memory.

The incorporation of bilingualism profiling enables a more precise interpretation of the data by contextualising each participant within their specific linguistic background. This facilitates the understanding of how different types of bilingualism might interact with the manifestation and examination of Developmental Language Disorder.

The second phase, which is the qualitative stage, consists of unstructured classroom observation conducted with the same group of students identified in the first phase. The aim of this phase is to capture students' linguistic and cognitive behaviour in their natural learning environment, providing insight into how DLD manifest in the classroom.

The results of the quantitative phase guide the focus of the qualitative observations; this relation serves as the base of this design. It ensures that the analysis is targeted and relevant. This allows the deficits to be examined and seen in an authentic educational context.

Overall, this design is well-suited for investigating complex phenomena such as developmental language disorder in bilingual settings. By combining linguistic and cognitive performances with descriptive data, the design provides a more in-depth understanding of how bilingualism impacts the development of students with developmental language disorder in a real educational environment. The following figure provides a visual overview of the data collection procedure, illustrating the sequential relationship between the quantitative and qualitative phases of the study.

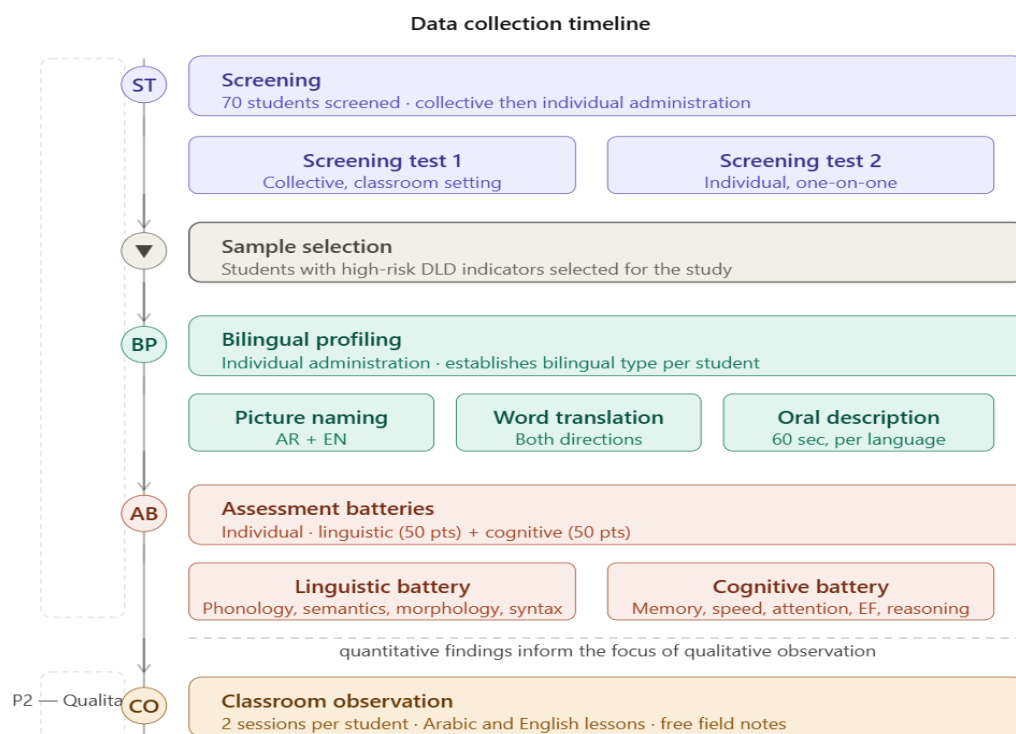


Figure 2 . 1 : An Overview of the data collection procedure

2.5 Participants

The targeted population consisted of middle school students enrolled in two public middle schools in Saida, Algeria: Khadija Oum El Mouminine Middle School and Mouloud Feraoun Middle School. This population was exposed to multilingual environments involving Algerian dialect, standard Arabic, French and English.

2.5.1 Sample and sampling technique

This research employed purposive criterion-based sampling. At first, 70 students were identified by teachers and guidance counsellors as students who exhibited language and learning difficulties. To confirm the eligibility, the students were screened using the two screening tests. Following this stage, there were 18 students showing high-risk indicators of developmental language disorder who were selected for the final sample. It included students from both middle schools and across all four middle school levels. Figure 2.2 illustrates the participant selection procedure, detailing the sequential stages

through which the final sample was identified.

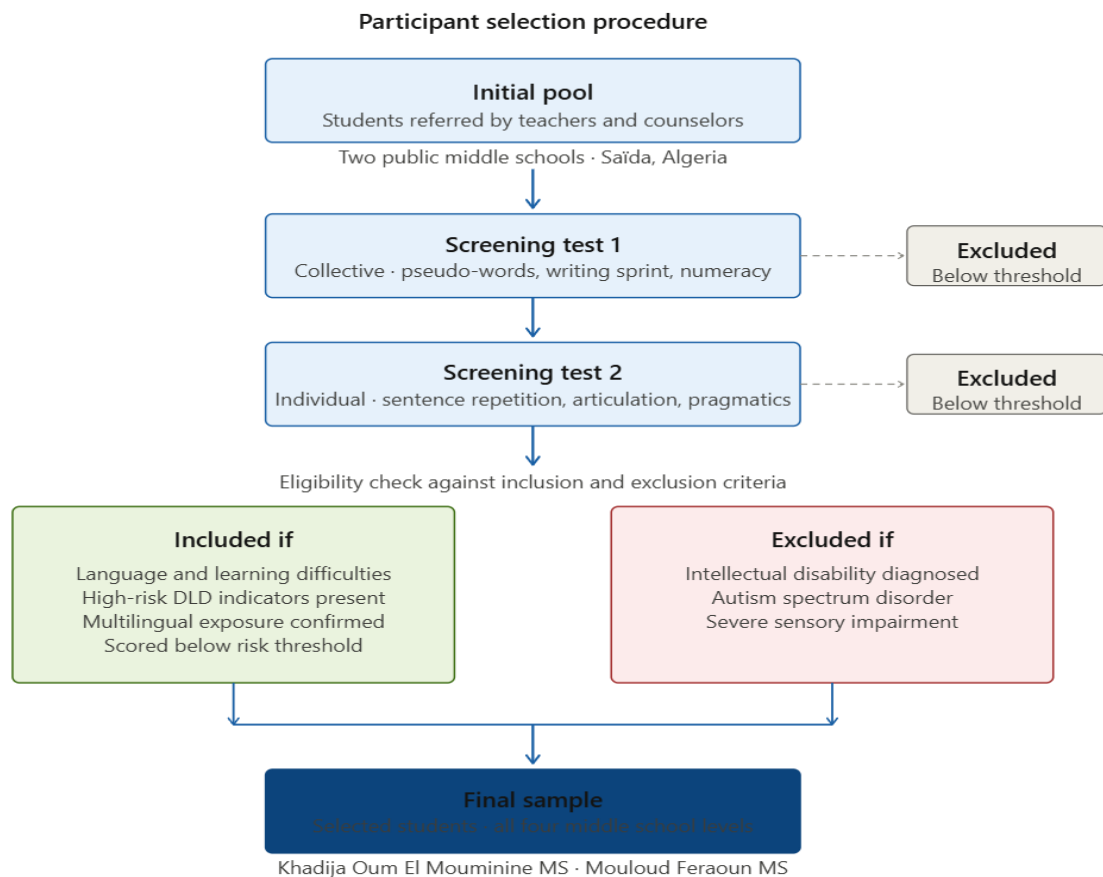


Figure 2 . 2: Participant Selection Procedure

2.5.2 Inclusion and Exclusion criteria

Participants in this study included students with language and learning difficulties who performed below the thresholds, showcasing indicators of high risk of developmental language disorder, and they also had exposure to multilingual input. However, students with diagnosed intellectual disabilities, autism spectrum disorder or severe sensory impairments were excluded from the study.

2.6 Context and Setting

This study was conducted in two public middle schools located in Saida, Algeria: Khadija Oum El Mouminine Middle School and Mouloud Feraoun Middle School. These schools are a part of the Algerian public education system, and they represent a typical middle school where students develop both communicative competence and academic skills.

This study targeted students from each academic level: first, second, third and fourth years of middle school. A total of 70 students participated in the screening phase of the study, with 18 students selected. This distribution ensured a balanced sample that allowed the observation of variations at different levels of learning.

The linguistic context of this study is multi-layered and dynamic; students are expected to use language not only for basic communication but also for more complex academic tasks such as reading comprehension, written expression, and problem solving, reflecting the linguistic complexity of Algerian society. Standard Arabic is the main language of instruction and is used for teaching academic subjects; however, Algerian dialect is also used in and outside of the classroom environment. Students also learn French and English as foreign languages.

Outside of the formal Instruction, students mainly use the Algerian dialect for everyday communication. With a noticeable rise in the use of English in code-switching or English borrowed words, as a result, they are constantly shifting between different forms of language depending on the context.

The coexistence of formal and informal language, plus the exposure to multiple foreign languages, creates a rich linguistic environment in which students constantly adapt their communicative strategies. This context is particularly relevant to the present study, as it provides a natural setting for examining how bilingualism interacts with cognitive and linguistic development in students with developmental language disorder (DLD).

2.7 Instruments

This section presents the instruments used to conduct the study, detailing the tools and measures used at each phase. The instruments were selected to identify students at risk for developmental language disorder (DLD), confirm the identification, and later assess bilingual profiles as well as linguistic and cognitive skills. Each instrument was chosen based on validity, reliability, and suitability for the population under study.

This section is organised in phases corresponding to the sequence of the study. The first phase focused on the screening stage used to confirm students with a high risk of DLD. This instrument was developed in consultation with Dr Afaf Adad, a certified speech-language pathologist at Cabinet ClairVocalise. Other Instruments were used in assessing their linguistic and cognitive performance, as well as to establish their bilingual profiles. All instruments were conducted on a one-on-one basis between the examiner and each participant with the exception of the first screening test, which was administered collectively in a classroom setting.

Phase two consists of unstructured classroom observations conducted with participants selected from the screening stage. Observations did not involve a structured scoring tool. Instead, it relied on free field notes recorded throughout each session to document naturally occurring behaviours among the sample.

2.7.1 The first screening test

The first screening test was administered bilingually with parallel versions in English and Arabic to ensure that students' performance is not affected by the lack of proficiency in any one language. Furthermore, a significant time period was introduced between the English and the Arabic tests to prevent students from relying on translation strategies or memory of the previous session to respond to the tests. The test consists of three parts, each targeting evidence of high risk of developmental language disorder. Each task was scored according to established criteria, and the combined performance across the three parts was calculated as a total score out of 50.

Part one: non-word (Pseudo-word)

This part consists of pseudo-words, which are words that are phonologically correct in structure but carry no lexical meaning (e.g., *flonk*, *trippet*, *dwarst*) (Snowling, 2000). The words were read aloud, and students were required to listen carefully to each word and write it down exactly as they heard it.

This part was designed to target phonological processing ability, one of the highest markers for dyslexia (Snowling, 2000; Hulme & Snowling, 2009). More specifically, it targets the student's ability to process and store phonemic sequences to perceive, hold it in memory and accurately reproduce the sound structure of a word they have never encountered before (Hulme & Snowling, 2009). Therefore, they cannot rely on vocabulary knowledge or visual word recognition to complete the task. The student's performance reflects the integrity of the phonological processing system directly (Snowling, 2000).

The scoring followed a partial credit system. A score above 8 out of 10 was considered normal phonological processing. A score below 6 out of 10 was flagged as a marker for high risk of dyslexia or dysorthographia. The nature of the error produced was also taken into consideration. In which errors students may write the correct phonemes, but in the wrong order, this was treated as an indicator of a breakdown in the ability to order sounds, reflecting a deeper disruption in the brain's ability to process phonologically.

Part two: writing sprint

The second part required students to write continuously for 120 seconds about themselves, without stopping or concern for mistakes. This part was designed to measure handwriting automaticity. Specifically, to analyse whether the physical act of writing has become an automated process or whether it still requires a high amount of cognitive effort.

The primary evaluation criteria were letters per minute (LPM). For middle school students. A rate below 60 LPM was treated as a marker for dysgraphia. As it suggests, the act of writing demands high cognitive resources. According to Berninger (2000) and

Kellogg (1999), when handwriting is not fully automatic, the act of writing consumes more space in the working memory and attention. As a result, there will be limited resources left for higher-level language processes, such as word retrieval, sentence construction, and idea organisation. Berninger and Swanson (1994) further emphasise that slow production rates can reflect both motor difficulties and constraints on language formulation.

Students' written samples were also examined to identify whether their writing is neat and organised on the page, which means that their writing should still be easy to read and maintain linearity when they have to write quickly. A student whose writing is significantly disorganised and inconsistent under timed conditions exhibits signs that writing automaticity has not been fully established.

Part three: basic numerical processing

This part of the screening test comprises four numerical tasks, each designed to assess a specific aspect of numerical cognition commonly seen in students with dyscalculia.

The first task requires students to place the number 15 on a number line ranging from 0 to 20. This task targets the integrity of the mental number line, which is a core component of the numerical representation. Studies indicate that people with dyscalculia frequently display a logarithmic representation of numerical value, resulting in consistent errors in number placement on a linear scale (Dehaene, 1997; Butterworth, 1999). A mark positioned correctly at around 75% of the line's total length was deemed correct, whereas variations from this location were viewed as indications of compromised numerical magnitude representation.

The second task, students had to identify the larger of two decimal values (0.08 and 0.8). This was designed to assess place value understanding versus reliance on superficial visual features. Students with dyscalculia usually select 0.08 as the larger

value because it has more digits, reflecting a tendency to process numbers as symbolic strings rather than quantities (Butterworth, 1999; Dehaene, 1997).

The third task presented an arithmetic reversal problem: given that $5 + 4 = 9$, students were asked to solve $9 - 4$. This problem checks if students really understood inverse operations rather than rote calculation. Students who rely on recounting or re-computation demonstrate limited conceptual fluency, a difficulty frequently associated with dyscalculia (Geary, 1994; Butterworth, 1999).

The fourth task required students to identify, without counting individually, which of two boxes contained more dots. This task assessed the Approximate Number System (ANS), described as the natural capacity to quickly estimate and compare amounts without direct counting. Deficiencies in this system have been recognised as a key trait of dyscalculia (Dehaene, 1997; Butterworth, 1999). Students who depended on counting, exhibited slower responses, or chose wrong answers were seen as showing a lack of quantity processing.

2.7.2 The second screening test

Unlike the first screening test, which was administered collectively in a classroom setting, the second screening test was conducted on a one-on-one basis between the examiner and each student. This setup was chosen to allow precise observation of each student's oral language production, articulation, and pragmatic comprehension in a controlled and focused environment. The test comprises three parts, each targeting a distinct dimension of language functioning.

Part One: Sentence Repetition Task

The first part consisted of ten sentences, each gradually increasing in syntactic and morphological complexity. The sentences were ordered to move from simple structures to more demanding constructions. The opening sentences presented basic subject-verb-object in the present continuous tense, such as "*The boy is eating an orange*" and "*The girl is playing with her dolls*". The latter half of the task increased in grammatical demand

through the introduction of multi-phrase constructions, past tense forms, coordinated clauses, and longer noun phrases, as seen in sentences such as *"They are watching a movie at home tonight," "The dog barked loudly at the mailman,"* and *"The baby was laughing and playing with his toys."* The examiner read each sentence aloud, and the student was required to repeat it back as accurately as possible.

Sentence repetition is widely regarded as one of the most robust markers for developmental language disorder, as it simultaneously draws on phonological short-term memory, syntactic knowledge, and semantic processing (Conti-Ramsden et al., 2001). Students cannot accurately repeat a sentence they do not grammatically represent; errors in repetition, therefore, reveal the boundaries of the student's underlying grammatical competence rather than mere memory failure.

Scoring followed a three-point scale per sentence. A score of 3 was awarded for a perfect, accurate repetition with no meaningful deviation from the original sentence. A score of 2 indicated minor errors of one to two deviations in which the overall meaning was still preserved. A score of 1 reflected moderate errors involving noticeable changes in word order, tense, or structure, resulting in partial loss of meaning. A score of 0 was assigned when the sentence was not attempted, was completely incomprehensible, or bore no meaningful resemblance to the original. The maximum total score for part one was 30 points.

Part Two: Single Word Repetition and Phonological Articulation

The second part targeted phonological articulation through a single word repetition Task containing fifteen words, each target specific phonemes and phonological structures. Target sounds ranged from individual phonemes such as /n/, /k/, /g/, /s/, /θ/, /r/, /l/, /tʃ/, /dʒ/, /ʃ/, and /v/, to consonant clusters and complex word structures found in words such as *spider*, *street*, *scissors*, *spaghetti*, and *elephant*. The examiner produced each word clearly, and the student was required to repeat it back immediately.

The type of errors produced for each item was recorded across six categories: omission, substitution, distortion, stuttering, delay, and mispronunciation, as the error

types carry distinct diagnostic implications for identifying speech and language difficulties (Dodd, 2005; Shriberg & Kwiatkowski, 1982a). The integration of an articulation assessment is supported by research demonstrating that phonological processing deficits and articulatory difficulties often co-exist as part of broader language impairments in individuals with DLD (Bishop, 1997). Each word was awarded one point for correct production, with a maximum score of 15 points for this part.

Part Three: Pragmatic Language, Social Scenario Interpretation

The third part assesses the pragmatic language ability through three social scenarios, each requiring the student to comprehend a communicative situation that goes beyond the literal meaning of an expression. The scenarios were designed to target a distinct pragmatic skill.

The first one is a sarcastic compliment directed at a student who received a poor exam result. The second scenario involved an indirect request, in which someone mentions being hungry while watching a friend eat without explicitly asking for food. The third scenario, on the other hand, required students to read non-verbal cues of disengagement, as a listener kept looking at the door and checking the time while offering a dishonest compliment. For each scenario, the student was asked a set of guided questions designed to reveal how they interpreted the communicative situation.

Pragmatic language difficulties include challenges with understanding concepts such as sarcasm, indirect communication, and social inference. These are often seen in students with developmental language disorder, and they represent a significant barrier to successful social and academic participation (Bishop, 2000; Norbury, 2014; Cummings, 2014; Adams, 2002). Students with DLD process language at a purely literal level, failing to interrogate social cues and context to interpret meaning appropriately (Bishop, 2000).

Scoring was distributed across the three scenarios with a maximum total of five points. Scenarios one and two were graded a maximum of two points, reflecting their greater cognitive and linguistic demand, while the third scenario was graded one point.

Taking a sarcastic compliment as an honest one or misinterpreting disengagement as genuine interest, as well as failing to recognise the indirect request, was treated as an indicator of pragmatic language difficulty consistent with the profile of students with DLD.

2.7.3 The bilingual profiling test

Following the screening phase, a bilingual profiling test was administered individually to each student. The primary purpose of this test was to determine the students' type of bilingualism by examining their performance in standard Arabic and English. More specifically, the test identifies language dominance and overall bilingual profile in order to analyse how different types of bilingualism influence linguistic and cognitive development.

This test consists of three parts. All parts require direct responses from the student, ensuring that the data reflects actual language ability rather than other factors. This design choice is supported by Grosjean (2001), who argues that bilingual competence should be assessed through observable performance across languages rather than through subjective self-evaluation, particularly in an educational context where there may be a lack of metalinguistic awareness.

The first part of the test is the picture naming task. The examiner presents a series of pictures one by one, and the students are required to name each one. There are two sections corresponding to the two languages. In the English section, the examiner presents ten pictures of common objects such as a bicycle, a rainbow, umbrella, plane, a house, tree, stairs, moon, cloud, and telephone. In the Arabic section, the student is presented with a different set of ten images representing items such as lighthouse, waterfall, train, shield, microscope, volcano, cage, compass, helmet, and mirror. The use of two different sets prevents direct translation strategies and ensures that each language is accessed independently. This type of design is used to measure the lexical retrieval and expressive vocabulary because it requires direct access to the mental lexicon without

contextual support (Levelt, 1989; Lahey & Edwards, 1999). This design is widely used with the bilingual population as it is supported by Peña et al. (2014), who emphasised picture naming as a reliable indicator of language vocabulary knowledge.

The second part of the test is a word translation task. In this task, the examiner provides a word in one language, and the student is asked to translate it into the other language. The task includes two directions. In the first direction, the student translates ten Arabic words into English, including items such as ” كتاب, مدرسة, ماء, قلم, باب, بيت, صديق, معلم, شمس, كرسي.” In the second direction, the student translates ten English words into Arabic, including happy, run, night, big, eat, red, play, cold, flower, and sky. This structure allows for the observation of asymmetries in translation performance, which indicate the language dominance and the relative strength of each language. The inclusion of translation is grounded in the bilingual lexical processing model by Kroll and Stewart (1994), including both directions, therefore allows the task to reveal asymmetries between the two languages rather than measuring vocabulary knowledge in only one direction.

The third part of the test is an oral description task in which the student is required to describe a picture for sixty seconds in each language separately. A single scene picture of a family having dinner together with various types of food laid on the table.

The task allows students to produce spontaneous speech rather than isolated words or memorised responses. According to Berman and Slobin (1994), picture-based oral production tasks are effective for producing natural language use across different linguistic levels simultaneously, including vocabulary, grammar, and fluency.

2.7.4 Cognitive Assessment Battery

The cognitive assessment battery was designed to evaluate students’ performance across six cognitive domains: working memory, processing speed, attention, executive functioning, critical thinking, and problem solving. The aim of this instrument was to examine how bilingualism impacts the cognitive functioning in middle school students

with Developmental Language Disorder (DLD), in alignment with research Question 2 and Hypothesis 2. The battery further compares cognitive domains in order to identify which cognitive skills were most affected.

Part One: Working Memory

The first part targets working memory through a visual recall task designed to assess short-term storage, retrieval, and relational memory processing. In this task, the student was shown a detailed scene picture for eight seconds before it was removed. The examiner asked a series of questions about the content of the picture. The first question targets a different item in the image; the student is required to remember several elements simultaneously. The next questions target relational processing by requiring the student to identify relationships between positions or actions within the scene. This task was designed to move from passive recall and active working memory processing, as proposed in Baddeley's (2003a) working memory model. The use of visual scenes rather than a verbal digit repetition task was deliberate to avoid the influence of expressive language difficulties associated with DLD (Gathercole & Alloway, 2008).

Part Two: Processing Speed

The second part targeted processing speed through a symbol-matching task designed to measure the students' speed and accuracy in visual information processing under timed conditions. The task consisted of multiple rows of visual symbols in which students were required to scan the sequence and identify every occurrence of a predetermined target symbol within sixty seconds. The number of correctly identified target symbols and the number of errors were both recorded, as the processing speed task does not rely on speed alone but on the balance between response accuracy and rapid performance (Wechsler, 2014). The use of timed symbol search formats provides

reliable indicators of cognitive processing efficiency, visual scanning ability, and rapid attentional allocation (Wolf & Bowers, 1999).

Part three: Attention

The third part targeted attention through a spot the difference task, which was designed to present the student with two similar pictures positioned side by side and the student is required to identify as many differences as possible within ninety seconds.

This design used visual comparison rather than verbally demanding attention activities in order to reduce the influence of expressive language difficulties. Spotting the difference activities require sustained visual attention, selective focus, and scanning accuracy, as students must ignore irrelevant similarities and compare visual details. The inclusion of a time limit increased attentional demand by requiring rapid and sustained concentration throughout the task.

The use of visual comparison in attention assessment is supported by cognitive assessment research in which visual comparison tasks provide an effective measure of attentional control and sustained concentration in students (Korkman et al., 2007). The side-by-side format also reflects principles used in neuropsychological visual attention tasks, where students are pushed to monitor competing stimuli while spotting inconsistencies between them. The number of correctly identified differences within the time limit was recorded. Performance across all six cognitive tasks was combined to produce a total cognitive score out of 50.

Part four: executive functioning

This part assessed executive functioning through a rule-switching task designed to measure cognitive flexibility and the student's ability to manage competing mental sets. The examiner presented a mixed sequence of numbers and letters while keeping two colour-coded cards visible throughout the task. When the red card was displayed, the student was required to classify numbers as odd or even; when the blue card was displayed, the student had to classify letters as vowels or consonants. Therefore, the

students had to continuously monitor the active rule while suppressing their previous response and shifting to a newly applicable one.

This design was theoretically motivated by current models of executive functioning. Miyake et al. (2000) identified that one of three separable but interrelated core components of executive functioning is mental set shifting alongside updating and inhibition. Diamond (2013) further characterised cognitive flexibility as the ability to adjust thinking in response to changing task demands and conditions. The aim of keeping the rule cards visible throughout the task was to isolate switching ability from working memory demands, making sure that errors reflect genuine difficulties in response rather than failures of instruction recall.

Part five: Logical Reasoning (critical thinking)

The fifth part assessed critical thinking through two activities targeting logical reasoning and inferential thinking. In the first activity, an odd-one-out task, in which a sequence of familiar pictures was presented, and the student was asked to identify the item that did not share a common category with the others. In the second activity, a cause-and-effect scenario, the student was shown a picture depicting a boy who had spilt water on the floor; the student had to explain what happened and why the floor was wet.

This design captures distinct but related dimensions of critical thinking. The odd-one-out task allows the student to analyse the attributes of presented items, detect similar features, and identify odd elements that contraindicate the established pattern. The cause-and-effect task requires the student to reason about an unobservable cause through observable evidence, generating a logical explanation rather than describing what is seen. Norris and Ennis (1989) emphasise that reasoning tasks must require students to move beyond direct observation and build logical interpretations based on available evidence.

Part six: problem solving

This part assessed problem-solving ability through a picture-based task designed to evaluate the student's ability to identify a problem and construct an appropriate solution.

Students were presented with a picture depicting a practical everyday problem, and they were asked to describe the scene and explain how the situation could be solved.

The use of picture-based scenarios was intentional to ensure that there were no unnecessary linguistic processing demands; rather, the focus was on the ability to solve problems successfully. Effective problem solving requires the student to notice that a difficulty exists and analyse the relevant components of the situation. Generate a possible solution and evaluate whether it is suitable for the relevant goal. Jonassen (2000) emphasised that situating a problem in realistic scenarios provides a more valid representation of a student's reasoning ability than an isolated theoretical question.

Students' responses were evaluated based on the clarity, logical coherence, and suitability to the proposed issue. In addition to the student responses, the strategies that were used during the task were taken into consideration since they offer important diagnostic information about the quality of the performance beyond what the outcome alone can reveal.

2.7.5 Linguistic Assessment Battery

The linguistic assessment battery was designed to diagnose students' performance across four domains: phonology, semantics, morphology, and syntax. The aim of this instrument was to examine how bilingualism impacts linguistic development in middle school students with developmental language disorder, in alignment with Research Question 1 and Hypothesis 1. It furthermore compares linguistic domains in order to identify which linguistic skills were most affected. Performance across the eight tasks was combined to produce a total linguistic score out of 50.

Domain one: phonology

Task one: phoneme deletion

This task targeted phonological manipulation through a phoneme deletion task in which Students were asked to repeat a word without a specific phoneme (e.g., "plane"

without /p/ becomes "lane"). Each language contained ten items that were selected to control for phonotactic complexity and phoneme position.

This design was theoretically motivated by current models of phonological awareness tasks in DLD research, as the capacity to consciously manipulate phonemes within words requires explicit metalinguistic awareness of sub-lexical structure (Snowling, 2000; Stackhouse & Wells, 1997). Bishop and Snowling (2004) further identified phonological processing deficits as core markers of DLD across languages.

Task two: syllable segmentation

This task revolves around syllable awareness through a segmentation activity in which the students were asked to tap, clap or state how many syllables there are in the word presented to them (e.g., "banana" = 3). Both languages contained ten items each, ranging from monosyllabic to polysyllabic words.

Syllable segmentation and phoneme deletion both help assess different levels of phonological processing. Syllable segmentation assesses awareness of the prosodic structure of language, which progresses earlier than phoneme awareness, but it is impaired in many children with DLD (Stackhouse & Wells, 1997). This task complements task number one by showcasing whether phonological deficits in bilingual students with DLD affect both syllabic and phonemic levels or are specific to one level.

Domain two: Semantics

Task three: Receptive vocabulary

This task targeted word comprehension through a picture pointing task in which students were presented with four pictures per item, and they had to point to the one matching the word spoken. Each language had ten items, each selected to be suitable for the sample.

The use of four pictures per item was intentional to ensure the guessing probability is reduced while maintaining simplicity for students with attention or processing difficulties. The three distractor pictures were selected to include items semantically or

phonologically similar to the target, rather than clear, unrelated objects. This increases diagnostic sensitivity by ensuring that correct responses are not just the elimination of implausible options (Nation & Snowling, 1999).

Task four: word Association

This task aims for semantic network organisation through a word association activity on which students must produce a related word to the cue word given (e.g., "school" → "teacher"). Each language contained ten items.

Word association tasks measure semantic network organisation. Rather than simply recognising the meaning of the word, students are required to activate related concepts (Nation & Snowling, 1999). Messer (1994) emphasised that word association tasks assess the complexity and interconnectedness of the mental lexicon, showcasing insight into how efficiently students can access and retrieve semantic information. The task was open-ended; any semantically plausible response was accepted. To ensure sensitivity to individual differences in lexical organisation and reduce scoring subjectivity.

Domain three: Morphology

Task five: verb conjugation

This task targeted inflectional morphology through a verb conjugation activity in which students were given a base verb and subject, and they had to correctly conjugate it. The task contained ten systematically different items only in Arabic.

Morphological assessment was restricted to Arabic because participants had received only one to four years of English instruction. Testing morphology in English would risk mistaking genuine linguistic impairment with insufficient second language exposure (Paradis et al., 2011; Bedore & Peña, 2008). Arabic, as the language of formal instruction, provided the appropriate foundation for assessing morphological competence. Verb conjugation in Arabic requires coordination of multiple morphological dimensions: person, number, gender, and tense. This morphological complexity makes conjugation particularly sensitive to impairment in students with DLD.

Task six: Noun pluralisation

This task aims for morphological processing through pluralisation activity, in which students produce the plural form of the singular noun they were given. The task contained ten items in Arabic. Like verb conjugation, this task is restricted to only Arabic because of participants' limited English exposure, which would make English morphological assessment unreliable.

This task used broken plurals instead of sound plurals because broken plurals are significantly more complex than regular plurals; they serve as highly sensitive indicators of morphological processing ability in students with DLD (Ravid & Farah, 1999). Broken plurals require a change of the internal structure of the word itself; it needs deep knowledge of Arabic morphological patterns that cannot be learned through simple rules (McCarthy, 1981).

Domain four: syntax

Task seven: sentence completion

This task targeted syntactic knowledge through a sentence completion activity in which students were given incomplete sentences, and they had to generate the missing word. The task contained ten items in Arabic. This task was limited to Arabic as well due to the same previous reasons.

The missing word varied systematically across syntactic categories (nouns, verbs, adjectives) and grammatical functions (subjects, objects, complements). This pushes students to use contextual and structural cues to generate an appropriate answer. This design assesses implicit syntactic knowledge, the ability to sense which particular position the word belongs to, and semantic coherence (Bishop, 2003). Students with DLD usually show deficits in syntactic processing, especially in the integration of structure and semantic meaning (Bishop, 2003). Therefore, sentence completion tasks are effective in diagnosing whether students can apply syntactic rules in context, a skill that is characteristically deficient in the DLD population.

Task eight: Grammatical judgement

This task targeted metalinguistic awareness through a judgment activity in which students identify whether the sentence that was read to them is correct or not. This task was also restricted to Arabic to ensure that the performance reflected their genuine metalinguistic ability.

The activity contained ten items: six grammatically incorrect and three correct ones. The incorrect sentences targeted specific error types, including subject-verb agreement, gender agreement, and person agreement. The inclusion of both identifying the error and correcting it was intentional. Grammatical judgment requires deep conscious knowledge of grammatical norms, unlike sentence completion, which can be done through implicit pattern matching (Conti-Ramsden, 2003). This design allows the study to identify students who can recognise incorrect sentences and those who can repair the sentence, providing in-depth insights into syntactic awareness. Students with DLD then demonstrated difficulty in grammatical judgment because such tasks require them to know what sounds right but also be able to identify what's wrong and why it's wrong (Conti-Ramsden, 2003).

2.7.6 Classroom Observation

This marks the second phase, which consists of unstructured classroom observation conducted with students identified during the screening phase. Two observation sessions were carried out per student, during English and Arabic lessons, as these two subjects allowed for a more complete picture of how DLD manifest on the language use.

The observer used a free field note rather than a predetermined checklist, which made it possible to capture natural behaviour without imposing external categories. According to Cohen et al. (2018), unstructured observation is most appropriate when the goal is to observe behaviour in its natural settings, making it well-suited for the nature of this study.

The aim of each session was to capture the students' language use and communicative behaviour, including their interaction with their teacher and classmates,

turn-taking, and observable indicators of language difficulty such as hesitation, word-finding pauses, and reduced engagement in language-dependent tasks.

To ensure accuracy, field notes were reviewed after the session, and the data were interpreted alongside the quantitative findings from phase one.

2.8 Data analysis

Data analysis followed the two-phase structure of the research design, with phases one and two analysed separately before being integrated at the interpretation stage.

Quantitative data gathered from the four instruments were organised and analysed using Microsoft Excel. Before analysis, all score sheets were reviewed for validity and accuracy, and scores were systematically entered into Excel, organised by bilingual group and instrument. Incomplete responses were marked and analysed according to the scoring criteria for each task. Classroom observation notes were reviewed and organised before thematic coding.

The two screening tests were analysed descriptively to identify students with high risks of developmental language disorder. In the first screening, students' performance across the four tasks was examined individually. Error patterns were identified, including phonological ordering, numerical errors, and inconsistency in handwriting, which were taken into consideration to determine which students fell below the risk threshold. For the second screening test, sentence repetition scores were calculated and analysed using the four-level scoring system, articulation errors were classified across the six predefined categories, and pragmatic language responses were assessed in terms of failure and literal interpretation of meaning.

Bilingual profiling test scores were calculated across the three tasks: picture naming task, word translation, and oral description. The students' performance was compared across both languages to identify which type of bilingualism they have. This classification was a very important comparative variable throughout the linguistic and cognitive analyses.

Linguistic assessment battery results were analysed across the four domains: phonology, semantics, morphology, and syntax at three levels: students' individual task performance, bilingual group, and domain averages. The phonological part was analysed across English and Arabic to identify patterns in phoneme deletion and syllable segmentation to recognise at which level the deficits appear, or whether the errors were consistent across both languages. Student's semantic performance was examined to differentiate between receptive and expressive lexical ability, morphological analyses, on the other hand, focused on syntactic analysis in which sentences were examined for completion, accuracy, and grammatical judgement.

Cognitive assessment battery results were examined across the six domains of working memory, processing speed, attention, executive functioning, critical thinking, and problem solving using the same three-level structure to identify which cognitive abilities were most affected and also to determine whether the bilingual type influences cognitive performance.

Classroom observation field notes were analysed using a thematic analysis technique; the notes were examined systematically to spot recurring themes related to the participants' classroom interaction, language use, difficulties in comprehension, and classroom behaviour. The findings were interpreted alongside the quantitative findings, strengthening the interpretation of the research conclusion.

The findings from phases one and two were interpreted in relation to the research questions and hypotheses. Quantitative findings were used to analyse cognitive and linguistic development across bilingual profiles of middle school students with developmental language disorder. qualitative findings were used to contextualise and support quantitative findings through triangulation. Figure 2.3: Demonstrate the overview of the data analysis process

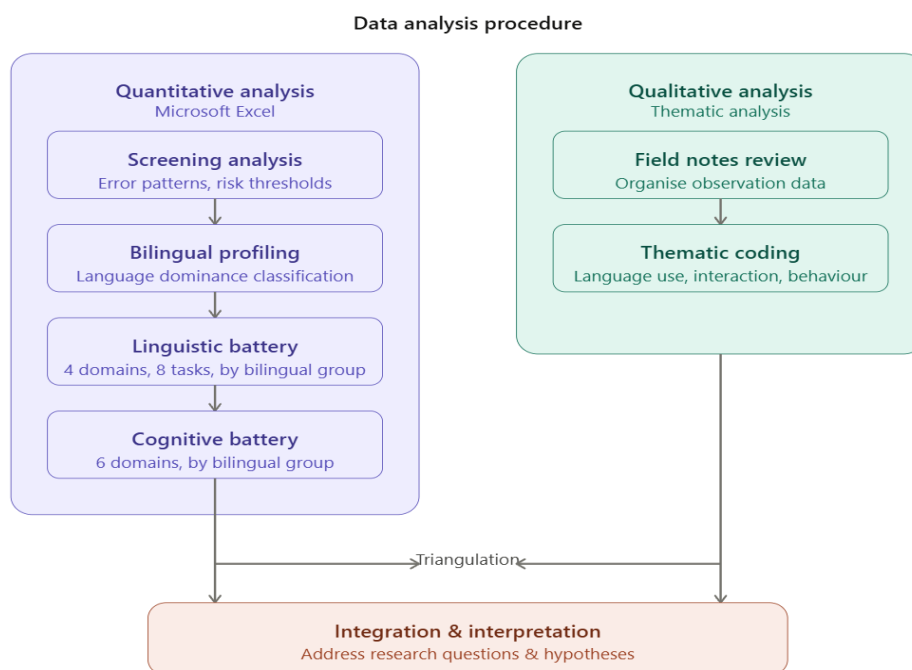


Figure 2 . 3 : An overview of the analysis procedure

The data will be presented using tables, descriptive comparisons across domains and bilingual groups, and score summaries. Patterns of cognitive and linguistic weakness will be highlighted, while for classroom observation, findings will be presented thematically, illustrating recurring behaviours and communication patterns during the lesson.

2.9 Validity and Reliability

One of the most important methodological considerations of this study was the validity and reliability of the instruments used. The two screening tests were reviewed by Dr Afaf Adad, a certified speech-language pathologist at Cabinet ClairVocalise, who offered insights on the diagnosis process and evaluated the instruments for clinical relevance. The specialist feedback was incorporated into the final version of the screening tests. The remaining instruments were designed based on established

frameworks and peer-reviewed literature in bilingualism, language assessment, and cognitive psychology.

Construct validity was reinforced by aligning the research questions, hypotheses, and tools. Each instrument was specifically designed to measure linguistic and cognitive domains as well as identify the bilingual group of participants with developmental language disorder.

Reliability was strengthened by ensuring all students were offered similar conditions using the same instructions, timing, and scoring criteria. A structured scoring system reduced subjective interpretation and preserved consistency. Assessment sessions were conducted under the supervision of the school counsellor to maintain ethical conduct throughout the study and procedural consistency.

For the qualitative phase. Reliability was enhanced through triangulation, where classroom observation findings were interpreted alongside the quantitative findings.

2.10 Ethical considerations

Ethical considerations were carefully preserved during all stages of the study. Before data collection, permission to conduct the study was granted by both schools, Khadija Oum El Mouminine Middle School and Mouloud Feraoun Middle School in Saida, Algeria. The study objectives, procedure and instruments were explained to the school's administration and council before the research began.

Participants in this study were informed that the activities were part of a study related to the students' learning process rather than being about developmental language disorder, as the school counsellors considered the topic sensitive for students at this age. Students were allowed to withdraw at any stage without any negative consequences.

Confidentiality and anonymity were maintained throughout the study process. Students' names were kept anonymous during data analysis to protect their identities. All collected data were kept securely and only used for academic purposes.

The psychological well-being of the participants was given special attention. All assessment tasks were designed to be age-appropriate and non-stressful to minimise any discomfort during the session. The sessions were conducted under the supervision of the school counsellors to maintain an ethically supportive environment through the study.

2.11 Conclusion

This chapter has presented the methodological framework of the study investigating the impact of bilingualism on the linguistic and cognitive development of middle school students with developmental language disorder.

It outlines the methodological framework and establishes the approach to investigate this complex phenomenon. The study combined quantitative assessments with qualitative observations through the adoption of a pragmatic research paradigm and sequential explanatory mixed methods design to capture measurable data and contextual insights.

The following chapter presents the findings of the study, followed by a discussion of the results, the limitations encountered, and the implications and recommendations drawn from the research.

CHAPTER THREE

FINDINGS, DISCUSSION, IMPLICATIONS, LIMITATIONS, AND RECOMMENDATIONS

3.1 Introduction

This chapter presents the findings, discussion, implications, limitations, and recommendations of the present study. It combines quantitative and qualitative findings gathered through the linguistic, cognitive batteries, and the bilingual profiling test, as

well as classroom observations, in order to provide a comprehensive understanding of how DLD manifests among bilingual individuals.

The first section of the chapter outlines the findings in relation to the research questions. The second part discusses and interprets those findings according to existing literature and theoretical framework on bilingualism and Developmental Language Disorder. The chapter further examines the implications of the study, the limitations and recommendations for future research.

3.2 PART ONE: FINDINGS

3.2.1 Participants Overview

A sample of 18 students was selected from a population of 70 to participate in the study. The demographic profile of the sample spans from 11 to 17 years old, with a mean age of 12.5 years. In terms of gender, the population consists of 38.8% male students and 61.1% female students.

To select the sample, all 70 students underwent a screening stage to identify those with high markers of developmental language disorder. As illustrated in Figure 3.1, the screening tests revealed 25.7% ($n = 18$) of the population showcased distinct markers of DLD, whereas the remaining 74.3% ($n = 52$) showed no indicators of DLD.

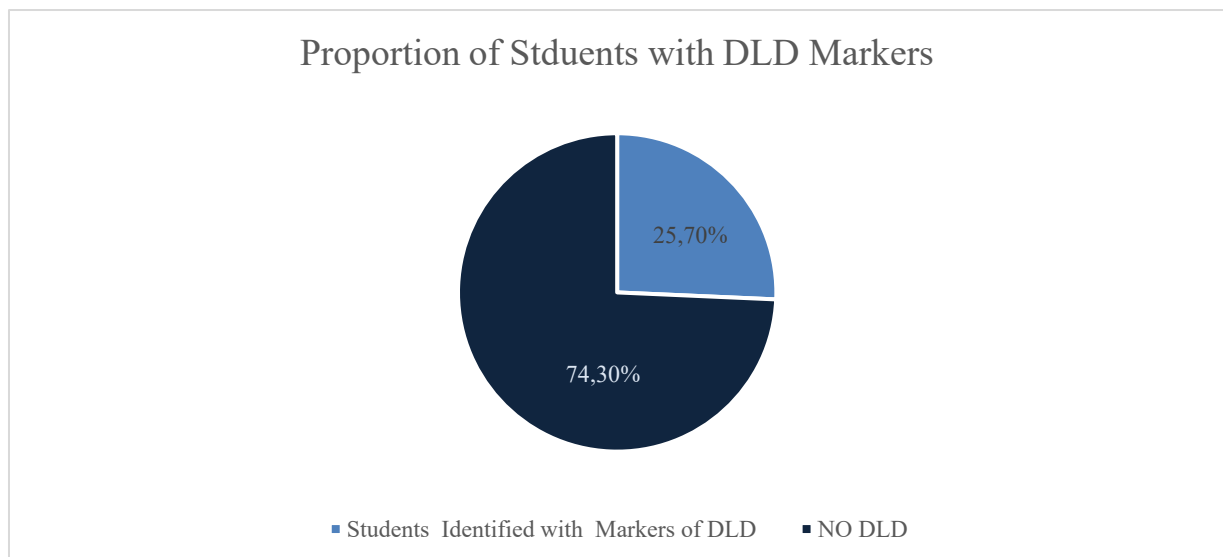


Figure 3 . 1: The sample selected

Following the overview demographics of the sample. Individual performance across the two screening measures was evaluated. The precise scores achieved by each of the 18 participants through both of the screening tests are displayed in Figure 3.2

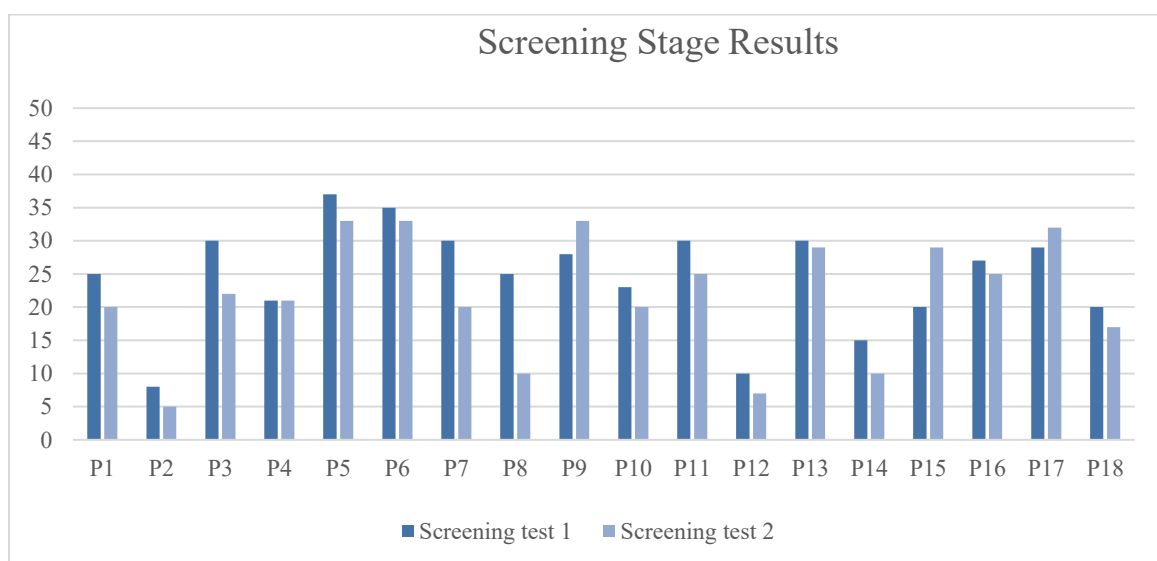


Figure 3 . 2 : participants' performance

The data reveals distinct patterns of performance between the two tests. For example, P7 and P8 demonstrated stable performance on the first screening, which targeted phonological decoding, handwriting automaticity, and basic numerical processing. However, their performance dropped on the second screening test, which

measures grammatical competence, Phonological articulation, and pragmatic language comprehension.

In contrast, participants 9 and 17 exhibit a better performance on the second screening test than on the first one. These participants' lower performance on test one showcased their struggle with phonological spelling, handwriting automaticity, and basic numerical processing.

Finally, a low performance pattern on both tests for a specific cluster of students, such as P2, P12, and P14, which means they struggled on all criteria of the screening assessment, showcasing a high-risk marker of developmental language disorder.

3.2.2 Participants' Bilingual Profiles

Following the evaluation of individual performance on the screening instruments. The participants' language groups were classified using a detailed bilingualism profiling metric. The bilingual profiling test categorised the sample into three groups: limited Bilinguals, emerging Bilinguals, and balanced Bilinguals, as shown in Figure 3.3.

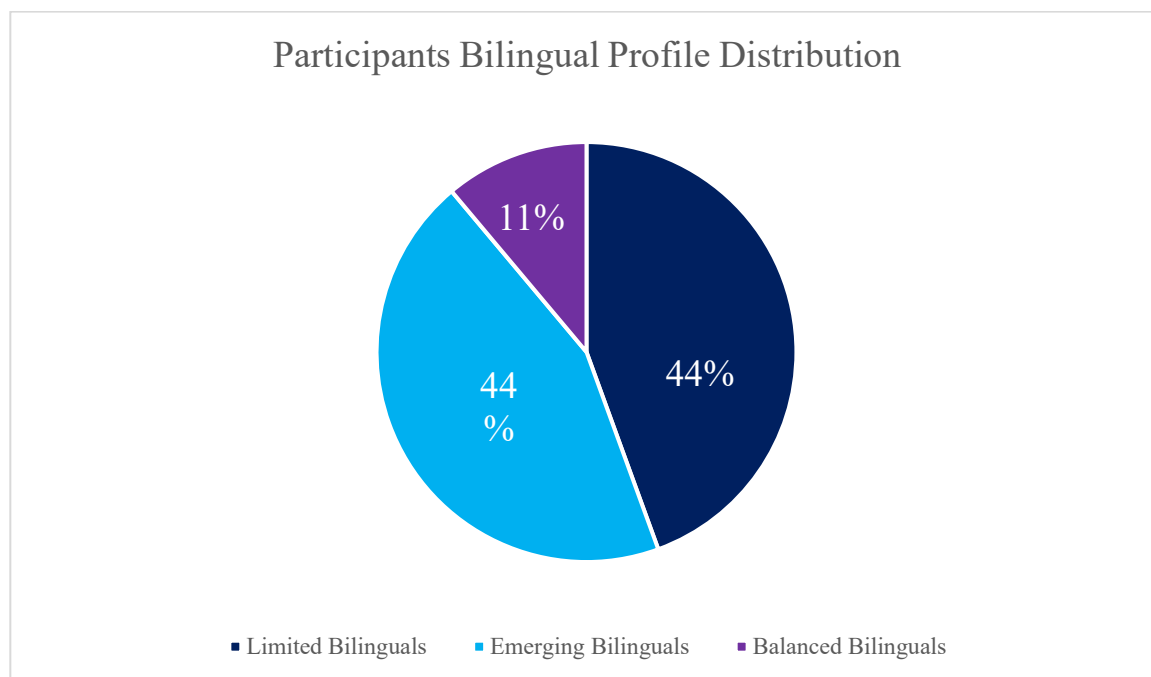


Figure 3 . 3 Distribution of Bilingual Types Among DLD participants

As the pie chart demonstrates a clear pattern when tracking the distribution of bilingual groups across the sample:

Limited Bilingual groups

consists of 8 participants: P2, P3, P4, P10, P11, P13, P14, and P15. These students demonstrated either highly restricted operational capacities or asymmetric proficiency levels between English and Arabic.

Emerging bilingual group

This

group form an equally large cluster within the sample, including 8 participants: P1, P5, P6, P8, P12, P16, P17, and P18. These students showcase relatively parallel functional competencies and balanced communication skills across both languages.

Balanced Bilinguals

This

group represents the smallest subset, consisting of two participants: P7 and P9. The profiling test identified these individuals as having higher proficiency than other participants, having advanced command and strong execution across Arabic and English.

This bilingual profiling categorisation establishes the necessary framework to investigate how distinct language exposure profiles interact with linguistic and cognitive domains in middle school students with developmental language disorder.

3.2.3 The impact of Bilingualism on linguistic skills

The overall performance of participants on the linguistic assessment battery

The first research question targets the relationship between bilingualism and the linguistic skills of middle school students with developmental language disorder. It investigates the impact across four domains: phonology, semantics, morphology, and

syntax. Data from the linguistic assessment battery revealed that most participants performed below than expected, with total scores ranging from 13 out of 50 to 41 out of 50 and a group mean of 29.28 out of 50. Figure 3.4 presents individual scores.

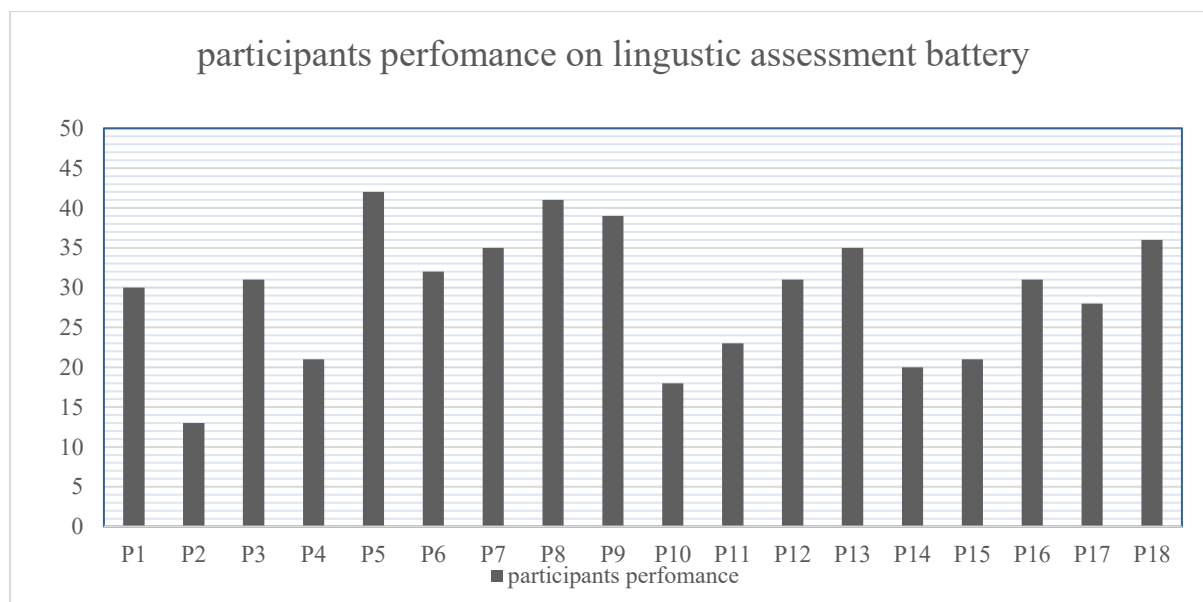


Figure 3 . 4: students' individual performance on the linguistic assessment battery

Across the sample, no participants achieved a score above 85% of the total available score, and six participants scored below 25, which indicates moderate to severe linguistic impairment across the group. Throughout the distribution, scores clustered into three broad performance groups. Eight participants scored between 13 and 23 out of 50, reflecting severe impairment. Seven participants scored between 28 and 35, reflecting a moderate impairment. Three participants achieved 39 and 42 out of 50, representing the strongest performance within the group.

performance by bilingual group

When scores from the linguistic assessment battery were examined according to the bilingual group. As illustrated in Figure 3.5, limited/emerging bilinguals produced the lowest group mean of 22.75 out of 50, and proficient sequential bilinguals reached the highest mean of 37 out of 50.

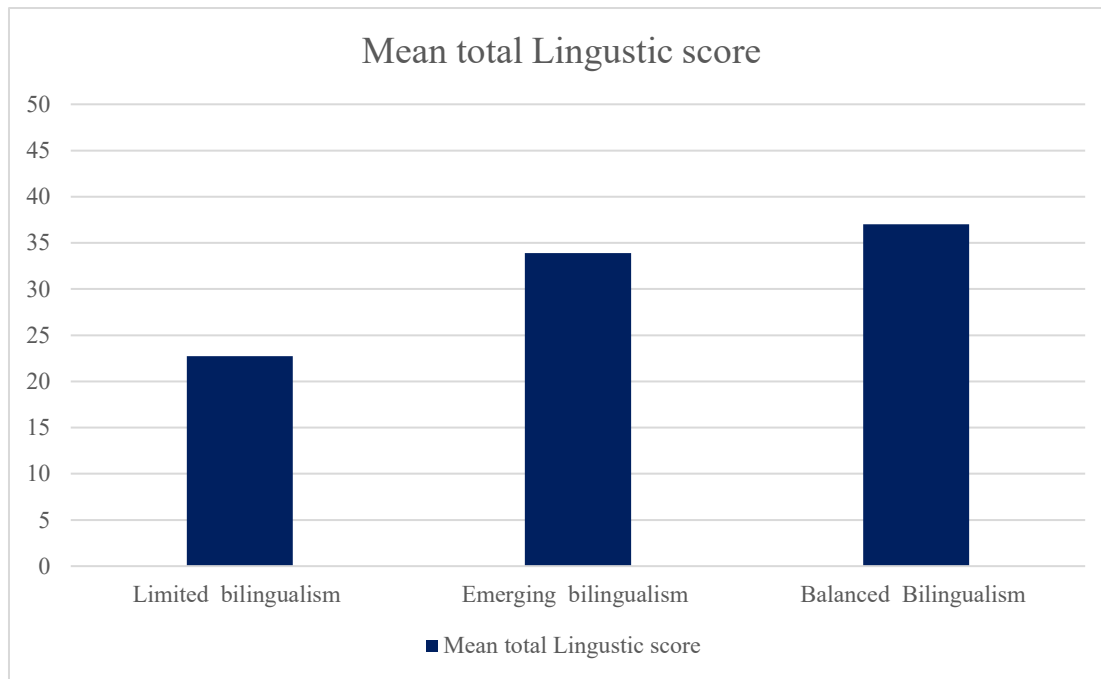


Figure 3 . 5: Mean linguistic scores by bilingual group

Within the limited group, scores ranged from 13 to 31 out of 50. Despite sharing the same bilingual classification, participants in this group showed a variation of scores, which suggests that even among students with limited bilingual profiles, individual linguistic performance differs. P2 scored the lowest in the linguistic assessment battery, while P3 scored 31, indicating some degree of functional linguistic ability within the same group.

Among emerging bilinguals. Performances ranged from 28 to 41 out of 50, with the mean of the group 33.88, higher than that of the limited group. In this group, scores ranged from 28 to 42 out of 50, showcasing a wide internal range within the group.

The two Balanced bilinguals, P7 and P9, scored 35 and 39 out of 50, placing them among the highest performers in the linguistic assessment battery.

3.2.4 The Impact of Bilingualism on Cognitive Skills

Overall performance on the cognitive assessment battery

The second research question investigates the Impact of bilingualism on the cognitive development of middle school students with developmental language disorder across the six domains (working memory, processing speed, attention, executive functioning, critical thinking, and problem solving). Figure 3.6 illustrates participants' individual performance on the cognitive assessment battery.

No participant achieved above 70% of the total available score. Scores clustered into three broad performance bands: seven participants scored between 10 and 18 out of 50, reflecting severe impairment; eight participants scored between 20 and 26 out of 50, which indicates moderate impairment; and three participants scored between 25 and 33 out of 50, reaching the strongest performance within the sample.

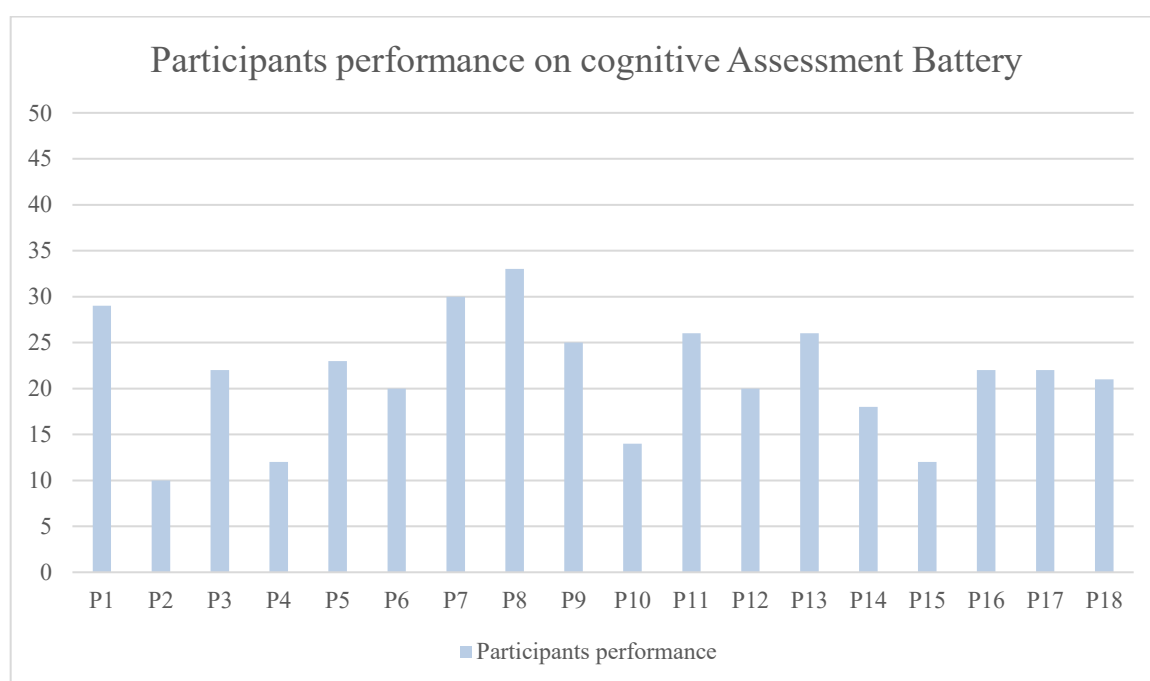


Figure 3 . 6 : Participants' individual performance on the cognitive assessment battery

performance by bilingual group

Cognitive assessment data were examined according to the bilingual groups, as illustrated in Figure 3.7 Limited bilinguals once again produced the lowest group mean. Balanced bilinguals scored the highest once again as well.

Within the limited group, participants' scores ranged from 10 to 26 out of 50. P2 produced the lowest scores in the group, having scored the lowest in the linguistic assessment battery as well.

Among emerging bilinguals, scores ranged from 20 to 33 out of 50, with a mean of the group of 23.75, which is higher than the previous bilingual group. In the cognitive battery, P8 produced the highest score of 33, while P16 and P17 both scored 22, and P18 scored 21. Overall, scores within this group appeared more concentrated within the low to mid twenties.

The Balanced bilinguals, P7 and P9, scored 30 and 25 out of 50, once again performing better than the other bilingual groups.

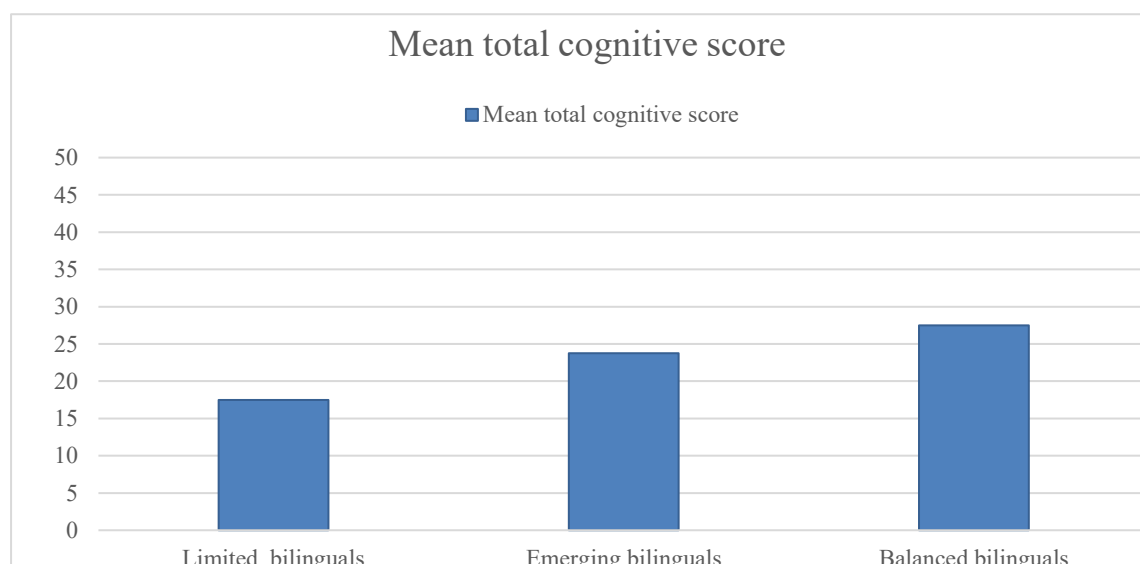


Figure 3 . 7 : cognitive performance within bilingual groups

3.2.5 Most Affected Linguistic and Cognitive Skills

A. Most affected linguistic skills

Data from the Linguistic Assessment battery revealed variation across the different linguistic domains. Certain skills appeared to be more affected than others, for example,

tasks related to grammatical accuracy, vocabulary retrieval, and sentence formulation generally produced lower performances among the limited bilingual group. In contrast, tasks involving basic comprehension and simple production showcased higher scores across the sample.

Figure 3.8 presents the mean score across all four linguistic domains assessed in the linguistic battery. Phonology recorded the highest mean of 8.11, followed by Semantic at 8.06, Morphology produced a mean of 6.61, and Syntax recorded the lowest mean among all the other domains with a mean of 6.50.

Based on these data, syntax and morphology were the most affected linguistic domains across the group. Phonology and Semantics produced comparably close means, but they remained below expected performance levels. The difference between the highest domain mean (phonology) and the lowest (Syntax) indicates that while all four domains were affected, the degree to which its affected varied across the linguistic profile of the participants.

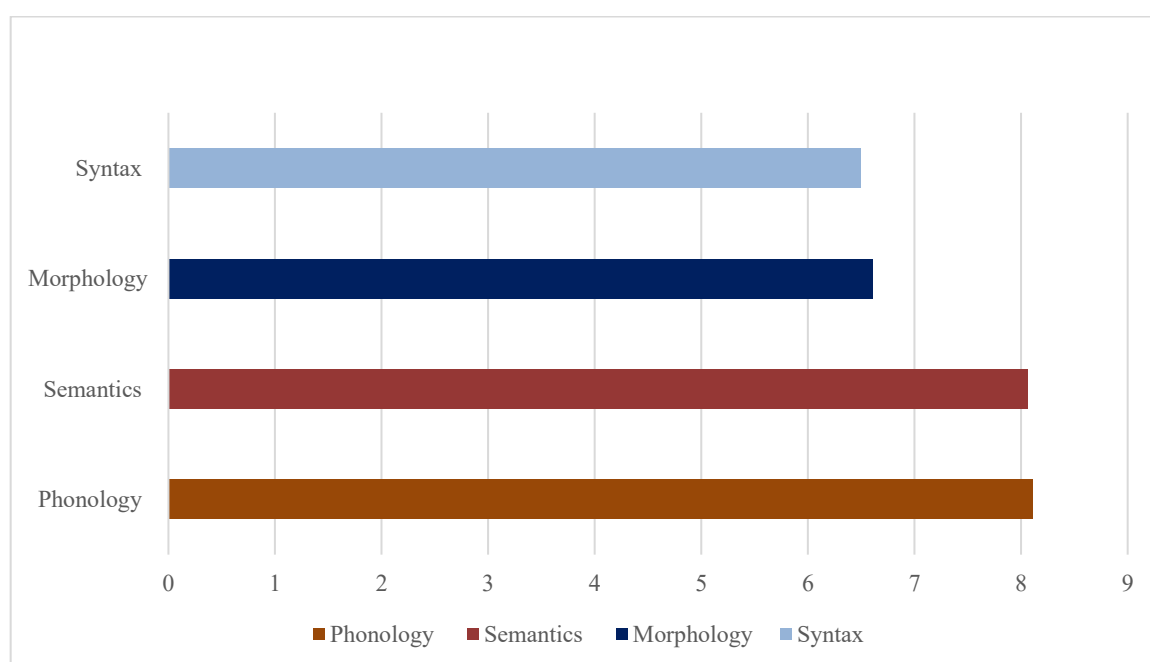


Figure 3 . 8: Mean Score Across Linguistic Domains

B. Most affected cognitive skills:

Across the cognitive domains assessed in the cognitive battery, processing speed recorded the highest mean of 5.61, followed by problem solving at 3.06, attention at 2.89, and working memory at 3.8. Executive functioning at 2.83, and critical thinking scored the lowest at 2.11.

Based on these data, critical thinking and executive functioning were the most affected among other cognitive domains. Processing Speed was the most preserved domain, scoring higher than all other domains. The remaining domains, problem solving, attention, and working memory, produced closely to each other. As it is shown in Figure 3.9.

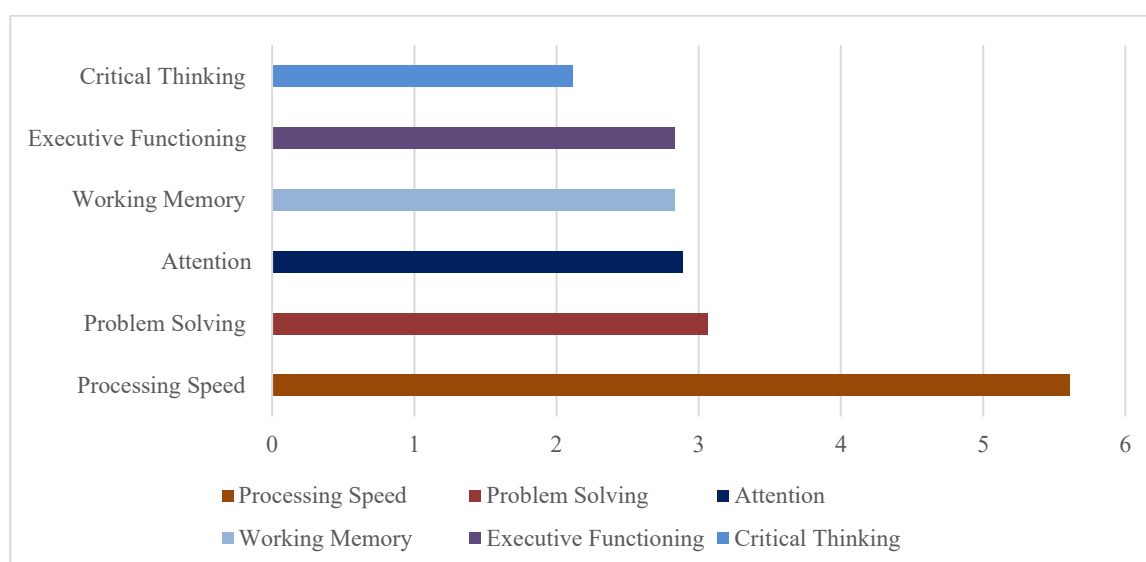


Figure 3 . 9 : mean score across cognitive domains

3.2.6 The influence of bilingual type on linguistic and cognitive domains

A. Influence on Linguistic Skills

According to bilingual groups across the four linguistic domains, Limited bilinguals performed the lowest of all groups, Emerging bilinguals produced intermediate means, while Balanced bilinguals recorded the highest means, as it is shown in Figure 3.10.

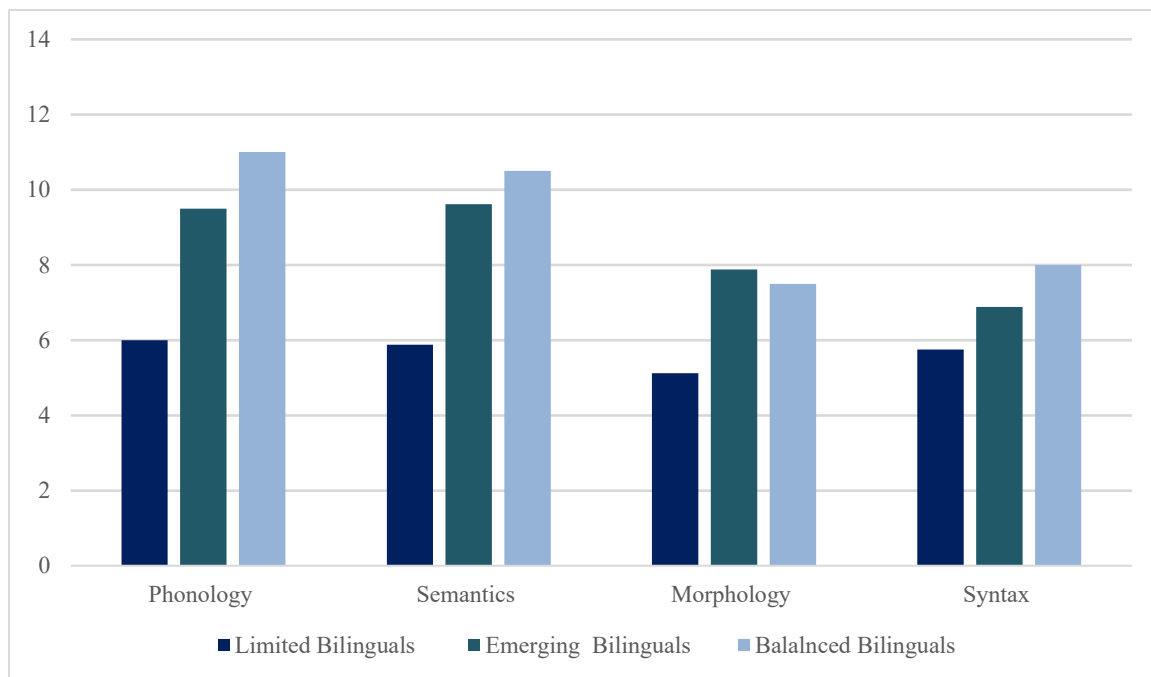


Figure 3 . 10 : Mean linguistic domain score across bilingual groups

The largest performance gap between bilingual groups was observed in phonology, where the difference between Limited and Balanced bilinguals was 5 points. The smallest gap was in syntax, where all three groups performed comparably low means. In Semantics, Limited group scored with a mean of 5.88, Emerging bilinguals performed with a mean of 9.62, and Balanced recorded 10.50, marking significant gaps between the groups, making Semantics the second most differentiated domain across bilingual groups.

In morphology, Limited Bilinguals performed the lowest once again, with a mean of 5.12; Emerging bilinguals scored the highest, with a mean of 7.88. Notably outperforming Balanced bilinguals, which scored a mean of 7.5. Making morphology the only domain where the proficient sequential group did not perform the highest.

In syntax, all groups recorded comparably low means, showing the smallest gap between group performances, with Limited Bilinguals scoring 5.75, Emerging group scoring 6.88, and Balanced group performing the highest, with a mean of 8, with a difference of only 2,25 points between the groups

B. Influence on Cognitive Skills

In cognitive domains, limited bilinguals performed the lowest, while emerging bilinguals also performed intermediate mean in cognitive skills, and Balanced sequential outperformed all other groups, as it is illustrated in Figure 3.11.

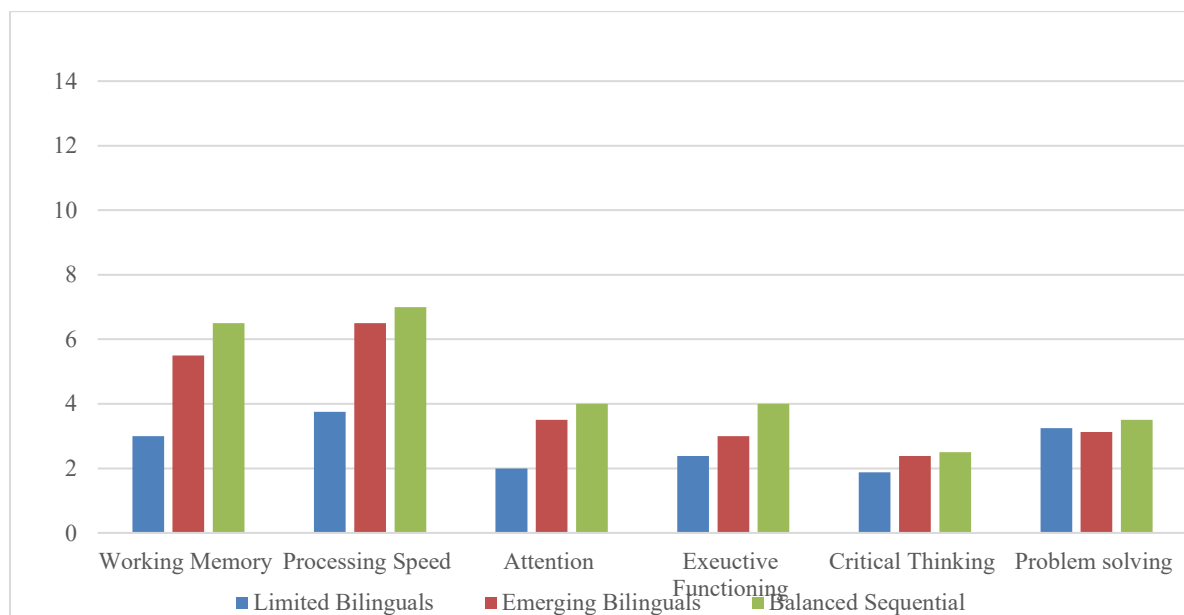


Figure 3 . 11: Mean cognitive domain scores by bilingual group

Limited bilinguals performed the lowest across five out of six domains. They scored with a mean of 3 in working memory, 3.75 in processing speed, 2.00 in attention, 2.38 in executive functioning, and 1.88 in critical thinking. Remarkably, problem-solving was the only domain where they did not perform the lowest, scoring a mean of 3.25 and outperforming the Emerging group.

Emerging bilinguals recorded intermediate means across most cognitive domains. They performed with a mean of 5.50 in working memory, 6.50 in processing speed, 3.50 in attention, and 3.00 in executive functioning, and in critical thinking, they achieved a mean of 2.38. However, they achieved the lowest with a performance mean of 3.13 in problem solving, making it the only domain where they performed the lowest.

Balanced bilinguals recorded the highest mean across all six domains; they achieved a mean of 6.50 in working memory and 7.00 in processing speed, marking a prominent gap between them and other groups in these domains. Furthermore, they recorded a mean of 4 in attention and 4.00 in executive functioning. In the final two domains, they

also showed the highest yet most closely clustered performance, with a mean of 2.5 in critical thinking and a mean of 3.5 in Problem Solving, marking the smallest gap between group performances.

3.2.7 Classroom Observation Findings:

The second phase of the study consists of unstructured classroom observation, which was conducted across two sessions per participant during English and Arabic lessons. Field notes were analysed using thematic analysis. Five recurring themes were identified across the observation sessions: Oral language production difficulties, reading and writing difficulties, comprehension and pragmatic difficulties, attention and cognitive behaviour, and social and participatory behaviour.

Oral language production difficulties

One of the most consistently observed behaviours among the sample is difficulties in Oral language Production. Stuttering was a recurring observed behaviour among the sample. Most notably, in participants 12 and 13, with P12 showcasing frequent and persistent stuttering throughout both languages. P9 demonstrated a distinct pattern of slow speech, repeating words said by the teacher or peers quietly or spelling them out. This participant also whispered responses rather than producing them normally. P2 demonstrated a frequent difficulty staying on topic and regularly inserting unrelated content into responses. Across the participants, most of them showed limited voluntary participation, remained silent during class discussions and only spoke when they were addressed directly.

Reading and writing difficulties

Deficiencies in Reading and writing were observed across the majority of the sample. Several students showcased slow writing speed and unnatural pen grip, and difficulty locating where to write, most visibly P2. When students are required to read aloud, many of them struggle with fluency, especially in English; they also constantly lose their place in the text and rely on a pen or a ruler to track their position in the text.

P2 demonstrated the most pronounced reading difficulties among participants, in which they notably took too long to process the teacher's instruction to read aloud, they also consistently broke down words into individual letters instead of, for example, reading the word "cat" as a whole unit, they read it as "c... a... t". Difficulty identifying the main idea of text, as well as misunderstanding or partially understanding written instructions, were common among most of the participants, often attributing overly literal meanings to figurative language in texts.

Comprehension and pragmatic difficulties

Several participants had issues with understanding their teachers' instructions or questions on the first delivery they required repetition before comprehending. A pattern of literal interpretation was seen across many participants in which figurative expressions, jokes, and sarcasm were misunderstood or taken at face value. P12 showed an inability to read social cues, appearing off and closed, having little to no engagement with other classmates. Struggling to comprehend abstract concepts and explaining why or how questions was also noted across some of the participants.

Attention and cognitive behaviour

Attention deficits were observed in varying degrees among students. P2 showed poor attention throughout the sessions, with slow reaction times. P9 was observed using their fingers to count pages or activity numbers when directed by the teacher to a specific page. Across the whole sample, many students showed a pattern of inattentive appearance without genuine engagement, often forgetting instructions mistake or asking the teacher to explain the recently given information. Difficulty multitasking was also frequently noted.

Social and participatory behaviour

Across the sample, social and participatory difficulties were widespread. The majority of the students showed low confidence or Physical signs of stress when being called upon by teachers, to which they would visibly shake and stutter upon being addressed, providing minimal responses, or repeating what a classmate had just said.

Some of the participants appeared to be shy or withdraw from interaction or eye contact during group or pair work.

3.2.8 Summary of Findings

This study investigated the impact of bilingualism on the linguistic and cognitive development of middle school students with developmental language disorder (DLD). From the initial population of 70 students from two public schools in Saida, Algeria. Out of the 70 population, 18 students were selected through a screening stage, to which they shown high markers of developmental language disorder.

The bilingual profiling test categorised the sample into three groups: Limited bilinguals (n=8), Emerging bilinguals (n=8), and Balanced bilinguals (n=2). This division provided the framework for examining how different bilingual profiles interact with linguistic and cognitive development in students with DLD.

Performance on the linguistic assessment battery revealed widespread deficiencies across all four domains. The findings showed that syntax and morphology were the most affected linguistic skills, while phonology and semantics demonstrated relatively stronger performance than other domains.

Bilingual type frequently influenced linguistic performance. Balanced bilinguals achieve the highest group mean, followed by Emerging bilinguals, while the lowest performers were limited bilinguals.

The cognitive assessment battery showcased difficulties across all six domains assessed. Critical thinking and executive functioning were the most affected skills, while processing speed was the most stable domain. Working memory, problem solving, and attention showcased an intermediate level of impairment.

Cognitive domains findings across bilingual groups stayed consistent with linguistic findings. Balanced bilinguals perform the best out of other groups, particularly in

processing speed and working memory. Emerging bilinguals achieved intermediate mean, while Limited bilinguals performed the lowest once again across all domains.

Unstructured classroom observation conducted during English and Arabic lessons provided contextual findings and insights on how developmental language disorder manifests in educational settings. Thematic analysis showcased five recurring themes: oral language production difficulties, reading and writing deficiencies, comprehension and pragmatic difficulties, attention and cognitive behaviour, and social and participatory patterns.

The triangulation of quantitative findings with observational findings strengthens the validity of the data. Individuals who scored lowest on linguistic and cognitive batteries demonstrated the most pronounced difficulties in classroom settings, while those with higher proficiency levels exhibited relatively stronger functional language use and classroom participation

Having established the findings of the study, the following sections will discuss and interpret these findings in relation to the research questions, hypotheses, and existing literature on bilingualism and developmental language disorder. It will contain the educational implications of the findings, the limitations, and offer a recommendation for future research; it will further acknowledge the limitations of the present study.

3.3 PART TWO: DISCUSSION

3.3.1 Discussion of Research Question One: The Impact of Bilingualism on Linguistic Skills

Overview of Linguistic Performance Across the Sample

The overall linguistic profile of the participants indicates a consistent pattern of reduced performance across phonology, semantics, morphology, and syntax, with participants' performances clustering into lower, intermediate, and relatively higher ranges. This pattern is consistent with the heterogeneous nature of developmental language disorder.

This data suggests that linguistic impairment in this sample cannot be reduced to a single level of severity that can be applied to all participants, but instead it reflects differences in how language processing systems function across the sample. Such variability in DLD literature is understood as reflecting differences in the efficiency of linguistic processing mechanisms, including limitations in grammatical computation, lexical access, and integration of linguistic information under cognitive load (Leonard, 2014; Bishop et al., 2017).

In addressing the first research question, this underlying pattern is relevant as it provides a framework for comparing bilingual proficiency groups systematically. Thus, any differences regarding bilingual profiles must be interpreted within the background of inherent variability in DLD, rather than as deviations from a uniform linguistic baseline.

Phonology: A Relatively Preserved but Functionally Compromised Domain

Among the first linguistic domains, phonology remained relatively preserved within the sample. Although the participant demonstrated below than expected. Comparatively, phonological tasks produced higher scores across other domains. This pattern showcases that phonological processing, while impaired, may be less impacted than higher-order morphosyntactic processing in this sample.

One possible interpretation is that phonological processing relies more on auditory discrimination and segmentation processes, which are more accessible than more demanding linguistic operations that require complex grammatical integration. This perspective aligns with frameworks of DLD that distinguish between phonological processing and more cognitively demanding processes involved in syntactic organisation and morphological manipulation (Leonard, 2014). Should this be the case, the pattern observed here may indicate a gradient of vulnerability within the linguistic system, where the severity increases with the complexity of the linguistic demands, a finding consistent with processing-based models of DLD, which argues that the core challenges lies in limitations on processing efficiency, rather than total lack of specific linguistic knowledge (Leonard, 2014; Bishop et al., 2017).

At the same time, relative preservation of phonology should not be perceived as evidence of intact phonological functioning. Classroom observation revealed a constant difficulty in speech fluency, sound-level processing, and reading behaviour, especially among lower performers who relied on letter-by-letter decoding and demonstrated slow oral production. These patterns suggest that phonological processing deficits are still evident even though phonology appears comparatively stronger at a quantitative level.

The bilingual context may also be relevant in understanding this pattern. Research on bilingual lexical and phonological processing indicates that both languages are simultaneously active during language use, which means that the participants engage in constant cross-linguistic phonological interaction as part of normal language processing (Kroll & Stewart, 1994; Green, 1998). Within this context, higher phonological performance may reflect greater cumulative exposure to sound-level processing across two phonological systems in contrast to more structurally demanding domains. Nevertheless, persistence of phonological difficulties across participants indicates that bilingual exposure alone does not eliminate phonological deficits associated with DLD, and any across-linguistic phonological interaction in this sample may be operating within an already impaired processing system.

Semantics: Relative Preservation and the Role of Bilingual Proficiency

Semantics emerged as the second strongest linguistic domain across the sample, producing a mean close to phonology. Although participants continue to demonstrate reduced performance, the semantics part seemed to be less impaired than morphology and Syntax, suggesting that basic lexical knowledge and word-level meaning are accessed more easily than more demanding domains. Unlike Syntax and morphology, semantic processing does not frequently rely on precise coordination of structural rules, which can partly explain its comparatively stronger performance within the DLD profile observed in this study (Leonard, 2014; Bishop et al., 2017).

The two Semantics tasks used in the study helped target distinct but related dimensions of lexical functioning. The receptive vocabulary part of the assessment targeted stored word meaning, while the word association task required participants to

activate semantically connected concepts from a given cue. The discrepancy between receptive processing and associative retrieval suggests that stored meaning may be less impaired than organizing semantics connections among lexical items. This perspective aligns with Nation and Snowling's (1999) idea, arguing that semantic deficits in individuals with language disorders typically reflect disorganised lexical representation instead of simple vocabulary gaps. Messer (1994) also emphasised that efficient retrieval relies on the strength of connections within the lexical network rather than on how many words are stored.

What makes the Semantic profile of this sample complex is the bilingual dimension of lexical organisation. Grosjean (2010) suggested that bilingual lexical knowledge operates as an integrated dynamic network rather than two isolated systems, with both languages simultaneously activated during processing. For students with DLD, this integrated but unreliable network may cause additional demands on semantic retrieval, especially when the proficiency profile across languages is asymmetrical. Therefore, the findings may reflect an interaction between DLD-related disorganisation and the additional organisational demands associated with managing lexical knowledge across two languages, with the severity of that interaction differing systematically with individual bilingual profile.

Morphology: Morphological Complexity and the Reversal of the Expected Bilingual Pattern

Morphology emerged as one of the most vulnerable linguistic domains across the sample, consistent with literature regarding DLD where morphological deficits are widely regarded as a central diagnostic marker of the disorder (Leonard, 2014; Bishop et al., 2017). However, the most theoretically interesting finding is not the deficits themselves, but the overturning of the expected bilingual hierarchy: Emerging bilinguals slightly outperforming Balanced bilinguals, making morphology the only domain in which this inversion happened.

This pattern is best comprehended in relation to the structural demands of Arabic morphology, specifically. Verb conjugation requires encoding the gender, person,

number, and tense, while Broken plural formation needs internal modification of the word pattern instead of predictable rule application. These demands cause Arabic morphology to be a highly sensitive area of impairment in students with DLD; successful performances do not rely on just adding simple prefixes or suffixes but on structuring words from inside out through a complex sound pattern (McCarthy, 1981; Ravid & Farah, 1999). Comprehensive framework often recommends using dual languages in testing to capture the bilingual child's full competence (Bedore & Peña, 2008). The design choice to restrict assessment to Arabic was a justified option for this specific population, as testing in English would have risked mistaking genuine impairment with insufficient exposure (Paradis et al., 2011).

Emerging bilinguals outperforming Balanced bilinguals may reflect on the fact that morphological competence in certain language depends on deeper grammatical engagement within the language rather on the overall bilingual proficiency level. Following this interpretation, morphological performance appears separated from the broader proficiency pattern observed across the linguistic domains. However, given that the Balanced group only contains two participants. This finding should not be considered evidence that higher bilingual proficiency limits morphological development. Instead, it demonstrates that Arabic morphological processing is highly sensitive to language-specific grammatical variables, which is a critical area for clinical assessment.

Syntax: Convergence Across Bilingual Groups and the Primacy of DLD-Related Vulnerability

Syntax was the most severely impaired linguistic domain during the linguistic assessment battery, recording the lowest mean among all participants. This finding is related to DLD literature, which recognises syntactic processing difficulties as the central clinical marker of the disorder (Bishop, 2003; Conti-Ramsden et al., 2001). Unlike phonological or semantic processing, syntactic production is uniquely difficult since it requires the management of word order, grammatical agreement, tense and sentence structure. For individuals with DLD, this complex process it overload their

limited processing capacity. As a result, syntax remained the weakest area no matter the bilingual profile of the child.

The most critical finding is the striking convergence seen across all bilingual groups. Syntax showed the narrowest gap between bilingual profiles; Limited, Emerging, and balanced all performed below than expected. It stands apart from semantics, where high bilingual proficiency led to better scores. Since Syntax deficits stayed the same across the sample this suggests that the weaknesses are related to the nature of DLD rather than external variables. This illustrates that while proficiency level moderated lexical semantics networks, it does not alter nor lessen core marker of Developmental Language Disorder.

The design of the syntactic task supports this perspective. Sentence completion assessed implicit syntactic knowledge and real time linguistic computation. In contrast, grammatical judgment task measured explicit rule reflection as well as metalinguistic awareness. Because students performed poorly across both tasks it indicates that their impairment clearly extends to deeper sentence level deficit. This vulnerability aligns with Bishop's (2003) frameworks which suggest that DLD disrupts a child's ability to integrate and manipulate morphosyntactic structures in speech production and comprehension.

3.3.2 Discussion of Research Question Two: The Impact of Bilingualism on Cognitive Skills

Overview of Cognitive Performance Across the Sample

The findings revealed that deficits extended beyond linguistic domains and were evident within all assessed cognitive domains. Performance remained consistently below expectations, with the majority of the students clustering within moderate to

severe impairment. The findings aligned with DLD frameworks that involve broader cognitive limitations rather than language deficits (Bishop, 2014a; Leonard, 1998, 2014). This pattern reinforces the clinical perspective that the disorder extends beyond linguistic limitations.

The cognitive findings closely mirrored the linguistic outcomes across the bilingual groups: balanced bilinguals similarly outperformed Emerging Bilinguals, while Limited bilinguals performed the lowest. Although this performance hierarchy was not preserved uniformly across every domain, problem-solving represented a significant exception. The frequent pattern suggests that cognitive functioning shifts alongside bilingual proficiency, which is consistent with Cummins's (1976) Threshold Hypothesis. Most importantly, these findings are not considered evidence of a universal bilingual advantage. Instead, they highlight differences in cognitive processing among this particular population.

Processing Speed: Relative Preservation and the Limits of Single-Task Measurement

Processing speed emerged as the most preserved function compared to other domains, achieving the highest mean score. However, this finding must be interpreted alongside the design of the task. The symbol-matching activity relied primarily on visual scanning efficiency and nonverbal pattern recognition rather than language-focused processing.

This formal test performance creates a sharp contrast to classroom observation findings, where participants demonstrated delays in following instructions and trouble keeping up with the lecture's pacing. This mismatch indicates that nonverbal tests cannot guarantee efficient representation of real-world processing. Wolf and Bowers (1999) argued that processing deficits in language-impaired individuals' surface when tasks require them to manage language, attention, focus and memory all at once. In the classroom context, most tasks are often language-driven, which explains why the participants still portrayed deficits in processing.

Nevertheless, a test in a quiet room can assess an isolated cognitive skill, but it cannot replicate how DLD manifest in bilingual students during classroom settings. The findings may demonstrate that measuring processing speed may depend on the setting: it seems less impaired when language demands are removed, but it still showcases limitations in a normal classroom when language demands are persistent.

Working Memory: Reduced Capacity Beyond Verbal Load

Working memory findings indicate that participants struggled to maintain and manipulate information under load. Using a visual recall task was an important choice in design as it ensured that poor performance did not indicate spoken language deficits. Because the outcomes of the task remained low even without heavy language demands, these memory deficits seem to be the result of general attention limitations.

This pattern supports Baddeley's (2003b) multi-component model, which demonstrates the central executive as a top-down, cross-model controller. When central resources are limited, failure will occur even with nonverbal tasks. Gathercole and Alloway (2008) argued similarly that memory deficits in children with language impairments extend beyond verbal recall and impact general information management.

Classroom data also supports this view. Students frequently have a hard time keeping up with instructions and ask for repetition; they also cannot hold multi-step tasks in mind long enough to perform them successfully. These findings confirm the patterns captured in testing extend to the real-world education context. Where participants must actively retain information and negotiate complex cognitive and linguistic systems.

Attention: Sustained Regulation and Cognitive Interference

Attention proved to be the primary area of weakness across the population, with the score remaining low among all bilingual groups. This pattern indicates a deep issue in sustaining focus, ignoring distractions, and staying engaged during tasks. Korkman et al. (2007) argue that attentional control is crucial to cognitive efficiency since it monitors relevant information while suppressing unnecessary items. In this study, the

low performances indicate that participants found it challenging to maintain stable cognitive focus.

Classroom findings back up these outcomes. Students constantly appeared disengaged during lessons, they often lost track of their work, and failed to keep up with the pacing of their environment. These behaviours confirm that attentional weakness operates at a functional level that hinders their academic trajectory.

The bilingual profile is relevant to understanding these results. For bilingual participants with DLD, whose attention is already fragile, monitoring two dual linguistic systems to activate the target language and suppress the other is likely overloading the system, increasing the failure of their already fragile attention.

Problem Solving: Practical Reasoning and the Reversal of the Expected Cognitive Pattern

Problem-solving produced an unexpected pattern. Unlike other cognitive domains, the limited bilingual participants scored slightly above Emerging bilinguals. This marked the only instance in cognitive assessment where limited bilinguals did not score the lowest. Even though the gap was small, it is still relevant in showing that problem-solving skills are not always related to bilingual proficiency.

The test used visual everyday pictures instead of word-based problems. to avoid the students getting stuck on trying to select words or process sentences. Instead, it enabled them to practice real-life thinking skills. Jonassen (2000) recommended that the use of real-world problems is a great tool to test a child's true thinking abilities. This is because it allows individuals to use familiar knowledge from their environment instead of giving them abstract, complex concepts. In the present study, the use of familiar pictures helped the participants overcome speech struggles by using cues to suggest a solution to the problem.

Nevertheless, this finding should be taken cautiously. The score gaps are not significant, and the balanced bilinguals had only two participants. This indicates that individual differences can shift the results. Therefore, the findings do not establish that

having lower language skills makes individuals better problem solvers. Instead, it highlights how individual thinking skills are used in real-world problem-solving.

Executive Functioning: Cognitive Flexibility and Compounding Demands in Bilingual DLD

Executive Functioning was among the most severely impaired domains, indicating a major difficulty in regulating and adjusting cognitive abilities. This domain included inhibitory control and cognitive flexibility. With flexibility proven to be limited, participants struggled to shift between competing response patterns or adjust to the changing task rules, demonstrating a poor ability to reorganise strategies dynamically. Diamond (2013) defines cognitive flexibility as the ability to adapt thinking and behaviour to meet shifting demands, which is built heavily on executive networks. Thus, this limitation reflects a deep deficit in adaptive cognitive regulation.

The bilingual profile here adds another dimension when interpreting this underlying data. Managing two language networks needs constant inhibitory control, which, according to Green's (1998) Inhibitory Control Model, management draws heavily on executive mechanisms. In the DLD profile, executive skills are already compromised, and they get overloaded with bilingual processing as well. This perspective suggests that DLD bilingual students face a double burden: they struggle with language and the needed network to manage their dual language systems.

Classroom data strongly support this aspect; students constantly struggled to shift between activities, adapt to modified teacher's instructions, or change strategies when routines changed. Rigid behaviours, delays during transitions, and difficulty adjusting to new rules occurred during observation sessions. These real-world patterns confirm that executive functioning deficits negatively impact the academic journey of the participants.

Critical Thinking: Higher-Order Cognitive Vulnerability as a Culmination of Lower-Order Deficits

Critical thinking was the most deeply impaired cognitive domain, recording the lowest overall mean. This outcome indicates that higher-order reasoning becomes unattainable when functions like working memory, attention, and executive control are already compromised. Therefore, severe critical thinking difficulty is not an isolated weakness; it is the cumulative result of a broader cognitive limitation driven by DLD.

The impairment influenced both analytical and inferential reasoning dimensions. Participants struggled to recognise relationships, categories, or explain cause and effect scenarios. As Norris and Ennis (1989) explained, critical thinking requires going beyond presented data toward abstract inference and evaluation. These clearly cause the overload of the already limited cognitive resources.

Classroom data backed these findings, in which students seemed to find it difficult to address “how “and “why” questions, grasp abstract concepts, or decode figurative language. Regulating these tasks in a bilingual background adds further pressure, as reasoning in a less proficient language demands complex cognitive monitoring. Ultimately, critical thinking difficulties reflect a combination of linguistic vulnerabilities and cognitive limitations. These two aspects make higher-order thinking exceptionally draining for bilingual students with DLD.

3.3.3 Sub-Hypothesis One: Differential Vulnerability Across Linguistic and Cognitive Domains

The first sub-hypothesis proposed that bilingualism affects language and thinking skills unevenly. The findings align with this perspective across both assessment batteries, revealing a clear variety of vulnerability rather than a uniform pattern of impairment.

In the linguistic battery, syntax and morphology were the most affected domains. phonology and semantics showed stronger relative performance, though they still remained below expected performance. This pattern indicates that language-centred tasks that require structural integration and rule manipulation are more vulnerable than other tasks that rely on automatic processes. Syntax depends on coordinating agreement,

grammar rules, and sentence structures all at once; Arabic morphology, however, is dependent on complex, internal structures. Conversely, phonological and semantics remained stable compared to other domains, indicating that complex structural and cognitive demands trigger the degree of vulnerabilities.

A similar pattern also emerged within the cognitive battery. Critical thinking and executive functioning recorded the lowest means, while processing speed demonstrated the strongest performances. This distribution is theoretically aligned; the domains with the most severe impairments were those requiring simultaneous coordination of multiple cognitive systems.

Executive skills depended on flexibility and inhibitory control, while critical thinking involves attention, working memory, and inferential reasoning. On the other hand, processing speed relies on visual scanning within low language demands. Thus, demands regarding higher order regulation are frequently more fragile than those with lower level processing operations.

In summary, the linguistic and cognitive findings emerge: limitations in bilingual students with DLD increase with the structural and cognitive density demands of the tasks.

3.3.4 Sub-Hypothesis Two: The Influence of Bilingual Type on Linguistic and Cognitive Development

The second sub-hypothesis proposed that bilingual type influences the development of middle school students with DLD. The findings support this perspective. Across most domains, Balanced bilinguals showcased the strongest performance, followed by Emerging bilinguals, while Limited bilinguals remained the lowest performers. This hierarchy aligns with Cummins's (1976) Threshold Hypothesis, which links higher bilingual proficiency to better cognitive and linguistic functioning.

However, this relationship was not uniform. Two exceptions appeared: Emerging bilinguals slightly outperforming Balanced bilinguals in morphology, and limited

bilinguals scoring slightly higher than Emerging bilinguals in problem solving. The morphologically unexpected pattern highlights that grammatical competence relies on language-specific immersion instead of bilingual proficiency. The exception within the performance of problem solving further proves that bilingual proficiency does not impact all domains similarly; some skills are dependent on task constraints and language-specific factors.

Most importantly, these data do not support a generalised bilingual advantage. This study investigates variation within a single bilingual sample with DLD, rather than an external comparison between a bilingual and a monolingual population. The findings demonstrate a group proficiency effect within the sample. This distinction is crucial because it positions bilingual type as a moderating variable rather than a determining one.

3.3.5 Triangulation of Quantitative and Qualitative Findings

The integration of phase one and two findings revealed substantial convergence within both sources. Participants who demonstrated lower performances on cognitive and linguistic batteries also exhibited the most prominent functional difficulties during classroom observation. Crucially, the five thematic analyses taken from the observations mapped directly onto the quantitative outcomes. Oral language production deficits included grammatical simplification, slow speech, reduced participation and struggling to understand implied meaning, aligned closely with syntactic and phonological weaknesses identified in the linguistic battery. Comprehension and pragmatic vulnerabilities, especially literal interpretation and difficulties grasping implied meaning, reinforced semantic findings. Similarly, the inattentiveness pattern observed in the classroom, plus the inability to follow teachers' instructions, supported the quantitative evidence of working memory and attentional deficits within the sample. This convergence strengthens the assessment battery's ability to capture limitations that are also evident in an authentic classroom setting.

Triangulation also revealed an important divergence within the processing speed data. In which processing speed was demonstrated as the most preserved domain in the cognitive battery, yet classroom observation findings reported behavioural slowness such as delayed responses, struggling to keep up with classroom pace, and slow reaction to the teacher's directions. This divergence is crucial in illustrating that performance within controlled assessment conditions does not always reflect the authentic targeted environment.

Overall, the triangulation process produces more comprehensive insights than either of the phases could independently produce. The quantitative phase identified produced patterns of relative strengths and limitations across linguistic and cognitive domains. While phase two contextualised these patterns within real educational interaction. The combination of these findings not only reveals where the limitations occur but also how they manifest for bilingual middle school students with DLD in their educational environment.

3.4 PART THREE: IMPLICATIONS

3.4.1 Implications for Teaching and Teacher Training

The findings of this study suggest that teachers play a crucial role in the early identification of bilingual students with DLD. Within the educational systems, language disorders and learning difficulties remain unnoticed. Many of the difficulties identified through the assessment batteries were also visible during classroom interaction. These findings indicate that classroom observation itself can offer valuable early indicators of DLD when teachers are adequately trained to spot them. However, without sufficient awareness of Developmental Language Disorder, such markers may be seen as low motivation, weak academic abilities, or limited language exposure.

The findings also highlighted the need for teacher training programs that should address the interaction between bilingualism and DLD. Several linguistic and cognitive

limitations observed in the study, particularly syntactic vulnerability, working memory limitations, and executive functioning difficulties, directly impact learning abilities. Therefore, teachers should adopt practical strategies for reducing unnecessary linguistic and cognitive complications within instruction. These may involve the simplification of complicated instructions, presenting information into smaller chunks, using visual aids to reinforce meaning, and encouraging participation without excluding slower responses. Given the diglossic nature of the Algerian community, teachers must take into consideration that deficits in standard Arabic may be due to greater morphosyntactic difficulties rather than weak academic performance.

At a pedagogical level, the data suggest that participants with a stronger bilingual profile generally demonstrated relatively stronger performance within linguistic and cognitive domains, indicating that bilingualism here is not detrimental for this sample. Educational practices should support development across both languages, while adapting instructional methods to certain cognitive and linguistic demands associated with Developmental Language Disorder. Therefore, the data highlights the importance of teacher preparation programs that can help intervene early in cases of DLD and help aid the academic trajectory of students.

3.4.2 Implications for Assessment and Clinical Practice

The research findings demonstrate that assessing bilingual students with DLD through a single language framework is insufficient. Linguistics outcomes differ systematically across bilingual profiles, indicating that language background and proficiency must be included in the assessment procedure rather than treated as a secondary variable. The bilingual profiling tool used in this study offered a practical insight into recognising the bilingual group each participant belongs to, allowing assessment outcomes to be interpreted within a linguistically valid framework. Without such a tool, there is a risk of confusing genuine developmental language difficulties with patterns from uneven bilingual exposure.

The findings also indicate that Arabic morphosyntactic tasks may be some of the most diagnostically sensitive tools for marking DLD in Arabic-speaking populations. Sentence repetition activities and grammatical judgment tasks frequently revealed severe syntactic deficits across bilingual groups, which support previous findings by Taha et al. (2021) regarding Arabic DLD assessment.

The need for more involvement of formalised speech-language pathology in the Algerian educational system was also highlighted. Support for students with language difficulties is often limited and inconsistent; it is mostly dependent on teachers' observations and school counsellors' aid rather than institutional assessment and intervention structures. Integration of speech-language pathologists into the educational system would strengthen early identification and intervention for students with DLD.

3.4.3 Implications for Educational Policy

The Algerian educational system currently lacks proper diagnostic tools and normative data for bilingual students with DLD, resulting in a barrier that hinders accurate identification of DLD in a multilingual context. The screening stage of this study identified 25.7% of the initial population as demonstrating DLD markers. This figure suggests that there is a potential for a significant number of students to remain unidentified within the system. These findings point toward the need for a systematic language screening process at school and the development of appropriate assessment instruments designed to fit the linguistic and cultural background of the Algerian community.

3.5 PART FOUR: LIMITATION

3.5.1 Sample Size and Subgroup Limitations

The target population presented a significant challenge due to limited institutional awareness and recognition regarding DLD within the school context. Several school

counsellors demonstrated limited understanding of DLD characteristics and indicators, requiring additional explanatory guidance before potential participants could be identified. In response to this limitation, a speech-language pathologist was contacted to guide the development of a screening test for verifying participants' suitability prior to inclusion in the study.

Selecting the sample was further complicated by parental hesitation regarding participation in the study. School counsellors indicated that some parents seemed concerned about the stigma or negative labelling associated with DLD, even in cases when students have already been identified as having language disorders or learning difficulties. Some parents preferred maintaining their child within the mainstream classroom without specialised additional support to avoid the “impaired” label. These facts may have introduced sampling bias by limiting access to some potentially eligible students.

3.5.2 Instrument Validation

Several assessments were used in the study due to the lack of available standardised Arabic DLD assessment tools suitable for the Algerian community. Although the instruments were built on an existing theoretical framework, they do not yet possess the established psychometric validation.

In addition, the qualitative classroom observation was conducted and interpreted primarily by the researcher without a formal comparison across multiple observers, which may cause some degree of bias in interpreting the behavioural patterns of the participants. Future studies should further validate these instruments across a larger bilingual population.

3.5.3 Absence of a Monolingual Comparison Group

This research does not include a monolingual group with DLD for comparison. This limits the ability to distinguish whether observed patterns were associated with bilingualism or reflect a broader characteristic of DLD and individual variability across participants.

3.5.4 Cross-Sectional Design

The research adopted a cross-sectional design, which means data were collected at a single point in time. This may limit the study in determining whether the observed linguistic and cognitive outcomes present a stable pattern within a significant period of time.

3.5.5 Unstructured Observation

The classroom observation offers a contextual insight; it relied on field notes rather than a standardised behaviour checklist. While this approach allowed for flexible and natural documentation of students' behaviour, it may have risked limited consistency of behavioural indicators across participants.

3.6 PART FIVE: RECOMMENDATION

3.6.1 Recommendations for Future Research

The findings of this study, while contributing significantly to the understanding of bilingualism and developmental language disorder in the Algerian context, also revealed several blind spots where further empirical investigation is essential. Future research should employ larger, more diverse samples to strengthen the generalizability of the findings. Comparative designs should include both bilingual and monolingual DLD

groups for a more isolated specific language influence of bilingualism on linguistic and cognitive outcomes.

3.6.2 Instrument Development and Validation

Research should centre around the development and psychometric validation of assessment instruments specifically made for the Algerian community. The tools used in this study provide a preliminary foundation that may support future standardisation and validation efforts across a larger sample.

3.6.3 Longitudinal Research

Because the present research adopted a cross-sectional design, it was not possible to investigate the developmental changes in bilinguals with DLD profiles over time. Longitudinal research is needed to investigate how linguistic and cognitive limitations evolve across different stages of academic and bilingual development.

3.6.4 Investigating Anomalous Findings

Certain findings observed a certain morphology reversal pattern and unexpected problem-solving results, which require further investigation. Future research should employ controlled studies to determine whether they reflect sampling variability and contextual factors.

3.6.5 Parental and Community Attitudes Toward DLD

During data collection, school counsellors expressed that parental hesitation and social stigma regarding mental health, language disorders and learning difficulties may

have an influence on participants' accessibility and interventions in diagnosing students. Future research should investigate parental and community attitudes toward DLD and other cases that hinder the academic trajectory of students; future studies must explore perceptions affecting early identification and intervention practices.

3.7 Conclusion

This study examined the impact of bilingualism on the linguistic and cognitive development of middle school students with DLD within the Algerian community. The findings showcased that participants demonstrated difficulties across all assessed domains, although the severity of the impairment varied across the bilingual profiles of the participants.

The study demonstrated that syntax and morphology presented the most impaired linguistic domains, while critical thinking and executive functioning emerged as the most affected cognitive functions. However, phonology, semantics, and processing speed produced stronger performances but still below than expected. The findings also indicated that Balanced bilinguals frequently achieved better performances than other bilingual groups.

The integration of both phases provided deeper insights into how DLD manifest in authentic educational settings. Overall, the chapter highlighted the complexity of the interaction between bilingualism, linguistic processing, cognitive functioning, and DLD-related limitations. The findings also highlighted the importance of early identification, specialised assessment and procedures, and educational support of students with DLD.

General Conclusion

Developmental Language Disorder (DLD) represents one of the most common yet frequently under-identified developmental conditions impacting language acquisition and academic performance. The challenge becomes more prominent in a multilingual population, where differentiating between language impairment and typical bilingual development remains a persistent concern for researchers and educators. Within the Algerian educational system, students with DLD remain neglected and misdiagnosed, especially those with a distinct bilingual profile. The empirical evidence regarding these bilingual students with DLD remains limited and unapplied context to the Algerian population.

Against this gap, the present study investigated the impact of bilingualism on cognitive and linguistic development of middle school students with Developmental Language Disorder and examined the extent to which differences in bilingual proficiency were associated with variations in performance across these domains. The study specifically emphasised identifying the domains which were most impaired or preserved; the bilingual profiles also played a key role in examining whether higher proficiency resulted in better performances. This investigation aimed to strengthen the understanding of bilingualism in interaction with DLD, specifically in an Algerian educational setting.

Investigating the findings in relation to the hypotheses has revealed that the first hypothesis proposed, which predicted that bilingual middle schoolers with DLD would showcase limitations across all four linguistic domains, with more prominent severity in complex structural processing, was supported. Students demonstrated difficulties across all domains assessed, and the severity of the impairment was evenly distributed. Morphological and syntactic processing emerged as the most impacted areas, while phonology and semantics abilities were comparatively less impaired, which was aligned with the prediction of the first hypothesis.

The second hypothesis, which emphasised that bilingual middle schoolers with DLD would demonstrate measurable deficits across all cognitive domains included in the battery, with most severe impairments in higher-order cognitive functioning, was also

supported with participants showcasing weakness in all domains and a severe degree of difficulty in higher-order cognitive skills.

The first sub-hypothesis, which proposed that the impact of linguistic and cognitive domains would not be uniform, resulting in different degrees of impairment, was confirmed. Performance outcomes showed a clear variability across domains. In which tasks that demanded more linguistic and were more complex cognitively produced lower outcomes than other ones.

The second sub-hypothesis, which predicted that bilingual profiling would moderate the linguistic and cognitive outcomes of students with DLD, was partially supported. The findings demonstrated a distinct pattern in which participants with high proficiency performed better in most of the tasks. In some domains, deviations emerged, suggesting that the relationship between higher bilingual proficiency and performance is not uniform across all domains. However, the interpretation of these findings should be considered in light of several methodological and contextual constraints.

One of the constraints is the sample of the study, which included 18 middle school students identified with high-risk markers of DLD across two public schools in Saïda, which restricted the generalisability of the findings. The cross-sectional design further limited the study as the interpretation to a single point of time prevented the analysis of developmental changes across a significant time period. In addition, the absence of standardised locally designed instruments further restricted the scope of the study.

Based on these limitations, future research should adopt a longitudinal design to examine the trajectory of cognitive and linguistic development in bilingual students with DLD. It should also include a larger, more diverse sample to enhance the generalisability of the findings. There is also a need to develop and validate standardised assessment tools adapted to the Algerian community to ensure diagnostic and intervention efficiency. From an education perspective, teacher training and school-based awareness

are essential to improve early identification probability and differentiate between language disorder and typical bilingual variations.

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Appendices

Appendix A Screening test 1 (administered in English and Arabic)

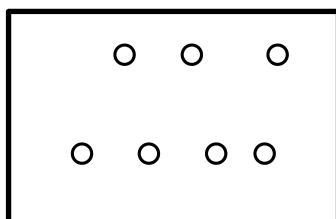
Part one: The instructor will read 10 made-up words. Please write them exactly as you hear them

1 _____	5 _____	8 _____
2 _____	6 _____	9 _____
3 _____	7 _____	10 _____
4 _____		

Part two: When the two-minute writing sprint starts, write as much as you can about yourself. Don't worry about mistakes, just keep the pen moving!

Part three:

1. Place a mark where the number 15 belongs :
0/-----/20
2. Circle the larger number :
0,08 OR 0,8
3. Solve this quickly :
If $5+4=9$
Then $9-4=.....$
4. Without counting one by one, which box has more?



Box A

The answer:.....

Appendix B Second screening test 2 (admini

Box B

○○○

○○○

rabic)

Part one:

Sentence repetition task

ITEM	Sentence	Score 0\5	Notes
1	The boy is eating an orange.		
2	The girl is playing with her dolls.		
3	He likes to read books before going to sleep.		
4	The cat is playing with the red ball.		
5	She runs to school every morning.		
6	They are watching a movie at home tonight.		
7	The dog barked loudly at the mailman.		
8	The baby was laughing and playing with his toys.		
9	The girl had dinner with her family.		
10	The little boy plays with his friends in the park.		

Observational

notes

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Part**two:**

the instructor will say a word and the student will try to repeat it back in the exact same way

Targeted word	sound		Omission	substitution	Distortion	Stuttering	Delay	Mispronunciation
Banan	/n/							
a	/m/							
Cup	/k/							
Gum	/g/							
Sun	/s/							
Thumb	/θ/							
Rabbit	/r/							
Yellow	/l/							
	/j/							
Chair	/tʃ/							
Orange	/dʒ/							
Shovel	/ʃ/							
	/v/							
Spider	/sp/							
Street	/str/							
Scissors	/s/							
	/z/							
Spaghetti	Structure							
Elephant	Structure							

If it's :	If it's consistent, it indicates
Omission	Speech delay
substitution	Speech delay

Distortion	Speech sound disorder
Stuttering	Stuttering
Delay	Language delay
Mispronunciation	Language delay

Part three: the student will be given three social scenarios which requires the interpretation of sarcasm, indirect requests, and social nuances.

- 1. First scenario:** Omar gets his exam paper back. He has a very bad mark; his friend looks at the paper and says, “Wow, Omar! You are very smart, you should teach the class! “
-

The Questions:

Is the friend being serious or joking?
 Does the friend actually think that Omar is smart?
 Why did the friend say that?

- 3. Second scenario:**

Ali is eating a delicious sandwich. His friend Amine looks at the sandwich and says, “I’m so hungry, I did not eat breakfast today “

The questions:

Why is Amine telling Ali that he is hungry?
 What does Amine actually mean?
 What should Ali do?

- 4. Third scenario:**

Fahd is talking to his friend for a long time. The friend is very tired; they keep looking at the door and the time. The friend says, “Wow, Fahd, you really know many things “

The Questions:

Does the friend like the story?
Why is the friend looking at the door and their watch?
Does the friend want to stay or go home?

Scenario	Skill tested		Incorrect Interpretation	Correct Interpretation
1	Sarcasm		Think Omar is actually smart	Know it's a joke
2	Indirect request		Thinks amine is just sharing a fact	Know that Ali is asking for food
3	Social nuance		Thinks the friend is impressed	Know that the friend wants to go home

Appendix C Bilingual Profiling Test

Part One: Picture Naming Task

The examiner shows pictures one by one. The student names each picture.

	Picture	English word 1/0
1	Bicycle	
2	Rainbow	
3	Umbrella	
4	Plane	

	Picture	English word 1/0
5	House	
6	Tree	
7	Stairs	
8	Moon	
9	Cloud	
10	Telephone	

	Picture	Arabic word 1/0
1	Light house	
2	waterfall	
3	Train	
4	Shield	
5	Microscope	
6	Volcano	
7	Cage	
8	Compass	
9	Helmet	
10	Mirror	

Part Two: (Word Translation Task)The examiner says a word in one language, and the student translates it into the other language. One point for each correct answer.

#	Arabic word	Response	Score	#	English word	Response	Score
1	كتاب			1	Happy		
2	مدرسة			2	Run		
3	ماء			3	Night		
4	قلم			4	Big		
5	باب			5	Eat		
6	بيت			6	Red		

#	Arabic word	Response	Score	#	English word	Response	Score
7	شمس			7	Play		
8	كرسي			8	Cold		
9	صديق			9	Flower		
10	معلم			10	Sky		

Part Three: Oral Description Task The examiner shows the student a picture of a family eating dinner together. The student is given 60 seconds to describe what they see in each language separately.

Arabic ver notes	Score	English ver notes	Score

Appendix D Linguistic Assessment Test

Task01: phoneme Deletion

The examiner says a word; the student repeats it without a specified phoneme (measures phonological manipulation) (ex, I say 'sun' without /s/ becomes 'un'. Now You Try:

Word	Remove	Correct	response	Score (1/0)
Plane	/p/	lane		
Smile	/s/	mile		
Frog	/f/	rog		
Bread	/b/	read		
Clap	/k/	lap		
Train	/t/	rain		
Fly	/f/	ly		
Grass	/g/	rass		
Slip	/s/	lip		
Print	/p/	rint		

Word	Remove	Correct	response	Score (1/0)
باب	/ب/	اب		
كتب	/ك/	تب		
سمك	/س/	مك		
فرح	/ف/	رح		
درس	/د/	رس		
نهر	/ن/	هر		
قلم	/ق/	لم		
شمس	/ش/	مس		
جبل	/ج/	بل		

حصان	/ح/	صان		
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Task 2: (Syllable Segmentation) The examiner says a word; the student taps/claps or

states the number of syllables (measures syllable awareness).

	Word	Syllables	response
1	Cat	1	
2	Table	2	
3	Banana	3	
4	Elephant	3	
5	Computer	3	
6	Sun	1	
7	Umbrella	3	
8	Butterfly	3	
9	Book	1	
10	Telephone	3	

	Word	Syllables	response
1	باب	1	
2	مدرسة	3	
3	كتاب	2	
4	تلفزيون	4	
5	قلم	2	
6	سيارة	3	
7	شمس	1	
8	طائرة	3	
9	بركان	3	
10	استاذ	3	

Task three: Semantic Processing

The examiner says a word and the students points to the correct picture .

	Word (English)	Score	Word (Arabic)	Score
1	Apple		قمر	
2	Chair		حذاء	
3	Dog		علبة	
4	Car		فستان	
5	Book		شجرة	
6	House		نافذة	
7	Sun		سمكة	
8	Tree		طاولة	
9	Teacher		جسر	
10	School		شمس	

Task 4: Word Association

The examiner gives a cue; the student produces a related word or lists items in a category

(measures the semantic network and lexical retrieval)

	English	Response	Score	Arabic	Response	Score
1	Kids			ربيع		
2	School			منزل		
3	Eat			قط		
4	Cold			بحر		
5	Book			ماء		
6	Run			ملابس		
7	Water			مدرسة		
8	Happy			هاتف		
9	Night			كرسي		
10	Chair			مائدة		

Task 5: Verb Conjugation (Arabic only)

the examiner provides a base verb and subject; student produces the correctly conjugated verb form (measures inflectional morphology).

	Base verb	Subject	Expected	response	Score (1/0)
1	كتب	هي	كتبت		
2	لعب	هم	لعبوا		
3	ذهب	أنا	ذهبت		
4	أكل	نحن	أكلنا		

5	درس	أنت	يرست		
6	فتح	هو	فتح		
7	رسم	أنتم	رسمتم		
8	سمع	هي	سمعت		
9	ركض	هما	ركضا		
10	قرأ	أنت	قرأت		

Task 6: Noun Pluralisation (Arabic only)

The examiner says a singular noun; the student produces the plural form (measures regular/irregular plural formation).

	Singular	Expected	Response	Score (1/0)
1	كتاب	كتب		
2	بيت	بيوت		
3	ولد	أولاد		
4	شجرة	أشجار		
5	قلم	أقلام		
6	مدرسة	مدارس		
7	باب	أبواب		
8	كرسي	كراسي		
9	طالب	طلاب		
10	صديق	أصدقاء		

Task 7: Sentence Completion (Arabic only)

The examiner reads an incomplete sentence; student supplies the missing word (measures morphosyntactic knowledge and vocabulary).

	sentence	Expected response	Score (1/0)
1	ذهب الولد مع أصدقائه إلى.....	المدرسة	
2	البنت.... الكتاب بعناية	قرأت	
3	 نحن نأكل الطعام في	المطبخ	

4	الطلاب في القسم كل يوم	يدرسون		
5	السماء..... في فصل الشتاء	ممطرة		
6	يشرح الأستاذ..... بطريقة واضحة	الدرس		
7	البنات..... في الحديقة	يلعبن		
8	هو يحب..... الكتب في المساء	قراءة		
9	الأم تطبخ لعائلته ا	الأكل		
10	الطفل..... بسرعة نحو المنزل	يركض		

Task 8: Grammaticality Judgment (Arabic only)

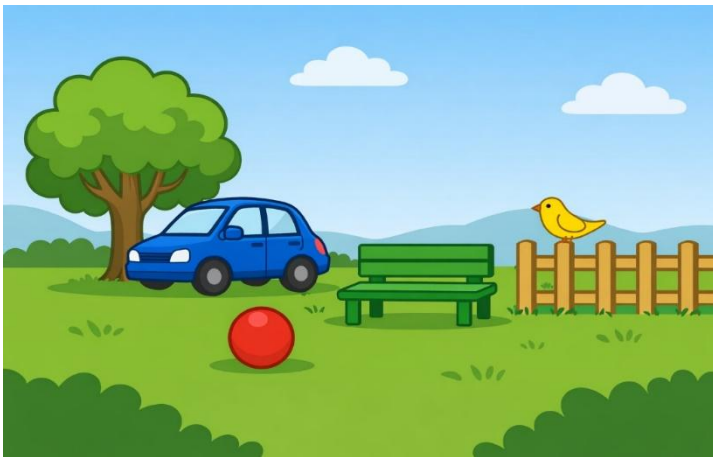
The examiner reads a sentence; student judges correct/incorrect and, if incorrect, provides correction (measures syntactic awareness).

	Sentence	Error t	Correct version	Judgment	Correction	Score (02)
1	البنات لعبو في الحديقة	Agreement error	البنات تلعب في الحديقة			
2	الأولاد ذهب الى المدرسة	Agreement error	الأولاد ذهبو إلى المدرسة			
3	هي تكتب الدرس	Correct	هي تكتب الدرس			
4	نحن يأكل الطعام معا	Person error	نحن نأكل الطعام معاً			
5	الطالب قرأت الكتاب	Gender error	الطالب قرأ الكتاب			
6	البنات رسم لوحة جميلة	Agreement error	البنات رسمن لوحة جميلة			
7	هو ذهب إلى السوق	Correct	هو ذهب إلى السوق			
8	الأطفال نام مبكراً	Agreement error	الأطفال ناموا مبكراً			
9	المعلمة كتبت على السبورة	Correct	—			

Appendix E Cognitive Assessment Test

Task 1: working memory

The examiner shows a single pictured scene for **8 seconds**, then removes it and asks the recall questions. Begin with a brief distractor question (“What is your favourite subject at school?”) before recall.



Question	Expected answer	Response
What color was the ball?	Red	
What color was the car?	Blue	
What color was the bench?	Green	
What color was the bird?	Yellow	
Name three objects you saw	Ball; Car; Bench; Bird; Tree; Fence (any three)	



Task 4: Rule Switching (Executive Functioning)

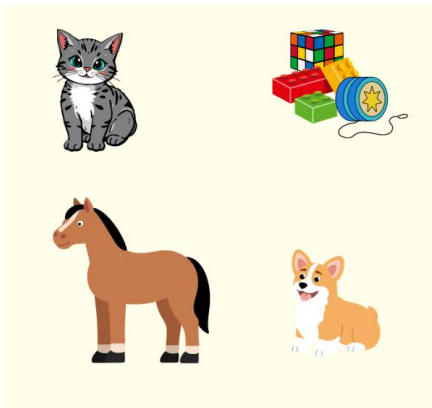
The examiner presents a mixed sequence of single items (numbers and letters). Switch rule after short blocks; student responds aloud according to the card cue. The examiner keeps the cards visible throughout.

Red card: classify the number as odd/even. **Blue card:** classify letter as vowel/consonant

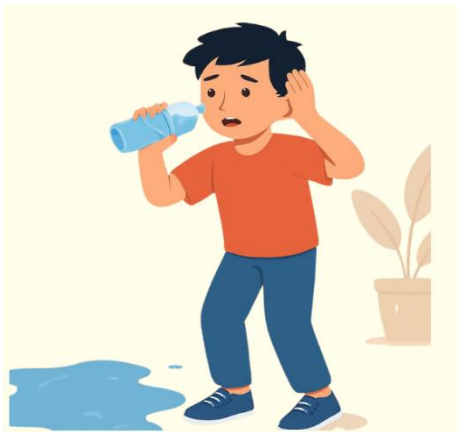
Stimulus	Rule cue	Expected	Response	Score (1/0)
7	Red	Odd		
4	Red	Even		
A	Blue	Vowel		
B	Blue	Consonant		
9	Red	Odd		
E	Blue	Vowel		

Task 5 : Logical Reasoning (Critical Thinking)

A. The examiner presents a **mixed sequence of familiar pictures**. the examiner asks the student to **identify the odd-one-out**



B. The examiner presents a picture showing a boy spilling water and a wet floor. The examiner asks the student to look at the picture and explain what happened and why the floor is wet. The student



Problem	Student Response
A. Odd-One-Out (2 items)	
B. Cause–Effect	

Task 6: (Problem Solving)

The examiner shows a **picture** depicting a **problem situation**. The student is asked to look at the picture and explain what is happening and what they would do to solve it



