The relationship between oral language skills and emergent literacy skills in Saudi Arabic-speaking children with and without DLD aged 4;0 to 6;11

A thesis submitted in fulfilment of requirements for the degree of Doctor of Philosophy
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Dedication

This thesis is dedicated to my ‘Ahmed’, my father who taught me to aim high, shoot to the stars, work hard, and never give up. To my ‘Mona’, my mother, for her unconditional love, encouragement, and support. To my heroes: brother, Abdulmohsin, and my sisters Halah, Sarah, and Bodour for their enthusiasm, unfailing support, and their tremendous love. To my angels: niece ‘Shaikha’ and nephews ‘Adel’ and ‘Ali’ for their joy and purity. And finally, to the soul of my beloved uncle ‘Mohammed’ who left us this year but never left our lives. His smile and laughter will always remain among us; may his soul rest in peace.

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledges.

Zakiyah Ahmed Alsiddiqi

Declaration of Authorship

I declare that the published study from this thesis report is my original work in collaboration with my supervisors and I am the primary author on this paper.

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Abstract

Although children with developmental language disorder (DLD) are known to have difficulties with emergent literacy skills, none of the available Arabic studies have examined emergent literacy skills in children with DLD. This is unexpected given that Arabic is the native language of approximately over 300 million people in the world. It has been suggested that oral language skills contribute significantly to emergent literacy skills in English-speaking children, so this study aims to fill this gap in Arabic studies by being the first to examine the associations between different oral language and emergent literacy skills in Arabic-speaking children, with and without DLD, aged 4;0 to 6;11 (years; months). The study will also investigate the relationships between verbal short-term memory (VSTM), socioeconomic status (SES), home literacy environment (HLE), and emergent literacy skills, and their impact on Arabic children with and without DLD. The aim is to provide additional new insights into relationships between oral language, VSTM, and emergent literacy skills in the Arabic language, and contribute to the understanding of emergent literacy development in Saudi Arabic-speaking children.

In terms of methodology, this study administered comprehensive Arabic language, VSTM and emergent literacy batteries to a typically developing (TD) group and DLD group of children based in Riyadh, Saudi Arabia. Consistent with existing literature, findings demonstrated that the TD group significantly outperformed the DLD group on emergent literacy measures. Findings also showed significant associations between oral language skills, VSTM, and emergent literacy skills in both TD and DLD groups; however, these associations were stronger in the DLD group than the TD group. Results also revealed that vocabulary knowledge and digit recall were significant predictors for emergent literacy skills in the DLD group only. This study represents an important first step in understanding emergent literacy skills and their relationships to language in Arabic-speaking children with and without DLD.

Chapter 1
Introduction

1.1 Background to the study

The ability to read fluently and accurately is a crucial skill for academic success (Catts et al., 2002; Gough & Tunmer, 1986). The process to learn this skill starts from a young age, with infants learning and expanding their knowledge through exposure to books as a matter of course. Reading is a linguistic-based skill and an essential means of communication and acts as a link between oral and written language skills. According to the Simple View of Reading (SVR) model (Gough & Tunmer, 1986), reading comprehension is the result of two primary skills: decoding and listening comprehension. In order to be successful readers, children must use both word-level cues (during the decoding process) and sentence-level cues (during the comprehension process) to competently comprehend the written script. Therefore, children must acquire strong linguistic skills early on in their development, as it will act as an anchor for their reading skills.

The relationship between oral language and emergent literacy skills has been studied for many years in English and other languages; however, there has been limited research on this topic in Arabic, particularly in children with developmental language disorder (DLD). Children with DLD are known to have unexplained difficulties with acquiring language (Bishop et al., 2017). Given that reading is a language-based skill, deficits in language will arguably hinder the acquisition of reading. Several studies have reported that DLD has a negative impact on literacy and academic skills (Boudreau & Hedberg, 1999; Catts et al., 2005; Gillon, 2004; Pratt et al., 2020) that often persist throughout the affected child's school years and beyond. In Saudi Arabia, speech and language therapists (SLTs) demonstrate tremendous efforts in providing support and services to children with DLD and their families, despite limited resources. However, due to the parents and educators' limited awareness of DLD and

the lack of resources, SLTs face difficulties in identifying emergent literacy deficits. It is therefore imperative that this study be carried out to not only raise awareness of DLD amongst educators and parents in Saudi Arabia, but to establish a possible means of improving emergent literacy in children with DLD. To this end, this study will investigate the relationship between oral language skills and emergent literacy acquisition in Saudi Arabic-speaking children with DLD and examine language predictors for emergent literacy skills.

1.2 Research Contribution

Despite the available literature in Arabic, no studies have examined the relationship between emergent literacy and oral language skills in Arabic-speaking children with and without DLD. Most of the Arabic studies have focused on school-aged children, so our knowledge about the emergent literacy skills in younger children (aged 4 to 6) is limited. Also, available studies have not considered a broad range of linguistic skills (e.g., semantic, morphosyntax, and comprehension) and emergent literacy skills (e.g., phonological awareness, letter knowledge, and decoding). As a result, the nature of the relationship between language and emergent literacy in young Arabic-speaking children is still unclear. It is possible that the relationship between oral language skills and emergent literacy may vary between languages and, given the phonological and orthographic differences between English and Arabic, the relationship between language deficits and emergent literacy skills in Arabic may be different from English. Therefore, studies on the relationship between language and emergent literacy in Arabic are crucial to advance scholarly knowledge on the foundational role that language plays in literacy development, and to inform early intervention.

1.3 Aims and Objectives

The primary aim of this study is to investigate the relationship between oral language and emergent literacy skills in Arabic-speaking children with and without DLD, and to identify the potential linguistic predictors for emergent literacy in Arabic. Understanding the

association between oral language and emergent literacy in Arabic is important from both a clinical and educational perspective. Having such knowledge would help to improve early intervention services provided to children with DLD as well as educate teachers and families about the impact of language deficits on literacy development. This research is important for a number of reasons:

1. The literature on the associations between oral language, VSTM, and emergent literacy skills of Arabic-speaking children with and without DLD is limited compared with well-documented studies in English and other languages. Therefore, this study aims to provide preliminary evidence concerning these relationships and fill the gap in the studies of emergent literacy skills in Arabic-speaking children with and without DLD.
2. Due to the paucity of research in Arabic emergent literacy skills, the findings of this study have the potential to contribute new knowledge about the nature of the associations between oral language, VSTM, and emergent literacy skills in Arabic-speaking children with and without DLD.

This thesis attempts to achieve the aims and objectives of this research by studying the relationship between oral language skills and emergent literacy skills in Saudi Arabic-speaking children with and without DLD disorders aged 4;0 to 6;11. In light of this context, the research questions are:

1. Do Saudi Arabic-speaking children with DLD differ from their TD peers in emergent literacy skills?

2. What is the relationship between language and emergent literacy skills in Arabic-speaking TD children and children with DLD?

3. What is the relationship between verbal short-term verbal memory and emergent literacy skills in Arabic-speaking TD children and children with DLD?

4. What is the relationship between home literacy environment, socioeconomic status, and emergent literacy skills in Arabic-speaking TD children and children with DLD?

1.4 Thesis outline

This thesis is composed of six chapters, including this introductory chapter. The remaining chapters of this thesis are structured as follows: Chapter 2 reviews existing research evidence on the importance of language for emergent literacy acquisition in English and other languages. The chapter starts by defining what emergent literacy is, as well as outline its components and models. This is followed by an overview of findings on the relationship between language and emergent literacy in English and other languages. Chapter 3 describes the Arabic language, its orthography, and characteristics. It also provides an overview of the available Arabic studies examining emergent literacy, phonological awareness, and the relationship between language and emergent literacy skills. Chapter 4 describes the methodology of the study, including participants' characteristics as well as the administration and scoring procedures for the Arabic language and emergent literacy tests. Chapter 5 provides the results of the data analyses and addresses the research questions. Finally, Chapter 6 presents the discussion of the results of this study. It also includes the theoretical implications and limitations of the study as well as directions for future research.

Chapter 2
Literature Review

The aim of this literature review is to provide a detailed understanding of the relationship between oral language and emergent literacy skills, and the rationale behind the creation of this study's research questions and hypotheses. It will start by providing a description of emergent literacy skills and outline its components and models. This is followed by an overview of findings on the associations between language and emergent literacy skills in children with and without DLD. A summary of the existing literature will be provided, highlighting research outcomes and the inconsistencies within these research outcomes.

2.1 Emergent Literacy

The process of learning to read begins in the early years of childhood, prior to formal reading instruction (Rhyner, 2009). Emergent literacy, also known as early literacy, reflects children's ability to understand reading and writing before they are considered readers and writers (Teale & Sulzby, 1986). The term was initially proposed by Clay (1966) and was based on the concept of *reading readiness*, which theorizes that there is a period where children acquire and experience different behaviours that are important for later literacy attainment. As a result, reading readiness proponents argue that children should not be exposed to reading instruction until they reach an age of mental readiness (i.e., age 6 (Rhyner, 2009)). On the other hand, emergent literacy advocates believe that literacy development begins early in children's lives and long before formal instruction (i.e., from birth until the time that they are formally taught reading), and that the acquisition of these skills is refined by children's interactions and exposure to different literacy inputs (Erickson, 2000; Rhyner, 2009).

Similar to language development, emergent literacy skills are acquired through an interactive and continuous process. As these skills emerge, they concurrently interact with early

oral language skills, and an interrelationship between oral language skills and written language skills gradually appears and develops over time. Thus, emergent literacy acts as a link between early language skills and literacy skills (Rhyner, 2009).

2.1.1 Emergent Literacy Components

Emergent literacy is considered a complex skill which is composed of different fundamental elements, and thus has motivated researchers to investigate this stage and try to understand how children demonstrate their emergent literacy knowledge. There are different classification systems, though they include similar important components: conceptual and procedural knowledge about literacy, language, and metalinguistic skills (Rhyner, 2009).

Conceptual knowledge includes skills that reflect children's abilities to understand the concept and function of print, such as: knowledge of reading conventions, book structure, and text directionality. Procedural knowledge entails skills that reflect children's ability to decode, such as: phonological awareness (i.e., syllable segmentation, blending, rhyming, and phoneme awareness), and letter knowledge (i.e., the ability to recognize and name letters, and grapheme-phoneme correspondence).

Since the focus of this study is to investigate the emergent literacy skills in Saudi Arabic-speaking children with and without DLD aged 4;0 to 6;11 (years; months), it is important to understand the two main procedural knowledge skills: phonological awareness and letter knowledge.

2.1.1.1 Phonological Awareness

Phonological awareness (PA) refers to the individual's conscious ability to detect, discriminate, and manipulate phonemes within their own language (Anthony & Francis, 2005). It is a multilevel and metalinguistic skill as it requires an explicit analysis of the words' structure (Gillon, 2018). To comprehend the spoken language, children should be able to segment the spoken language (i.e., into words, syllables, and phonemes), hold these segmented

elements in their working memory, and process them (i.e., identification, blending, deletion, or manipulation (Mcbride-Chang, 1995).

Children begin to acquire these skills during the early stages of development. PA skills undergo a continuum process of development starting from tacit analysis (i.e., rhyming and segmentation) to explicit analysis (i.e., sound manipulation and segmentation (Stackhouse et al., 2002). The development of the meta-PA is facilitated by the accumulation of sensory (i.e., auditory, visual, and motor) experiences with the phonological system (Stackhouse et al., 2002). This means that the child must listen to the sound, lip-read the sound, and write the sound's symbol while learning to read. At the early stages of literacy development, children have limited letter knowledge experiences; therefore, their meta-PA skills are implicit and reflect their understanding of words' forms (i.e., number of syllables, and similarities and differences in rhyming). However, as they gain more experience with letters, their meta-PA skills become more explicit and reflect their understanding of words' components (i.e., number of phonemes, phoneme position within the word, and phoneme manipulation (Rhyner, 2009)). Several studies have indicated the importance of PA for literacy development (Gillon, 2018; Hulme et al., 2002; Lonigan et al., 2000; Christopher J. Lonigan et al., 2009; Muter et al., 2004; Shanahan & Lonigan, 2010). In a meta-analysis study, the National Early Literacy Panel demonstrated that PA skills had moderate effects in predicting literacy skills in children. Of the PA skills, phoneme awareness skills such as, phoneme manipulation, segmentation, or deletion were found to be the strongest predictors of word reading (Hulme et al., 2002, 2012; Hulme & Snowling, 2019).

2.1.1.2 Letter Knowledge

Letter knowledge is the beginning of orthographic knowledge, and one of the higher levels of the emergent literacy skills. Letter knowledge entails skills in letter naming and grapheme-phoneme correspondence: in alphabetic writing systems, graphemes (i.e., letters) represent

phonemes. Therefore, understanding that a grapheme links to a specific phoneme is crucial for reading. To do this, children must have intact phonological representations and grapheme-phoneme correspondence skills. This explains the close associations between phoneme awareness and letter knowledge skills (Foulin, 2005; Hulme et al., 2002; Lerner & Lonigan, 2016; Metsala & Walley, 1998); thus, letter knowledge is also another predictor of word reading (Gillon, 2018; Hulme & Snowling, 2019; Shanahan & Lonigan, 2010).

2.1.2 Emergent Literacy Models

According to Sénéchal et al. (2001), emergent literacy depends on two main developmental perspectives: the neo-Piagetian view and the neo-Vygotskian view. The neo-Piagetian view focuses on the development and maturity aspects of literacy acquisition. According to this view, children's understanding of literacy is different from adults, and they acquire literacy skills gradually as they developmentally grow over time. The neo-Vygotskian view, on the other hand, recognizes that children need to engage in different literacy experiences (e.g., shared book activities or exposure to literacy materials) and interact with more proficient readers, such as parents or older siblings, in order to competently acquire emergent literacy skills.

Several studies have investigated the development of emergent literacy skills in the early years (i.e., from birth to 5 years old). As a result, different models have been suggested to provide researchers with frameworks describing emergent literacy components and how they are related to each other. The following sections will discuss the theoretical models that are relevant to this study.

2.1.2.1 Simple View of Reading (SVR) Model

As shown in Figure 2.1, the SVR model posits that, for children to become successful readers, they must use both word-level cues (i.e., decoding) and sentence level cues (i.e., during the comprehension process (Gough & Tunmer, 1986)). In other words, this view has suggested

that reading comprehension is the product of two main interrelated elements: decoding and language comprehension. Thus, deficits in either of these elements may lead to poor reading comprehension. The SVR does not claim that reading is simple, but it has simplified the complexity of the reading process by defining the two essential components (Hoover & Tunmer, 2018a). Certainly, the SVR has informed educators and researchers about the importance of examining both decoding and language comprehension when assessing literacy skills. It has also contributed to the classification of different reading disabilities: dyslexia (i.e., difficulties with decoding), hyperlexia (i.e., difficulties with language comprehension), or garden-variety reading (i.e., difficulties with both decoding and comprehension (Catts, 2018). However, the SVR focuses on the reader-internal factors and, thus, does not address the other factors that may influence the acquisition of literacy skills (e.g., decoding irregular words, differences between listening and reading comprehension, and differences in linguistic characteristics (Francis et al., 2018; Kirby & Savage, 2008)).

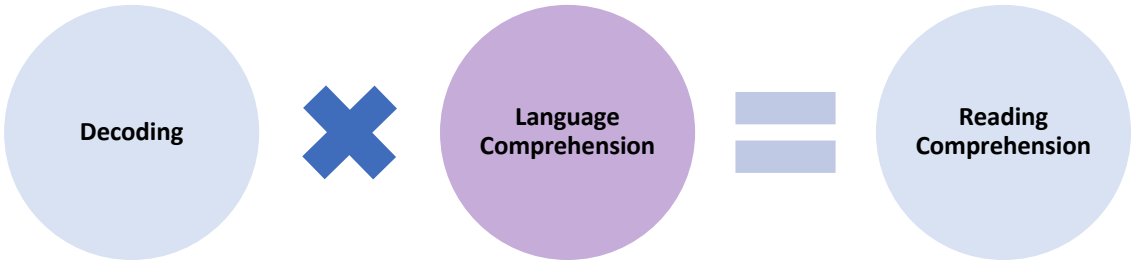

Figure 2.1. *Simple View of Reading (Gough & Tunmer, 1986)*

2.1.2.2 Outside-In, Inside-Out Model

In the expanding amount of literature on emergent literacy, researchers have become increasingly interested in identifying its components. In 1998, Whitehurst and Lonigan proposed the outside-in, inside-out model. According to this model, emergent literacy includes two distinct but interrelated main domains: the *outside-in* (i.e., broader view) which refers to language comprehension, and the *inside-out* (i.e., narrower view) which refers to decoding-

related skills. The outside-in domain includes the elements that reflect children's abilities to understand the context and function of print. These elements are language, narrative, convention of print, and emergent reading. The inside-out domain includes elements that help children to decode and translate the written script such as knowledge of graphemes, phonological awareness, syntactic awareness, phoneme-grapheme correspondence, and emergent writing.

The outside-in, inside-out model revealed the complexity of the reading process and defined the elements necessary for literacy acquisition. According to this model, the literacy process is represented as a continuum with the inside-out domain on one end (i.e., at the beginning of the reading process), the outside-in domain on the other (i.e., at the end of the reading process), while language skills are in the middle of the model linking the two domains. One drawback of the outside-in, inside-out model is that it does not provide a clear description of the interrelationships between the subskills within each domain (Rohde, 2015).

2.1.2.3 Reading Rope Model

Shortly after Whitehurst and Lonigan's (1998) model, Scarborough developed the reading rope model in 2001. In this model, as shown in Figure 2.2, reading is represented as a rope composed of two main intertwining cords. These cords represent the main reading domains: language comprehension and word recognition (i.e., decoding). Both cords are composed of different specific strands which represent the subskills involved in proficient reading, and each strand is intertwined with the other – indicating the interrelationships between the subskills.

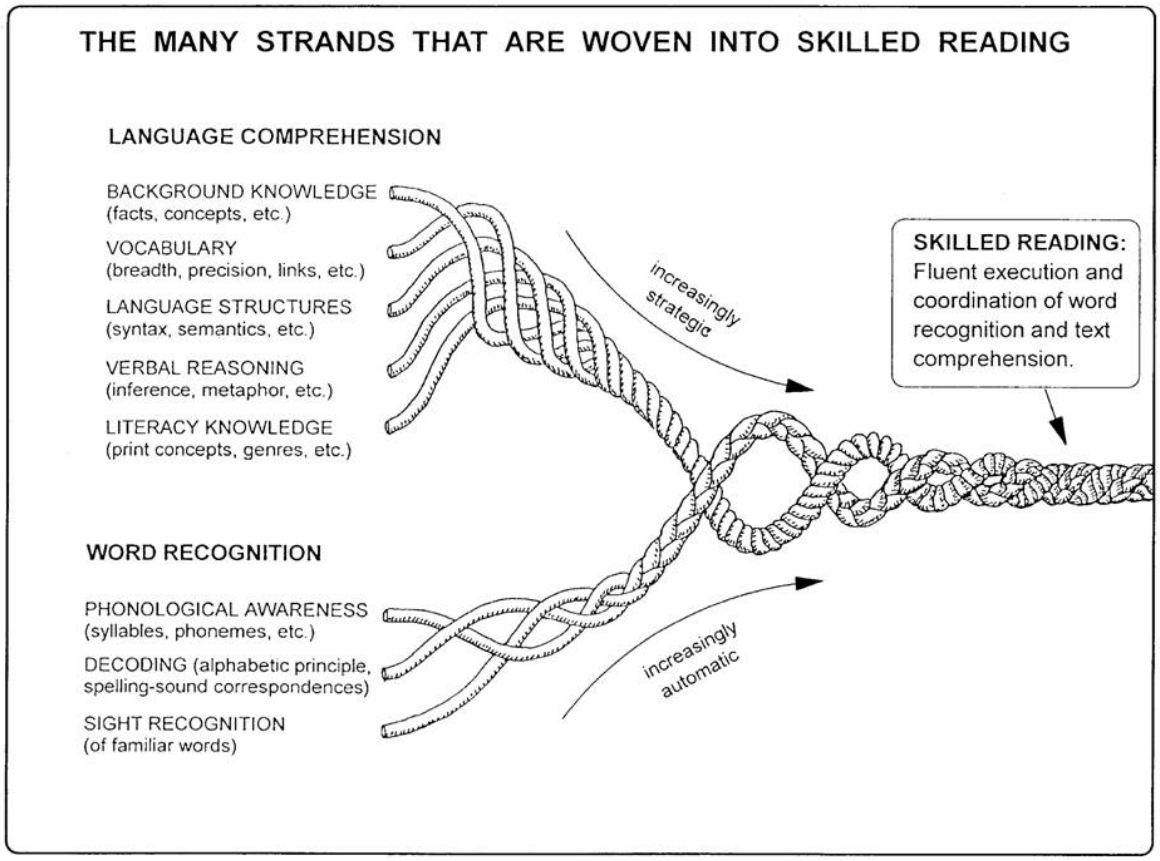

Figure 2.2. *Reading Rope Model (from Scarborough, 2001)*

The model also demonstrates how these subskills are related and influence each other's development, indicating the importance of each subskill for reading comprehension. While Scarborough's reading rope model refined the previous reading models by specifying the specific skills that underly reading, it does not include environmental factors or has explored their importance for literacy acquisition (Rohde, 2015).

2.1.2.4 Comprehensive Emergent Literacy Model

The comprehensive emergent literacy model (CELM) was developed by Rohde (2015). Similar to the previous models, CELM also propounds that emergent literacy is composed of different subskills that undergo a specific developmental sequence, with each subskill supporting the development of the other. CELM, however, goes further by highlighting the impact of the environment on emergent literacy acquisition. According to this model, emergent literacy is dependent on a set of environmental factors, looking closely at a child's community

and culture. It also purports that emergent literacy development is influenced by different environmental factors, such as exposure to different literacy materials and activities, and the support that children may receive from their caregivers to facilitate their literacy development. A large body of research has investigated the importance of environmental factors on learning to read (Aram et al., 2013; Hemmerechts et al., 2017; Najmaldeen, 2020; Neumann, 2016; Pan et al., 2017); therefore, it is important to examine these factors on literacy acquisition (Rohde, 2015).

The models discussed above have provided general theoretical frameworks related to emergent literacy development, and have defined the important subskills that underlie reading. To understand how children decode the written script, other researchers have further developed more specific models that attempt to explain the process of word recognition (i.e., decoding). One model that has dominated the literature on word recognition theories is the connectionist model (Seidenberg, 2005).

2.1.2.5 Connectionist Model

The connectionist model (Seidenberg, 2005), based on what was previously known as the triangle model, emphasizes the importance of phonological representations to word recognition. According to this model (see Figure 2.3), three main domains need to be activated: orthographic knowledge (i.e., visual processing), phonologic knowledge, and semantic knowledge. It theorizes that word recognition is based on the connection between orthographic and the phonologic knowledge, and that this connection allows the development of direct connections between orthographic and semantic knowledge. Thus, the activation of the semantic process depends on the activation of both orthographic and phonological pathways simultaneously.

However, depending on different factors (e.g., word frequency, regularity and irregularity of words, and reading experience), the model sometimes may rely more on one

pathway than the other. During the early stages of reading development, when children begin to learn decoding new words, the model depends more on the orthography-phonology-semantic pathway. For example, decoding a new word such as *book* involves orthographic knowledge (i.e., letter knowledge), thereby activating phonological knowledge (i.e., grapheme-phoneme correspondence) in order to access the semantic knowledge. With more reading experience and learning, the connections between the three processes – orthographic, phonological, and semantic – are strengthened, and the contributions of the orthography-semantic pathway to the reading process is increased.

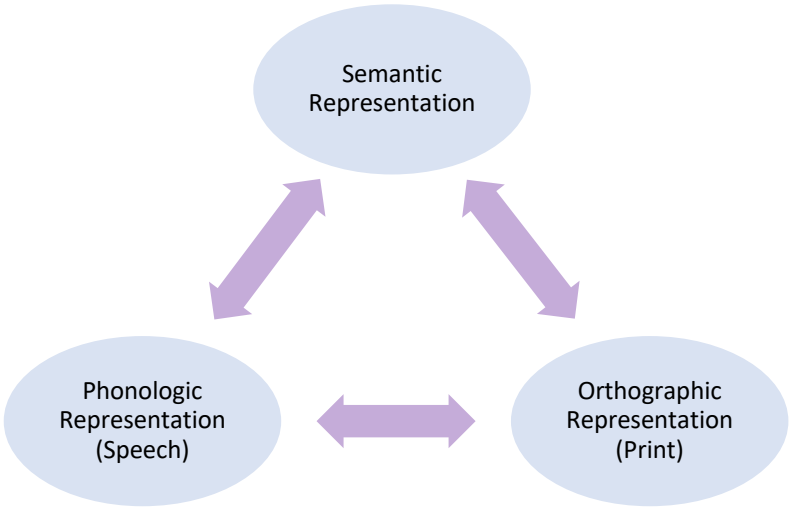

Figure 2.3. *The triangle model of word recognition (Seidenberg & McClelland,1989)*

In summary, despite the differences between the discussed models, every model has its own value and provides researchers with a specific theoretical framework with which to guide their investigations. The SVR model can be seen as a first attempt towards an understanding of the reading comprehension process as it defines the two main pivotal domains (i.e., decoding and language comprehension) of reading skills, demonstrating how language is related to literacy. In its attempt to simplify the complexity of the reading process, the SVR does not identify the underlying subskills of each domain, but its value is in offering a general

framework for understanding the reading process, which has provided researchers with the main blueprint for understanding literacy skills.

The outside-in, inside-out and reading rope models have both taken the SVR blueprint as a starting point and developed it to include the complexity of the reading process. Both models also identify the underlying subskills of decoding and language comprehension. As discussed earlier (see section 2.1.2.3), while using the same starting points, the reading rope model then advances the outside-in, inside-out model by outlining how different subskills are related to – and influence the development of – each other. Based on the hypothesis that literacy is acquired within a context of culture and community, the CELM then built upon these two models' analyses of subskills to include children's environment as a factor influencing the acquisition of literacy. Finally, the connectionist model analyses the decoding process and identifies the three important domains for decoding: phonological, orthographical, and semantic representations.

Despite the differences between the models discussed, all demonstrate how language and literacy skills are fundamentally related to each other – a hypothesis supported by numerous studies (Catts & Hogan, 2003; Psyridou et al., 2018; Snowling et al., 2016; Tambyraja et al., 2015; Wilson & Lonigan, 2010).

2.2 Oral Language and Emergent Literacy Skills

2.2.1 Oral Language and Emergent Literacy skills in Typically Developing Children

A growing body of research has highlighted the importance of oral language skills in the development of emergent literacy and later literacy skills (Catts et al., 2015; Dickinson et al., 2019; Kendeou et al., 2009; Lonigan et al., 2000; Muter et al., 2004), but some questions remain. For example, which oral language skill contributes most to emergent literacy acquisition? How does the relationship between oral language and literacy manifest (and possibly change) over time? Due to the myriad factors that influence the literacy acquisition

(e.g., language characteristics, a child's internal factors, environmental factors, etc., (Gillon, 2004; Hulme et al., 2015; Mol & Bus, 2011; Snowling et al., 2019)), there is no simple answer to any of these questions. More recently, evidence from longitudinal studies has shaped our understanding of reading acquisition and its relationship with oral language skills. The following section will discuss these studies and highlight the contribution that oral language skills make.

2.2.1.1 Evidence from English Studies

In a longitudinal study, Kendeou et al. (2009) examined the oral language and decoding skills of 297 children aged 4;0 to 8;0. Consistent with Storch and Whitehurst (2002), Kendeou et al. found that oral language (i.e., narrative and vocabulary knowledge) and decoding skills (i.e., phonological awareness, letter knowledge, and word identification) were highly correlated at age four but became weaker at age six. While oral language skills predicted decoding-related skills (e.g., phonological awareness, letter knowledge, and word identification) at age 4, this predictive power diminished two years later. The findings indicate that oral language and decoding-related skills act as one construct at the beginning of literacy acquisition (i.e., during the preschool period), but, over time, the skills become separate and follow their own developmental trajectories, as indicated by their weak relationship in kindergarten (aged 5;0 to 6;0) (Kendeou et al., 2009). In other words, despite the dissociation between oral language and decoding skills later on in a child's development, each skill influences the development of the other during the early developmental stages. The authors further reported that both oral language and decoding-related skills predicted reading comprehension in the second grade (aged 7;0 to 8;0). This finding supports the well-documented evidence that reading comprehension is the product of two independent skills: decoding and language comprehension (Catts & Kamhi, 2005; Gillon, 2018; Gough & Tunmer, 1986; Hjetland et al., 2019; Hoover & Tunmer, 2018c; Hulme & Snowling, 2014).

In another longitudinal study, Catts et al. (2015) used the SVR framework to examine the early predictors of reading comprehension. They followed the development of decoding-related skills (e.g., phonological awareness and letter knowledge) and the oral language skills (e.g., narrative and vocabulary knowledge) in 366 children aged 5 to 9; they also tested word-reading skills (i.e., word recognition) at the end of their second grade (aged 8) and reading comprehension skills at the end of the third grade (aged 9). The authors found that, at age 5, oral language skills were positively correlated with letter knowledge and phonological awareness. They also found that second-grade word recognition skills were predicted by the kindergarten (aged 5) phonological awareness and letter knowledge skills; however, kindergarten oral language skills did not predict second-grade word recognition. Due to the strong associations between phonological awareness and oral language skills, Catts et al. suggested that children's phonological awareness skills act as a reflection of their language skills. Thus, oral language skills may have an indirect effect on word recognition with phonological awareness skills as the mediator. The importance of oral language skills re-emerged later at third-grade level (aged 8 to 9) as a significant predictor of reading comprehension. These findings are consistent with previous studies (Gough & Tunmer, 1986; Kendeou et al., 2009; Lonigan et al., 2000; Muter et al., 2004) which support the SVR (Gough & Tunmer, 1986) by highlighting the importance of oral language skills for reading comprehension skills.

Based on the findings from the above-mentioned studies (Catts et al., 2015; Kendeou et al., 2009), one could argue that oral language skills are not important during the early stages of literacy acquisition (i.e., ages 4 to 6). However, due to the strong correlations between preschool oral language and decoding-related skills (i.e., phonological awareness and letter knowledge), early oral language skills are, arguably, important for emergent literacy development. The above-mentioned studies have suggested a direct effect of oral language

skills on decoding-related skills, and indirect effect on word recognition (i.e., mediated by decoding-related skills) and later literacy acquisition.

In summary, different longitudinal studies have examined emergent literacy skills in young children and explored the relationship between these skills and oral language skills (Catts et al., 2015; Dickinson et al., 2019; Kendeou et al., 2009; Muter et al., 2004; Storch & Whitehurst, 2002). However, these studies have shown inconsistent findings related to the language predictors of literacy skills. This could be due to several reasons: (1) the studies did not use the same oral language measures. For example, Storch & Whitehurst (2002) included measures of vocabulary knowledge, narratives, and word structure, while Catts et al. (2015) measured vocabulary knowledge and narrative skills only; (2) different tests were administered at different points in time (Muter et al., 2004); and (3) the studies combined several language tests into a single construct (i.e., oral language skills) without looking at the individual effect of each language skill (i.e., vocabulary, morphosyntax, narratives, listening comprehension) on emergent literacy acquisition (Catts et al., 2015; Kendeou et al., 2009; Storch & Whitehurst, 2002).

Some studies, on the other hand, have demonstrated the direct effect of different oral language skills on emergent literacy acquisition (Dickinson et al., 2019; Muter et al., 2004; Suggate et al., 2018). Dickinson et al., for example, investigated the relationship between the language and decoding-related skills of 489 African-American (aged 4;5 year) from low socioeconomic homes. Broad language and decoding-related tests were administered at three different stages: the last two months of preschool, kindergarten, and first grade. The authors found that language skills contributed directly and indirectly to decoding-related skills. Of the language skills, vocabulary knowledge was found to be the most important predictor of decoding-related skills (phonological awareness and letter knowledge) in kindergarten and first grade. Discourse skills, on the other hand, were found to be predictors of only phonological

awareness skills in kindergarten and first grade. They also found that vocabulary knowledge and syntax were predictors of first-grade reading.

In contrast to earlier findings (Catts et al., 2015; Muter et al., 2004; Storch & Whitehurst, 2002), Dickinson et al. suggested that language and decoding-related skills are not separate during the early stages of literacy acquisition (emergent literacy stage). Consistent with the reading rope model (Scarborough, 2001), both skills are interrelated and influence the development of each other. Furthermore, with vocabulary being the most important language predictor to decoding-related skills, this evidence highlighted the importance of semantic knowledge for phonological awareness and letter knowledge and supports the connectionist model which emphasizes the importance of the associations between semantic knowledge, phonologic knowledge and letter knowledge (Seidenberg, 2005) (see section 2.1.2.5).

2.2.1.2 Importance of Different Language Skills for Literacy

The finding that language is a multi-dimensional construct that affects literacy acquisition leads us to question the importance of these different language skills on literacy. The following sections will address this question by reviewing evidence related to the following language skills: vocabulary, morphosyntax, and listening comprehension.

Vocabulary knowledge is one of the earliest acquired language skills, and acts as the foundation for the process of language development and reading acquisition. It is important for literacy in both decoding and language comprehension (Ricketts et al., 2007; Suggate et al., 2018). As discussed earlier (see section 2.1.2.5), the connectionist model (Seidenberg, 2005) highlights the importance of the bidirectional connections between the three main processes of word recognition: orthographic, phonological, and semantic knowledge. During the early stages of decoding, children rely more on their semantic knowledge to facilitate the acquisition of the grapheme-phoneme mapping process. Thus, vocabulary knowledge facilitates the acquisition of phonological awareness skills (Metsala & Walley, 1998). However, while

reading irregular words (i.e., words that do not follow the regular phoneme-grapheme pattern), the effect of vocabulary on decoding-related skills may vary in English. In such cases, children rely more on their phonological awareness skills and syntactic knowledge to access their semantic knowledge. Phonological awareness has also been found to support vocabulary development (Dickinson et al., 2019).

Vocabulary also plays a significant role in reading comprehension (Catts et al., 2015; Muter et al., 2004; Scarborough, 2001; Storch & Whitehurst, 2002; Suggate et al., 2018). Muter et al. (2004) found that vocabulary knowledge and grammatical skills were significant predictors of reading comprehension at ages 6 and 7. Similarly, Suggate et al. (2018) found that reading comprehension at age 12 was predicted by vocabulary skills at 1;7 year (19 months). These findings highlight the crucial role that vocabulary knowledge plays in literacy acquisition.

Once children begin to assemble words into meaningful sentences (i.e., two-word utterances; around their second year), they begin to develop their morphosyntactic skills (Paul et al., 2018). Morphological knowledge refers to the sensitivity to the internal structure of the words and the ability to break down the words into smaller meaningful units such as roots, prefixes and suffixes (Nagy et al., 2014). Extensive research has shown that morphological knowledge contributes significantly to literacy acquisition (Dawson et al., 2017; Gillon, 2018; Green, 2009; James et al., 2020; Nagy et al., 2014). Morphological awareness refers to the conscious ability to analyse words into their components' morphemes (i.e., smallest meaningful unit). Similar to PA skills, morphological awareness is a metalinguistic skill that requires an explicit analysis of the words (Nagy et al., 2014). In a cross-sectional study, James et al. (2020) examined the relationship between morphological awareness and reading comprehension skills across three different age groups: 6;0 to 8;11, 9;0 to 11;11, and 12;0 to 13;11. They found that, in all age groups, morphological awareness contributed significantly

to reading comprehension skills above and beyond vocabulary, phonological awareness, word reading, and nonverbal reasoning. As a result, they recommended including morphological awareness strategies in classroom-reading instructions.

The effect of morphological awareness strategies on literacy skills has been explored in different intervention studies (Apel et al., 2013; Bowers et al., 2010; Kirby et al., 2012). The 2013 study by Apel et al. examined the effect of morphological awareness intervention on literacy skills of children from low socioeconomic status in kindergarten (aged 5;4), first grade (aged 6;6), and second grade (aged 7;7). Consistent with a study three years before (Bowers et al., 2010), their results showed that morphological intervention had a significant positive effect on children's literacy skills. These findings suggest that introducing children to explicit instructions on the structure of words would enhance their literacy development skills.

Listening comprehension refers to the ability to listen to and understand spoken language. During the early years of development – before exposure to written language – children's language comprehension is often referred to as listening comprehension (Hoover & Tunmer, 2018) and is an important component of reading comprehension (Gough & Tunmer, 1986). Hoover and Tunmer (2018) have shown that there is a close relationship between reading comprehension and listening comprehension skills as they engage the same cognitive capacities but have different access points: reading comprehension through script and listening comprehension through speech.

Numerous studies have included listening comprehension in comprehensive language assessment with the other language skills such as vocabulary and syntax, and investigated the effect of these variables on reading as one generic language construct (i.e., language comprehension). Findings showed that children who had difficulties with language comprehension also had difficulties with reading comprehension skills, despite having age-appropriate levels of reading fluency and accuracy (Foorman et al., 2015; Kendeou et al., 2009;

Nation et al., 2010; Storch & Whitehurst, 2002). However, these studies have not examined the direct effect of listening comprehension, as a single linguistic construct, on reading skills. This has limited our understanding of the importance of listening comprehension for literacy acquisition.

An interrelationship between reading and listening comprehension was reported in a recent study by Wolf et al. (2019). The authors found that listening comprehension explained 40% of the variance in reading comprehension skills, and that reading comprehension explained 34% of the variance in listening comprehension. This, again, shows how both skills are highly interrelated and tap into general language comprehension processes despite their different modalities. The authors also found that vocabulary and word-reading skills were significant predictors of both listening and reading comprehension skills. The importance of vocabulary was explained by its essential role in general language comprehension skills such as understanding different concepts and making inferences. Finally, it was also reported that both vocabulary and listening comprehension contributed significantly to reading comprehension, highlighting the importance of including both skills when assessing language comprehension.

2.2.1.3 Importance of Verbal Short-Term Memory for Literacy

VSTM is one of the primary phonological processing skills (McBride, 2015). According to Baddeley and Hitch's working memory model (1974), short-term memory consists of different but interactive systems in which information is held, processed, and retained. The model consists of the central executive system – a limited capacity attentional system – which is responsible for monitoring and integrating information from the other systems, the phonological loop (i.e., verbal short-term memory), which is responsible for storing, processing, and retaining verbal input, and the visual sketchpad which is responsible for storing, processing and retaining visual and spatial input. In 2000, the model was updated

by Baddeley to include the episodic buffer which is assumed to be controlled by the central executive system to integrate information from several sources. In this study, the author mainly focused on the phonological loop which is also known as verbal short-term memory (VSTM).

VSTM refers to the ability to listen and store information over a short period when other competing cognitive demands are absent (Gathercole et al., 2006; Jackson et al., 2020). Different studies have reported that VSTM is correlated with reading skills in young readers and is the primary predictor of phonological awareness in children (Cunningham et al., 2020; Layes et al., 2021; Martinez Perez et al., 2012; McBride, 2015). Phonological awareness requires adequate means of storage of phonological codes and an activation of phonological representations to manipulate the syllabic or phonemic structures of the words. Therefore, any deficits in VSTM may hinder the acquisition of phonological awareness skills. VSTM is traditionally measured by digit span recall or nonword repetition tasks. It should be noted that these two tasks address different underlying VSTM skills. Digit span recall examines the ability to process the order of information given (i.e., order VSTM), while nonword repetition tasks assess the ability to process the information's items (i.e., item VSTM) (Majerus et al., 2008; Martinez Perez et al., 2012).

Martinez Perez et al. (2012) conducted a longitudinal study to investigate the relationship between VSTM and decoding skills in 74 children of kindergarten age (mean age = 5;8) in the US. They aimed to examine the effects of VSTM for item information and VSTM for order information on decoding skills. They tested children's phonological awareness and VSTM skills at the end of the kindergarten level, and their decoding skills one year later in first grade. Findings showed that order VSTM, but not item VSTM, significantly predicted decoding skills in first grade. This finding was attributed to the role of order VSTM capacities in acquiring new phonological representations. When reading a new word (i.e., decoding), children must link different graphemes to their corresponding phonemes in a particular order,

then temporarily store this coded sequence to read it out. Similar findings were also reported in children with reading difficulties (Hachmann et al., 2014).

A recent 5-year longitudinal study conducted by Cunningham et al. (2020) investigated the effect of memory on reading development in children aged 4, 5, 6, and 9. Similar to Martinez Perez et al. (2012), they found that VSTM measured by digit span and repetition of phonemes directly predicted word-level reading in children aged 4 to 6, and indirectly via phonological awareness skills; while VSTM when measured by nonword repetition predicted word-level reading in children aged 6 to 9. In the early stages of decoding, children rely more on their serial order VSTM to learn how to translate the graphemes into their corresponding phonemes. Once children become proficient decoders, they start to rely more on other linguistic and metalinguistic skills that are crucial for reading comprehension.

2.2.1.4 Summary

In summary, studies on TD children have investigated the relationship between oral language and emergent literacy skills, and, as a result, a number of oral language predictors of emergent literacy in children have been proposed. It is important, however, to consider the different variables studies have used, such as the different ages, backgrounds, and numbers of children analyzed, different models used, and different study designs. Therefore, these findings must be interpreted with caution.

Overall, studies have suggested that oral language and emergent literacy skills are related, and that the relationship between these skills may change over time (Catts et al., 2015; Dickinson et al., 2019; Kendeou et al., 2009). The studies have also demonstrated how oral language skills contribute directly and indirectly to emergent literacy skills. The direct effect of oral language skills was explained by the importance of oral language skills in decoding-related skills (i.e., phonological awareness and letter knowledge). For example, Dickinson et al. (2019) reported that vocabulary knowledge was found to be the significant predictor to

phonological awareness and letter knowledge, which supports the connectionist model (Seidenberg, 2005). The indirect effect of oral language skills was explained by the importance of oral language skills in word recognition as mediated by decoding-related skills (i.e., phonological awareness and letter knowledge (Catts et al., 2015; Kendeou et al., 2009).

Moreover, different oral language skills were found to be predictors of reading comprehension. For example, James et al. (2020) and Apel et al. (2013) reported the importance of morphological awareness on reading comprehension skills, while Wolf et al. (2019) highlighted the importance of listening comprehension on reading comprehension skills. Regarding VSTM, Cunningham et al. (2020) and Martinez Perez et al. (2012) suggested that the serial order VSTM (i.e., digit span) is important during the decoding skills, while the importance of the item VSTM (i.e., nonword repetition) emerge once children acquire their decoding skills.

These findings indicate the complexity of the associations between oral language and emergent literacy skills. Thus, it is crucial to understand how these relations manifest in children with language disorders, particularly those with developmental language disorder.

2.2.2 Emergent Literacy in Children with Developmental Language Disorder

2.2.2.1 Developmental Language Disorder

Developmental language disorder (DLD) is a heterogeneous neurodevelopmental disorder that emerges in early childhood and persists into adulthood. It affects approximately 7.5% of children (Norbury et al., 2016) and is characterized by language difficulties with no known differentiating condition such as autism spectrum disorder, cerebral palsy, brain injury, or sensorineural hearing loss (Bishop et al., 2016, 2017). These difficulties may affect one or several language domains including phonology, morphology, syntax, semantics, and/or pragmatics.

Language difficulties in children with DLD are manifested in different ways; for example, some children may show severe impairments in their morphosyntax skills but only mild deficits in their semantic skills, while other children may struggle with receptive language skills more than their expressive language skills. Due to the heterogeneity of DLD, it is recommended to define children's language profiles based on their language strengths and weaknesses (Bishop et al., 2017). DLD may affect children's reading and writing skills, leading to academic difficulties (Botting, 2020; D. Boudreau & Hedberg, 1999; Catts et al., 2001; Gillon, 2018; McGregor, 2020; Pratt et al., 2020). McGregor (2020) reported that school-age children with DLD are six times more likely than their peers to have literacy and spelling difficulties.

2.2.2.2 Profiles of Language in Children with DLD

2.2.2.2.1 Semantic

Children with DLD may acquire their first words later than their TD peers (Leonard, 2014; Leonard et al., 2019) and their semantic knowledge reportedly less in-depth (Leonard et al., 2019). Some children with DLD may have limited knowledge about the word meaning such as difficulties in finding words' synonyms or antonyms, resulting in a limited lexical repertoire (Bishop et al., 2017). Some school-aged children with DLD have word-finding difficulties, where they struggle to name words despite understanding their meaning (Ladányi & Lukács, 2019; Messer & Dockrell, 2006). It has been suggested that children with DLD struggle with semantics because of weak lexical representations or weak phonological representations of the words (i.e., storage of words' phonological characteristics, phonological processing (Leonard, 2014)).

2.2.2.2.2 Phonology

Children with DLD may show persistent speech production difficulties that are linguistic in origin, such as failing to differentiate between phonemes (Bishop et al., 2017). For example, a child may say "wabbit" instead of "rabbit" (i.e., substitute /w/ for /r/) due to their phonological processing difficulties. Because language difficulties may co-occur with persistent phonological problems (Hayiou-Thomas et al., 2017; Leonard, 2014), it is recommended to assess all other language domains when phonological problems persist beyond the age of 5 (Bishop et al., 2017).

Due to their weak phonological representations, children with DLD also may have difficulties with their phonological awareness skills: the ability to recognize and manipulate spoken sounds of words and sentences (Bishop et al., 2017; Leonard, 2014). For example, children may find it difficult to segment the word into syllables or identify the initial phonemes of the words (i.e., bat and boat begin with the same phoneme /b/). Phonological awareness (PA) is one of the main components of emergent literacy skills (see section 2.1.1.1); therefore, difficulties in PA may hinder the acquisition of literacy. Different studies have reported difficulties in PA in children with DLD (Boudreau & Hedberg, 1999; Catts et al., 2002; Pratt et al., 2020; Snowling et al., 2019; Tambyraja et al., 2015; Thatcher, 2010), and these studies will be discussed in section 2.2.2.4.

2.2.2.2.3 Morphosyntax

Morphosyntactic deficits have been recognized as the hallmark deficit in children with DLD (Abdalla & Crago, 2008; Dorothy V.M. Bishop, 2014; Calder et al., 2021; Leonard, 2014b; Moscati et al., 2020; Shaalan, 2010; Taha et al., 2020). These difficulties are evident in both expressive domains such as using the correct grammatical structure of the language, and receptive domains such as comprehending the meaning that is conveyed by the grammatical rules of the language (Bishop et al., 2017). Children with DLD show deficits in the use of different grammatical inflectional morphemes (Bishop, 2014), such as past tense (-ed), third

person singular (-s), auxiliary and copula *be*, and auxiliary *do* forms (Calder et al., 2021; Leonard & Kueser, 2019). Some studies have indicated that children with DLD are prone to substitute accusative words (i.e., him, her, them) for nominative case pronouns (i.e., he, she, and they) (Leonard, 2014). Other difficulties in the use of different complex sentences, such as wh-questions, passive, and subject-verb agreement, were also reported in children with DLD (Leonard, 2014b).

2.2.2.3 Verbal Short-Term Memory in DLD

Several reports have shown that language difficulties in children with DLD are related to their memory deficits, specifically: working memory, VSTM and procedural memory systems (Archibald & Gathercole, 2006; Gathercole et al., 2006; Jackson et al., 2020; Montgomery et al., 2010; Ullman et al., 2020). Working memory is a multidimensional system composed of four separate but interactive mechanisms: the central executive (i.e., domain general), phonological loop, the visuospatial sketchpad (i.e., the last two systems are domain-specific systems), and the episodic buffer (Baddeley, 2000; Baddeley & Hitch, 1974). It refers to the ability to store information while engaging in other highly cognitive demands (Gathercole et al., 2006). For instance, backward digit recall task involves briefly storing verbal information while reversing the digits' order. Procedural memory involves a slow and gradual learning process in which the acquired skill becomes largely automatic over time (Ullman et al., 2020). Language development in general – grammar in particular – undergoes a similar process. Children develop procedural memory and language skills slowly and gradually, and these skills become automatic and inflexible over time (Ullman et al., 2020). In this study, the author mainly focused on VSTM (see section 2.2.1.3), which refers to the ability to listen and store information over a short period when other competing cognitive demands are absent (Gathercole et al., 2006; Jackson et al., 2020a). Nonword repetition (NWR) and digit span tasks

both assess the ability to encode, store, retrieve, and imitate the spoken output (i.e., unfamiliar words, or string of numbers).

A vast body of research has shown that language difficulties in children with DLD are related to memory deficits (Jackson et al., 2020; Montgomery et al., 2010; Ullman et al., 2020). Children with DLD scored low results in NWR and digit span tasks (Archibald & Gathercole, 2007; Archibald & Gathercole, 2006; Bishop et al., 2017; Conti-Ramsden et al., 2001; Leonard, 2014; Shaalan, 2010, 2020; Taha et al., 2021; Wallan, 2018). In fact, NWR has been reported as one of the clinical markers of DLD across different languages (Archibald & Gathercole, 2007; Khater, 2012; Shaalan, 2020; Taha et al., 2021; Xiaoqing & Jiandan, 2016). This could be due to the items' familiarity effects in the two tasks. Digit span recall (i.e., which assesses the order VSTM skill) includes familiar items (i.e., digits) that are stored in the long-term memory, while nonword repetition (i.e., which assess the item VSTM) includes unfamiliar items (i.e., nonwords) that do not exist in the long-term memory. Because of their memory deficits, children with DLD find it harder to retain new items (i.e., unfamiliar words) than familiar ones. Nevertheless, it is important to assess different VSTM underlying processing skills in children with DLD and include both tasks – digit span and nonword repetition – to understand how different underlying skills are related to emergent literacy skills in children with DLD.

2.2.2.4 Emergent Literacy and Language in Children with DLD

Language difficulties have been related to delayed emergent literacy skills in children with DLD, with studies documenting that these children are also at risk of having emergent and later literacy difficulties (Boudreau & Hedberg, 1999; Catts & Hogan, 2003; Catts & Kamhi, 2005; Pratt et al., 2020; Snowling et al., 2016, 2018; Tambyraja et al., 2015; Thatcher, 2010). In their 1999 study, Boudreau and Hedberg examined the effect of language difficulties on emergent literacy skills in 18 children with DLD, aged 4;6 to 5;8 (56 to 70 months), and

compared their performance with that of 18 TD peers matched on age, gender, and socioeconomic status. Boudreau and Hedberg reported that children with DLD aged 5;2 (62 months) performed at a significantly lower level on emergent literacy skills (e.g., rhyme, letter names, and print concepts) compared with age- and socioeconomic status-matched TD children. Findings showed significant relationships between decoding and phonological awareness skills, but none between decoding and narrative skills. Based on these findings, the authors suggested that early literacy skills may consist of a single construct (i.e., decoding skills), and that decoding and language are independent skills. Children may have narrative skill difficulties, as noted in this study, but their phonological processing skills are intact, or the opposite. Although these findings demonstrated some evidence of the language effect on emergent literacy skills, they were limited and cannot be generalized due to several reasons: small sample size, the study's design, and the use of only one language measure (i.e., narrative skills) rather than administering a comprehensive language test.

To overcome the previous study's limitations, Catts et al. (2002), in a longitudinal study, examined emergent and later literacy skills of 570 children with DLD for 4 years from kindergarten age (5;10 to 6;0). They administered broad language and literacy measures, so, for language, they tested vocabulary, morphosyntax, narrative, and listening comprehension skills. Phonological awareness measures included syllable and phoneme deletion, and a rapid naming test. For reading, letter identification, word recognition, and reading comprehension tests were administered. They also tested children's nonverbal cognitive abilities. The authors found that kindergarten children with DLD were at high risk of developing reading difficulties in second and fourth grades in school. Approximately 50% of children with DLD were found to have reading difficulties at second- and fourth-grade level. The severity and the persistence of language impairments were found to be linked to literacy outcomes in school-aged children; that is, children with DLD with more severe language impairments had lower reading

outcomes. Regarding literacy predictors, Catts et al. found that letter knowledge was the best kindergarten predictor of literacy performance of school-aged children, followed by grammar composite and phonological awareness skills. These findings indicated that children who show difficulties with letter knowledge may inform early identification, and once formal literacy instruction has begun, children with DLD should be considered at risk.

Tambyraja et al. (2015) documented significant difficulties with alphabet knowledge, print knowledge, and rhyme awareness in children with DLD. The authors reported that 75-80% of children with DLD were at risk of emergent literacy difficulties. In another longitudinal study, Snowling et al. (2016) followed 220 children at risk of dyslexia and with language difficulties from preschool to middle childhood. They identified three developmental trajectories: resolving language impairment (LI), emerging LI, and persistent LI, and explored the effect of language deficits on literacy acquisition among these groups. Consistent with the previous evidence, results demonstrated that emerging LI and persistent LI groups performed significantly lower than the TD group on all literacy-related measures (i.e., letter knowledge, phoneme awareness, rapid automatized naming, and single word reading) at ages 5;6 and 8. However, the resolving LI group performed at a similar level to their TD peers on all literacy-related measures. Snowling et al. (2016) explained the findings by referring to the critical age hypothesis (Bishop & Adams, 1990). Children who have language difficutlies that are present at the time of formal reading instruction, as observed in the emerging LI and persistent LI groups, are at substantial risk of literacy difficulties. On the other hand, children whose language difficulties resolve before formal reading instructions, as observed in the resolving LI group, are at a lower risk. Another interesting finding was that 48% of the emerging LI group and 41% of the persistent LI group were diagnosed with dyslexia at age 8.

2.2.3 Dyslexia and DLD

Dyslexia is language-based disorder defined as a difficulty with decoding and spelling skills that is caused by phonological deficits (Adlof & Hogan, 2018). DLD is also a language disorder (see section 2.2.2.1) that may cause reading difficulties. However, due to the broader language deficits in DLD, it is more associated with poor reading comprehension (Adlof & Hogan, 2018; Bishop & Snowling, 2004; Snowling et al., 2020). This in turn has led to the emergence of different types of reading difficulties: dyslexia (difficulties with decoding), hyperlexia (difficulties with language comprehension), or garden variety reading (difficulties with both decoding and comprehension) as mentioned earlier in section 2.1.2.1. Thus, dyslexia and DLD may co-occur, resulting in the child having difficulties in both phonological and reading comprehension skills (garden variety reading).

In a follow-up study, Snowling et al. (2019) used data from a previous longitudinal study (Snowling et al., 2016) and examined children's language and reading skills at age 8. They aimed to identify the rate of comorbidity between dyslexia and DLD and examine the shared risk factors for poor decoding between the two. In terms of comorbidity, the authors found that, at age 8, the rate of co-occurrence between dyslexia and DLD was quite high – 43% of children with DLD had dyslexia, and 58% of children with dyslexia had DLD. Also, in a retrospective analysis, they found that 76% of children with dyslexia had significant language deficits at 5;6 years. Consistent with previous studies (Hulme et al., 2015; Scarborough, 1990), the authors suggested that language disorders may act as a precursor of dyslexia, and that dyslexia and DLD may have shared phonological processing deficits.

Although dyslexia and DLD share similar phonological processing deficits, the authors found that the two disorders have different developmental trajectories. During the preschool period, Snowling et al. (2019) found that, in dyslexia, phonological difficulties are observed without other co-occurring difficulties of similar severity in other language skills, such as vocabulary and grammar. Whereas in DLD (i.e., only DLD), they found that phonological

difficulties decreased over time, resulting in having better decoding skills than in dyslexia. They also found that, in the comorbid form of DLD (DLD and dyslexia), poor phonology is accompanied by poor vocabulary and grammar skills.

Concerning reading comprehension, Snowling et al. (2020) followed up the previous studies (Snowling et al., 2016, 2019) to examine children's reading comprehension skills at age 8, and compare them among the groups: dyslexia, DLD, dyslexia and DLD (comorbid), and TD. They found that children in all clinical groups – DLD, dyslexia, and comorbid – had reading comprehension deficits; however, the severity of these difficulties was different among the groups. The dyslexia group showed mild reading comprehension deficits, while the other two DLD groups – DLD and comorbid – demonstrated more severe reading comprehension deficits. Reading comprehension deficits in the dyslexia group were found to be due to their significant decoding difficulties, whereas in the DLD group, language comprehension difficulties were found to be the cause of reading comprehension deficits. Most severe reading comprehension difficulties were found in the comorbid group – dyslexia and DLD – due to the dual effects of decoding and language comprehension deficits. Overall, these findings support the SVR model (Gough & Tunmer, 1986) and, again, highlight the importance of both decoding and language skills to reading comprehension skills.

2.3 Evidence from Different Languages

The crucial role of language skills on emergent literacy skills have been explored in other languages. Various cross-sectional studies examined the emergent literacy skills in children with and without DLD (Brizzolara et al., 2011; Moll et al., 2016; Oliveira et al., 2021; Pratt et al., 2020; Wong et al., 2010). For example, Pratt et al. (2020) examined emergent literacy skills in 30 Spanish-speaking children with and without DLD – 15 children with DLD and 15 TD children aged 3;10 to 6;6. A battery of comprehension-related emergent literacy tests (narrative retell and print concept knowledge) and decoding-related emergent literacy

tests (beginning sound, rhyme awareness, alphabet knowledge, and name-writing) were administered. In accordance with the existing literature (Boudreau & Hedberg, 1999; Catts et al., 2001; Hulme & Snowling, 2014; Ricketts, 2011; Tambyraja et al., 2015), Spanish-speaking children with DLD performed significantly lower than their TD peers on all comprehension-related and decoding-related emergent literacy tests. Despite the limitations of this study, which include the small sample size and the study's cross-sectional design, the evidence is at least a suggestion there could be cross-linguistic universality regarding the effect of DLD on emergent literacy skills.

Oliveira et al. (2021), on the other hand, explored language and literacy skills in school-aged European Portuguese-speaking children by investigating the relationship between DLD and dyslexia. They compared language and literacy skills across three different groups: DLD (in 7 children), dyslexia (in 11 children), and typically developing (TD) age-matched peers (in 21 children). Their age ranged from 7;3 to 11;3 (88 to 136 months) (i.e., second, third, and fourth grade levels). For language skills, the DLD group showed significant language impairments in all language measures – vocabulary, grammar, and morphosyntax – when compared with the TD group, and performed significantly lower than the dyslexia group on the vocabulary knowledge test. In the phonological processing tests, both DLD and dyslexia groups performed similarly, which was significantly lower than the TD group. This evidence is in accordance with the study by Snowling et al. (2016, 2019), suggesting that both DLD and dyslexia share similar phonological processing deficits. For language skills, children with dyslexia performed similarly to their TD peers; however, children with DLD demonstrated severe language difficulties when compared with the TD group. Based on the comparison between DLD and dyslexia groups, although the analyses did not show significant differences between the groups on listening comprehension and morphosyntax tests, raw score differences were large. The lack of significance was explained as being due to the lack of power and limited

sample size. The only significant difference between the groups was found in the vocabulary knowledge tests. Despite the limited findings, they may provide potential confirmatory evidence that children with DLD exhibit broader language deficits than children with dyslexia (Snowling et al., 2016, 2019).

Evidence from non-alphabetic languages, such as Chinese, also suggests that DLD and dyslexia may share similar phonological processing deficits. For example, Wong et al. (2015) examined DLD and dyslexia in 94 Cantonese Chinese-speaking children, aged 6 to 7, to understand whether both disorders have different cognitive deficits. Despite the orthographic differences, the authors confirmed the existing evidence (Snowling et al., 2016, 2019) and found that both DLD and dyslexia shared similar phonological deficits as measured by phonological awareness tests. However, the DLD group had a lower performance on morphological awareness skills, while the dyslexia group showed a lower performance on orthographic skills. This evidence suggests that morphological awareness deficit is associated with DLD, and orthographic deficit is associated with dyslexia. Despite the shared phonological processing deficits between DLD and dyslexia, it has been suggested that both DLD and dyslexia are distinct disorders and linked to different underlying cognitive deficits.

Other studies have investigated how different dialects impact the acquisition of emergent literacy skills (Bühler et al., 2018; Gatlin & Wanzek, 2015; Saiegh-Haddad et al., 2020; Saiegh-Haddad & Haj, 2018; Schiff & Saiegh-Haddad, 2017). In a longitudinal study, Bühler et al. (2018) found negative associations between Swiss-German dialect use and overall literacy performance in standard German. The mismatch between the spoken dialect and the standard language may reduce the consistency of grapheme-phoneme correspondence which may impede the acquisition of decoding skills. Similar findings have been found in Arabic speaking children (Saiegh-Haddad & Haj, 2018; Schiff & Saiegh-Haddad, 2018). Up until school enrolment, Arabic speaking children are only exposed to the spoken Arabic dialect.

Once they start formal schooling, they start learning modern standard Arabic. Both forms of Arabic have different linguistic characteristics which may impact the acquisition of Arabic literacy skills. Further details will be discussed in Chapter 3, section 3.1.

2.4 Importance of Home Literacy Environment on Emergent Literacy Skills

As mentioned previously (see section 2.1) the development of emergent literacy is refined by children's interactions and exposure to different literacy experiences. Numerous cross-language studies have indicated the importance of children's environment on emergent literacy acquisition (McBride, 2015; Rhyner, 2009; Sénéchal et al., 2001). Home literacy environment (HLE) has been found to be highly associated with children's language and early literacy development, including phonological awareness, print concept, vocabulary, letter knowledge, and later reading skills (Aram et al., 2013; Dickinson & Porche, 2011; Hamilton et al., 2016; Hassunah-Arafat et al., 2021; Zhang et al., 2020). HLE is an umbrella term that describes children's literacy experiences in their homes, and these experiences can be direct (i.e., includes children's direct engagement in literacy activities such as shared-book activity) and indirect (i.e., includes children's indirect experiences such as observing adults reading) experiences (Rhyner, 2009). It is important to know that the effect of HLE may vary depending on different environmental factors. One crucial factor is family socioeconomic status (SES).

SES is an important environmental factor that may affect HLE as well as literacy acquisition (Neumann, 2016). Different SES factors such as family income, parental education, parental occupation, and parental literacy beliefs have a remarkable influence on HLE. For example, low SES may result in limited book exposure and limited access to different literacy materials. Substantial evidence has demonstrated that children from low SES backgrounds are at greater risk of literacy difficulties when compared with children from higher SES backgrounds (Cabell et al., 2013; Hamilton et al., 2016; Neumann, 2016; Pan et al., 2017; Strang & Piasta, 2016).

2.4.1 Evidence from English-Speaking Children and Other Languages

In a longitudinal study, Hamilton et al. (2016) compared HLE in children at family risk of dyslexia (n = 116) with TD children (n = 72) and investigated the relationships between SES, HLE, and emergent literacy skills in both groups. They aimed to examine whether HLE at age 4 (with mean age of 4;2 to 5;5) predicted emergent literacy skills one year later (mean age range of 5;0 to 6;5) in both groups. To measure family SES, they assessed parental educational levels and parental occupational status. For HLE, they assessed children's story book exposure (i.e., frequency of book exposure, and number of children's books at home) and the instructions that parents give to children (i.e., frequency of direct teaching: letters, reading words, and writing words). These measures were obtained through interviewing parents and giving them a report checklist. For emergent literacy skills, children were assessed on phoneme awareness skills (i.e., phoneme isolation and deletion tests), letter knowledge, single-word recognition, and single-word reading. In terms of SES, findings showed that SES in the at-risk group was lower than the TD group. In terms of HLE, findings demonstrated that children in the at risk group experienced less exposure to story books compared with the TD group. This was explained as being the result of the lower SES background. Moreover, the authors found that HLE affected emergent literacy acquisition in both groups, and that the developmental relationships between SES, HLE, and emergent literacy skills were the same in both groups. SES had an indirect effect on emergent literacy skills via HLE, according to the results. This evidence suggests that rich literacy experiences may facilitate the acquisition of emergent literacy skills in children in the family risk group and the TD group. Similar findings are also noted in other studies (Altun et al., 2018; Mol & Bus, 2011; Neumann, 2016; Skibbe et al., 2008; Tabors et al., 2001).

In China, Zhang et al. (2020) conducted a longitudinal study to investigate how HLE predicts Chinese reading skills. They followed 159 children from kindergarten level (mean age

5;5) until second grade (mean age = 7;8). For HLE, they tested formal literacy, informal literacy experiences, and access to literacy resources (i.e., number of children's books at home). Formal home literacy experiences included teaching children to read Chinese characters, pinyin knowledge (romanization system for Standard Mandarin Chinese), and writing Chinese characters. Informal home literacy experiences that were noted include bedtime stories and daily shared-book activities. For emergent literacy skills, they tested phonological awareness, pinyin knowledge, and rapid automatic naming (RAN). They tested word-reading in first grade (mean age = 6;5) and reading comprehension in second grade (mean age = 7;8), and information on HLE and SES were obtained from parents answering questionnaires. Findings showed that formal literacy experiences directly predicted pinyin knowledge in kindergarten and indirectly predicted word-reading and reading comprehension skills. Teaching pinyin was one example of the formal literacy experience, and the results showed that this direct teaching of pinyin facilitated the acquisition of pinyin skills in kindergarten-aged children and helped them to read Chinese characters in first grade, which in turn enhanced their reading comprehension skills as they got older. In contrast to the existing literature, the authors found that informal literacy experiences such as bedtime stories and shared-book activities did not predict emergent literacy or reading skills in children. This result was explained as possibly due to *a social desirability bias*; for example, asking parents about the frequency of shared-book activities may be sensitive to social desirability in which parents may reflect on their intentions rather than the actual actions, and so resulting in inaccurate responses. The authors also explained that excluding assessing access to literacy resources from informal literacy experiences might be another reason for the lack of significant effect of literacy exposure to emergent literacy skills in the study. Although literacy exposure did not show any effect on emergent literacy skills, the number of children's books at the home of each participant was found to be a significant predictor to all emergent literacy skills. Despite the inconsistencies of

the discussed findings, the study adds to the existing literature and demonstrates the importance of access to literacy resources and formal home literacy experiences on emergent literacy acquisition.

2.5 Summary

In summary, the significance of oral language skills for emergent and later literacy skills has been well-documented in English. Cross-linguistic studies have also provided preliminary evidence supporting findings observed in the English language. Despite orthographic differences between languages, evidence suggests some universality of the importance of language skills for emergent literacy skills across languages. As discussed in this chapter, children with DLD speaking different languages may have difficulty with emergent and later literacy skills. However, Semitic languages such as Arabic are not well represented in the current literature. Existing Arabic studies (Abu-Rabia, 2007; Abu-Rabia et al., 2003; Al-Sulaihim & Marinis, 2017; Najmaldeen, 2020; Saiegh-Haddad et al., 2020; Tibi, 2010) have mainly examined the phonological awareness and literacy skills in school-aged children with and without reading difficulties. Despite the available evidence, Arabic language has not been studied in detail and, so, many questions remain unanswered: Do Arabic-speaking children with DLD demonstrate difficulties with emergent and later literacy skills? Is the relationship between language and literacy in Arabic similar to that in the English language? What do the available Arabic studies suggest regarding the relationship between language and literacy in Arabic? These questions will be addressed in the next chapter, which will also discuss the Arabic language, orthography, and existing evidence from the Arabic language on language and literacy development.

Chapter 3
Arabic Language

This chapter will focus on the Arabic language, its orthography, and characteristics. It will also provide an overview of existing Arabic studies that have examined emergent literacy, phonological awareness, and the relationships between language and emergent literacy skills in children both with and without reading difficulties. Further, the impact of a home literacy environment and socioeconomic status on emergent literacy skills will be discussed. The chapter will conclude with a description of the current study, its aims and research questions.

3.1 Introduction

Different languages have different linguistic and orthographic characteristics that may influence the process of reading acquisition. For instance, some languages such as Spanish, Italian, and German are known to have transparent orthography in which they have a clear grapheme-phoneme correspondence (i.e., one-to-one relations – the grapheme has one specific corresponding phoneme) while other languages such as English have opaque/deep orthographies in which they have distant grapheme-phoneme relations and so have poor grapheme-phoneme correspondence. For example, in English, there are orthographically similar words that do not rhyme (e.g., rough, though, and through) and orthographically different words that have the same rhyme (e.g., see, key, and sea). Arabic, on the other hand, is an example of mixed or semi-transparent orthography. It is considered a transparent orthography when diacritical markers are used (e.g., in children's books or poetry), but opaque orthography when diacritical markers are not used (Smythe et al., 2008). Mapping between graphemes and phonemes in transparent orthographies such as Spanish and German is easier than in opaque/deep orthographies such as English (Gillon, 2018). One report claims that, in opaque/deep orthographies, the acquisition of phonological awareness skill is slow due to the

inconsistency of grapheme-phoneme links when compared with transparent orthographies (Duncan et al., 2013; Gillon, 2018). Goswami et al. (2005) also found that phoneme awareness skills were rapidly developed in German-speaking children when compared to their English-speaking peers. Despite these differences, it is important to recognise that phonological awareness (PA) development has a universal sequence (i.e., implicit to explicit progression, see Chapter 2 section 2.1.1.1) of acquisition across different languages (Anthony & Francis, 2005; Gillon, 2018).

3.2 Arabic Language

Arabic is the official language of 27 countries, and the native language of more than 300 million people in the world (Hermena & Reichle, 2020; Saiegh-Haddad, 2018). It is the language of the Qur'an, so it is the religious language of all Muslims globally. Arabic belongs to the group of Semitic languages (e.g., Hebrew, Amharic, and Maltese). Like Hebrew, Arabic is a morpheme-dense language and depends on its root-derived word composition (i.e., root and pattern morphemes are linked in words). The Arabic word consists of the root: three-consonant strings (e.g., /drs/ درس) which convey the semantic group to which this word belongs, and the pattern morphemes which are phonological structures that consist of vowels (i.e., letters or diacritics) or vowels and consonants that are linked with the root (e.g., /a:/ and /e/, or /u/, /u/ and /u:/). See Table 3.1 below for examples.

Table 3.1. *Arabic orthographic morpheme-dense characteristics*

Root	/drs/ درس	
Patterns	/a:/ and /e/ ـِ ، ا	/u/ and /u:/ ـُ ، و
Root + Patterns examples	دارِس	دُروس
	studied	lessons

3.3 Arabic Orthography and Characteristics

Arabic's writing system is *abjad*, a consonantal orthographical system (Daniels, 1992), where the alphabet represents mainly the consonants of the language. It contains 28 letters, all of which are consonants except for the letter أ which represents the vowel /a/, and the letters و /w/ and ي/j/ acting as semi-vowels /u:/ and /i:/, respectively (Hermena & Reichle, 2020; Saiegh-Haddad & Henkin-Roitfarb, 2014). The Arabic script is cursive, and it is written and read from the right to the left. Because the script is cursive, the shape of letters differs depending on their placement in words (i.e., initial, medial, final following a connecting letter, and final following a non-connecting letter) – see Figure 3.1. Overall, 22 letters (ب، ت، ث، ج، ح، خ، س، ش، ص، ض، ط، ظ، ع، غ، ف، ق، ك، ل، م، ن، هـ، ي) connect to adjacent letters via ligatures, while the remaining six letters (ا، د، ذ، ر ، ز، و) connect only to the preceding letters. Moreover, dots in the Arabic orthography accompany some of the Arabic graphemes (e.g., - ب/b/, - ج/d͡ʒ/, - ق/q/, and - ذ/ð/). Some of the Arabic letters share the same basic structure, but they are distinguished by the amount of dots and their placement below or above the letter. For example, the following letters: - ب/b/, - ت/t/, and - ث/θ/ share the same basic form of the letter; however, they are different based on the number and placement of the dots: in - ب/b/- there is a single dot below the form, in - ت/t/ there are two dots above the form, and in - ث/θ/ there are three dots above the form. Previous research has suggested that the visual complexity of Arabic graphemes might slow down the reading acquisition in children (Asaad & Eviatar, 2013; Khateb et al., 2014).

Letter	Final	Medial	Initial
ح	ـح	ـحـ	حـ

Figure 3.1. *Different shapes of the letter depending on its placement in word*

The writing system also uses diacritical markers (i.e., short vowels /a/, /u/, /i/) which are placed above, or below the letters to specify the words' pronunciations (see Figure 3.2). However, it is important to mention that these diacritical markers are not always written in the scripts, which may impede the grapheme-phoneme correspondence process. Arabic orthography is semi-transparent (i.e., mixed) because it includes both vowelized and non-vowelized scripts (Hermena & Reichle, 2020). Vowelized scripts – those with diacritical markers – are used only in children's books, poetry, and the Qur'an. Non-vowelized scripts require the reader to have knowledge of the text's context as well as the right level of language skills (i.e., semantic and morphosyntax) to understand the writing. Several studies have investigated the importance of vowels on reading accuracy in children and found that vowels act as a facilitator for word-reading in both skilled and unskilled readers (Abu-Rabia, 2007; Schiff & Saiegh-Haddad, 2017).

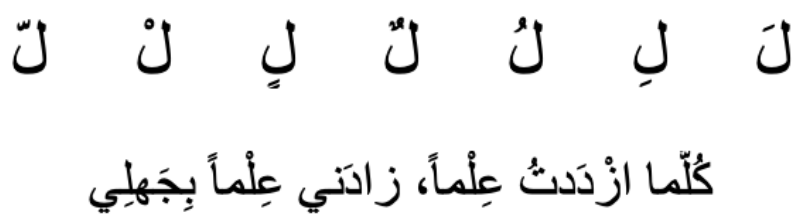

Figure 3.2. *Diacritical markers in words and, underneath, a* **t***ranslation of: "The more I learn, the more I learn of my ignorance" – Imam Alshafi'i*

3.4 Diglossia

Diglossia is another characteristic of the Arabic language and orthography. It is a sociolinguistic characteristic of the language in which speakers use two different models of the same language within different conditions (e.g., Standard Arabic language or Modern Standard Arabic, Spoken Arabic language; dialect) (Ferguson, 1959). The spoken Arabic dialects (SpA) have syntactic, morphological, phonological, and semantic properties that differ from the Modern Standard Arabic (MSA). For example, semantically, the word *shoe* is known as

/ħiða:ʔ/ in MSA but includes multiple labels in SpA, depending on the regional dialects; for example, it is /d͡ʒazmah/ in the Saudi's central region dialect, and /boʊtˁ/ in the Lebanese and the Palestinian dialects. Moreover, phonemic substitution may occur in some Arabic dialects such as in Egyptian Arabic. For example, the phoneme /ð/ in MSA is substituted with /d/ in the Egyptian dialect. Most Arabic-speaking countries use different dialects, and some countries, such as Saudi Arabia, use different dialects within different regions.

So, how does diglossia affect reading acquisition? In the Arab culture, children are only exposed to SpA during the early years of their development, before they enter school. They begin to learn MSA once they start school and are exposed to formal reading instruction; thus, it is almost considered as a second language (Ayari, 1996). This may pose a challenge to children while learning to read. Indeed, research has found that diglossia has a negative impact on literacy acquisition in TD children and children with reading difficulties (Asaad & Eviatar, 2013; Saiegh-Haddad, 2005; Saiegh-Haddad & Haj, 2018; Schiff & Saiegh-Haddad, 2017). Furthermore, the linguistic distance between SpA and MSA has a crucial role in phonological representation, and it has been found to delay phonological awareness development in Arabic-speaking children (Saiegh-Haddad et al., 2020; Saiegh-Haddad & Haj, 2018).

In 2017, Schiff and Saiegh-Haddad examined the impact of diglossia on word reading skill in Arabic speaking children with and without dyslexia. Findings showed that diglossia has negative impact on word reading skills in the dyslexic group. In a recent study, Asadi and Abu-Rabia, (2021) investigated the effect of diglossia and lexical distance on phonological awareness and rapid naming skills in Arabic speaking children. Consistent with previous studies (Haddad, 2003; Saiegh-Haddad, 2005; Saiegh-Haddad & Haj, 2018), the authors found significant effect of diglossia on both skills. Processing SpA was easier than processing MSA in all administered tasks.

To examine the effect of diglossia on listening comprehensions skill, Asadi et al., (2022) conducted a cross-sectional study to compare children's performances on listening comprehension in Arabic speaking children with and without DLD. The authors found that both groups demonstrate higher listening comprehension performance in SpA than in MSA. Again, this evidence indicate that processing SpA is easier than processing MSA in young children. Findings also showed significant differences between the TD and DLD groups on listening comprehension skills in both SpA and MSA. The poor performance in listening comprehension skills was explained due to children's language deficits in the DLD group.

In summary, it is clear from the studies reviewed above that diglossia has significant effect on the acquisition of Arabic emergent literacy skills, and thus, need to be taken into consideration when examining children's emergent literacy skills.

3.5 Evidence from Arabic Studies

A number of studies on Arabic have investigated phonological awareness, literacy acquisition, and the effect of orthographic factors and home literacy exposure on literacy in TD children and children with reading difficulties (Abu-Rabia, 2000; Abu-Rabia & Siegel, 2002; Al-sulaihim & Marinis, 2017; Asadi, Khateb, & Shany, 2017; Asadi, Khateb, Ibrahim, et al., 2017; Najmaldeen, 2020; Saiegh-Haddad, 2007; Saiegh-Haddad & Haj, 2018; Saiegh-Haddad & Taha, 2017; Schiff & Saiegh-Haddad, 2017; Taibah & Haynes, 2011; Tibi, 2010). In accordance with evidence from research into English, these studies have shown the importance of phonological awareness skills, language skills, a home literacy environment, and socioeconomic status on literacy acquisition in Arabic-speaking children. These studies will be discussed in the following sections.

3.5.1 Phonological Awareness Development

In 2010, Tibi (2010) conducted a study to investigate the development of PA skills in 140 Arabic-speaking, school-aged children (grades 1-3; aged 6 to 8) from Al-Ain city in the

United Arab Emirates. Children were tested on initial sound identification, rhyme oddity, syllable deletion, and phoneme segmentation, using MSA. To examine the development of the selected PA skills, Tibi compared children's performance across the three school grade levels. Consistent with the existing literature, findings indicated a hierarchal development of phonological awareness skills across all grade levels, and that these skills undergo similar developmental pattern starting from tacit analysis (i.e., rhyming and alliteration) to explicit analysis (i.e., phoneme segmentation) (Anthony & Francis, 2005; Stackhouse et al., 2002). Tibi's findings are considered one of the first Arabic results that supports the universal PA acquisition pattern (i.e., implicit to explicit progression). Although the study has provided important evidence, it should be noted that the study included only school-aged children who were exposed to formal reading instruction, which may have influenced their performance.

A few years later, Abou-Elsaad et al., (2016) examined the relationship between different phonological awareness skills and word reading in 80 Egyptian Arabic-speaking children aged 5;6 to 8;6. In contrast to Tibi's study, the authors used SpA Egyptian dialect, since all children were exposed to the dialect in their daily lives. They also administered more PA tests: syllable blending, syllable segmentation, initial phoneme isolation, phoneme blending, phoneme segmentation, and rhyme recognition. The children's performance was compared across the groups: group 1 included children aged 5;6 to 7;0, and group 2 included children aged 7;0 to 8;6. Supporting previous findings (Anthony & Francis, 2005; Stackhouse et al., 2002), results showed developmental patterns of PA skills and that blending skills develop before segmentation skills.

These findings were confirmed in a recent work by Najmaldeen (2020). In her PhD study, Najmaldeen tested PA skills (i.e., rhyme awareness, syllable segmentation, alliteration awareness, phoneme isolation, and blending) in Saudi Arabic-speaking children. She included younger age groups – aged 4;0 to 6;11 – and a larger sample size (384 children, divided into

three age groups: 4;0 to 4;11, 5;0 to 5;11, and 6;0 to 6;11). Overall, consistent with other studies (Al-sulaihim & Marinis, 2017; Mohamed et al., 2021), results indicated the effect of age on children's performance across the age groups, showing a hierarchal developmental pattern for all assessed PA skills and an increased sensitivity to smaller units, such as phonemes, the older they were.

Evidence from existing Arabic studies suggests that Arabic PA skills follow a similar developmental pattern to English PA and other languages, including Spanish, Italian, and French. Thus, PA development appears to be universal across languages, with children beginning to acquire an awareness of larger units (i.e., words and syllables) before smaller units (i.e., phonemes) (Anthony & Francis, 2005; Duncan et al., 2013; Gillon, 2018; Goswami et al., 2005).

3.5.2 Oral Language and Emergent Literacy in Arabic

A growing body of research is investigating emergent and later literacy skills in Arabic-speaking TD children and children with reading difficulties. However, to date, none of the available studies have directly investigated the relationship between language and literacy in the Arabic language. Most studies have either highlighted the importance of PA skills to literacy, or have indirectly examined the effect of language by measuring language skills of children with reading difficulties, or by assessing the validity of the SVR model in the Arabic language.

3.5.2.1 Simple View of Reading (SVR) in Arabic

The suitability of the SVR model in Arabic has been examined by Asadi, Khateb, and Shany (2017). Based on the unique orthographic characteristics of the Arabic language, the authors predicted that orthographic knowledge and morphological knowledge would contribute to reading comprehension more than decoding and listening comprehension skills. They tested decoding, listening comprehension, orthographic knowledge, morphological knowledge, and

reading comprehension in 1,385 school-aged Arabic-speaking children in grades 1-6, and aged 6;8 to 11;6 (81.9 months to 140 months). The authors found that the basic SVR model (which includes decoding and listening comprehension) significantly predicted reading comprehension skills (56% of the variance) in all grade levels, and that the contribution of this model diminished gradually until it stabilized in the fourth grade (explaining the 40% of the variance). They also found that the contribution of decoding was high in grade 1 and gradually diminished until it stabilized in grade 3, while listening comprehension increased from grade 1 until it stabilized in grade 4. This evidence is consistent with several findings in similar studies in English, indicating the importance of both skills – decoding and listening comprehension – to reading comprehension, and that the contribution of these skills may vary at different stages of literacy acquisition (Gough & Tunmer, 1986; Kendeou et al., 2009; Storch & Whitehurst, 2002). Furthermore, the authors found that the addition of orthographic and morphological knowledge to the basic model have increased the variables' contributions by an additional 10 – 20% of the variance in all grade levels. An interesting finding was that decoding failed to be a significant predictor of reading comprehension when orthographic and morphological knowledge were added to the model. However, all other variables – listening comprehension, orthographic, and morphological knowledge – remained significant across all grades, 1-6. These findings confirm previous evidence from studies on the Arabic language and highlight the importance of orthography and morphology to Arabic literacy acquisition (Abu-Rabia et al., 2003; Asaad & Eviatar, 2014; Asadi, Khateb, Ibrahim, et al., 2017; Khateb et al., 2014). In summary, the 2017 study by Asadi, Khateb, and Shany confirms the validity of the SVR in Arabic, but it has also highlighted the need to consider the unique Arabic orthographic characteristics when assessing children's literacy.

3.5.2.2 Importance of Language for Arabic Literacy

The cognitive predictors of early reading acquisition has been the focus of a study conducted by Abu-Ahmad et al. (2014). They assessed 194 Arabic-speaking children, aged on average 5;9, towards the end of their time at kindergarten (mean age 5;9), and again at the start of the second grade, and compared the effects of decoding-related skills (phoneme awareness, phonological processing, orthographic processing, print concept, and morphological awareness) and oral language skills (general nonverbal ability, receptive vocabulary, syntactic awareness, and working memory) on word-reading. They concluded that decoding-related skills were stronger predictors of word recognition in Arabic than oral language skills. Decoding-related skills predicted 33% of the variance in word recognition while oral language skills predicted 11% of the variance in word recognition. They also found that morphological awareness skills (explaining 17% of the variance), and syntactic awareness (explaining 11% of the variance) are important contributors to word recognition. This finding is in line with other Arabic studies (Abu-Rabia, 2007; Asadi, Khateb & Shany, 2017), which point to the important role of morphology in reading development in Arabic. This suggests that Arabic-speaking readers rely on the morphological structure of the word along with decoding related skills to facilitate word-reading skills.

Receptive vocabulary skills, although paired with non-verbal reasoning skills as a measure of general ability, were also found to be a significant predictor of word-reading skills. However, the contribution of the skills paired together was lower than the other variables (explaining 6% of the variance). Although the result showed how vocabulary may contribute to word-reading, it is limited and cannot be generalized; the study did not directly examine the effect of vocabulary knowledge on word-reading skills, so future studies may need to directly assess the importance of vocabulary knowledge on literacy acquisition in Arabic. To address this gap, Asadi, Khateb, Ibrahim, et al. (2017) examined the direct contributions of vocabulary knowledge to reading skills (i.e., decoding and reading fluency) in 1305 school-aged children

in grades 1 to 6, (from first grade; mean age = 6;8, to sixth grade; mean age = 11;6) as part of their study. They found that vocabulary knowledge failed to contribute to decoding and reading fluency, and attributed this lack of contribution to the high importance of other cognitive (i.e., phonological awareness, phonological memory) and orthographic (i.e., morphological knowledge, and orthographic knowledge) variables on decoding and reading fluency skills. The authors proposed that vocabulary knowledge may contribute to improved reading skills, such as reading comprehension.

In a 2018 study, Schiff and Saiegh-Haddad demonstrated the importance of morphological knowledge on word-reading skills in Arabic-speaking children. They examined the contributions of PA and morphological awareness skills on word-reading skills in 100 school-aged children (20 children each from grade 2, grade 4, grade 6, grade 8, and grade 10). Findings indicated that morphological awareness skills were significant predictors of word-reading when controlling for grade levels and PA skills. Similar results were also noted in previous studies, which confirm the crucial role of morphological skills in literacy acquisition in Arabic (Abu-Rabia, 2007; Abu-Rabia & Siegel, 2002; Asadi, Khateb, & Shany, 2017; Saiegh-Haddad & Taha, 2017; Taha & Saiegh-Haddad, 2017).

3.5.2.3 Summary

To summarise, it is clear from the studies reviewed above that Arabic PA skills undergo similar developmental pattern of English PA skills, starting from awareness of larger linguistic units (e.g., words and syllables) to awareness of smaller units (e.g., phonemes) (Mohamed et al., 2021; Najmaldeen, 2020; Tibi, 2010). Consistent with the evidence from the English studies (Gough & Tunmer, 1986; Kendeou et al., 2009; Storch & Whitehurst, 2002), the available Arabic studies demonstrate that some oral language skills such as, vocabulary knowledge and morphosyntax have a role to play in the development of emergent and later literacy skills in Arabic speaking children (Abu-Rabia, 2007; Abu Ahmad et al., 2014; Asadi,

Khateb, Ibrahim, et al., 2017; Schiff & Saiegh-Haddad, 2018). Yet, the importance of the oral language skills on emergent literacy skills in children Arabic speaking children with DLD is still unclear.

3.5.3 Importance of Verbal Short-Term Memory on Arabic Literacy

A number of studies have included tasks that measure the effect of phonological memory on Arabic literacy skills. In a cross-sectional study, Taibah and Haynes (2011) examined the effect of VSTM (measured by nonword repetition and digit recall tests) on word recognition and fluency skills in 237 children from kindergarten (mean age = 6;3) to third grade (mean age = 9;18). The results showed no effect of VSTM on word recognition skills, but it is important to note that the authors did not examine the effect of each task on literacy skills separately. Instead, they computed a composite score which included both tasks (i.e., digit recall and nonword repetition tests).

In contrast to Taibah and Haynes (2011), Asadi, Khateb, Ibrahim, et al. (2017) found that VSTM as measured by digit span testing, and phonological working memory testing (i.e., backward digit span) contributed significantly to decoding skill and reading fluency skill. This evidence was confirmed in a recent study by Hassanein et al. (2021). The authors examined the relationships between phonological processing, orthographical knowledge, morphological awareness, and word-reading skills in first- and second grade-level students (N = 188 children, mean age of 6;8) in Doha, Qatar. Similar to Asadi, Khateb, Ibrahim, et al. (2017), they investigated the effect of VSTM, which was measured using a digit span test on word-reading skills (i.e., decoding and reading fluency). Findings demonstrated that VSTM was a statistically significant predictor for decoding skills. Consistent with the evidence from the English studies, findings from Asadi, Khateb, Ibrahim, et al. (2017) and Hassanein et al., (2021) highlighted the importance of VSTM for decoding in Arabic-speaking children (Cunningham et al., 2020; Layes et al., 2021; McBride, 2015). However, it is not clear which underlying memory skills –

VSTM or working memory – are important for decoding skills in Arabic-speaking young children.

The importance of phonological memory skill on literacy skills were also investigated in children with dyslexia. For example, Elbeheri and Everatt (2007) tested working memory skills in 332 children (40 children with dyslexia and 292 TD children) aged 9;4 to 11;6. They reported significant differences between TD children and children with dyslexia on the working memory test. Yet, the correlation analyses demonstrated weak associations between working memory and reading skills in the TD group, and no associations were found between working memory and reading skills in the dyslexic group. Lack of associations in the TD group could be explained by the participants' young age, with the average age being 10;5. As mentioned in Chapter 2 (see section 2.2.1.3), once children become proficient decoders they start to depend on their higher linguistic skills; thus, the importance of working memory may diminish over time. In the dyslexic group, lack of associations could be explained due to the severity of their decoding skill deficit, which may mask the importance of working memory skill.

In contrast to previous findings, Zayed et al. (2013) found significant correlations between working memory and PA skills, such as rhyme detection, syllable blending, phoneme isolation, and phoneme blending tests in 40 preschool children (20 TD and 20 children at risk of literacy difficulties; their mean age was 5;6). However, the involvement of memory in PA skills in these results could be due to the participants' age and the different measures used in their study.

In summary, there is emerging evidence of the importance of memory to reading skills in Arabic. Yet, the lack of consensus about short-term/verbal/phonological memory's contributions to reading skills in Arabic limits our understanding of the crucial role that memory plays in reading acquisition in Arabic-speaking children with and without reading and language difficulties. Learning about the effect of different underlying memory skills on

reading acquisition in Arabic would advance our knowledge about the relationship between memory and emergent/later literacy skills in children.

3.5.4 Importance of Home Literacy Environment on Arabic Literacy

Only a few Arabic studies have investigated the effect of HLE and SES on emergent and later literacy skills (Aram et al., 2013; Hassunah-Arafat et al., 2021; Najmaldeen, 2020). Aram et al. (2013) examined the relationships between SES, HLE, and literacy skills in Arabic-speaking children (N = 89; mean age 5 to 8, SD = 4.32 months) in Israel, and their findings demonstrated significant associations between the variables. SES and HLE were found to correlate significantly to all literacy skills. Moreover, consistent with most cross-language studies, SES was found to contribute significantly to literacy skills (i.e., letter knowledge was 18% of the variance, phonological awareness 18% of the variance, and concept of print 20% of the variance) indicating that a low SES may act as a risk factor in literacy difficulties in Arabic-speaking children. Results also showed that HLE is highly associated with SES, suggesting that a higher SES may facilitate more exposure to different literacy experiences and a richer HLE, while a lower SES may limit the exposure to different literacy experiences. Moreover, results replicated previous similar findings from cross-language studies and showed that HLE predicted emergent literacy skills: phonological awareness (6% of the variance beyond SES) and concept of print (9% of the variance beyond SES). Similar findings were recently replicated by Hassunah-Arafat et al., (2021).

To conclude, the results of the studies reviewed above suggest a substantial association between SES, HLE, and emergent literacy skills. Therefore, it is important to understand children's environment and examine different environmental factors that may contribute to children's language and literacy development.

3.6 Conclusion

This chapter has provided a review of the existing literature in the Arabic language regarding emergent literacy, phonological awareness skills, and the relationships between language and emergent literacy skills in children with and without reading difficulties. Overall, the available Arabic studies (Mohamed et al., 2021; Najmaldeen, 2020; Tibi, 2010) have suggested that Arabic PA skills undergo a similar developmental pattern of PA skills in English and other languages (Anthony & Francis, 2005; Gillon, 2018), starting from an awareness of larger linguistic units (e.g., words and syllables) to an awareness of smaller units (e.g., phonemes).

Regarding the relationship between oral language and literacy skills, most of the Arabic studies (Abu-Rabia, 2007; Abu Ahmad et al., 2014; Asadi, Khateb, Ibrahim, et al., 2017; Schiff & Saiegh-Haddad, 2018) have reported the importance of morphological skills on emergent and later literacy skills in Arabic-speaking children. But this evidence can be explained by the specific characteristic of the Arabic language; as discussed in section 3.2, Arabic is a morpheme-dense language in which morphemes play an integral part in the Arabic words' composition (Taha & Saiegh-Haddad, 2017). Vocabulary knowledge was also found to be important to emergent and later literacy skills in Arabic-speaking children (Abu Ahmad et al., 2014). However, none of the available studies have directly examined the effect of different language skills on emergent literacy skills in Arabic-speaking children with and without DLD.

The chapter also provided a review of Arabic studies that have investigated the effect phonological memory skills on literacy (Asadi, Khateb, Ibrahim, et al., 2017; Hassanein et al., 2021; Zayed et al., 2013). In general, consistent with the English studies (Cunningham et al., 2020; Layes et al., 2021; McBride, 2015), these studies have highlighted the importance of phonological memory skills on emergent literacy skills in TD children and children with dyslexia. However, further studies are needed to clearly understand the importance of different

underlying memory skills (e.g., VSTM or working memory) on emergent literacy skills in Arabic-speaking children with and without DLD. Finally, the chapter reviewed studies that have explored the importance of SES and HLE on literacy skills in Arabic-speaking children. Overall, evidence from Arabic supports evidence from English and reported the significance of SES, and HLE on literacy skills in TD children. To date, none of the available Arabic studies have examined the effect of SES and HLE on emergent literacy skills in children with DLD.

So far, little attention has been paid to examine emergent literacy skills in children with and without DLD. What is not clear is the nature of the associations between oral language and emergent literacy skills in Arabic-speaking children with and without DLD. Consequently, there are number of unresolved questions in the area of DLD and its association with emergent literacy development. To address these questions, the aims of this study are: (1) to examine emergent literacy skills of Saudi Arabic-speaking children with and without DLD aged 4;00 to 6;11, (2) to investigate the relationship between language, VSTM, and emergent literacy skills, and (3) to explore the relationship between the home literacy environment, socioeconomic status, and emergent literacy skills. Examining these relations will provide additional insight into relations between oral language and emergent literacy skills in the Arabic language and contribute to our understanding of early literacy development in Arabic-speaking children with and without DLD.

3.7 Research Questions

This study aims to address the following research questions:

1. Do Saudi Arabic-speaking children with DLD differ from their TD peers in emergent literacy skills?
2. What is the relationship between language and emergent literacy skills in Arabic-speaking TD children and children with DLD?

3. What is the relationship between short-term verbal memory and emergent literacy skills in Arabic-speaking TD children and children with DLD?
4. What is the relationship between home literacy environment, socioeconomic status, and emergent literacy skills in Arabic-speaking TD children and children with DLD?

Chapter 4
Methodology

This chapter will present the research methodology used in this study. First, it will describe ethics and recruitment process. This is followed by information regarding the participants in the study. Data collection methods and procedures that were used to carry out this study will be described. The chapter will conclude with a description of the data analysis methods.

4.1 Ethics, Recruitment and Consent

Ethical approval was granted by the School of Psychology and Clinical Language Sciences Research Ethics Committee, University of Reading (approval no. 2019–050-VS), and permission to conduct the testing was obtained from the Higher Ministry of Education in Riyadh, Saudi Arabia. TD children were recruited from four public (non-fee paying) kindergartens and reported by their parents and teachers to be developing language typically. Heads of nurseries were sent invitation letters explaining the project. Then, with the help of the teachers, parents of children who were in the interest age range (i.e., 4; 0 – 6;11 years old) were sent the study's information sheets, parental and child consent forms, and demographic questionnaires including parental education level, parental occupation, family income, and development history (see Appendix A). All parents of potential participants were asked to sign the consent forms, fill demographic and developmental history questionnaires, and send them back to the teachers if they accepted the request to participate.

Children with DLD were recruited from speech and language clinics at King Abdulaziz University Hospital and King Fahad Medical City in Riyadh. First, heads of speech and language clinics were sent invitation letters explaining the study. Then, ethical approvals and permissions to access the clinics and patients' database were granted by both hospitals. Following approval, the researcher worked with the SLTs to identify diagnosed DLD children

within the targeted age range and inclusionary criteria. Then, parents of children with DLD were invited to participate in the study by the researcher. If they were interested, then appointments were set up for them. During the first appointment, the researcher explained the study and read the consent form to the parents. Parents were also informed that they were free to withdraw at any time. Once approval and consent forms were signed, the researcher initiated the testing process. Parents were invited to ask any questions after the sessions. Participation was voluntary, but parents were informed that they could receive language support sessions if requested.

4.2 Participants

Sixty-six Saudi Arabic-speaking children were recruited for the study. The participants included 40 TD children (20 boys, 20 girls; aged 4;0 to 6;11), and 26 children with DLD (17 boys, 9 girls; aged 4;0 to 6;11). All participants were monolingual Arabic speakers and both groups were matched for their age and socioeconomic status. To control for socioeconomic status, parents completed a demographic questionnaire including parental educational level, parental occupation, and family income. These three main socioeconomic components are known to influence parents' inputs and interactions with their children (Rowe, 2018). See Table 4.1 for demographic information for both groups of participants.

Inclusionary criteria for the TD group were: (1) age-appropriate language skills as reported by their parents and teachers, (2) no hearing impairment, (3) no history of speech, language, or communication disorder, and (4) no diagnoses of other neurological, social, emotional, behavioural, emotional, or sensory disorders as reported by their parents. The children with DLD (mean age = 5;2 (62.73 months), SD = 10.77 months) were diagnosed with DLD by qualified SLTs and had been receiving speech and language therapy. Since standardized Arabic language assessments are not available, it was crucial to ensure that children diagnosed with DLD met the criteria for DLD set out by Bishop et al. (2016) and

Bishop et al. (2017). Inclusionary criteria for this group are: (1) a diagnosis of developmental language disorder, and (2) no known differentiating condition (e.g., brain injury, cerebral palsy, sensorineural hearing loss, autism, and other genetic conditions). This was confirmed by administering the Arabic language battery (see Table 5.1 in Chapter 5) which shows that the DLD group scored significantly lower than the TD group on all administered language tests.

Table 4.1. *Participants' demographic characteristics*

	Group	
	TD $n = 40$	*DLD* $n = 26$
Socioeconomic Status	%(*n*)	
Family Income per month		
17,000 Saudi Riyal or <	55(22)	61.5(16)
22,500 Saudi Riyal	17.5(7)	15.4(4)
27,500 Saudi Riyal or >	20(8)	19.2(5)
Father's Education		
High school & Diploma	20(8)	38.5(10)
University degree	40(16)	42.3(11)
Postgraduate degree	40(16)	15.4(4)
Mother's Education		
High school & Diploma	22.5(9)	34.6(9)
University degree	55(22)	53.8(14)
Postgraduate degree	22.5(9)	7.7(2)
Home Literacy Environment	%(*n*)	
Book Exposure	75(30)	69.2(18)
No. of books at home		
5 books or <	60(24)	34.6(9)
5 – 7 books	12.5(5)	26.9(7)
7 – 10 books	10(4)	7.7(2)
< 10 books	12.5(5)	23.1(6)
Shared Book Activity		
Always	7.5(3)	11.5(3)
Sometimes	52.5(21)	46.2(12)
Rarely	32.5(13)	30.8(8)
Never	5(2)	7.7(2)

Note. TD: Typically Developing, DLD: Developmental Language Disorder.

4.2 Materials

To assess the relationship between oral language skills and emergent literacy skills, a comprehensive Arabic language and emergent literacy test battery was administered. Table 4.2 provides a summary of these assessments. Due to the lack of standardized Arabic assessments,

all measures were developed and designed by the researcher. Picture stimuli, words, and sentences were adapted from previous studies (Najmaldeen, 2020; Shaalan, 2010; Wallan, 2018). To evaluate the feasibility and the appropriateness of the adapted measures, all measures were piloted with 10 TD children aged between 4;0 and 6;0 year, with a mean age of 5;3 (64 months, SD = 9.35). Results indicated that measures were age appropriate and age sensitive. A brief description of the pilot study is provided in Appendix B. Each assessment is described below.

Table 4.2. *Arabic Language Battery and Arabic Emergent Literacy Battery*

Arabic Language Battery		Arabic Emergent Literacy Battery	
Receptive Language Skills		*Phonological Awareness*	
(1) Vocabulary Knowledge	Receptive Expressive	(1) Syllable Segmentation	
(2) Oral Comprehension	Literal Inferential	*Phoneme Awareness*	
Expressive Language Skills		(2) Phoneme Isolation	Initial Final
(3) Sentence Repetition	Syntactic Skill	(3) Phoneme Deletion	Initial Final
(4) Language Sample	MPU	*Letter Knowledge*	
Additional Tests		(4) Letter Name	
(5) Nonverbal Reasoning		(5) Letter Sound	Isolation Initial
(6) Non-word Repetition			Medial Final
(7) Digit Recall		*Decoding*	
		(1) Single word reading	

Note. MPU: Morpheme per utterance

4.2.1 Arabic Language Battery

In 2010, the National Early Literacy Panel meta-analysis study noted that explicit oral language assessments, which address a broad range of linguistic skills, were more sensitive in defining the linguistic precursors for later literacy skills (Shanahan & Lonigan, 2010). Thus, a comprehensive language battery was administered to evaluate different receptive and

expressive language skills. Since most children in the current study are only exposed to the spoken Arabic (SpA) dialect, all tests were administered with SpA. Each of the tests will be explained in more detail in separate sections below.

4.2.1.1 Arabic Picture Vocabulary Test (APVT)

The Arabic Picture Vocabulary Test (Shaalan, 2010) was standardized on Qatari children aged 4;6 to 9;4. The test includes 132 age-appropriate stimuli that increase in complexity and are divided into 10 different groups with 12 stimuli in each group. For the purposes of this study, the APVT test was modified to make it culturally and age-appropriate for the participants. An adapted shorter version was used to evaluate children's receptive vocabulary knowledge. The test included 96 stimuli which ranged in difficulty and were divided into 8 different groups with 12 items per group (see Appendix C). Stimuli were chosen from the following categories: verbs, nouns, adjectives, animals, and professions. Due to dialectal differences, some stimuli were substituted with common Saudi dialect words. For example, the Qatari dialect word / muχam:a/ which means 'broom' in English, was substituted by the Saudi dialect word /muknisa/. The test was administered digitally using PowerPoint to improve child's engagement. Each slide consisted of 4 coloured pictures (obtained from Shutterstock.com). The researcher asked children to point to the target picture by asking "where is ….., or show me …..". Children were required to point to the picture that they thought was correct. Every correct response was scored as 1, and every incorrect or no response was scored as 0. Repetition was allowed if the child was distracted. Before testing, practice items were presented first to ensure that children were able to follow the tester's instructions.

4.2.1.2. Listening Comprehension Test

The Squirrel Story Narrative Comprehension Assessment (NCA) (Dawes, 2017) was used to assess children's listening comprehension skills by asking literal and inferential

questions. Since the story was found to be culturally and age-appropriate, it was translated into Arabic. The story includes a clear and simple story structure, emotions that can be inferred, and age-appropriate vocabulary. The task includes 13 questions providing information about children's ability to orally comprehend narratives. Some of these questions consisted of two parts, resulting in 14 inferential questions and five literal questions. The application version was used, and the NCA protocol and scoring scale was followed (Dawes, 2017). Children were required to watch and listen to the story on an iPad whilst the researcher told the story. Children were then asked to answer comprehension questions while looking through the story pictures. Children's responses were audio-recorded for later offline scoring. The NCA scoring scale ranged from 0 – 2 points for each question (for further scoring guide details please see (Dawes, 2017)) which provided a total score of 28 for inferential questions and 10 for literal questions. Scoring guides were specific to each question, but in general every detailed appropriate answer was scored as 2, every general appropriate answer was scored as 1, and every inappropriate answer was scored as 0. For examples, see table 4.3 below.

Table 4.3. *Example of scoring Squirrel Story Narrative Comprehension Assessment questions*

	Question	2 points	1 point	0 point
1	Where does this story happen?	In the tree and the forest	In the tree	Here
2	Look at the animals in this picture. How do you think they are feeling?	Happy, or excited	Ok, or good	Hungry

4.2.1.3 Arabic Expressive Vocabulary Test-2 (AEVT-2)

The Arabic Expressive Vocabulary test was developed to assess children's expressive vocabulary knowledge. Stimuli were selected based on item categories and difficulty. Stimuli were chosen to include verbs, adjectives, and singular and plural nouns from different groups such as: animals, toys, objects, places, and professions. A familiarity rating scale was collected

from 10 Arabic-speaking adults. Each word received a rating from 1– 4 (1 = totally unfamiliar word and 4 = totally familiar word). Based on the familiarity rating scale and the author's clinical experience, the 85 stimuli were ranked from most familiar to least familiar (see Appendix D). The test was administered digitally using PowerPoint. Each slide consisted of one coloured picture (obtained from Shutterstock.com). Children were asked to name the presented picture by asking them "what is this?". Synonyms were counted as correct responses. Every correct response was scored as 1, and every incorrect or no response was scored as 0.

4.2.1.4 Arabic Sentence Imitation Task (ASIT)

The Arabic Sentence Imitation Task (ASIT) was developed to assess children's ability to use morpho-syntactic structure during their communication. Following the LITMUS Sentence Repetition principles (Marinis & Armon-Lotem, 2016), the ASIT task included different syntactically complex structures that have been found to be difficult for Arabic-speaking children diagnosed with DLD (e.g., present tense, passive sentences, object questions, subject and object relative sentences, and accusative pronouns). The task consisted of 37 sentences that were grouped in three different levels and presented in a randomized order. Level 1 comprised simple mono-clausal sentences that mainly included language-specific structures: past tense, present tense, noun plurals, bound pronouns, and negation. Level 2 consisted of sentences with complements which require movement: passive sentences and object questions. Level 3 featured bi-clausal sentences and sentences that required both embedding and movement: accusative pronouns, subject relative, and object relative sentences. To eliminate the memory capacity effect, the sentences' length was controlled for the number of words (5 – 6 words per sentence) and number of syllables (8 – 15 syllable per sentence) (see Appendix E). Table 4.4 provides a summary of the syntactically complex structures that have been chosen for the ASIT task.

Table 4.4. *Distribution of the items used in the Arabic Sentence Imitation Task (N=37)*

	Syntactic Structure		Item number
1	Past tense: Masculine, Feminine	SV, VS order	1, 10, 13, 34
2	Present tense: Masculine, Feminine	SV, VS order	4, 5, 9, 19
3	Pronouns: 1st, 2nd, and 3rd singular	SV, VS order	7, 11, 20, 24, 27
4	Objects WH Q: what, who, which; Masculine and Feminine		2, 15, 17, 29, 33, 35,
5	Negation: Masculine and Feminine	SV, VS order	16, 32
6	Plural Feminine: Past and Present tense	SV, VS order	3, 30
7	Plural Masculine: Past and Present tense	SV, VS order	8, 28
8	Irregular Plural		23, 25
9	Passive voice		22, 37
10	Accusative pronouns	O, SV order	18, 36
11	Subject Relative: Masculine, Feminine	SV, VS order	12, 31
12	Object Relative: Masculine, Feminine	SV, VS order	6, 21
13	Sentential Complement: Masculine, Feminine	SV, VS order	14, 26

Children were asked to listen carefully and repeat the heard sentence verbatim. Repetition was allowed if the child was distracted. The children's audio was recorded for later orthographic transcription and offline scoring. Responses were scored using the target syntactic structure's scoring method, which is a binary scoring system that aims to assess children's ability to repeat the target grammatical structure in the sentence. The child receives 1 point if

he/she maintains the target syntactic structure and 0 if the child makes an error or omits the target syntactic structure from the sentence. For examples, see table 4.5 below.

Table 4.5. *Example of the sentence repetition target syntactic scoring method*

	Sentence	1 point	0 point
Item 21	/laħag elwalad elkalb elli elbissah ʕaðˀitah/ Chase-past-3MS the-boy the-dog that the-cat bite.		
Translation	The boy chased the dog that the cat bit.		
Target Syntactic structure	Object relative		
Child	/laħag elwalad elbissah ʕaðˀitah/ Error type: omission of the Object: the-dog /elkalb/ and the Object relative: who /elli/. The repetition is deviated from the target syntactic structure.		X

4.2.1.5 Spontaneous Language Sample

A language sample was used to provide a more naturalistic assessment of expressive language and as a tool for further language analysis (i.e., number of different words, mean length of utterance, and narrative skills). Spontaneous language samples were obtained using the wordless picture book *Frog, Where Are You?* (Mayer, 1969). This book was chosen because it has been used across different languages and cultures. Each child generates their own story while describing the presented pictures. Children were asked to look through the picture book and describe what they see. They were encouraged by the researcher to say out loud whatever they were thinking about as they look at the pictures. Elicitation questions (e.g., "Tell me what happened here?", or "What did the boy do?") were used when children demonstrated difficulties describing the pictures. Children's intelligible utterances were analysed to calculate the mean morpheme per utterance (MPU). MPU was calculated by dividing the total number of morphemes by the total number of utterances produced in the language sample. The author followed Shaalan and Khater's (2006) guidelines of counting Arabic morphemes, which were adapted from Dromi and Berman (1982). Based on their

guidelines, imitations, unintelligible utterances, fillers (e.g., “um” or “aah”), repeated utterances, and yes/no answers were excluded. Every meaningful prefix or suffix that was attached to the inflected verb, noun, or adjective was counted as a single morpheme. For examples, see Table 4.6 below.

Table 4.6. *Example of counting morphemes*

Word Type	Word Example	Number of Morphemes
Inflected Verb	/jina:di/ Call-Present-3MS he is calling out	/ji/ + /na:di/ = 2 morphemes Singular masculine present tense
Inflected Noun	/dˤufdaʔain/ Frog + /ain/ denotes the dual form two frogs	/dˤufdaʔ/ + /ain/ = 2 morphemes Noun dual
Inflected Adjective	/zaʔla:n/ he is sad	/zaʔla:n/ = 1 morpheme Masculine adjective

4.2.2 Arabic Emergent Literacy Battery

4.2.2.1 Phonological Awareness Tests

A range of phonological awareness tests have been developed to evaluate children’s meta-phonological skills. Analytic phonological awareness tests (i.e., deleting, counting, and manipulating) are the strongest predictors of decoding and reading comprehension (Shanahan & Lonigan, 2010). Thus, different analytic phonological awareness tests were administered and included different linguistic unit sizes – from syllable level to phoneme level. Since most children in the current study are only exposed to the spoken Arabic (SpA) dialect, and to control for the diglossia effect, all tests were administered with SpA. The following tests were included:

4.2.2.1.1 Syllable Segmentation Test

A syllable segmentation test was developed to evaluate children’s ability to detect the number of syllables in words. The test comprised three practice stimuli and 10 test stimuli, ranging from one to five syllables in length (i.e., two stimuli for every syllable length). The order of the stimuli was randomized. Children were asked to listen to the word and segment it

into syllables. To simplify the task, five different tokens were presented, and children were asked to point to the tokens or clap while they orally segmented the words into syllables. Saying the syllables while segmenting the word was considered a correct response; for example, segmenting the Arabic word /ʔisˁbaʕ/ (which means 'finger') into two syllables and saying /ʔisˁ-baʕ/. To limit the memory capacity effect, each stimulus was presented with a coloured picture using PowerPoint (see Appendix E). Correct oral responses were scored as 1, incorrect or no oral responses were scored as 0. Correctly clapping the words without saying it out loud was scored as 0.

4.2.2.1.2 Phoneme Awareness Tests

Phoneme awareness skills were assessed using phoneme isolation (initial, final), and phoneme deletion (initial, final) tasks. The phoneme isolation subtest aimed to assess children's ability to identify a sound in a word and isolate this sound. For the initial phoneme isolation subtest, children were asked to listen to the words and then isolate the initial phoneme of the word. For example, "What is the first sound in the word /χaru:f/ (sheep in English)?" (Answer: /χ/). For the final phoneme isolation subtest, children were asked to listen to a word and isolate the final phoneme of the word. For example, "What is the last sound in the word /ħali:b/ (i.e., milk in English)?" (Answer /b/). The phoneme isolation subtest consisted of three practice stimuli and 12 test stimuli, ranging from one to three syllables in length. The targeted phonemes in both tasks were early developing phonemes /w, j, l, n, k, ʕ, q, ʃ, χ, ɣ, ðˁ, ħ/. To limit the memory capacity effect, each stimulus was presented with a coloured picture using PowerPoint (see Appendix E). Correct responses were scored as 1, incorrect or no responses were scored as 0.

Phoneme deletion is considered to be more difficult than phoneme isolation as it requires a higher level of phonemic awareness. The phoneme deletion subtest aimed to assess the child's ability to identify the target sound, delete the sound from the word, and then say the

new word. For the initial phoneme deletion subtest, children were required to listen to the word, and then say the word without the initial phoneme. For example, “Say /na:r/ (fire in English) without the /n/”, (answer: /a:r/). For the final phoneme deletion subtest, children were required to listen to the word, and then say the word without the final phoneme. For example, “Say /bint/ (girl in English) without /t/”, (answer: /bin/). This subtest included 3 practice stimuli, and 12 test stimuli of one and two syllables in length. All stimuli in both subtests were balanced in terms of single phonemes (CVC), clusters (CCVC), short vowels (V), and long vowels (V:). For the initial phoneme deletion task, the cluster position was at the beginning of the word, and for the final deletion task, the cluster position was at the end of the word. To limit the memory capacity effect, each stimulus was presented with a colour picture using PowerPoint (see Appendix E). Correct responses were scored as 1, incorrect or no responses were scored as 0.

4.2.2.2 Letter Knowledge

Letter knowledge is the beginning of orthographic knowledge, and one of the higher levels of emergent literacy skills. As children become more experienced with letters, they become more aware of the words’ components: syllables and phonemes (Rhyner, 2009). Arabic orthography includes 28 letters. All of them are consonants except for the letter ا/a/ which acts as a carrier for the glottal phoneme /ʔ/ (i.e.,ء,أ) (Saiegh-Haddad & Henkin-Roitfarb, 2014). One factor that may influence the acquisition of Arabic reading is the variability of the Arabic graphemes’ shapes in the written scripts (Asaad & Eviatar, 2013). Thus, three different tasks were used to evaluate children’s letter knowledge: letter naming, grapheme-phoneme correspondence in isolation, and grapheme-phoneme correspondence in all positions, to assess children’s knowledge of all letter shapes. All letters were presented on white cards, and children were required to name them (in the letter-naming task) and sound them out (in the grapheme-phoneme correspondence tasks). Correct responses were scored as 1, incorrect or no responses were scored as 0.

4.2.2.3 Decoding

Decoding words is one of the highest levels of emergent literacy skills. To read a single word, children must segment the word into phonemes, translate the phonemes into sounds, and blend the phonemes again. Thus, decoding requires sophisticated and explicit linguistic and cognitive processing skills. For the purpose of this study, a single-word reading test was administered. The test included 20 simple single words presented on white cards (see Appendix F). Stimuli were chosen from children's books, and each word contained three letters. For example: the word /ʃams/ (شمس) in Arabic, which means 'sun' in English. Children were required to read the words. Correct responses were scored as 1, incorrect or no responses were scored as 0.

4.2.3 General Cognitive Ability and Verbal Short-Term Memory Tests

4.2.3.1 Nonverbal Reasoning Test

To assess the children's nonverbal reasoning abilities, the Raven's Coloured Progressive Matrices (CPM) (Raven, 2007) was administered. CPM is a standardized measure of children's cognitive and reasoning skills for children aged 5 to 11. The test includes three different sets (i.e., A, B, and AB) which progressively increase in complexity. Each set comprises 12 stimuli that include geometric figures with a missing element (i.e., a puzzle). Children were asked to look at the figures and choose the most appropriate figure to complete the designs' puzzle from several options presented beneath the main puzzle. As this test is not standardized on Arabic-speaking children, raw scores were used to gauge a general baseline of children's nonverbal reasoning skills. Correct responses were scored as 1, incorrect or no responses were scored as 0.

4.2.3.2 Nonword Repetition Test

Shaalan (2010) administered a nonword repetition test to Gulf Arabic-speaking children with DLD to assess phonological short-term memory, phonological processing,

auditory processing skills, and speech-motor processing skills. The test included 30 nonword stimuli which were presented in a randomized order (see Appendix G). Children were required to carefully listen to the nonwords and repeat them verbatim. Correct responses were scored as 1, incorrect or no responses were scored as 0.

4.2.3.3 Digit Recall Test

A digit recall test was administered to evaluate children's verbal memory abilities. The digit recall subtest from the Clinical Evaluation of Language Fundamentals' Fourth Edition (CELF-4) (Semel et al., 2006) was adapted for Arabic. Children were asked to repeat back a series of numbers in the same order they heard them. Correct responses were scored as 1, incorrect or no responses were scored as 0.

4.3 Procedure

Children were assessed individually in a quiet area of their nursery setting, school, or speech and language therapy clinic. The number of sessions varied between 2 to 3 sessions depending on the participants' age, and motivation; younger children (i.e., aged 4;0 to 4;11) required three sessions because of their lower attention span. Each session lasted approximately 1 hour, and children were given as many breaks as needed. All participants were required to complete the general cognitive ability and VSTM tests, the Arabic language battery, and the Arabic emergent literacy battery. Typically developing children were also required to complete a hearing screening test to rule out any hearing deficits. DLD children had already completed a hearing screening test prior to their diagnosis. All tests were administered by the researcher, who is a qualified speech and language therapist, and audio-recorded using a Sony ICD-UX560F digital voice recorder. To engage participants during testing, each child was provided with a task rewards chart to complete as a motivation for participation. They received a big sticker when they completed the chart.

4.4 Reliability

Interrater reliability was established by having a second qualified Saudi Arabic-speaking speech and language therapist who independently scored the responses of 15 children (23% of the sample). According to Cicchetti (1994), intraclass correlation coefficient (ICC) values from .60 to .74 indicate good levels of agreement and values from .75 to 1.0 indicate excellent levels of agreement. For the language assessments, ICC values were excellent, for receptive vocabulary (α = 1.0), expressive vocabulary (α = .99), listening comprehension (α = .99), sentence repetition (α = 1.0), and MPU (α = 1.0). For the emergent literacy assessment, ICC values were excellent for syllable segmentation, phoneme awareness, letter knowledge, and decoding (α = 1.0). Finally, ICC values were also excellent for nonword repetition and digit recall (α = 1.0).

4.5 Analysis

All statistical analyses were performed using IBM SPSS Statistics, version 27. Raw scores were converted to percentages, and composite scores of vocabulary knowledge (i.e., receptive and expressive vocabulary tests), listening comprehension (i.e., inferential and literal questions), phoneme awareness (i.e., phoneme isolation and deletion tests), letter knowledge (i.e., letter naming and letter sound tests), and emergent literacy (i.e., syllable segmentation, phoneme awareness, and letter knowledge tests) were obtained. Shapiro-Wilk's test was used to test the normality of the distributions. Results revealed non-normal distribution of data ($p < .05$), therefore, nonparametric tests were used. Mann-Whitney U tests were used to investigate the differences in performance between groups on all emergent literacy tasks, and effect sizes were calculated by dividing the Z score by the square root of the total sample size. A p-value cut-off of 0.0125 was adopted and corrected for multiple comparisons using the Bonferroni approach, as suggested by Field (2013). A power analysis revealed that a sample size of 82 (i.e., TD group = 41, and DLD group = 41) was needed to achieve a large effect size with a p

value of 0.0125. Further, a Spearman's rank correlation coefficient for age was calculated to examine the relationships between oral language skills, VSTM and emergent literacy skills, and between SES, HLE, and emergent literacy skills in TD and DLD groups. Finally, hierarchal regression analyses were used to examine the relative contributions of oral language and verbal short-term measures in predicting emergent literacy skills in both groups. Significance levels were set at $p < .05$.

Chapter 5
Results

This study aims to examine: (1) emergent literacy skills of Saudi Arabic-speaking children with and without DLD aged 4;00 to 6;11, (2) the relationship between language, short-term verbal memory and emergent literacy skills, and (3) the relationship between the HLE, SES, and emergent literacy skills. Examining these relations will provide additional insight into relations between oral language and emergent literacy skills in the Arabic language and contribute to our understanding of early literacy development in Arabic-speaking children with and without DLD. The research questions are:

1. Do Saudi Arabic-speaking children with DLD differ from typically developing peers on emergent literacy skills?
2. What is the relationship between language and emergent literacy skills in Arabic-speaking children with and without DLD?
3. What is the relationship between short-term verbal memory and emergent literacy skills in Arabic-speaking children with and without DLD?
4. What is the relationship between home literacy environment, socioeconomic status, and emergent literacy skills in Arabic-speaking children with and without DLD?

This chapter starts with descriptive statistics for general cognitive ability, VSTM, and Arabic language tests in both groups. These findings are presented in Section 5.1. Following descriptive analyses, the author addressed the research questions. To address the first research question, this study explored the emergent literacy skills of both groups and investigated the effect of age on these skills. Then, emergent literacy skills were compared between the TD and DLD groups. Based on the existing literature, the author predicted that, compared to TD children, children with DLD would demonstrate lower overall accuracy on emergent literacy tests. To further investigate this hypothesis, a Mann-Whitney U test was conducted to compare

the means of the two groups' performances on all emergent literacy measures. Findings are described in Section 5.2.

To address the second research question, the author examined the relationship between children's performance on language and emergent literacy tests. This was followed by an investigation of the relationships between different oral language and emergent literacy skills. Based on previous studies, it was predicted that oral language skills (vocabulary knowledge and syntactic skills) would be related to emergent literacy skills in both groups. To further investigate this hypothesis, a Spearman's rank correlation coefficient for age within each group was calculated to explore the relationship between oral language and emergent literacy skills in both groups. Then, a multiple hierarchal regression analyses was conducted within each group to investigate the relative contributions of language measures in predicting emergent literacy skills. All findings are presented in Section 5.3.

To address the third research question, the author examined the relationship between short-term verbal memory and emergent literacy skills. It was then hypothesized that verbal short-term memory skills would be related significantly to emergent literacy skills in both groups. To further investigate this hypothesis, a Spearman's rank correlation coefficient was calculated for age within each group to examine the correlations between digit recall, nonword repetition and emergent literacy composite score. Then, a multiple hierarchal regression analysis was conducted within each group to investigate the relative contributions of these measures in predicting emergent literacy skills. All findings are presented in Section 5.4. Lastly, to address the fourth research question, the author examined the relationships between HLE, SES, and emergent literacy performance. This study's aims were: (1) to examine the HLE and SES and compare these across the groups, and (2) to explore whether HLE and SES correlate with emergent literacy skills. A Spearman rank correlation coefficient for age within each group was calculated, and findings are presented in Section 5.5.

5.1 Descriptive Statistics for General Cognitive Abilities, Verbal Short-Term Memory Tests, and Arabic language Tests in TD and DLD groups

5.1.1 Arabic Language Battery

Since standardized Arabic language assessments are not available, it was crucial to ensure that children with DLD met the eligibility criteria. The Arabic language battery was administered to TD and DLD groups to confirm the presence or absence of DLD in the DLD group by comparing their performances with their TD peers. Distribution of scores across groups on the following language measures: vocabulary knowledge, syntactic skills, listening comprehension, and MPU will be described. In all cases, means, medians, standard deviations (SD), and ranges are presented in Table 5.1. For the purpose of comparison analysis, raw scores were converted to percentages, and overall composite scores of vocabulary knowledge (i.e., receptive and expressive vocabulary test scores) and listening comprehension (i.e., inferential and literal questions' scores) were computed.

To further investigate the differences between the groups on all language measures, data sets were first checked for assumptions of normality and homogeneity. Levene's test of homogeneity of variance was significant for vocabulary knowledge (p <.05), and syntactic skills (p <.001), likely because TD children had higher means and greater variability. Since assumptions were violated in most data sets, nonparametric analyses were conducted. A Mann-Whitney U test with four dependent measures: vocabulary knowledge, syntactic skills, listening comprehension, and MPU was used. A Bonferroni correction was applied to control for multiple comparisons and the significance level was set to 0.0125. Findings revealed significant differences between the groups on vocabulary knowledge (U = 275, z = -3.22, p = .001, r= 0.39), syntactic skills (U = 86, z = -5.70, p < .001, r= 0.70), listening comprehension (U = 115.50, z = -5.31, p < .001, r= 0.65), and MPU (U = 235.50, z = -3.11, p = .002, r= 0.39). Overall, children with DLD performed significantly lower than their TD peers in all language

tests, which confirmed their diagnosis. Differences in performance across groups in language tests are presented in Figure 5.1.

Table 5.1. *Results of Arabic Language Battery of TD and DLD groups (raw and percentage correct scores)*

	TD *n* = 40				**DLD** *n* = 26			
	Raw Scores		*Percentage Correct %*		*Raw Scores*		*Percentage Correct%*	
Measures	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*
Language Assessments								
Vocabulary Knowledge*	135.88 (17.04) 95 - 174	137.50	75.10 (9.29) 53 – 96	76.00	111.23 (32.43) 50 – 164	112	61.54 (17.95) 28 – 91	62
Syntactic Skills (SRT)**	29.70 (6.01) 13 – 37	31	80.33 (16.23) 35 – 100	84.00	12.65 (10.31) 0 – 35	11.50	34.19 (27.87) 0 – 95	31
Listening Comprehension**	16.25 (5.32) 8 – 31	16	47.60 (13.67) 24 – 84	48.00	7.50 (5.31) 0 – 16	8.00	22.12 (15.91) 0 – 49	24
MPU*	6.42 (1.89) 4.10 – 13	6.00	- -	-	4.70 (2.31) 0 – 10.70	4.80	- -	-

Note. TD: Typically developing, DLD: Developmental language disorder, SD: Standard deviation, SRT: Sentence repetition, MPU: Mean length per utterances.
*p<.05, **p<.001

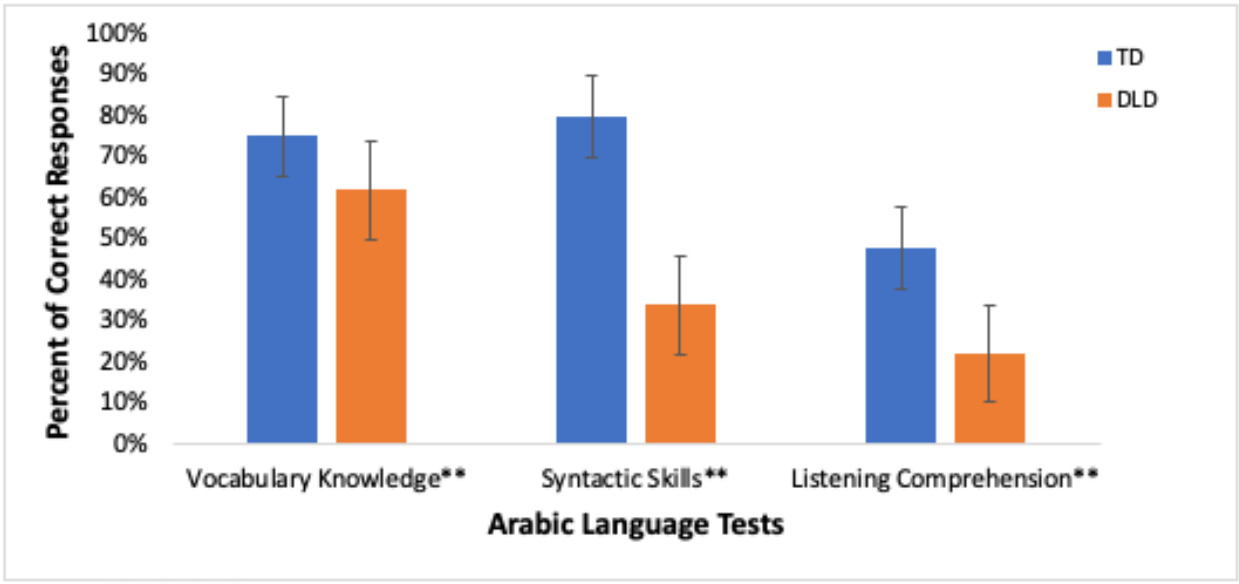

Figure 5.1. *Mean scores in vocabulary knowledge, syntactic, and listening comprehension skills in TD children and children with DLD.*

5.1.2 General Cognitive Ability and Verbal Short-Term Memory Tests: Nonverbal Reasoning Skills, Digit Recall, and Nonword Repetition

Distribution of scores across groups on general cognitive ability and verbal short-term memory measures (i.e., nonverbal reasoning, digit recall, and nonword repetition) are provided in this section. In all cases, means, medians, SD, and ranges are presented in Table 5.2. For the purpose of comparison analysis, raw scores were converted to percentages. Overall, no differences between the groups were found on nonverbal reasoning skills. However, the means of the TD children were significantly higher than the means of children with DLD on the digit recall and the nonword repetition tasks.

To further investigate the effect of group on the performance of children on the following measures: nonverbal reasoning skills, digit recall, and nonword repetition tasks, data sets were first checked for assumptions of normality and homogeneity. Levene's test of homogeneity of variance was significant (p <.001) for the nonword repetition test, likely because the TD children had higher means and greater variability. Since assumptions were violated in most data sets, nonparametric analyses were used. A Mann-Whitney U test was used to compare the means of children's performances on nonverbal reasoning ability, digit recall, and nonword repetition tests between the TD and DLD groups, and effect sizes were calculated. A Bonferroni correction was applied to control for multiple comparisons and the significance level was set to 0.016. Results revealed a significant difference between the groups on digit recall (U = 160.50, z = -4.79, p < .001, r= 0.58) and nonword repetition (U = 50.50, z = -6.18, p < .001, r= 0.76). For nonverbal reasoning skills, children's scores were not significantly different between the two groups (U = 420, z = -1.32, p = .188, r= 0.16). Differences in performance across groups in general cognitive ability and VSTM tests are presented in Figure 5.2.

Table 5.2. *Results of general cognitive abilities and VSTM of TD and DLD groups (raw and percentage correct % scores)*

	TD *n* = 40				**DLD** *n* = 26			
	Raw Scores		*Percentage Correct %*		*Raw Scores*		*Percentage Correct%*	
Measures	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*
Nonverbal Reasoning	13.18 (4.48) 6 – 28	13	36.67 (12.38) 17 – 78	36	11.50 (5.76) 1 – 22	11	31.92 (16.00) 3 – 61	31
Digit Recall**	5 (1.39) 3 – 8	5	31.33 (8.78) 19 – 50	31	3.00 (1.60) 0 – 7	2.50	18.81 (9.94) 0 – 44	13
Non-word Repetition**	26.18 (3.46) 16 – 30	27	87.25 (11.58) 53 – 100	90	10.46 (7.08) 0 – 30	0	34.88 (23.59) 0 – 100	30

Note. TD: Typically developing, DLD: Developmental language disorder, SD: Standard deviation.
*p<.05, **p<.001

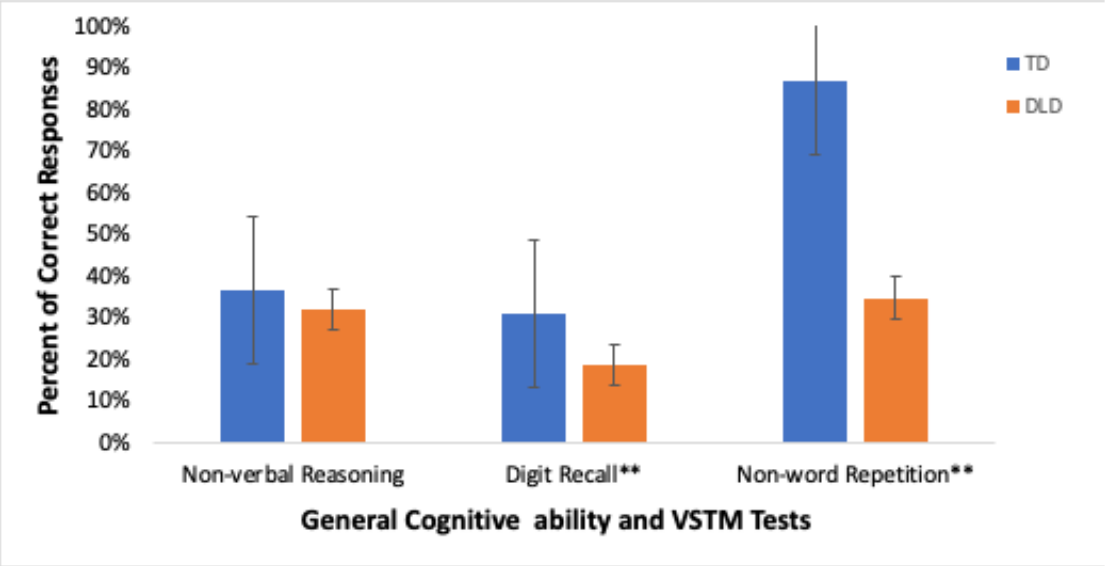

Figure 5.2. *Mean scores in nonverbal reasoning and VSTM skills in TD children and children with DLD.*

5.2 Comparison of TD and DLD's Performance on Emergent Literacy Skills

The first research aim was to compare children's emergent literacy performance skills across TD and DLD groups. The emergent literacy battery was administered to explore children's performances across the groups. The battery was composed of the following emergent literacy skills: syllable segmentation, phoneme awareness, letter knowledge, and decoding. First, a comparison of children's performances on all emergent literacy tests was carried out. Then, the author computed an overall emergent literacy composite (ELC) score by combining syllable segmentation, phoneme awareness, and letter knowledge tests, and compared children's ELC scores across the groups. Distribution of scores across groups on emergent literacy measures will be described in this section. In all cases, means, medians, standard deviations (SD), and ranges are presented in Table 5.3. For the purpose of comparison analysis, raw scores were converted to percentages. Overall, the means of the TD children were higher than the means of children with DLD on all emergent literacy tests.

To further investigate the differences across the groups on all emergent literacy measures, data sets were first checked for assumptions of normality and homogeneity. Since assumptions were violated in most data sets, nonparametric analyses were conducted. A Mann-Whitney U test with four dependent measures: syllable segmentation, phoneme awareness, letter knowledge, and decoding were used. For the analysis's purposes, and to limit the number of variables, composite scores of phoneme awareness (i.e., phoneme isolation and phoneme deletion test scores) and letter knowledge (i.e., letter naming and letter sound test scores) were computed. A p-value cut-off of 0.0125 was adopted and corrected for multiple comparisons using the Bonferroni approach as suggested by Field (2013).

Results revealed a significant difference between the groups on syllable segmentation (U= 201.50, z = -4.231, p < .001, r= 0.52) and phoneme awareness (U= 259.5, z = -3.536, p < .001, r= 0.44). However, although the mean scores of letter knowledge and decoding in the

TD group were higher than the DLD group, these scores were not significantly different between the two groups (U= 350, z = -2.236, p = .025), (U= 443, z = -1.414, p = .157). Given that children in both groups demonstrate low performance on decoding skills (see Table 5.3), a decoding test was not included in the emergent literacy composite.

The next analysis compared children's ELC scores in both groups. A Mann-Whitney U test with one dependent measure: emergent literacy composite, was used. Results revealed a significant difference between the groups on the emergent literacy composite (U= 268.50, z = -3.307, p < .001, r= 0.17), indicating that children with DLD performed significantly lower than their TD peers. Overall, findings demonstrated that children with DLD had significantly lower scores on syllable segmentation, phoneme awareness, and emergent literacy composite compared with the TD group. Differences in performance across groups in emergent literacy tests are presented in Figure 5.3

To summarize the results for the comparison of TD and DLD groups on emergent literacy skills, significant differences between the groups were observed on most emergent literacy skills. In accordance to the existing literature (Boudreau & Hedberg, 1999; Catts et al., 2015; Kendeou et al., 2009; Pratt et al., 2020), children with DLD performed significantly lower than their TD peers on emergent literacy composite score, syllable segmentation and phoneme awareness skills. No significant differences between the groups were found on letter knowledge and decoding skills. Further interpretations will be discussed in Chapter 6.

Table 5.3. *Results of emergent literacy tests of TD and DLD groups (raw and percentage correct % scores)*

	TD *n* = 40				**DLD** *n* = 26			
	Raw Scores		*Percentage Correct %*		*Raw Scores*		*Percentage Correct%*	
Measures	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*	*Mean (SD) Range*	*Median*
Emergent Literacy Assessments								
Syllable Segmentation**	5.08 (2.45) 0 – 9	5	50.85 (24.37) 0 – 90	50.00	1.96 (2.46) 0 – 7	.50	19.62 (24.57) 0 – 70	5.00
Phoneme Awareness**	4.06 (3.37) 0 – 11	3.63	34.10 (28.06) 0 – 90	30.00	1.46 (3.03) 0 – 11	.00	12.35 (25.31) 0 – 92	.00
Letter Knowledge	15.28 (15.30) 0 – 44	7.50	35.75 (33.56) 0 – 98	19.50	10.92 (16.10) 0 – 45	2.84	25.54 (35.27) 0 – 100	9.00
Decoding	2.90 (5.63) 0 – 19	.00	14.50 (28.17) 0 – 95	.00	1.58 (5.43) 0 – 20	.00	7.88 (27.14) 0 – 100	.00
Emergent Literacy Composite**	8.14 (6.64) 0 – 21	5.66	40.23 (26.14) 0 – 89	34.83	4.78 (6.84) 0 – 21	1.33	19.17 (26.03) 0 – 87	6.17

Note. TD: Typically developing, DLD: Developmental language disorder, SD: Standard deviation.
***p<.05, **p<.001**

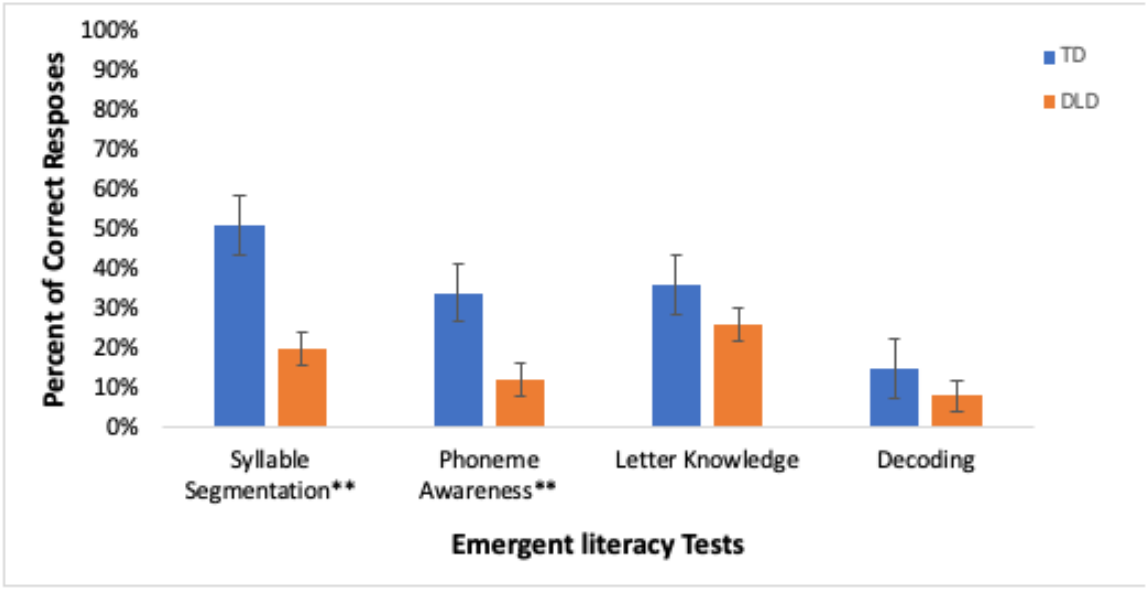

Figure 5.3. *Mean scores in emergent literacy tests in TD children and children with DLD.*

5.2.1 Effect of Age: A Developmental Trajectory Approach

Following Thomas et al.'s 2009 cross-sectional developmental trajectory method, four linear trajectories were constructed for TD and DLD groups: three trajectories assessing the relationship between each emergent literacy skill (i.e., syllable segmentation, phoneme awareness, and letter knowledge) and increasing chronological age, and another trajectory assessing the relationship between the emergent literacy composite and increasing chronological age. Analysis of covariance (ANCOVA) was conducted to compare the developmental trajectory of the DLD group against the TD group. According to Thomas et al., (2009), the presence of significance main effect of group indicates that the DLD group shows a delay in the onset of development of the target skill, and a significant interaction between age and group indicates that the rate of the development of the target skill is different between the groups. A delayed developmental trajectory occurs when both the effect of the group and the interaction between the group and age are significant.

5.2.1.1 Syllable Segmentation

ANCOVA was carried out with syllable segmentation as the dependent variable and group as the fixed factor, with age as the covariate. The overall R^2 was .491. The model explained a significant proportion of the variance [$F(3,62) = 19.912$, $p < .001$, $\eta^2 = .491$]. There was no overall effect of group [$F(1,62) = 3.565$, $p = .064$, $\eta^2 = .054$]. This suggests that the intercepts of the two groups are not reliably different at the youngest age of measurements in the DLD group. This indicates that the DLD group does not show a delayed onset in the development of the syllable segmentation skill. With groups combined, chronological age (CA) significantly predicts the level of performance on the syllable segmentation test [$F(1,62) = 22.738$, $p < .001$, $\eta^2 = .268$]. When the groups were analysed in isolation, CA reliably predicts performance in both the TD group [$F(1, 38) = 20.546$, $p < .001$, $\eta^2 = .54$], with $R^2 = .351$ and the DLD group [$F(1, 24) = 5.504$, $p = .028$, $\eta^2 = .23$], with $R^2 = .153$. There was no interaction

between group and age, suggesting that the trajectories are parallel and the rate of the development of syllable segmentation is the same in both groups [$F(1, 62) = 1.095$, $p = .300$, $\eta^2 = .017$]. Developmental trajectories for each group are presented in Figure 5.4 below.

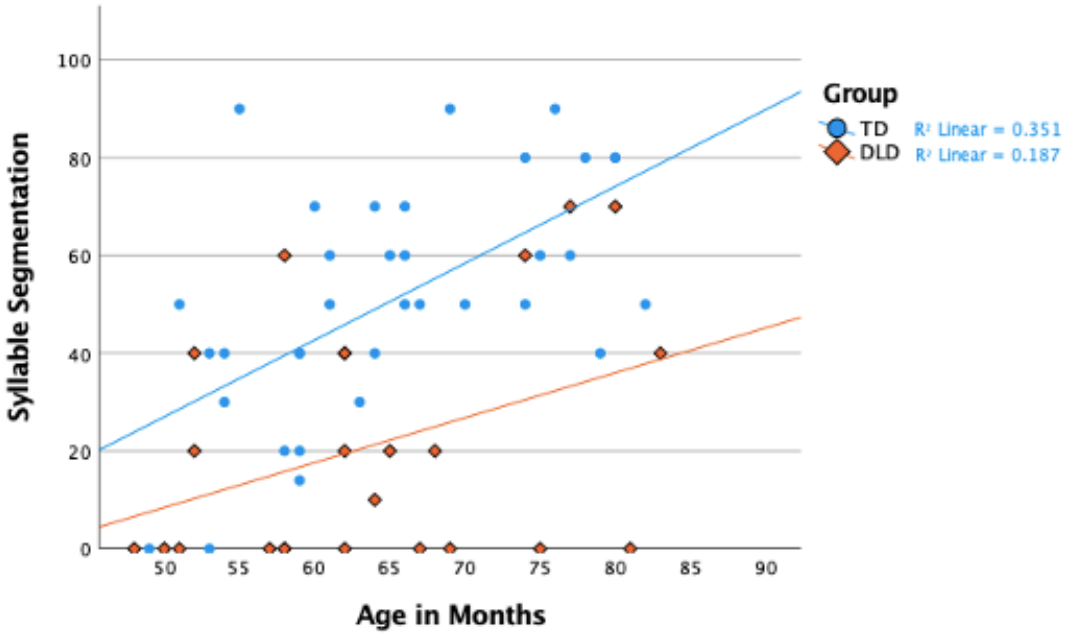

Figure 5.4. *Syllable segmentation performance and chronological age in TD children and children with DLD.*

5.2.1.2 Phoneme Awareness

ANCOVA was carried out with phoneme awareness as the dependent variable and group as the fixed factor, with age as the covariate. The overall R^2 was .417. The model explained a significant proportion of the variance [$F(3,62) = 14.77$, $p < .001$, $\eta^2 = .417$]. There was no overall effect of group [$F(1,62) = .047$, $p = .829$, $\eta^2 = .001$]. This suggests that the intercepts of the two groups are not reliably different at the youngest age of measurements in the DLD group. This indicates that the DLD group does not show a delayed onset in the development of the phoneme awareness skill. With groups combined, chronological age (CA) significantly predicted level of performance on phoneme awareness test [$F(1,62) = 25.179$, $p < .001$, $\eta^2 = .289$]. When the groups were analysed in isolation, CA reliably predicted performance in the TD group [$F(1, 38) = 26.198$, $p < .001$, $\eta^2 = .68$], with $R^2 = .408$ and the

DLD group [$F(1, 24) = 4.644$, $p = .041$, $\eta^2 = .193$], with $R^2 = .162$. There was no interaction between group and age, suggesting that the trajectories are parallel and the rate of the development of phoneme awareness is the same in both groups [$F(1, 62) = 2.87$, $p = .095$, $\eta^2 = .044$]. Developmental trajectories for each group are presented in Figure 5.5 below.

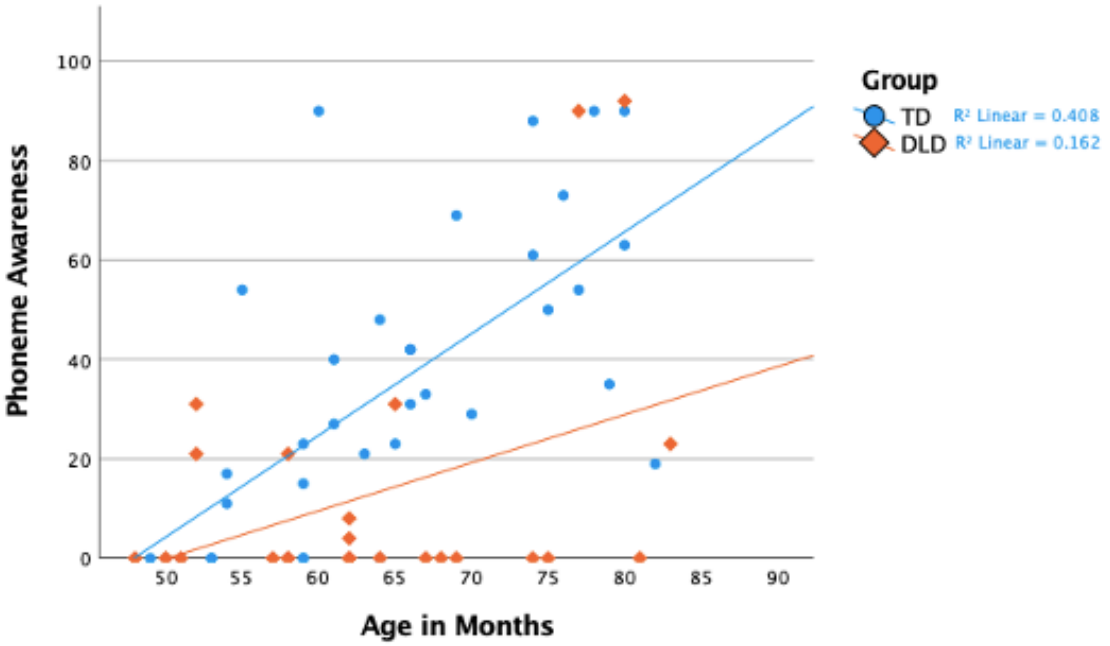

Figure 5.5. *Phoneme Awareness performance and chronological age in TD children and children with DLD.*

5.2.1.3 Letter Knowledge

ANCOVA was carried out with letter knowledge as the dependent variable and group as the fixed factor, with age as the covariate. The overall R^2 is .322. The model explained a significant proportion of the variance [$F(3,62) = 9.821$, $p < .001$, $\eta^2 = .322$]. There was no overall effect of group [$F(1,62) = .004$, $p = .952$, $\eta^2 = .000$]. This suggests that the intercepts of the two groups are not reliably different at the youngest age of measurements in the DLD group. This indicates that the DLD group does not show a delayed onset in the development of the letter knowledge skill. With groups combined, chronological age (CA) significantly predicted level of performance on letter knowledge test [$F(1,62) = 26.868$, $p < .001$, $\eta^2 = .302$].

When the groups were analysed in isolation, CA reliably predicted performance in the TD group [$F(1, 38) = 17.886$, $p < .001$, $\eta^2 = .432$], with $R^2 = .320$ and the DLD group [$F(1, 24) = 9.769$, $p = .005$, $\eta^2 = .406$], with $R^2 = .289$. There was no interaction between group and age, suggesting that the trajectories are parallel and the rate of the development of letter knowledge is the same in both groups [$F(1, 62) = .130$, $p = .720$, $\eta^2 = .002$]. Developmental trajectories for each group are presented in Figure 5.6 below.

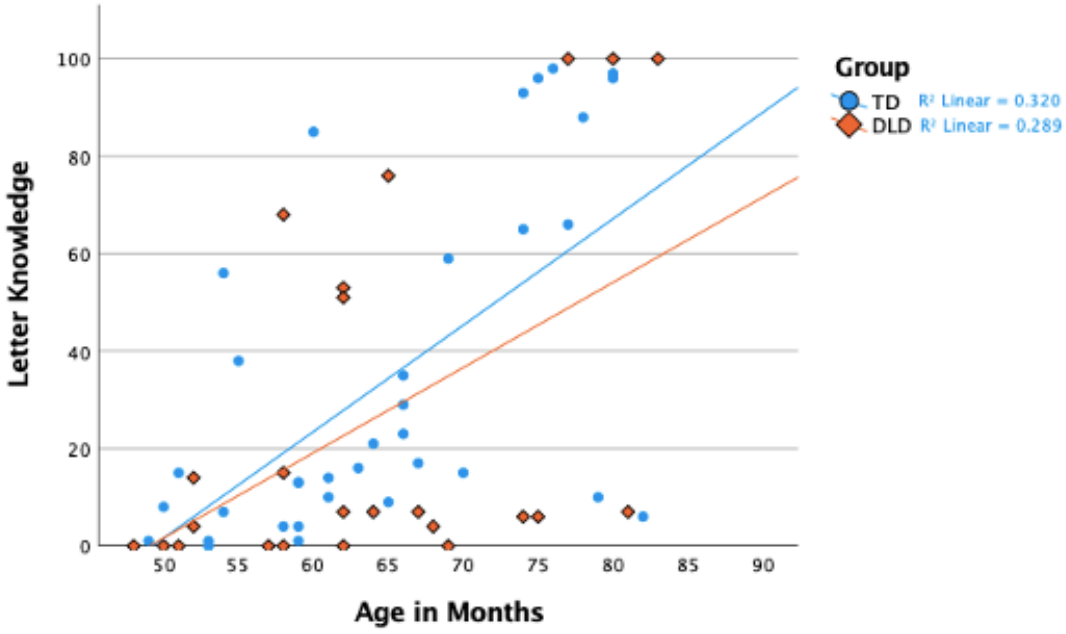

Figure 5.6. *Letter Knowledge performance and chronological age in TD children and children with DLD.*

5.2.1.4 Emergent Literacy Composite

ANCOVA was carried out with emergent literacy as the dependent variable and group as the fixed factor, with age as the covariate. The overall R^2 was .450. The model explained a significant proportion of the variance [$F(3,62) = 16.895$, $p < .001$, $\eta^2 = .450$]. There was no overall effect of group [$F(1,62) = .529$, $p = .470$, $\eta^2 = .008$]. This suggests that the intercepts of the two groups are not reliably different at the youngest age of measurements in the DLD

group. This indicates that the DLD group does not show a delayed onset in the development of the emergent literacy skill. With groups combined, chronological age (CA) significantly predicted level of performance on emergent literacy tests [$F(1,62) = 34.299$, $p < .001$, $\eta^2 = .356$]. When the groups were analysed in isolation, CA reliably predicted performance in the TD group [$F(1, 38) = 28.536$, $p < .001$, $\eta^2 = .751$], with $R^2 = .429$ and the DLD group [$F(1, 24) = 9.389$, $p = .005$, $\eta^2 = .390$], with $R^2 = .281$. There was no interaction between group and age, suggesting that the trajectories are parallel and the rate of the development of emergent literacy is the same in both groups [$F(1, 62) = .976$, $p = .327$, $\eta^2 = .015$]. Developmental trajectories for each group are presented in Figure 5.7 below.

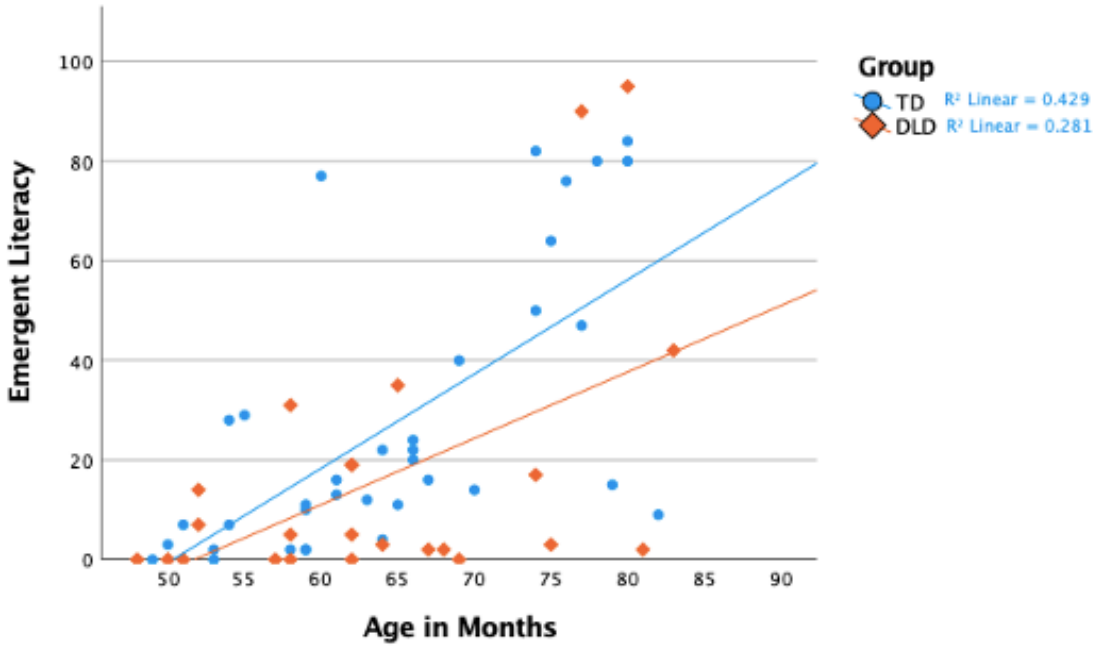

Figure 5.7. *Emergent Literacy performance and chronological age in TD children and children with DLD.*

To summarize the results for the developmental trajectories, age effects were observed for all emergent literacy measures in both groups. Results showed that children's performances have been improved with age in TD and DLD groups. DLD group showed developmental

trajectories running underneath the TD group, which suggest lower performance on syllable segmentations, phoneme awareness, and emergent literacy composite. The onset and the rate of the development of all emergent literacy skills were observed to be similar in both groups. Further interpretations will be discussed in Chapter 6.

5.3 Associations Between Language and Emergent Literacy Variables in Arabic

The second research question examines the relationship between oral language and emergent literacy skills in the TD and DLD groups. Language ability was measured using four tests: vocabulary knowledge, syntactic skills, listening comprehension, and MPU. Emergent literacy skills were measured using four tests: syllable segmentation, phoneme awareness, letter knowledge, and decoding. First, this study explored the relationships between the language variables and different emergent literacy skills. Then, the author computed an overall emergent literacy composite score by combining syllable segmentation, phoneme awareness, and letter knowledge tests, and explored the relationship between the language variables and the emergent literacy composite score in both groups.

5.3.1 Partial Correlations Controlling for Age in the TD and the DLD Groups

Since assumptions of parametric correlations were not met in most data sets, correlations were performed using Spearman's rank correlation coefficient controlling for age within each group. Table 5.4 below shows the different results for the two groups. In the TD group, significant positive correlations were observed between vocabulary knowledge and syllable segmentation, phoneme awareness, and letter knowledge. Further, there were significant positive correlations between syntactic skills and all emergent literacy skills. In the DLD group, all language tasks were significantly positively correlated with syllable segmentation, phoneme awareness, and letter knowledge. Syntactic skills were also significantly correlated with decoding skills.

The next analysis examined correlations between all language variables and emergent literacy composite scores. Table 5.5 shows the degree of correlations between all measures controlling for age in both groups. Again, as it can be seen in Table 5.5, results were different between the groups. Vocabulary knowledge and syntactic skills were significantly positively correlated with emergent literacy composite scores in the TD group, while all language predictors were positively significantly correlated to emergent literacy composite scores in the DLD group. In the DLD group, the highest correlations were found between vocabulary knowledge and syntactic skills, and emergent literacy composite scores.

Table 5.4. *Correlations between oral language and emergent literacy skills of TD and DLD groups (Spearman's rho)*

	TD (*n* = 40)				DLD (*n* = 26)			
	SS	Phoneme A.	LK	Decoding	SS	Phoneme A.	LK	Decoding
Vocabulary Knowledge	.389*	.387*	.359*	.158	.587*	.672**	.726**	.383
Syntactic Skills	.355*	.390*	.534**	.357*	.596*	.602*	.574*	.517*
Listening Comprehension	-.018	.070	.051	-.168	.430*	.179	.460*	.014
MPU	.232	.258	.216	-.007	.573*	.550*	.427*	.278

Note. TD: Typically developing, DLD: Developmental language disorder, SS: Syllable segmentation, Phoneme A: Phoneme awareness, PA: Phonological awareness, LK: Letter knowledge, MPU: Morpheme per utterances
*p<.05, **p<.001

Table 5.5. *Correlations between oral language and emergent literacy composite scores of TD and DLD groups (Spearman's rho)*

	TD (*n* = 40)	DLD (*n* = 26)
	ELC	ELC
Vocabulary Knowledge	.365*	.735**
Syntactic Skills	.434*	.661**
Listening Comprehension	-.040	.455*
MPU	.213	.560*

Note. TD: Typically developing, DLD: Developmental language disorder, ELC: Emergent literacy composite, MPU: Morpheme per utterances
*p<.05, **p<.001

5.3.2 Language Predictors of Emergent Literacy Skills in Arabic

To examine the relative contributions of language measures in predicting emergent literacy skills, hierarchical multiple regression analyses were carried out using the emergent literacy composite score as the dependent variable. A power analysis revealed that a sample size of 26 was needed to achieve a large effect size with a p value of 0.05 based on 4 predictors.

5.3.2.1 Hierarchical multiple regression

Following the partial correlation analysis, hierarchical multiple regressions analyses were applied for each group separately. An emergent literacy composite score was used as the dependent variable, and in the first model age and nonverbal reasoning skill were entered as covariate variables. In the second and third models, vocabulary knowledge and syntactic skills were added respectively to investigate their significant contribution to explaining variance in emergent literacy skills. Vocabulary knowledge was entered first because it is one of the earliest acquired oral language skills and shows higher correlations with emergent literacy skills in the DLD group. Results of regression analyses for the TD group and the DLD group are presented in Table 5.6 and Table 5.7, respectively.

For the TD group, as Table 5.6 shows, the first model, which includes age and nonverbal reasoning skills as predictors, is significant [$F(2,37) = 17.123$, $p < .001$], with $R^2 = .481$. In this model, age is a significant predictor: $\beta = .522$, $t = 3.807$, $p < .001$, explaining 48% of variance. The second model, which includes vocabulary knowledge as a predictor, is not significant [$F(3,36) = 13.586$, $p = .057$], with R^2 change = .050. Also, the last model, which included syntactic skill as a predictor, is not significant [$F(4,35) = 11.151$, $p = .135$], with R^2 change = .029. Overall, results of the regression analyses demonstrate that age is the only predictor that contributes significantly to emergent literacy skills in the TD group in the sample.

However, results of regression analyses for the DLD group are different. As Table 5.7 shows, the first model, which includes age and nonverbal reasoning skills as predictors, is

significant [$F(2,23) = 9.301$, $p < .001$], with $R^2 = .447$. In this model, nonverbal reasoning skills is the only significant predictor: predictor: $\beta = .452$, $t = 2.628$, $p = .015$, explaining 45% of variance. The second model, which includes vocabulary knowledge as a predictor, is also significant [$F(3,22) = 8.758$, $p = .041$], with $R^2 = .544$, and accounting for an additional 7.5% of variance. The third model, which includes syntactic skill as a predictor, is not significant [$F(4,21) = 8.523$, $p = .056$], with R^2 change = .075. Overall, results of the regression analyses demonstrate that vocabulary knowledge is the only predictor that contributes significantly to emergent literacy skills in the DLD group in the sample.

To summarize the results for the associations between language and emergent literacy skills, significant associations were observed between oral language and emergent literacy skills in TD and DLD groups. These associations were more evident in the DLD group due to their oral language deficits. Results also indicate the potential importance of vocabulary knowledge for emergent literacy acquisition. This evidence is not surprising since vocabulary knowledge is known to be one of the foundational skills for decoding (Seidenberg, 2005). Further interpretations will be discussed in Chapter 6.

Table 5.6. *Hierarchical regression analysis predicting emergent literacy skills in the TD group*

	Model 1			Model 2			Model 3		
Predictor	*B*	*SE*	*B*	*B*	*SE*	*β*	*B*	*SE*	*β*
Age	1.46	.382	.522**	1.288	.378	.462*	.971	.425	.348*
NV	.557	.290	.263	.326	.303	.154	.267	.300	.126
Vocabulary Knowledge				.758	.385	.385	.450	.137	.137
Syntactic Skills							.457	.299	.284
R^2		.481**			.531			.560	
R^2 change		.481**			.050			.029	

Note. $N = 40$. B: Unstandardized Beta, SE: Standard error of B, β: Standardized Beta, NV: Nonverbal reasoning skills.
*p<.05, **p<.001

Table 5.7. *Hierarchical regression analysis predicting emergent literacy skills in the DLD group*

	Model 1			Model 2			Model 3		
Predictor	*B*	*SE*	*B*	*B*	*SE*	*β*	*B*	*SE*	*β*
Age	.822	.421	.336	.556	.410	.227	.496	.384	.203
NV	.744	.283	.452*	.163	.376	.099	-.009	.362	-.006
Vocabulary Knowledge				.758	.350	.516*	.315	.394	.215
Syntactic Skills							.459	.227	.485
R^2		.447**			.544*			.619	
R^2 change		.447**			.097*			.075	

Note. $N = 26$. B: Unstandardized Beta, SE: Standard error of B, β: Standardized Beta, NV: Nonverbal reasoning skills.
*p<.05, **p<.001

5.4 Associations Between VSTM and Emergent Literacy Variables in Arabic

The third research question examines the relationship between VSTM – as measured by digit recall (order VSTM) and nonword repetition (item VSTM) tests – and emergent literacy skills in the TD and DLD groups. First, this study explored the relationships between the digit recall, nonword repetition, and emergent literacy composite score. Then, the author examined the relative contributions of these measures in predicting emergent literacy skills in both groups.

5.4.1 Partial Correlations Controlling for Age in the TD and the DLD Groups

Since assumptions of parametric correlations were not met in most data sets, correlations were performed using Spearman's rank correlation coefficient controlling for age within each group. As Table 5.8 shows, results were different for the two groups. In the TD group, only digit recall was found to be significantly correlated with an emergent literacy composite. While, in the DLD group, digit recall, and nonword repetition tests were found to be significantly correlated with an emergent literacy composite.

To examine the relative contributions of these measures in predicting emergent literacy skills, hierarchical multiple regression analyses were carried out using the emergent literacy composite score as the dependent variable. A power analysis revealed that a sample size of 26 was needed to achieve a large effect size with a p value of 0.05 based on 4 predictors.

5.4.2 Hierarchical Multiple Regression

Following the partial correlation analysis, hierarchical multiple regressions analyses were applied. An emergent literacy composite score was used as the dependent variable, and in the first model age and nonverbal reasoning skill were entered as covariate variables. In the second and third models, digit recall and nonword repetition were added respectively to investigate their significant contribution to explaining variance in emergent literacy skills. Digit recall was entered first because it shows higher correlations with emergent literacy skills

in both groups. Results of regression analyses for the TD group and the DLD group are presented in Table 5.9 and Table 5.10, respectively.

As Table 5.9 shows, the first model, which includes age and nonverbal reasoning skills as predictors, is significant [F (2,37) =17.123, $p < .001$], with $R^2 = .481$. In this model, age is the only significant predictor: $\beta = .522$, t = 3.807, $p < .001$, explaining 48% of variance. The second model, which includes digit recall as a predictor, is also significant [F (3,36) =6.186, $p = .018$], with $R^2 = .557$, and accounting for an additional 7.6% of variance. The third model, which includes nonword repetition as a predictor, is not significant [F (4,35) =.831, $p = .368$], with $R^2 = .567$. Overall, results of the regression analyses demonstrate that digit recall is the only predictor that contributes significantly to emergent literacy skills in the TD group in this study's sample.

For the DLD group, as shown in Table 5.10, the first model, which includes age and nonverbal reasoning skills as predictors, is significant [F (2,23) =9.301, $p = .001$], with $R^2 = .447$. In this model, nonverbal reasoning skills are the only significant predictor: $\beta = .452$, t = 2.628, $p = .015$, explaining 45% of variance. The second model, which includes digit recall as a predictor, is also significant [F (3,22) =17.375, $p < .001$], with $R^2 = .691$, and accounting for an additional 24% of variance. The third model, which includes nonword repetition as a predictor, is not significant [F (4,21) =.871, $p = .361$], with $R^2 = .703$. Overall, results of the regression analyses demonstrate that digit recall is the only predictor that contributes significantly to emergent literacy skills in the DLD group in this study's sample.

Table 5.8. *Correlations between nonverbal reasoning, digit recall, nonword repetition and emergent literacy composite scores of TD and DLD groups (Spearman's rho)*

	TD (*n* = 40)	DLD (*n* = 26)
	ELC	ELC
Nonverbal Reasoning	.213	.471*
Digit Recall	.341*	.627**
Nonword Repetition	.225	.474*

Note. TD: Typically developing, DLD: Developmental language disorder, ELC: Emergent literacy composite
*p<.05, **p<.001

Table 5.9. *Hierarchical regression analysis predicting emergent literacy skills in the TD group*

	Model 1			Model 2			Model 3		
Predictor	*B*	*SE*	*β*	*B*	*SE*	*β*	*B*	*SE*	*β*
Age	1.46	.382	.522**	1.297	.364	.465*	1.189	.383	.427*
NV	.557	.290	.263	.230	.301	.109	.203	.304	.096
Digit Recall				.996	.401	.335*	.987	.402	.332*
Nonword Repetition							.253	.278	.112
R^2		.481**			.557*			.567	
R^2 change		.481**			.076*			.010	

Note. *N* = 40. B: Unstandardized Beta, SE: Standard error of B, *β*: Standardized Beta, NV: Nonverbal reasoning skills.
*p<.05, **p<.001

Table 5.10. *Hierarchical regression analysis predicting emergent literacy skills in the DLD group*

	Model 1			Model 2			Model 3		
Predictor	*B*	*SE*	*β*	*B*	*SE*	*β*	*B*	*SE*	*β*
Age	.822	.421	.336	.407	.337	.166	.382	.339	.156
NV	.744	.283	.452*	.152	.259	.092	.135	.260	.082
Digit Recall				1.78	.429	.674**	1.598	.475	.603*
Nonword Repetition							.155	.166	.139
R^2		.447*			.691**			.703	
R^2 change		.447**			.244**			.012	

Note. $N = 40$. B: Unstandardized Beta, SE: Standard error of B, *β*: Standardized Beta, NV: Nonverbal reasoning skills.
*p<.05, **p<.001

To summarize the results for the associations between VSTM and emergent literacy skills, digit recall and nonword repetition were observed to be separable as evident by their different associations with emergent literacy skills in TD and DLD groups. Results also reveal that serial order VSTM, as measured by digit recall, is more important on emergent literacy acquisition than item VSTM, as measured by nonword repetition, during the early stages of development (i.e., 4;0 – 6;11 years old) in Arabic speaking children with and without DLD. Further interpretations will be discussed in Chapter 6.

5.5 Home Literacy Environment

This section addresses the fourth research question, which examines families' SES and HLE, and how they relate to emergent literacy skills in children. Two SES factors were assessed: the children's parents' education level and family income. The parents' education level was measured on the following three-point scale: 1 = high school and diploma level, 2 = university degree level, and 3 = postgraduate level. Monthly family income was measured on the following three-point scale: 1 = 17,000 Saudi Riyal or less, 2 = 22,500 Saudi Riyal, and 3 = 27,500 Saudi Riyal or more. Descriptive statistics for the SES variables are presented in Table 4.1 in Chapter 4. As indicated in Table 4.1, the monthly family income in this study's sample is mostly 17,000 Saudi Riyal or less (55% in the TD group and 61.5% in the DLD group). In terms of the parents' education level, less than half of the fathers in both groups are university degree holders (40% in the TD group, and 42.3% in the DLD group), but more than half of the mothers in both groups do hold university degrees (55% in the TD group, and 53.8% in the DLD group).

Next, three factors were considered to assess HLE: book exposure, number of books owned, and frequency of shared book activity. Book exposure was measured on the following two-point scale: 1 = yes and 2 = no. The number of books at home was measured on the following four-point scale: 1 = 5 books or less, 2 = 5 to 7 books, 3 = 7 to 10 books, and 4 =

more than 10 books. The frequency of shared-book activity was measured on the following four-point scale: 1 = never, 2 = rarely, 3 = sometimes, and 4 = always. Descriptive statistics for all variables are presented in Table 4.1 in Chapter 4. As shown in Table 4.1, parents indicated that most of their children are exposed to books (75% in the TD group, and 69% in the DLD group). In terms of shared book activity, most parents in both groups reported that they occasionally read books with their children (53% in the TD group and 46% in the DLD group), and that most of the children in both groups (60% in the TD group and 35% in the DLD group) have an average of 5 books or less in their homes and fewer have 7 books or more.

5.5.1 Comparison of SES and HLE between TD and DLD Groups

To investigate the differences between the groups on SES and HLE, data sets were first checked for assumptions of normality and homogeneity. Since all variables were categorical variables, a Chi-squared test was used. In the first Chi-squared analysis, this study explored the SES variables – fathers' education level, mothers' education level, and family income – between the groups. Results show there are no significant differences between the groups in terms of the fathers' education level X^2 (2, N = 65) = 5.16, p= .076, the mothers' education level X^2 (2, N = 65) = 2.93, p= .231, and family income X^2 (2, N = 62) = .141, p= .932. In the second Chi-squared analysis, this study explored the HLE variables – book exposure, number of books owned, and frequency of shared book activity – between the groups. Results also show no significant differences between the groups on book exposure X^2 (1, N = 65) = .072, p= .789, number of books owned X^2 (3, N = 62) = 5.00, p= .172, and frequency of shared book activity X^2 (3, N = 64) = .612, p= .894.

5.5.2 Association between HLE, SES and Emergent Literacy Skills

To examine the relationship between HLE, SES, and emergent literacy skills in the TD and DLD groups, Spearman's rank correlation coefficient calculation within each group was used. The author investigated the relationship between the HLE, SES, and an overall emergent

literacy composite score (i.e., syllable segmentation, phoneme awareness, and letter knowledge tests) in both groups. Significance levels were set at $p < .05$. As Table 5.11 shows, the results are similar for both groups. In the TD group, no significant correlations are observed between SES and the emergent literacy composite, and between HLE and the emergent literacy composite. Similarly, in the DLD group, no significant correlations are found between SES and the emergent literacy composite, and between HLE and the emergent literacy composite.

The author also examined the relationships between HLE, SES, and emergent literacy skills in the whole sample. Spearman's rank correlation coefficient calculation for the whole sample was used. Significance levels were set at $p < .05$. As the results in Table 5.12 show, no significant correlations are observed between SES and the emergent literacy composite, nor between HLE and the emergent literacy composite.

To summarize the results for the associations between HLE, SES, no significant differences were found between the groups on SES and HLE suggesting that TD and DLD groups have similar SES and HLE. Findings also demonstrate no significant associations between SES, HLE, and emergent literacy skills in both groups. Further interpretations will be discussed in Chapter 6.

Table 5.11. *Correlations between HLE, SES and the emergent literacy composite score of TD and DLD groups (Spearman's rho)*

	TD (*n* = 37)	DLD (*n* = 25)
Socioeconomic Status	ELC	ELC
Father education level	-.112	.015
Mother education level	-.312	.177
Family income	.164	.152
Home Literacy Environment		
Book Exposure	-.088	-.163
No. of books at home	.213	.049
Shared book activity	-.303	-.035

Note. TD: Typically developing, DLD: Developmental language disorder, No.: Number
*p<.05, **p<.001

Table 5.12. *Correlations between HLE, SES and emergent literacy composite score of the whole sample (Spearman's rho)*

	N = 62
Socioeconomic Status	ELC
Father education level	.097
Mother education level	-.014
Family income	.156
Home Literacy Environment	
Book Exposure	-.128
No. of books at home	.027
Shared book activity	-.152

Note. No.: Number, *p<.05, **p<.001

Chapter 6
Discussion

The literature on emergent literacy skills in Arabic-speaking children is scarce, especially studies that explore the relationships between oral language and emergent literacy skills in children with DLD. To this end, the main aims of this study to address this scarcity are: (1) to examine emergent literacy skills of Saudi Arabic-speaking children with and without DLD aged 4;00 to 6;11, (2) to investigate the relationship between language, verbal short-term memory, and emergent literacy skills in children with and without DLD, and (3) to explore the relationship between the home literacy environment, socioeconomic status and emergent literacy skills in children with and without DLD.

Three major findings have emerged from this study. Firstly, Arabic-speaking children with DLD show difficulties in acquiring emergent literacy skills, as made evident by their performance on different emergent literacy tests when compared with their TD peers. Secondly, there is a significant association between oral language and emergent literacy skills in both groups, but the nature of these relationships is different between the groups. Vocabulary knowledge was found to be a significant predictor for emergent literacy skills in the DLD group. Finally, there is a significant association between VSTM and emergent literacy skills in both groups. Digit recall was found to be a significant predictor for emergent literacy skills in both TD and DLD groups.

This chapter will address the study's research questions and discuss the findings outlined in Chapter 5. Section 6.1 will focus on emergent literacy skills in the TD and DLD groups and will discuss how the DLD group differs from the TD group on emergent literacy skills. The second section, 6.2, will discuss the developmental pattern of emergent literacy skills in the DLD group and compare it with the TD group. Section 6.3 will discuss the

relationships between oral language and emergent literacy skills, and between VSTM and emergent literacy skills in both groups. The fourth section, 6.4, will discuss the relationships between HLE, SES, and emergent literacy skills in both groups. Finally, Section 6.5 will focus on the findings' theoretical implications and future research directions.

6.1 Emergent Literacy Skills in TD and DLD Children

The first research question focused on differences between TD and DLD groups on emergent literacy tasks. Based on previous research (Boudreau & Hedberg, 1999; Catts et al., 2002; Snowling et al., 2019), the author of this thesis predicted that children with DLD would perform lower than their TD peers on all emergent literacy tasks: syllable segmentation, phoneme awareness, letter knowledge, and decoding.

As predicted, there were significant differences between the groups in syllable segmentation and phoneme awareness. The finding that children with DLD scored significantly lower than the TD children on syllable segmentation and phoneme awareness is in line with the existing literature across different languages, such as English (Boudreau & Hedberg, 1999; Catts et al., 2002), Spanish (Pratt, 2017), Italian (Brizzolara et al., 2011), and Chinese (Wong et al., 2010).

It has long been established that language plays a significant role in literacy development (Snow, 2020; Storch & Whitehurst, 2002), and that strong linguistic and metalinguistic skills are necessary for children to learn to decode and comprehend written script (Gough & Tunmer, 1986; Scarborough, 2009). Thus, deficits in any of the fundamental elements may interfere with the development of emergent literacy skills, as seen in children with DLD. This was also confirmed when the author administered the Arabic language battery for both groups. Results showed significant differences between the groups on vocabulary knowledge, syntactic skills, listening comprehension, and (MPU) (see Table 5.1 in Chapter 5), which may explain the emergent literacy deficits in the DLD group.

Regarding letter knowledge and decoding skills, this study's findings show no significant differences in children's performances between the groups. The lack of differences between the groups on letter knowledge was certainly surprising. One possible explanation of this finding is that children with DLD were receiving speech and language therapy services before the start of the data collection period. During their speech and language therapy sessions, children may have been exposed to different letters which may explain their familiarity with them. Another reason could be that 5-year-old children in both groups are still acquiring letter knowledge (Najmaldeen, 2020). For decoding skills, lack of differences between the groups could be explained by the fact that many children in both groups had not started school at the time when the assessments were done. Decoding usually starts to develop around age 6 when children are exposed to formal literacy instruction (Najmaldeen, 2020). As a result, not all children in the TD group were able to decode.

Despite this, this study's results have revealed that children's performances on emergent literacy composite scores are significantly different between the groups. TD children, as they are still acquiring some emergent literacy skills, outperformed the DLD children. In general, this study's preliminary findings provide additional confirmation of results in existing literature (Boudreau & Hedberg, 1999; Catts et al., 2015; Dickinson et al., 2019; Kendeou et al., 2009; Pratt et al., 2020; Snowling et al., 2016) and demonstrate how Arabic-speaking children with DLD will most likely face difficulties with emergent literacy acquisition.

6.2 Developmental Trajectories of Emergent Literacy Skills in the TD and DLD Groups

To explore the developmental pattern of emergent literacy skills in the DLD group in comparison with the TD group, a developmental trajectory approach was used. The study's aim was to investigate the effect of age on the development of emergent literacy skills in both groups, and to investigate whether children with DLD show a delayed onset or rate of

development on syllable segmentation, phoneme awareness, letter knowledge, and emergent literacy composite when compared with their TD peers.

6.2.1 Age Effect

Following the cross-sectional developmental trajectory method developed by Thomas et al. (2009), four linear trajectories were constructed for each group, with each trajectory assessing the relationship between an emergent literacy skill (i.e., syllable segmentation, phoneme awareness, letter knowledge, and emergent literacy composite) and increasing chronological age. Findings revealed that children's performance improved with age, showing a clear developmental progression of all emergent literacy skills (i.e., syllable segmentation, phoneme awareness, letter knowledge, and decoding skills) and on the emergent literacy composite score (see figures in Chapter 5, section 5.2) in both groups. These findings are in line with the existing literature (Al-sulaihim & Marinis, 2017; Gillon, 2018; Lonigan et al., 2000; Mohamed et al., 2021; Najmaldeen, 2020) which suggest that, as children develop over time, their phonological awareness skills improve in TD and DLD groups.

6.2.2 Rate and Onset of Development of Emergent Literacy Skills in TD and DLD

6.2.2.1 Syllable Segmentation

Referring to Figures 5.1 in Chapter 5, the DLD group shows a developmental trajectory running underneath – and almost parallel – to the TD group, which suggests lower performance on syllable segmentation in the DLD group. Although the DLD group shows a flatter trajectory than the TD group, suggesting that children with DLD are acquiring syllable segmentation at a slower rate than their TD peers, the onset and the rate of the development of syllable segmentation are not significantly different between the groups. The lack of differences in the onset of the development could be explained by the children's age and the task's difficulty. In both groups, most children (aged 4 to 5) are still acquiring syllable segmentation skills and had not reached the stability level at the time they were assessed.

6.2.2.2 Phoneme Awareness

For phoneme awareness (see Figure 5.2.), the DLD group shows a developmental trajectory running underneath the TD group that appears to be flatter than the one for the TD group, which suggests lower performance on phoneme awareness in the DLD group. In fact, when compared with the syllable segmentation, the DLD trajectory in phoneme awareness is flatter, with most children's performances not rising above the lowest level. Phoneme awareness is considered the most difficult phonological awareness skill because it requires an explicit awareness of words' phonemes (Gillon, 2018; Rhyner, 2009; Stackhouse et al., 2002). As discussed previously (see Chapter 2, section 2.2.2.1), children with DLD are known to have difficulties with language skills as well as limitations in their general processing (Leonard, 2014), which may affect their explicit awareness of words' components. Although the visual inspection of the trajectories suggests that children with DLD are acquiring phoneme awareness at a slower rate than their TD peers, the rate and the onset of development is not significantly different between the groups. The lack of differences in the onset of the development could be explained by the children's age and the task's difficulty. In both groups, most children (aged 4 to 5) are still acquiring phoneme awareness skills and had not reached the stability level at the time they were assessed.

6.2.2.3 Letter Knowledge

For letter knowledge (see Figure 5.3), the gap between the TD and DLD trajectories is narrow, suggesting that both groups are acquiring letter knowledge in the same pattern of development. The onset and the rate of the development of letter knowledge is the same in both groups, showing that both groups of children begin to acquire letter knowledge once they are exposed to letters. In Saudi Arabia, formal exposure to letters usually begins in kindergarten, and particularly during the second kindergarten year when most children reach the age of 5 (Najmaldeen, 2020). This explains the similar pattern of development in both groups, and the

lack of differences in the onset and rate of development. Also, it is important to note that some children in the DLD group were exposed to different letters during their speech therapy sessions (see Section 6.1) which may explain their familiarity to different letters.

6.2.2.4 Emergent Literacy Composite

For the emergent literacy composite (see Figure 5.4), the DLD group shows a developmental trajectory running underneath the TD group which suggests lower performance on emergent literacy skills in the DLD group. As shown in Figure 5.4, at the beginning of the emergent literacy acquisition, the gap between the trajectories is narrow but it gradually widens as children get older. Although the DLD trajectory suggests that children with DLD are acquiring emergent literacy skills at a slower rate than their TD peers, the rate and the onset of development are not significantly different between the groups. The lack of differences in the onset of the development could be explained by the children's age and the task's difficulty. In both groups, most children (aged 4 to 5) are still acquiring emergent literacy skills and had not reached the stability level at the time they were assessed.

In summary, TD and DLD trajectories show that children's performance increase as they get older. However, the pattern of the development between the groups may suggest that children with DLD acquire these skills at a slower rate than their TD peers. The lack of significant differences between the groups could be explained by: (1) the variability in DLD children's performance (Leonard, 2014), and (2) the children's age range in both groups (4;0 to 6;11), as most of them were still acquiring emergent literacy skills at the time of being tested and so had not yet reached levels of stability. Therefore, these results should be interpreted with caution.

6.3 Oral Language, Verbal Short-Term Memory, and Emergent Literacy Skills

6.3.1 Associations between Oral Language and Emergent Literacy Skills

The second research question focused on whether oral language skills are related to emergent literacy skills in the TD and DLD groups. The researcher also aimed to assess which of the oral language skills measured were the most important predictors of emergent literacy in TD children and those with DLD. The key finding from Chapter 5 was that variables are related in different ways in each group. In the TD group, only vocabulary knowledge and syntactic skills are significantly correlated with emergent literacy skills, but the regression analyses revealed that neither of these oral language measures are significant predictors of emergent literacy skills in TD children. TD children are acquiring emergent literacy skills in a typically developing pattern, with strong general language skills. Storch and Whitehurst (2002) argued for the importance of the relationship between emergent literacy and oral language skills in the preschool years (i.e., aged 4;0 to 4;11) and how this relationship weakens once children got older. Similarly, Kendeou et al. (2009) reported that oral language skills predicted emergent literacy skills at age 4, but this predictive power diminished when children reached the age of 6. It is worth noting that, in the current study, due to the small sample size, the author did not examine the effect of oral language skills on emergent literacy across different age groups. This could also explain the lack of predictive power of oral language skills on emergent literacy in the TD group. However, this does not imply that oral language skills are less important to emergent literacy in children aged 4;0 to 6;11.

As children get older and enter school, print knowledge and phonological awareness contribute to their reading ability (Storch & Whitehurst, 2002). Due to the significant associations between vocabulary knowledge, syntactic skills, and emergent literacy skills, it can be assumed that oral language skills are important and have an indirect effect on reading ability, mediated by letter knowledge and phonological awareness skills (Catts et al., 2015; Storch & Whitehurst, 2002).

In the DLD group, consistent with several studies (Boudreau & Hedberg, 1999; Catts et al., 2002), correlational analyses showed that all oral language skills assessed in this study were significantly positively correlated with emergent literacy skills. Children with DLD are known to have difficulties with linguistic processing skills, and lag behind their TD peers in all language domains (Leonard, 2014). This means that they may be using all their linguistic resources during emergent literacy tasks, resulting in stronger relationships between all assessed oral language skills and emergent literacy measures. When comparing all measured language skills, this study's results showed that vocabulary knowledge had the strongest correlations with all emergent literacy skills, followed by syntactic skills. These findings are in line with the well-documented evidence that vocabulary and morphosyntax play an important role in literacy acquisition (Catts et al., 2002; Muter et al., 2004; Snow, 2020; Storch & Whitehurst, 2002). Vocabulary and morphosyntax are foundational skills for both decoding and reading comprehension (Duff et al., 2015; Muter et al., 2004). During decoding, children must have competent vocabulary knowledge and they must understand the rules and the structure of their language to comprehend written language. Since most of the alphabetic languages are morphologically based, understanding the morphological rules of the language is crucial for decoding the written script as well. Regarding the Arabic language, previous studies (Abu-Rabia, 2007; Abu-Rabia et al., 2003) have suggested that morphosyntax plays a significant role in Arabic literacy development, which would suggest that it may also be related to emergent literacy. The results of this study support this, showing moderate positive correlations between MPU and most of the emergent literacy measures (e.g., syllable segmentation, phoneme awareness, and letter knowledge) in the DLD group. Finally, moderate positive correlations were found between listening comprehension, syllable segmentation, and letter knowledge. One possible explanation for this could be similar underlying processing skills for both phonological awareness and listening comprehension skills. Both listening

comprehension and phonological awareness tap into a broader range of linguistic skills (Catts & Kamhi, 2005). In listening comprehension, children must listen to the auditory input, then analyse and access their semantic and syntactic knowledge to comprehend the spoken output. Similarly, phonological awareness requires higher metalinguistic skills.

Results of the hierarchical multiple regression analyses demonstrated that only vocabulary knowledge, at this early stage of literacy development, was a significant predictor of emergent literacy skills, which suggests that it is important for emergent literacy skills development in children with DLD. This is in line with several studies suggesting that the growth of phonological awareness skills is strongly related to the growth of vocabulary knowledge during the preschool years (Carroll et al., 2003; Hipfner-Boucher et al., 2014; Ventura et al., 2007). Findings such as these are in agreement with the lexical restructuring model (Metsala & Walley, 1998) and the connectionist model (Seidenberg, 2005). Children during the early stage of development begin to acquire words as whole phonological units. Then, gradually as they learn more words, the expansion of their vocabulary size enhances their phonological sensitivity and they become more aware of the words' phonemes.

In summary, this study's findings show that oral language skills are associated with emergent literacy skills in Arabic-speaking children with and without DLD. The nature of this relationship is different between the TD and the DLD groups. When compared with the TD group, stronger associations were found in the DLD group. This evidence, however, does not imply that oral language skills are less important in the TD group than in the DLD group. In fact, these findings support different studies (Catts et al., 2015; Dickinson et al., 2019; Storch & Whitehurst, 2002), and suggest that oral language skills may have direct and indirect relationships to emergent literacy skills in Arabic-speaking children. Direct associations can be seen at the beginning of the development of emergent literacy skills (i.e., when children begin learning PA skills such as syllable segmentation), and once they start learning how to

decode, indirect relationships between oral language and emergent literacy skills appear as mediated by their PA skills. Therefore, in the TD group, where most of the children (i.e., those aged 5 and 6) begin to learn how to decode, the associations between oral language and emergent literacy skills were limited only to the most important oral language skills: vocabulary knowledge and syntactic skills. Whereas, in the DLD group, due to their oral language deficits, they showed difficulties in acquiring PA and decoding skills, which then resulted in stronger relationships between all oral language skills and emergent literacy skills. Of the language skills, vocabulary knowledge was found to be the significant predictor of emergent literacy skills in the DLD group. Also, this study's results show that the TD group outperformed the DLD group on most emergent literacy skills, and the developmental trajectories show indications of a slow rate of development of emergent literacy skills in the DLD group. However, it is important to note that these findings should be interpreted with caution.

6.3.2 Associations between Verbal Short-Term Memory and Emergent Literacy Skills

The third research question focused on whether VSTM – as measured by digit recall and nonword repetition tests – was related to emergent literacy skills in the TD and DLD groups. Several studies have indicated that VSTM plays an important role in phonological awareness development in different languages (Cunningham et al., 2020; Gorman, 2012; Layes et al., 2021; Martinez Perez et al., 2012). Phonological awareness requires adequate means of storing phonological codes and an activation of phonological representations in order to manipulate the syllabic or phonemic structures of the words. Thus, any deficits in VSTM may affect the acquisition of phonological awareness skills. Martinez Perez et al. (2012) and Cunningham et al. (2020) investigated the role of VSTM in reading development and found that serial order VSTM tasks (i.e., digit recall) significantly predicted word-reading skills from

ages 4 to 6, and nonword repetition indirectly (i.e., via phoneme awareness skills) predicted word-reading skills from ages 6 to 9.

In Chapter 5, this study explored the relationships between digit recall, nonword repetition, and emergent literacy skills in TD children and children with DLD. Based on the existing literature, it was predicted that VSTM – as measured by digit recall and nonword repetition – would be a significant predictor of emergent literacy skills in both groups. Results of the correlational analyses demonstrated that variables were related in different ways in each group. In the TD group, only digit recall was significantly correlated with emergent literacy and explained the unique variance in emergent literacy skills. In the DLD group, correlational analyses showed that both digit recall and nonword repetition were significantly positively correlated with emergent literacy skills, but only digit recall was found to explain the unique variance in emergent literacy skills.

Consistent with various studies (Cunningham et al., 2020; Ehri, 2017; Hachmann et al., 2014; Martinez-Perez et al., 2012), these findings demonstrate that different aspects of VSTM (i.e., serial order VSTM and item VSTM) are separable as they showed different relationships with emergent literacy skills, and that serial order VSTM, as measured by digit recall, appears to be a significant predictor of emergent literacy skills during the early stages of development (ages 4 to 6). As discussed previously (see Chapter 2, section 2.2.1.3), during the early stages of decoding, children begin to learn how to link different graphemes to their corresponding phonemes in a particular order. This early stage of development demands that children rely more on their serial order VSTM. Once they acquire their decoding skills, they begin to rely more on other linguistic and metalinguistic skills that are important for later literacy skills. In the current study, most of the children (aged 5 and 6) had not yet acquired decoding skills at the time of being tested, which explains the significant role of digit recall in emergent literacy skills in TD and DLD groups.

In the DLD group, nonword repetition was found to be significantly associated with emergent literacy skills. This evidence can be explained by the limited processing skills in children with DLD (Leonard, 2014). Children with DLD are frequently reported to have difficulties with VSTM, in particular nonword repetition, which has been identified to be one of the clinical markers of DLD (Conti-Ramsden & Durkin, 2007; Jackson et al., 2020; Norbury et al., 2008; Shaalan, 2020; Taha et al., 2021). Due to the limited processing skills in DLD children, more demands are placed on all the cognitive resources that those children have, resulting in stronger relationships between all skills in general, and particularly between VSTM (i.e., nonword repetition and digit recall) and emergent literacy skills. Despite this, as discussed above, only serial order VSTM (i.e., digit recall) was found to be a significant predictor for emergent literacy skills in the DLD group.

In terms of Arabic studies, these findings differ from those of Taibah and Hynes (2011), as they reported no significant effect of VSTM on word-recognition skills in children. However, it is worth noting that the authors, in their study, treated digit recall and nonword repetition skills as one inseparable skill (i.e., they computed a VSTM composite score), whereas the author of this study examined the effect of each skill separately. This study's results support those reported in Asadi, Khateb, Ibrahim, et al. (2017) and Hassanein et al. (2021) on the crucial role of VSTM on emergent literacy skills in Arabic-speaking children, and extend their findings by examining the effect of different underlying VSTM processing skills (i.e., serial order VSTM measured by digit span, and item VSTM measured by nonword repetition) on emergent literacy skills in Arabic-speaking children. Thus, this study's evidence highlights the importance of the serial order VSTM on emergent literacy skills in TD and DLD Arabic-speaking children. However, due to the limited sample size these findings should be interpreted with caution.

6.4 Home Literacy Environment, Socioeconomic Status, and Emergent Literacy Skills

The fourth research question focused on whether HLE and SES were related to emergent literacy skills in the TD and DLD groups. Many studies have highlighted the crucial roles of SES and HLE on emergent literacy development in children. Children from families with lower SES tend to have limited exposure to literacy activities at home, which may affect the development of their phonological awareness skills (Aram et al., 2013; Duncan & Seymour, 2000; Hassunah-Arafat et al., 2021; Hemmerechts et al., 2017; Najmaldeen, 2020; Neumann, 2016; Pan et al., 2017). Neumann (2016) explored the effect of SES on emergent literacy skills in 101 Australian preschool children, aged 3 to 5. She found that children whose families had a lower SES had both poorer emergent literacy skills and limited exposure to literacy activity at home. Although parents with lower and higher SES were reported to spend similar amounts of time reading to their children, the frequency of parental teaching of letters and words were reported to be different between the groups. Parents with lower SES reported teaching their children fewer letters and words when compared with parents with higher SES.

Hassunah-Arafat et al. (2021) evaluated the specific contributions of SES and HLE to the emergent literacy skills of Israeli Arabic-speaking children. In line with several English and worldwide studies, they found that SES predicted children's emergent literacy skills, and that HLE had positive relationships with children's emergent literacy skills, concluding that a richer HLE is associated with better emergent literacy skills.

In Chapter 5, this study explored the relationships between HLE, SES, and emergent literacy skills in TD and DLD children. First, the author aimed to explore whether SES and HLE are different between the groups. Then, the relationships between the variables and emergent literacy skills were examined. Findings in Chapter 5 showed no significant differences between the groups on SES and HLE, indicating that both groups had a similar SES (i.e., which was assessed by parents' education levels and family income) and HLE (i.e., which

was assessed by book exposure, number of books owned, and frequency of shared book activity).

For the purpose of this study, the author aimed to control for SES, which explained the lack of significance between the groups on this variable. All participants were recruited from middle-class families to ensure similarity between the groups. As for HLE, the lack of differences between the groups can be explained by parents' awareness levels in the DLD group. Due to their children's linguistic needs, most parents introduced speech and language therapy activities at home using books and other language materials, such as picture cards or letter flash cards, which enhanced their children's exposure to literacy materials at home.

The results of the correlational analyses showed that neither SES variables (parents' education levels and family income) nor HLE variables (book exposure, number of books owned, and frequency of shared book activity) were significantly related to emergent literacy skills in TD and DLD groups. Lack of correlations between variables in the TD group could be because children in this group are developing their literacy skills in a typical manner, resulting in a lack of associations between variables. In the DLD group, lack of associations could be due to the limited sample size of this group (n = 26). A power analysis revealed that a sample size of 29 is needed to achieve a large effect size with a p value of .05. Another explanation is that the DLD group showed a limited range of performance in emergent literacy skills due to their oral language deficits. In other words, the oral language deficits in the DLD group may have influenced the significance role of their HLE on emergent literacy skills, resulting in there being limited associations between HLE and emergent literacy skills (Skibbe et al., 2008). Having a larger DLD sample with better variance of performances may have shown different results.

The author also looked at the relationships between the variables in the group of TD and DLD children as a whole, and results showed no significant associations between SES,

HLE, and emergent literacy skills. This was an unexpected finding, given that studies have shown that SES and HLE significantly correlate with emergent literacy skills (Aram et al., 2013; Hassunah-Arafat et al., 2021; Hemmerechts et al., 2017; Neumann, 2016). Lack of correlations between variables could be due to the study's method of examining SES and HLE. Both SES and HLE statistics were obtained through questionnaires answered only by the parents, who may be prone to social desirability bias (Kluczniok et al., 2013; Neumann, 2016). For example, parents may overestimate or underestimate the frequency and importance of home literacy exposure, resulting in less reliable responses.

6.5 Theoretical Implications, Future Research Directions, and Conclusion

6.5.1 Theoretical Implications

The results of this study have important theoretical implications in the academic sphere of analysing children with DLD. For one, examining the relationships between oral language and emergent literacy skills in Arabic-speaking children with and without DLD has provided evidence for the importance of oral language on emergent literacy skills. As mentioned in the literature, acquisition of emergent literacy skills starts in the early years of children's lives, even before they are exposed to formal literacy instruction, and continue to be acquired gradually through an interactive and continuous process with their oral language skills (Rhyner, 2009). In other words, emergent literacy skills are influenced by age and oral language abilities. Different models (Gough & Tunmer, 1986; Scarborough, 2001; Seidenberg, 2005; Whitehurst & Lonigan, 1998) have provided numerous frameworks that show how oral language and emergent literacy skills are related. For example, the reading rope model (Scarborough, 2001) has identified the underlying subskills of each main skill. Identifying these subskills has demonstrated how different oral language and emergent literacy skills are interrelated and influence the development of each other. The connectionist model (Seidenberg, 2005), on the other hand, focuses on decoding skills and demonstrates the importance of semantic knowledge

and phonological representations on decoding skills. Despite the differences between the models, all demonstrate how language and literacy skills are related to each other. Different studies have suggested a connection between oral language and emergent literacy skills in English (Catts & Hogan, 2003; Psyridou et al., 2018; Snowling et al., 2016; Tambyraja et al., 2015; Wilson & Lonigan, 2010), and other languages (Brizzolara et al., 2011; Moll et al., 2016; Oliveira et al., 2021; Pratt et al., 2020; Wong et al., 2010), yet no study had examined these relationships for Arabic-speaking children with and without DLD.

With all the above in mind, this study fills a crucial gap in knowledge by examining the associations between oral language and emergent literacy skills in Arabic-speaking children. Comparing Arabic-speaking DLD children with their TD peers has provided a preliminary insight into their emergent literacy skills. This insight will facilitate the advancement of knowledge into different oral language factors that may contribute to emergent literacy acquisition.

Consistent with the reading rope (Scarborough, 2001) and connectionist models (Seidenberg, 2005), findings from this current study show how different oral language skills may influence the development of different emergent literacy skills in Arabic-speaking TD and DLD children, and highlight the importance of vocabulary knowledge for the development of emergent literacy skills. For instance, although TD and DLD children showed a clear developmental progression in emergent literacy skills, a visual inspection of the developmental trajectories suggests that children with DLD show indications of a slow rate of development in emergent literacy skills. This can be explained by poor oral language skills hindering their emergent literacy acquisition. This again was confirmed when the author compared children's performances on different emergent literacy skills and looked at the relationships between oral language skills and emergent literacy skills in both groups. As discussed in Sections 5.1 and 5.3.1, children with DLD performed significantly lower than their TD peers on the emergent

literacy composite, and oral language skills were significantly positively correlated with emergent literacy skills in the TD and DLD groups. These findings indicate the importance of the relationship between language and the development of emergent literacy skills. Out of all the assessed oral language skills, vocabulary knowledge and syntactic skills were found to have the strongest relationships with all emergent literacy skills in both groups. The regression analyses also demonstrate that only vocabulary knowledge was found to be a significant predictor of emergent literacy skills in the DLD group. Early language skills, particularly vocabulary and syntactic skills, are important skills for decoding and comprehension (Duff et al., 2015; Muter et al., 2004). Thus, any deficits in these early skills could be a red flag for later literacy difficulties.

For young children with DLD, SLTs are often the primary service providers. Therefore, being sensitive to other speech- and language-related problems that these children might face later in the future, such as literacy difficulties, is important. This knowledge should inform speech and language therapy management and intervention strategies, in terms of including developmentally appropriate emergent literacy tasks in assessments to have some insight into children's literacy acquisition, and to provide appropriate interventions to improve their skills and prevent any further difficulties later in their lives. However, due to the limited number of Arabic studies, there is a significant need for further research to refine the findings of this study and to continue exploring the effectiveness of language on emergent literacy acquisition within different contexts (e.g., interventions research, and longitudinal studies with larger samples and broader assessments).

In terms of educational settings, the findings of this study will provide educators with preliminary evidence of the role of oral language skills in emergent literacy (i.e., early reading). The evidence gathered and analysed by the author shows the possibility that deficits in oral language skills will hinder the acquisition of emergent literacy skills. Literacy difficulties are

common, affecting 3% to 10% of students (Snowling & Hulme, 2013) who are often referred to special educational teachers for support. However, despite this significant support, most educators are not fully aware of the relationships between oral language and literacy skills, as well as the importance of referring those students to SLTs for a comprehensive language assessment. As discussed previously (see Chapter 2), there are different types of literacy difficulties: dyslexia (i.e., difficulties with decoding), hyperlexia (i.e., difficulties with language comprehension), or garden variety reading (i.e., difficulties with both decoding and comprehension; Catts, 2018). In Saudi Arabia, most educators are only familiar with dyslexia, which is caused by phonological processing deficits (Adlof & Hogan, 2018). These deficits are more apparent than DLD (McGregor, 2020). As a result, children with phonological processing deficits are more likely to receive SLT services. DLD, on the other hand, is known to be a hidden disorder and is consequently underserved and relatively unknown. DLD is a heterogenous neurodevelopmental disorder that is characterized by language difficulties with no known differentiating conditions (e.g., autism spectrum disorder, cerebral palsy, brain injury, and sensorineural hearing loss (Bishop et al., 2016, 2017)). These difficulties may affect one or several language domains, including phonology, morphology, syntax, semantics, and/or pragmatics. Thus, any deficits in these domains may affect the acquisition of children's literacy skills, resulting in hyperlexia or garden variety reading difficulties.

Therefore, this study strongly recommends educators be made familiar with DLD and understand the impact of different language deficits on children's academic skills. The collaboration between SLTs and educators is very important as it helps to identify students' receptive and expressive language skills, and to understand how they are using their linguistic skills in academic settings in general – literacy in particular (Justice, 2006; Squires et al., 2013). Educators should be mindful of possible links between oral language and emergent literacy

skills and, where literacy difficulties are identified, refer to SLTs to assess a student's language skills and access appropriate support when needed.

An overall aim of the current study was to raise awareness about DLD and its impacts on individuals among the Arabic-speaking community. In Saudi Arabia, there is limited awareness about DLD, though there have been recent efforts to raise awareness of this condition. Within the last two years, the author of this study has collaborated with her colleagues – Dr. Aseel Alkadhi, an assistant professor at King Saud University and a paediatric SLT from Saudi Arabia, and Dr. Juhayna Taha, a paediatric SLT from Palestine studying for her PhD at the University of Reading – in raising awareness of DLD in the Arab community. As part of this work, the team created an Arabic DLD social media platform on Facebook. Twitter, and Instagram (DlDisorder) and a website (dldisorderar.com), which provide resources to educate families, clinicians, teachers, and other professionals about DLD. The website includes different Arabic resources that provide information about the signs of DLD, the importance of early diagnosis and intervention, as well as different tips and strategies to help children with DLD during their communication in daily life and academic settings. The website also includes a range of blogs and summaries of latest research findings of DLD literature to inform clinicians of any up-to-date research and to support them while providing evidence-based services to individuals with DLD.

6.5.2 Limitations and Future Research Directions

This study has addressed some important gaps in the literature on the Arabic language. This is the first cross-sectional study that has aimed to investigate the relationships between the oral language and emergent literacy skills in Saudi Arabic-speaking TD and DLD children aged 4;0 to 6;11. Overall, this study's findings are in line with existing literature (Catts et al., 2002; Muter et al., 2004; Snow, 2020; Storch & Whitehurst, 2002) suggesting a strong relationship between oral language and emergent literacy skills in TD and DLD groups in

Arabic-speaking children. Specifically, children with DLD scored significantly lower on emergent literacy skills, suggesting that their poorer oral language skills have had a negative impact on emergent literacy skill acquisition. Further, this study's findings revealed that vocabulary knowledge and digit recall were significant predictors of emergent literacy in the DLD group. However, the findings of this study should be interpreted with caution due to the following limitations.

Firstly, regarding the sampling process, both groups included small sample sizes, which may have constrained findings. Also, for the purpose of controlling for SES, participant recruitment was limited to middle-class level in one city, Riyadh, in Saudi Arabia. Future studies should recruit larger sample sizes and test middle-class participants from different regions in Saudi Arabia to replicate the existing findings so that more definitive conclusions can be drawn.

Secondly, the gender imbalance in the DLD group was not controlled due to the limited sample size, resulting in more boys than girls. This may reflect the reported bias in boys with DLD being more likely to receive clinical services (Morgan et al., 2017) despite a similar prevalence in boys and girls (Norbury et al., 2016) as the participants in the study were recruited from SLT caseloads.

Thirdly, the severity imbalance in the DLD group was not controlled due to the limited sample, resulting in less severe language impairments in the younger group than the older groups. Future studies should include more balanced cases in each age group to have more accurate results, and to examine the effect of severity on emergent literacy acquisition.

Fourthly, the study uses a cross-sectional design only, which provides a snapshot of children's emergent literacy performances at one point in time. The original research plan was to include both cross-sectional and longitudinal designs to compare between the groups, and to investigate the oral language predictors for emergent literacy skills in both groups. However,

due to COVID-19, the author was unable to test the participants at different times. To have a more accurate understanding of the relationship between oral language and emergent literacy skills, future studies should include longitudinal designs and investigate this relationship at different points in time. Also, it should be noted that multiple correlations were carried out, such that, by chance, 1 in 20 may be significant due to chance. In terms of VSTM, although the current study provided preliminary important evidence, future studies should investigate in more detail the effect of different underlying VSTM skills (i.e., serial and item VSTM) on emergent literacy skills across different time points.

In terms of HLE, this study was exploratory and relied on parents answering questionnaires, which is a limitation in that their answers may have been skewed by inadvertent parental bias, resulting in less reliable responses. Furthermore, there were only 5 questions on HLE, so this area was not investigated comprehensively in the questionnaire. Aspects not covered include HLE materials, activities, and the active involvement of children during literacy activities at home. Therefore, it is important for future studies to have a better understanding of children's HLE, to include comprehensive HLE questions, and combine them with observational methods for more reliable outcomes.

Finally, most of the administered tasks were not standardized on Saudi Arabic-speaking children. Further validation of these tasks is required for research and clinical purposes. Moreover, due to the participants' young age (4 – 6 years old) and to control for the diglossia effect, all tasks were administered with spoken Arabic dialect (SpA). Future studies should further investigate the effect of diglossia and other factors that may influence emergent literacy development in Arabic-speaking children such Arabic orthography characteristics (e.g., letters' visual attributes, and short and long vowels) that have not been addressed in this study.

6.5.3 Conclusion

This study had offered a valuable contribution to the field's knowledge regarding Arabic-speaking children with DLD. It represents an important first step in understanding emergent literacy skills and their relationships to language in Arabic-speaking children with and without DLD. In accordance with the existing literature, findings have demonstrated that language deficits may be related to the acquisition of emergent literacy skills. This was confirmed by the significant differences between the TD and DLD groups on most emergent literacy skills. Children with DLD performed significantly lower than their TD peers on syllable segmentation, phoneme awareness, and emergent literacy composite. Preliminary findings have also shown that developmental pattern of emergent literacy skills in both groups are different. The developmental trajectories of the DLD group indicate a slow rate of development of emergent literacy skills when compared with the TD group. However, due to the lack of the statistical significance, this evidence should be interpreted with caution and future developmental studies are required to confirm the results.

The study has also described the relationships between oral language, VSTM, and emergent literacy skills in both groups. Findings are consistent with different theoretical frameworks (Gough & Tunmer, 1986; Scarborough, 2001; Seidenberg, 2005), which suggest significant associations between oral language and emergent literacy skills in both groups. In fact, these associations are more evident in the DLD group due to their oral language deficits. Like the reading rope model (Scarborough, 2001), this study's results in the DLD group show how different oral language skills are interrelated with different emergent literacy skills, and that the development of one skill is influencing the other. Results also indicate the potential importance of vocabulary knowledge for emergent literacy acquisition. This evidence is not surprising since vocabulary knowledge is known to be one of the foundational skills for decoding (Seidenberg, 2005).

Regarding VSTM, this study's preliminary results extend the available Arabic evidence (Asadi, Khateb, Ibrahim, et al., 2017; Hassanein et al., 2021) and demonstrate that different aspects of VSTM (i.e., serial order VSTM and item VSTM) are separable – as made evident by their different relationships with emergent literacy skills in TD and DLD groups. This study's findings reveal that serial order VSTM, as measured by digit recall, is more important on emergent literacy acquisition than item VSTM, as measured by nonword repetition, during the early stages of development in Arabic-speaking children aged 4;0 to 6;11 with and without DLD. Although this study did not find any significant associations between SES, HLE, and emergent literacy skills in either group, it is believed to be the first study that has examined these associations in Arabic-speaking children with and without DLD aged 4; 0 to 6;11.

To summarise, this study blazes a trail for future research into the relationship between oral language and early literacy skills in the Arabic language, and thus also paves the way for boosting the clinical and education provision that children with DLD receive.

References

Abdalla, F., & Crago, M. (2008). *Verb morphology deficits in Arabic-speaking children with specific language impairment*. *29*, 315–340. https://doi.org/10.1017/S0142716408080156

Abou-Elsaad, T., Ali, R., & Abd El-Hamid, H. (2016). Assessment of Arabic phonological awareness and its relation to word reading ability. *Logopedics Phoniatrics Vocology*, *41*(4), 174–180. https://doi.org/10.3109/14015439.2015.1088062

Abu Ahmad, H., Ibrahim, R., & Share, D. L. (2014). *Cognitive Predictors of Early Reading Ability in Arabic: A Longitudinal Study from Kindergarten to Grade 2*. 171–194. https://doi.org/10.1007/978-94-017-8545-7_8

Abu-rabia, S. (2000). *Effects of Exposure to Literary Arabic on Reading Comprehension in Diglossic Situation*. 147–157.

Abu-Rabia, S. (2007). The role of morphology and short vowelization in reading arabic among normal and dyslexic readers in grades 3, 6, 9, and 12. *Journal of Psycholinguistic Research*, *36*(2), 89–106.

Abu-Rabia, S., Share, D., & Mansour, M. S. (2003). Word recognition and basic cognitive processes among reading-disabled and normal readers in Arabic. *Reading and Writing*, *16*(5), 423–442.

Abu-Rabia, S., & Siegel, L. S. (2002). Reading, syntactic, orthographic, and working memory skills of bilingual Arabic-English speaking Canadian children. *Journal of Psycholinguistic Research*, *31*(6), 661–678. https://doi.org/10.1023/A:1021221206119

Adlof, S. M., & Hogan, T. P. (2018). Understanding dyslexia in the context of developmental language disorders. *Language, Speech, and Hearing Services in Schools*, *49*(4), 762–773. https://doi.org/10.1044/2018_LSHSS-DYSLC-18-0049

Al-sulaihim, N., & Marinis, T. (2017). Phonological Awareness and literacy in Arabic-Speaking. *Arab Journal of Applied Linguistics*, *2*(1), 74–90.

Altun, D., Tantekin Erden, F., & Snow, C. E. (2018). A multilevel analysis of home and classroom literacy environments in relation to preschoolers' early literacy development. *Psychology in the Schools*, *55*(9), 1098–1120. https://doi.org/10.1002/pits.22153

Anthony, J. L., & Francis, D. J. (2005). Development of phonological awareness. *Current Directions in Psychological Science*, *14*(5), 255–259. https://doi.org/10.1111/j.0963-7214.2005.00376.x

Apel, K., Brimo, D., Diehm, E., & Apela, L. (2013). Morphological awareness intervention with kindergartners and first- and second-grade students from low socioeconomic status homes: A feasibility study. *Language, Speech, and Hearing Services in Schools*, *44*(2), 161–173. https://doi.org/10.1044/0161-1461(2012/12-0042)

Aram, D., Korat, O., Saiegh-Haddad, E., Arafat, S. H., Khoury, R., & Elhija, J. A. (2013). Early literacy among Arabic-speaking kindergartners: The role of socioeconomic status, home literacy environment and maternal mediation of writing. *Cognitive Development*, *28*(3), 193–208. https://doi.org/10.1016/j.cogdev.2012.10.003

Archibald, L., & Gathercole, S. (2007). Nonword repetition in specific language impairment- More than a phonological short-term memory deficit. *Psychonomic Bulletin & Review*, *14*, 919–924.

Archibald, L. M. D., & Gathercole, S. E. (2006). Short-term and working memory in specific language impairment. *International Journal of Language and Communication Disorders*, *41*(6), 675–693. https://doi.org/10.1080/13682820500442602

Asaad, H., & Eviatar, Z. (2013). The effects of orthographic complexity and diglossia on letter naming in Arabic: A developmental study. *Writing Systems Research*, *5*(2), 156–168.

Asaad, H., & Eviatar, Z. (2014). Learning to read in Arabic: The long and winding road. *Reading and Writing*, *27*(4), 649–664.

Asadi, I. A., & Abu-Rabia, S. (2021). The Impact of Diglossia on Phonological Processing. *Reading Psychology*, *42*(7), 685–699. https://doi.org/10.1080/02702711.2020.1864608

Asadi, I. A., Khateb, A., Ibrahim, R., & Taha, H. (2017a). How do different cognitive and linguistic variables contribute to reading in Arabic? A cross-sectional study from first to sixth grade. *Reading and Writing*, *30*(9), 1835–1867. https://doi.org/10.1007/s11145-017-9755-z

Asadi, I. A., Khateb, A., Ibrahim, R., & Taha, H. (2017b). How do different cognitive and linguistic variables contribute to reading in Arabic? A cross-sectional study from first to sixth grade. *Reading and Writing*, *30*(9), 1835–1867. https://doi.org/10.1007/s11145-017-9755-z

Asadi, I. A., Khateb, A., Mansour-Adwan, J., & Khoury-Metanis, A. (2022). When Developmental Language Disorder Meets Diglossia: A Cross-Sectional Investigation of Listening Comprehension Among Native Arabic-Speaking Preschoolers. *Journal of Psycholinguistic Research*. https://doi.org/10.1007/s10936-022-09885-5

Asadi, I. A., Khateb, A., & Shany, M. (2017). How simple is reading in Arabic? A cross-sectional investigation of reading comprehension from first to sixth grade. *Journal of Research in Reading*, *40*, S1–S22. https://doi.org/10.1111/1467-9817.12093

Ayari, S. (1996). Diglossia and illiteracy in the Arab world [1]. *Language, Culture and Curriculum*, *9*(3), 243–253. https://doi.org/10.1080/07908319609525233

Baddeley, A. (2000). *The episodic buffer: a new component of working memory?*

Baddeley, A. D., & Hitch, G. (1974). *Working Memory* (pp. 47–89). https://doi.org/10.1016/S0079-7421(08)60452-1

Bishop, D. V. M. (2014). Problems with tense marking in children with specific language impairment: Not how but when. In *Philosophical Transactions of the Royal Society B: Biological Sciences* (Vol. 369, Issue 1634). Royal Society. https://doi.org/10.1098/rstb.2012.0401

Bishop, D. V. M., & Adams, C. (1990). A Prospective Study of the Relationshipbetween Specific Language Impairment,Phonological Disorders andReading Retardation. *Embarazo Adolescente: Entre La Política y Los Derechos*, *31*(7), 1027–1050. https://doi.org/10.1111/j.1469-7610.1990.tb00844.x

Bishop, D. V. M., & Snowling, M. J. (2004). Developmental dyslexia and specific language impairment: Same or different? *Psychological Bulletin*, *130*(6), 858–886. https://doi.org/10.1037/0033-2909.130.6.858

Bishop, Snowling, M. J., Thompson, P. A., Greenhalgh, T., Adams, C., Archibald, L., Baird, G., Bauer, A., Bellair, J., Boyle, C., Brownlie, E., Carter, G., Clark, B., Clegg, J., Cohen, N., Conti-Ramsden, G., Dockrell, J., Dunn, J., Ebbels, S., … Whitehouse, A. (2017a). Phase 2 of CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development:

Terminology. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *58*(10), 1068–1080. https://doi.org/10.1111/jcpp.12721

Bishop, Snowling, M. J., Thompson, P. A., Greenhalgh, T., Adams, C., Archibald, L., Baird, G., Bauer, A., Bellair, J., Boyle, C., Brownlie, E., Carter, G., Clark, B., Clegg, J., Cohen, N., Conti-Ramsden, G., Dockrell, J., Dunn, J., Ebbels, S., … Whitehouse, A. (2017b). Phase 2 of CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development: Terminology. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *58*(10), 1068–1080. https://doi.org/10.1111/jcpp.12721

Botting, N. (2020). Language, literacy and cognitive skills of young adults with developmental language disorder (DLD). *International Journal of Language and Communication Disorders*, *55*(2), 255–265. https://doi.org/10.1111/1460-6984.12518

Boudreau, D., & Hedberg, N. (1999). A comparison of early literacy skills in children with specific language impairment and their typically developing peers. *American Journal of Speech-Language Pathololy*, *8*(August), 249–260.

Boudreau, D. M., & Hedberg, N. L. (1999). A Comparison of Early Literacy Skills in Children with Specific Language Impairment and Their Typically Developing Peers. *American Journal of Speech-Language Pathology*, *8*(3), 249–260. https://doi.org/10.1044/1058-0360.0803.249

Bowers, P. N., Kirby, J. R., & Deacon, S. H. (2010). The Effects of Morphological Instruction on Literacy Skills. *Review of Educational Research*, *80*(2), 144–179. https://doi.org/10.3102/0034654309359353

Brizzolara, D., Gasperini, F., Pfanner, L., Cristofani, P., Casalini, C., & Chilosi, A. M. (2011). Long-term reading and spelling outcome in Italian adolescents with a history of specific language impairment. *Cortex*, *47*(8), 955–973. https://doi.org/10.1016/j.cortex.2011.02.009

Bühler, J. C., von Oertzen, T., McBride, C. A., Stoll, S., & Maurer, U. (2018). Influence of dialect use on early reading and spelling acquisition in German-speaking children in Grade 1. *Journal of Cognitive Psychology*, *30*(3), 336–360. https://doi.org/10.1080/20445911.2018.1444614

Cabell, S. Q., Justice, L. M., Logan, J. A. R., & Konold, T. R. (2013). Emergent literacy profiles among prekindergarten children from low-SES backgrounds: Longitudinal considerations. *Early Childhood Research Quarterly*, *28*(3), 608–620. https://doi.org/10.1016/j.ecresq.2013.03.007

Calder, S. D., Claessen, M., Leitão, S., & Ebbels, S. (2021). A profile of expressive inflectional morphology in early school-age children with developmental language disorder. *Clinical Linguistics and Phonetics*. https://doi.org/10.1080/02699206.2021.1931454

Carroll, J. M., Snowling, M. J., Hulme, C., & Stevenson, J. (2003). The Development of Phonological Awareness in Preschool Children. *Developmental Psychology*, *39*(5), 913–923. https://doi.org/10.1037/0012-1649.39.5.913

Catts, H. W. (2018). The Simple View of Reading: Advancements and False Impressions. *Remedial and Special Education*, *39*(5), 317–323. https://doi.org/10.1177/0741932518767563

Catts, H. W., Adlof, S. M., Hogan, T. P., & Weismer, S. E. (2005). Are Specific Language Impairment and Dyslexia Distinct Disorders? *Journal of Speech, Language, and Hearing Research*, *48*(6), 1378–1396. https://doi.org/10.1044/1092-4388(2005/096)

Catts, H. W., Fey, M. E., Tomblin, B. J., & Zhang, X. (2002). *A Longitudinal Investigation of Reading Outcomes in Children With Language Impairments*. *December*. https://doi.org/10.1044/1092-4388(2002/093)

Catts, H. W., Fey, M. E., Zhang, X., & Tomblin, J. B. (2001). Estimating the Risk of Future Reading Difficulties in Kindergarten Children. *Language, Speech, and Hearing Services in Schools*, *32*(1), 38–50. https://doi.org/10.1044/0161-1461(2001/004)

Catts, H. W., Herrera, S., Nielsen, D. C., & Bridges, M. S. (2015). Early prediction of reading comprehension within the simple view framework. *Reading and Writing*, *28*(9), 1407–1425. https://doi.org/10.1007/s11145-015-9576-x

Catts, H. W., & Hogan, T. P. (2003). Language basis of reading disabilities and implications for early identification and remediation. *Reading Psychology*, *24*(3–4), 223–246. https://doi.org/10.1080/02702710390227314

Catts, H. W., & Kamhi, A. G. (2005). *The Connections Between Language and Reading Disabilities*. Lawrence Erlbaum Associates, Inc., Publishers.

Clay, M. (1966). *Emergent reading behavior*.

Conti-Ramsden, G., Botting, N., & Faragher, B. (2001). Psycholinguistic Markers for Specific Language Impairment (SLI). In *J. Child Psychol. Psychiat* (Vol. 42, Issue 6).

Conti-Ramsden, G., & Durkin, K. (2007). Phonological short-term memory, language and literacy: Developmental relationships in early adolescence in young people with SLI. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *48*(2), 147–156. https://doi.org/10.1111/j.1469-7610.2006.01703.x

Cunningham, A. J., Burgess, A. P., Witton, C., Talcott, J. B., & Shapiro, L. R. (2020). Dynamic relationships between phonological memory and reading: a five year longitudinal study from age 4 to 9. *Developmental Science*, 0–2. https://doi.org/10.1111/desc.12986

Daniels, P. T. (1992). The syllabic origin of writing and the segmental origin of the alphabet. In *The Linguistics of Literacy* (pp. 83–110).

Dawes, E. C. (2017). *The hidden language skill: oral inferential comprehension in children with developmental language disorder*. Curtin University.

Dawson, N., Rastle, K., & Ricketts, J. (2017). Morphological Effects in Visual Word Recognition: Children, Adolescents, and Adults. *Journal of Experimental Psychology: Learning Memory and Cognition*, *44*(4), 645–654. https://doi.org/10.1037/xlm0000485

Dickinson, D. K., Nesbitt, K. T., & Hofer, K. G. (2019). Effects of language on initial reading: Direct and indirect associations between code and language from preschool to first grade. *Early Childhood Research Quarterly*, *49*, 122–137. https://doi.org/10.1016/j.ecresq.2019.04.005

Dickinson, D. K., & Porche, M. V. (2011). Relation Between Language Experiences in Preschool Classrooms and Children's Kindergarten and Fourth-Grade Language and Reading Abilities. *Child Development*, *82*(3), 870–886. https://doi.org/10.1111/j.1467-8624.2011.01576.x

Dromi, E., & Berman, R. A. (1982). A morphemic measure of early language development: Data from modern Hebrew. *Journal of Child Language*, *9*(2), 403–424. https://doi.org/10.1017/S0305000900004785

Duncan, L. G., Castro, S. L., Defior, S., Seymour, P. H. K., Baillie, S., Leybaert, J., Mousty, P., Genard, N., Sarris, M., Porpodas, C. D., Lund, R., Sigurdsson, B., Thráinsdóttir, A. S., Sucena, A., & Serrano, F. (2013). Phonological development in relation to native language and literacy: Variations on a theme in six alphabetic

orthographies. *Cognition*, *127*(3), 398–419. https://doi.org/10.1016/j.cognition.2013.02.009
Duncan, L. G., & Seymour, P. H. K. (2000). Socio-economic diåerences in foundation-level literacy. In *British Journal of Psychology* (Vol. 91).
Ehri, L. C. (2017). *Orthographic mapping and literacy development revisited* (pp. 127–146). https://doi.org/10.1075/swll.15.08ehr
Elbeheri, G., & Everatt, J. (2007). Literacy ability and phonological processing skills amongst dyslexic and non-dyslexic speakers of Arabic. *Reading and Writing*, *20*(3), 273–294. https://doi.org/10.1007/s11145-006-9031-0
Erickson, K. A. (2000). ALL CHILDREN ARE READY TO LEARN: AN EMERGENT VERSUS READINESS PERSPECTIVE IN EARLY LITERACY ASSESSMENT. In *SEMINARS IN SPEECH AND LANGUAGE-VOLUME* (Vol. 21).
Ferguson, C. A. (1959). Diglossia. WORD, *15*(2), 325–340. https://doi.org/10.1080/00437956.1959.11659702
Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. Sage.
Foorman, B. R., Herrera, S., Petscher, Y., Mitchell, A., & Truckenmiller, A. (2015). The structure of oral language and reading and their relation to comprehension in Kindergarten through Grade 2. *Reading and Writing*, *28*(5), 655–681. https://doi.org/10.1007/s11145-015-9544-5
Foulin, J. N. (2005). Why is letter-name knowledge such a good predictor of learning to read? *Reading and Writing*, *18*(2), 129–155. https://doi.org/10.1007/s11145-004-5892-2
Francis, D. J., Kulesz, P. A., & Benoit, J. S. (2018). Extending the Simple View of Reading to Account for Variation Within Readers and Across Texts: The Complete View of Reading (CVRi). *Remedial and Special Education*, *39*(5), 274–288. https://doi.org/10.1177/0741932518772904
Gathercole, S. E., Alloway, T. P., Willis, C., & Adams, A. M. (2006). Working memory in children with reading disabilities. *Journal of Experimental Child Psychology*, *93*(3), 265–281. https://doi.org/10.1016/j.jecp.2005.08.003
Gatlin, B., & Wanzek, J. (2015). Relations among children's use of dialect and literacy skills: A meta-analysis. *Journal of Speech, Language, and Hearing Research*, *58*(4), 1306–1318. https://doi.org/10.1044/2015_JSLHR-L-14-0311
Gillon, G. T. (2005). Phonological Awareness Acquisition and Intervention. *Language, Speech, and Hearing Services in Schools*, *36*(Dld), 281–285.
Gillon, G. T. (2018). *Phonlogical Awareness from Research to Practice* (Second). The Guilford Press.
Gorman, B. K. (2012). Relationships between vocabulary size, working memory, and phonological awareness in Spanish-speaking English language learners. *American Journal of Speech-Language Pathology*, *21*(2), 109–123. https://doi.org/10.1044/1058-0360(2011/10-0063)
Goswami, U., Ziegler, J. C., & Richardson, U. (2005). The effects of spelling consistency on phonological awareness: A comparison of English and German. *Journal of Experimental Child Psychology*, *92*(4), 345–365. https://doi.org/10.1016/j.jecp.2005.06.002
Gough, P. B., & Tunmer, W. E. (1986). Decoding, Reading, and Reading Disability. *Remedial and Special Education*, *7*(1).
Green, L. (2009). Morphology and literacy: Getting our heads in the game. *Language, Speech, and Hearing Services in Schools*, *40*(3), 283–285. https://doi.org/10.1044/0161-1461(2009/08-0091)

Hachmann, W. M., Bogaerts, L., Szmalec, A., Woumans, E., Duyck, W., & Job, R. (2014). Short-term memory for order but not for item information is impaired in developmental dyslexia. *Annals of Dyslexia*, *64*(2), 121–136. https://doi.org/10.1007/s11881-013-0089-5

Haddad, E. S. (2003). Linguistic distance and initial reading acquisition : The case of Arabic diglossia. *Applied PsychoLinguistics*, *24*, 431–451.

Hamilton, L. G., Hayiou-Thomas, M. E., Hulme, C., & Snowling, M. J. (2016). The Home Literacy Environment as a Predictor of the Early Literacy Development of Children at Family-Risk of Dyslexia. *Scientific Studies of Reading*, *20*(5), 401–419. https://doi.org/10.1080/10888438.2016.1213266

Hassanein, E. E. A., Johnson, E. S., Alshaboul, Y. M., Ibrahim, S. R., & Megreya, A. M. (2021). Examining Factors That Predict Arabic Word Reading in First and Second Graders. *Reading and Writing Quarterly*. https://doi.org/10.1080/10573569.2021.1907637

Hassunah-Arafat, S. M., Aram, D., & Korat, O. (2021). Early literacy in Arabic: the role of SES, home literacy environment, mothers' early literacy beliefs and estimation of their children's literacy skills. *Reading and Writing*, *34*(10), 2603–2625. https://doi.org/10.1007/s11145-021-10158-1

Hayiou-Thomas, M. E., Carroll, J. M., Leavett, R., Hulme, C., & Snowling, M. J. (2017). When does speech sound disorder matter for literacy? The role of disordered speech errors, co-occurring language impairment and family risk of dyslexia. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *58*(2), 197–205. https://doi.org/10.1111/jcpp.12648

Hemmerechts, K., Agirdag, O., & Kavadias, D. (2017). The relationship between parental literacy involvement , socio-economic status and reading literacy. *Educational Review*, *69*(1), 84–100. https://doi.org/10.1080/00131911.2016.1164667

Hermena, E. W., & Reichle, E. D. (2020). Insights from the study of Arabic reading. *Language and Linguistics Compass*, *14*(10), 1–26. https://doi.org/10.1111/lnc3.12400

Hipfner-Boucher, K., Milburn, T., Weitzman, E., Greenberg, J., Pelletier, J., & Girolametto, L. (2014). Relationships between preschoolers' oral language and phonological awareness. *First Language*, *34*(2), 178–197. https://doi.org/10.1177/0142723714525945

Hjetland, H. N., Lervåg, A., Lyster, S. A. H., Hagtvet, B. E., Hulme, C., & Melby-Lervåg, M. (2019). Pathways to reading comprehension: A longitudinal study from 4 to 9 years of age. *Journal of Educational Psychology*, *111*(5), 751–763. https://doi.org/10.1037/edu0000321

Hoover, W. A., & Tunmer, W. E. (2018a). The Simple View of Reading: Three Assessments of Its Adequacy. *Remedial and Special Education*, *39*(5), 304–312. https://doi.org/10.1177/0741932518773154

Hoover, W. A., & Tunmer, W. E. (2018b). The Simple View of Reading: Three Assessments of Its Adequacy. *Remedial and Special Education*, *39*(5), 304–312. https://doi.org/10.1177/0741932518773154

Hoover, W. A., & Tunmer, W. E. (2018c). The Simple View of Reading: Three Assessments of Its Adequacy. *Remedial and Special Education*, *39*(5), 304–312. https://doi.org/10.1177/0741932518773154

Hulme, C., Bowyer-Crane, C., Carroll, J. M., Duff, F. J., & Snowling, M. J. (2012). The Causal Role of Phoneme Awareness and Letter-Sound Knowledge in Learning to

Read: Combining Intervention Studies With Mediation Analyses. *Psychological Science*, *23*(6), 572–577. https://doi.org/10.1177/0956797611435921
Hulme, C., Hatcher, P. J., Nation, K., Brown, A., Adams, J., & Stuart, G. (2002). Phoneme awareness is a better predictor of early reading skill than onset-rime awareness. *Journal of Experimental Child Psychology*, *82*(1), 2–28. https://doi.org/10.1006/jecp.2002.2670
Hulme, C., Nash, H. M., Gooch, D., Lervåg, A., & Snowling, M. J. (2015). The Foundations of Literacy Development in Children at Familial Risk of Dyslexia. *Psychological Science*, *26*(12), 1877–1886. https://doi.org/10.1177/0956797615603702
Hulme, C., & Snowling, M. J. (2014). The interface between spoken and written language: Developmental disorders. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *369*(1634). https://doi.org/10.1098/rstb.2012.0395
Hulme, C., & Snowling, M. J. (2019). The interface between spoken and written language: Developmental Disorders. *Philosophical Transactions of The Royal Society*, *369*(1634), 1–8.
Jackson, E., Leitão, S., Claessen, M., & Boyes, M. (2020a). *Working, Declarative, and Procedural Memory in Children With Developmental Language Disorder*. https://doi.org/10.23641/asha
Jackson, E., Leitão, S., Claessen, M., & Boyes, M. (2020b). *Working, Declarative, and Procedural Memory in Children With Developmental Language Disorder*. https://doi.org/10.23641/asha
James, E., Currie, N. K., Tong, S. X., & Cain, K. (2020). The relations between morphological awareness and reading comprehension in beginner readers to young adolescents. *Journal of Research in Reading*, 1–21. https://doi.org/10.1111/1467-9817.12316
Justice, L. M. (2006). Evidence-Based Practice, Response to Intervention, and the Prevention of Reading Difficulties. *Language, Speech, and Hearing Services in Schools*, *37*(4), 284–297. https://doi.org/10.1044/0161-1461(2006/033)
Kendeou, P., van den Broek, P., White, M. J., & Lynch, J. S. (2009). Predicting Reading Comprehension in Early Elementary School: The Independent Contributions of Oral Language and Decoding Skills. *Journal of Educational Psychology*, *101*(4), 765–778. https://doi.org/10.1037/a0015956
Khateb, A., Khateb-Abdelgani, M., Taha, H. Y., & Ibrahim, R. (2014). The impact of orthographic connectivity on visual word recognition in Arabic: A cross-sectional study. *Reading and Writing*, *27*(8), 1413–1436. https://doi.org/10.1007/s11145-014-9499-y
Kirby, J. R., Deacon, S. H., Bowers, P. N., Izenberg, L., Wade-Woolley, L., & Parrila, R. (2012). Children's morphological awareness and reading ability. *Reading and Writing*, *25*(2), 389–410. https://doi.org/10.1007/s11145-010-9276-5
Kirby, J. R., & Savage, R. S. (2008). *Can the simple view deal with the complexities of reading?*
Kluczniok, K., Lehrl, S., Kuger, S., & Rossbach, H. G. (2013). Quality of the home learning environment during preschool age - Domains and contextual conditions. *European Early Childhood Education Research Journal*, *21*(3), 420–438. https://doi.org/10.1080/1350293X.2013.814356
Ladányi, E., & Lukács, Á. (2019). Word retrieval difficulties and cognitive control in specific language impairment. *Journal of Speech, Language, and Hearing Research*, *62*(4), 918–931. https://doi.org/10.1044/2018_JSLHR-L-17-0446

Layes, S., Lalonde, R., & Rebai, M. (2021). Reading-related abilities underlying phonological awareness: a cross-sectional study in children with and without dyslexia. *Logopedics Phoniatrics Vocology*, *46*(3), 110–117. https://doi.org/10.1080/14015439.2020.1768283

Leonard, L. (2014a). *Children with Specific Language Important*.

Leonard, L. (2014b). *The Language Characteristics of SLI: A Detailed Look at English*.

Leonard, L. B., & Kueser, J. B. (2019). Five overarching factors central to grammatical learning and treatment in children with developmental language disorder. In *International Journal of Language and Communication Disorders* (Vol. 54, Issue 3, pp. 347–361). Wiley Blackwell. https://doi.org/10.1111/1460-6984.12456

Leonard, L., Karpicke, J., Deevy, P., Weber, C., Christ, S., Haebig, E., Souto, S., Kueser, J. B., & Krok, W. (2019). *Retrieval-Based Word Learning in Young Typically Developing Children and Children With Developmental Language Disorder I: The Benefits of Repeated Retrieval*. https://doi.org/10.23641/asha

Lerner, M. D., & Lonigan, C. J. (2016). Bidirectional relations between phonological awareness and letter knowledge in preschool revisited: A growth curve analysis of the relation between two code-related skills. *Journal of Experimental Child Psychology*, *144*, 166–183. https://doi.org/10.1016/j.jecp.2015.09.023

Lonigan, C., Burgess, S., & Anthony, J. (2000). Development of emergent literacy and early reading skills in preschool children: evidence from a latent-variable longitudinal study. *Developmental Psychology*, *36*(5), 596–613. https://doi.org/10.1037/0012-1649.36.5.596

Lonigan, C. J., Anthony, J. L., Phillips, B. M., Purpura, D. J., Wilson, S. B., & McQueen, J. D. (2009). The Nature of Preschool Phonological Processing Abilities and Their Relations to Vocabulary, General Cognitive Abilities, and Print Knowledge. *Journal of Educational Psychology*, *101*(2), 345–358. https://doi.org/10.1037/a0013837

Majerus, S., Poncelet, M., Van der Linden, M., & Weekes, B. S. (2008). Lexical learning in bilingual adults: The relative importance of short-term memory for serial order and phonological knowledge. *Cognition*, *107*(2), 395–419. https://doi.org/10.1016/j.cognition.2007.10.003

Marinis, T., & Armon-lotem, S. (2016). *Sentence repetition*. *January 2015*.

Martinez Perez, T., Majerus, S., & Poncelet, M. (2012). The contribution of short-term memory for serial order to early reading acquisition: Evidence from a longitudinal study. *Journal of Experimental Child Psychology*, *111*(4), 708–723. https://doi.org/10.1016/j.jecp.2011.11.007

Mayer, M. (1969). *Frog, where are You?* (illustrated). Dial Book for Young Readers.

McBride, C. (2015). *CHILDREN'S LITERACY DEVELOPMENT A Cross-Cultural Perspective on Learning to Read and Write* (2nd ed.). Routledge.

Mcbride-Chang, C. (1995). What Is Phonological Awareness? In *Journal of Educational Psychology* (Vol. 87, Issue 2).

McGregor, K. K. (2020). How We Fail Children With Developmental Language Disorder. *Language, Speech, and Hearing Services in Schools*, *51*(4), 981–992. https://doi.org/10.1044/2020_lshss-20-00003

Messer, D., & Dockrell, J. E. (2006). Children's Naming and Word-Finding Difficulties: Descriptions and Explanations. *Journal of Speech, Language, and Hearing Research*, *49*(2), 309–324. https://doi.org/10.1044/1092-4388(2006/025)

Metsala, J. L., & Walley, A. C. (1998). Spoken Vocabulary Growth and the Segmental Restructuring of Lexical Representations: Precursors to Phonemic Awareness and

Early Reading Ability. In *Word recognition in beginning literacy Publisher:* (pp. 99–130). Routledge.
Mohamed, A. H. H., Hassan, A. S., Al-Qaryouti, I., Al-Hashimi, A., & Al-Kalbani, Z. (2021). The development of phonological awareness among preschoolers. *Early Child Development and Care*, *191*(1), 108–122. https://doi.org/10.1080/03004430.2019.1607320
Mol, S. E., & Bus, A. G. (2011). To Read or Not to Read: A Meta-Analysis of Print Exposure From Infancy to Early Adulthood. *Psychological Bulletin*, *137*(2), 267–296. https://doi.org/10.1037/a0021890
Moll, K., Thompson, P. A., Mikulajova, M., Jagercikova, Z., Kucharska, A., Franke, H., Hulme, C., & Snowling, M. J. (2016). Precursors of Reading Difficulties in Czech and Slovak Children At-Risk of Dyslexia. *Dyslexia*, *22*(2), 120–136. https://doi.org/10.1002/dys.1526
Montgomery, J. W., Magimairaj, B. M., & Finney, M. C. (2010). Working Memory and Specific Language Impairment: An Update on the Relation and Perspectives on Assessment and Treatment. *American Journal of Speech-Language Pathology*, *19*(1), 78–94. https://doi.org/10.1044/1058-0360(2009/09-0028)
Morgan, P. L., Farkas, G., Hillemeier, M. M., Li, H., Pun, W. H., & Cook, M. (2017). Cross-cohort evidence of disparities in service receipt for speech or language impairments. *Exceptional Children*, *84*(1), 27–41. https://doi.org/10.1177/0014402917718341
Moscati, V., Rizzi, L., Vottari, I., Chilosi, A. M., Salvadorini, R., & Guasti, M. T. (2020). Morphosyntactic weaknesses in developmental language disorder: The role of structure and agreement configurations. In *Journal of Child Language* (Vol. 47, Issue 5, pp. 909–944). Cambridge University Press. https://doi.org/10.1017/S0305000919000709
Muter, V., Hulme, C., Snowling, M. J., & Stevenson, J. (2004). Phonemes, rimes, vocabulary, and grammatical skills as foundations of early reading development: Evidence from a longitudinal study. *Developmental Psychology*, *40*(5), 665–681. https://doi.org/10.1037/0012-1649.40.5.665
Nagy, W. E., Carlisle, J. F., & Goodwin, A. P. (2014). Morphological Knowledge and Literacy Acquisition. *Journal of Learning Disabilities*, *47*(1), 3–12. https://doi.org/10.1177/0022219413509967
Najmaldeen, G. (2020). *A Comprehensive Assessment of Reading-Related Skills in TD 4 - 7 year old saudi chidlren* (Issue February). City, University of London.
Nation, K., Cocksey, J., Taylor, J. S. H., & Bishop, D. V. M. (2010). A longitudinal investigation of early reading and language skills in children with poor reading comprehension. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *51*(9), 1031–1039. https://doi.org/10.1111/j.1469-7610.2010.02254.x
Neumann, M. M. (2016). A socioeconomic comparison of emergent literacy and home literacy in Australian preschoolers. *European Early Childhood Education Research Journal*, *24*(4), 555–566. https://doi.org/10.1080/1350293X.2016.1189722
Norbury, C., Gooch, D., Wray, C., Baird, G., Charman, T., Simonoff, E., Vamvakas, G., & Pickles, A. (2016). The impact of nonverbal ability on prevalence and clinical presentation of language disorder: evidence from a population study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *57*(11), 1247–1257. https://doi.org/10.1111/jcpp.12573
Norbury, C., Tomblin, B. J., & Bishp, D. V. M. (2008). Understanding Developmental Langauge Disorders. In *Taylor & Francis*.

Oliveira, C. M., Vale, A. P., & Thomson, J. M. (2021). The relationship between developmental language disorder and dyslexia in European Portuguese school-aged children. *Journal of Clinical and Experimental Neuropsychology*.

Pan, J., Kong, Y., Song, S., McBride, C., Liu, H., & Shu, H. (2017). Socioeconomic status, parent report of children's early language skills, and late literacy skills: a long term follow-up study among Chinese children. *Reading and Writing*, *30*(2), 401–416. https://doi.org/10.1007/s11145-016-9682-4

Paul, R., Norbury, C., & Gosse, C. (2018). *Language Disorders from Infancy through Adolescence: Listening, Speaking, Reading, Writing, and Communicating* (5th ed.). Mosby.

Pratt, A. S., Grinstead, J. A., & McCauley, R. J. (2020). Emergent literacy in spanish-speaking children with developmental language disorder: Preliminary findings of delays in comprehension-and code-related skills. *Journal of Speech, Language, and Hearing Research*, *63*(12), 4193–4207. https://doi.org/10.1044/2020_JSLHR-19-00239

Psyridou, M., Eklund, K., Poikkeus, A. M., & Torppa, M. (2018). Reading outcomes of children with delayed early vocabulary: A follow-up from age 2–16. *Research in Developmental Disabilities*, *78*(June 2017), 114–124. https://doi.org/10.1016/j.ridd.2018.05.004

Raven, J. (2007). Coloured Progressive Matrices . In *Pearson*.

Rhyner, P. M. (2009). *Emergent Literacy and Language Development: Promoting Learning in early childhood*.

Ricketts, J. (2011). Research Review: Reading comprehension in developmental disorders of language and communication. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *52*(11), 1111–1123. https://doi.org/10.1111/j.1469-7610.2011.02438.x

Ricketts, J., Nation, K., & Bishop, D. V. M. (2007). Vocabulary is important for some, but not all reading skills. *Scientific Studies of Reading*, *11*(3), 235–257. https://doi.org/10.1080/10888430701344306

Rohde, L. (2015). The comprehensive emergent literacy model: Early literacy in context. *SAGE Open*, *5*(1). https://doi.org/10.1177/2158244015577664

Rowe, M. L. (2018). Understanding Socioeconomic Differences in Parents' Speech to Children. *Child Development Perspectives*, *12*(2), 122–127. https://doi.org/10.1111/cdep.12271

Saiegh-Haddad, E. (2005). Correlates of reading fluency in arabic: Diglossic and orthographic factors. *Reading and Writing*, *18*(6), 559–582. https://doi.org/10.1007/s11145-005-3180-4

Saiegh-Haddad, E. (2007). Linguistic constraints on children's ability to isolate phonemes in Arabic. *Applied Psycholinguistics*, *28*(4), 607–625. https://doi.org/10.1017/S0142716407070336

Saiegh-Haddad, E. (2018). MAWRID: A Model of Arabic Word Reading in Development. *Journal of Learning Disabilities*, *51*(5), 454–462. https://doi.org/10.1177/0022219417720460

Saiegh-Haddad, E., & Haj, L. (2018). Does phonological distance impact quality of phonological representations? Evidence from Arabic diglossia. *Journal of Child Language*, 1377–1399.

Saiegh-haddad, E., & Henkin-roitfarb, R. (2014). The structure of Arabic Language and orthography. In *Handbook of Arabic Literacy* (Vol. 9, pp. 3–28). https://doi.org/10.1007/978-94-017-8545-7

Saiegh-Haddad, E., Shahbari-Kassem, A., & Schiff, R. (2020). Phonological awareness in Arabic: the role of phonological distance, phonological-unit size, and SES. *Reading and Writing*, *33*(6), 1649–1674. https://doi.org/10.1007/s11145-020-10019-3

Saiegh-Haddad, E., & Taha, H. (2017). The Role of Morphological and Phonological Awareness in the Early Development of Word Spelling and Reading in Typically Developing and Disabled Arabic Readers. *Dyslexia*, *23*(4), 345–371. https://doi.org/10.1002/dys.1572

Scarborough, H. (2001). *Handbook for research in early literacy*. Guilford Press.

Scarborough, H. S. (1990). Very Early Language Deficits in Dyslexic Children Published by : Blackwell Publishing on behalf of the Society for Research in Child Development Stable URL : http://www.jstor.org/stable/1130834 Very Early Language Deficits in Dyslexic Children. *Child Development*, *61*(6), 1728–1743.

Schiff, R., & Saiegh-Haddad, E. (2017). When diglossia meets dyslexia: The effect of diglossia on voweled and unvoweled word reading among native Arabic-speaking dyslexic children. *Reading and Writing*, *30*(5), 1089–1113. https://doi.org/10.1007/s11145-016-9713-1

Schiff, R., & Saiegh-Haddad, E. (2018). Development and relationships between phonological awareness, morphological awareness and word reading in spoken and standard Arabic. *Frontiers in Psychology*, *9*(APR), 1–13.

Seidenberg, M. S. (2005). *Connectionist Models of Word Reading*.

Semel, E., Wiig, E. H., & Secord, W. (2006). *Clinical Evaluation of Language Fundamentals - Fourth Edition UK (CELF-4 UK)* (4th ed.). Pearson Education Limited.

Sénéchal, M., Lefevre, J. A., Smith-Chant, B. L., & Colton, K. V. (2001a). On refining theoretical models of emergent literacy the role of empirical evidence. *Journal of School Psychology*, *39*(5), 439–460. https://doi.org/10.1016/S0022-4405(01)00081-4

Sénéchal, M., Lefevre, J.-A., Smith-Chant, B. L., & Colton, K. V. (2001b). On Refining Theoretical Models of Emergent Literacy The Role of Empirical Evidence. In *Journal of School Psychology* (Vol. 39, Issue 5).

Shaalan, S. (2010). Investigating Grammatical Complexity in Gulf Arabic Speaking Children with Specific Language Impairment (SLI). *Doctoral Dissertation, UCL (University College London))*, *May*, 335.

Shaalan, S. (2020). *Nonword Repetition Skills in Gulf Arabic-Speaking Children With Developmental Language Disorder*. https://doi.org/10.23641/asha

Shaalan, S., & Khater, M. (2006). *Counting Morphemes in Qatari-Arabic*.

Shanahan, T., & Lonigan, C. J. (2010). The National Early Literacy Panel. *Educational Researcher*, *39*(4), 279–285. https://doi.org/10.3102/0013189x10369172

Skibbe, L. E., Justice, L., Zucker, T., & McGinty, A. (2008). Relations Among Maternal Literacy Beliefs, Home Literacy Practices, and the Emergent Literacy Skills of Preschoolers With Specific Language Impairment. *EARLY EDUCATION AND DEVELOPMENT*. https://doi.org/10.1080/10409280701839015

Smythe Ian, Everatt John, Al-Menaye Nasser, He Xianyou, Capellini Simone, Gyarmathy Eva, & Siegel Linda S. (2008). Predictors of Word-level Literacy amongst Grade 3 Children in Five Diverse Languages. *Dyslexia: An International Journal of Research and Practice*, *24*(3). https://doi.org/10.1002/dys

Snow, P. C. (2020). SOLAR: The Science of Language and Reading. *Child Language Teaching and Therapy*. https://doi.org/10.1177/0265659020947817

Snowling, M. J., Duff, F. J., Nash, H. M., & Hulme, C. (2016). Language profiles and literacy outcomes of children with resolving, emerging, or persisting language impairments. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *57*(12), 1360–1369. https://doi.org/10.1111/jcpp.12497

Snowling, M. J., Gooch, D., McArthur, G., & Hulme, C. (2018). Language Skills, but Not Frequency Discrimination, Predict Reading Skills in Children at Risk of Dyslexia. *Psychological Science*, *29*(8), 1270–1282. https://doi.org/10.1177/0956797618763090

Snowling, M. J., Hayiou-Thomas, M. E., Nash, H. M., & Hulme, C. (2020). Dyslexia and Developmental Language Disorder: comorbid disorders with distinct effects on reading comprehension. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *61*(6), 672–680. https://doi.org/10.1111/jcpp.13140

Snowling, M. J., Nash, H. M., Gooch, D. C., Hayiou-Thomas, M. E., & Hulme, C. (2019). Developmental Outcomes for Children at High Risk of Dyslexia and Children With Developmental Language Disorder. *Child Development*, *90*(5), e548–e564. https://doi.org/10.1111/cdev.13216

Squires, K. E., Gillam, S. L., & Ray Reutzel, D. (2013). Characteristics of Children Who Struggle with Reading: Teachers and Speech-Language Pathologists Collaborate to Support Young Learners. *Early Childhood Education Journal*, *41*(6), 401–411. https://doi.org/10.1007/s10643-013-0577-6

Stackhouse, J., Wells, B., Pascoe, M., & Rees, R. (2002). From phonological therapy to phonological awareness. *Seminars in Speech and Language*, *23*(1), 27–42. https://doi.org/10.1055/s-2002-23509

Storch, S. A., & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: evidence from a longitudinal structural model. *Developmental Psychology*, *38*(6), 934–947.

Strang, T. M., & Piasta, S. B. (2016). Socioeconomic differences in code-focused emergent literacy skills. *Reading and Writing*, *29*(7), 1337–1362. https://doi.org/10.1007/s11145-016-9639-7

Suggate, S., Schaughency, E., McAnally, H., & Reese, E. (2018). From infancy to adolescence: The longitudinal links between vocabulary, early literacy skills, oral narrative, and reading comprehension. *Cognitive Development*, *47*, 82–95. https://doi.org/10.1016/j.cogdev.2018.04.005

Tabors, P. O., Snow, C. E., & Dickinson, D. K. (2001). Homes and schools together: Supporting language and literacy development. In *Beginning literacy with language: Young children learning at home and school.* (pp. 313–334). Paul H Brookes Publishing.

Taha, H., & Saiegh-Haddad, E. (2017). Morphology and Spelling in Arabic: Development and Interface. *Journal of Psycholinguistic Research*, *46*(1), 27–38. https://doi.org/10.1007/s10936-016-9425-3

Taha, J., Stojanovik, V., & Pagnamenta, E. (n.d.). *Sentence repetition as a clinical marker of Developmental Language Disorder: Evidence from Arabic 2 3 To be published at the Journal of Speech, Language and Hearing Research*.

Taha, J., Stojanovik, V., & Pagnamenta, E. (2020). Expressive verb morphology deficits in Arabic-speaking children with Developmental Language Disorder. *Speech Language and Hearing Research*, 1–18. https://doi.org/10.1044/2020_JSLHR-19-00292

Taha, J., Stojanovik, V., & Pagnamenta, E. (2021). *Nonword Repetition Performance of Arabic-Speaking Children With and Without Developmental Language Disorder: A Study on Diagnostic Accuracy*. https://doi.org/10.23641/asha

Taibah, N. J., & Haynes, C. W. (2011). Contributions of phonological processing skills to reading skills in Arabic speaking children. *Reading and Writing*, *24*(9), 1019–1042.

Tambyraja, S. R., Schmitt, M. B., Farquharson, K., & Justice, L. M. (2015). *Person-centered approach to examining emergent literacy risks in children with specific language impairment* (Vol. 5).

Teale, W. H., & Sulzby, E. (1986). *Emergent Literacy: Writing and Reading. Writing Research: Multidisciplinary Inquiries into the Nature of Writing Series*.

Thatcher, K. L. (2010). The development of phonological awareness with specific language-impaired and typical children. *Psychology in the Schools*, *47*(5), 467–480. https://doi.org/10.1002/pits.20483

Thomas, M. S. C., Annaz, D., Ansari, D., Scerif, G., Jarrold, C., & Karmiloff-Smith, A. (2009). Using Developmental Trajectories to Understand Developmental Disorders. *Journal of Speech, Language, and Hearing Research*, *52*(2), 336–358. https://doi.org/10.1044/1092-4388(2009/07-0144)

Tibi, S. (2010). Developmental hierarchy of Arabic phonological awareness skills. *International Journal of Special Education*, *25*(1), 27–33.

Ullman, M. T., Earle, F. S., Walenski, M., & Janacsek, K. (2020). The neurocognition of developmental disorders of language. *Annual Review of Psychology*, *71*, 389–417. https://doi.org/10.1146/ANNUREV-PSYCH-122216-011555

Ventura, P., Kolinsky, R., Fernandes, S., Querido, L., & Morais, J. (2007). Lexical restructuring in the absence of literacy. *Cognition*, *105*(2), 334–361. https://doi.org/10.1016/j.cognition.2006.10.002

Wallan, A. (2018). *Evaluation of Arabic tests of sentence repetition and verbal short term memory for Saudi preschoolers*. City University London.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child Development and Emergent Literacy. *Evaluation*, *69*(3), 848–872. https://doi.org/10.1111/j.1467-8624.1998.tb06247.x

Wilson, S. B., & Lonigan, C. J. (2010). Identifying preschool children at risk of later reading difficulties: Evaluation of two emergent literacy screening tools. *Journal of Learning Disabilities*, *43*(1), 62–76. https://doi.org/10.1177/0022219409345007

Wolf, M. C., Muijselaar, M. M. L., Boonstra, A. M., & de Bree, E. H. (2019). The relationship between reading and listening comprehension: shared and modality-specific components. *Reading and Writing*, *32*(7), 1747–1767. https://doi.org/10.1007/s11145-018-9924-8

Wong, A. M. Y., Ho, C. S. H., Au, T. K. F., Kidd, J. C., Ng, A. K. H., Yip, L. P. W., & Lam, C. C. C. (2015). (Dis)connections between specific language impairment and dyslexia in Chinese. *Reading and Writing*, *28*(5), 699–719. https://doi.org/10.1007/s11145-015-9546-3

Wong, A. M. Y., Kidd, J. C., Ho, C. S. H., & Au, T. K. F. (2010). Characterizing the overlap between SLI and dyslexia in Chinese: The role of phonology and beyond. *Scientific Studies of Reading*, *14*(1), 30–57.

Zayed, A. M., Roehrig, A. D., Arrastia-Lloyd, M. C., & Gilgil, N. M. (2013). Phonological Awareness and Working Memory in Arabic-Speaking Egyptian Preschool Children at Risk for Dyslexia. *International Journal of Psychological Studies*, *5*(1). https://doi.org/10.5539/ijps.v5n1p139

Zhang, S. Z., Inoue, T., Shu, H., & Georgiou, G. K. (2020). How does home literacy environment influence reading comprehension in Chinese? Evidence from a 3-year longitudinal study. *Reading and Writing*, *33*(7), 1745–1767. https://doi.org/10.1007/s11145-019-09991-2

Appendix A: Parents' Information Sheet, Consent Forms and Demographic Questionnaire

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Language, Language Impairments and Emergent Literacy
Information Sheet for Educators/Parents/Guardians

We would like to invite your child to take part in a research study. Before you decide whether you are happy for your child to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish.

What is the purpose of the study?

The purpose of this study is to find out how language is related to early reading, and how language impairments may impact on the acquisition of reading skills in Arabic-speaking preschool children.

Why has my child been invited?

We have invited your child to take part in this study because he/she is typically developing Arabic-speaking preschool child.

Does my child have to take part?

It is totally up to you and to your child to decide whether or not he/she will take part. If you and your child agreed to participate, we would ask you to keep this information sheet and to sign a consent form. You and your child are free to withdraw from the study at any time without providing any reasons.

What does the study include?

The study includes two phases: Phase 1 which will start in September 2019, and Phase 2 which will start in September 2020. During each phase, two test batteries will be administered: a *Language Assessment Battery* and an *Emergent Literacy Battery Test*. Each battery consists of different short tasks. Your child will be asked to participate in these tasks in order to assess his/her language and literacy skills.

During the testing period, your child will be asked to participate in two 45-minute sessions including short breaks. At the beginning, your child will be asked to participate in a non-verbal test in which he/she will be shown several puzzles and he/she will have to find the right piece to complete it. This task takes 15 minutes.

The Language Assessment Battery includes the tasks listed below. Each task takes 10 – 15 minutes to complete.
Receptive Vocabulary Subtest: The researcher will say a word and the child will point to one of the pictures that corresponds to the given word.

Sentence Repetition Subtest: The researcher will say a sentence and the child will be asked to repeat the sentence verbatim.

Nonword Repetition Subtest: The researcher will say words/digits and the child will be asked to repeat the words/digits verbatim.

Listening Comprehension subtest: The researcher will tell a story and the child will be asked to answer different questions related to the story.

Language Sample: The researcher will ask the child to describe a picture and tell a story.

The Emergent Literacy Battery Test includes the subtests listed below. Each task takes 10 – 15 minutes to complete.

Phonological Awareness Subtest: The researcher will say a word and the child will be asked to count the number of syllables, or phonemes of the word (e.g., how many syllables in the word "car"? Or how many phonemes in the word "bed"?). The child also will be asked to isolate the initial/final phoneme of the words (e.g., What is the first phoneme in the word "bat" or what is the last phoneme in the word "camel"?).

Letter Knowledge Subtest: The researcher will say a letter and the child will point to one of the letters' shapes that corresponds to the letter's name.

Single Word Reading: The researcher will show the child a single three-letters word and the child will read the word loudly.

Where and when will the study take place?

The sessions will take place in a quiet room in the King Saud University clinic during morning time.

Who will be present?

The tasks will be administered by the researcher herself, Ms. Zakiyah Alsiddiqi, who has experience in working with children. She is a certified Speech-Language Pathologist, and has been working with different types of paediatric language impairments in children.

What are the possible benefits of taking part?

The information we get will help us to understand the strength of the relationship between different language skills and emergent literacy skills in Arabic-speaking preschool children. Further, the information will help us understand how language impairments may impact the literacy acquisition in Arabic preschool children. This information is important as it will help speech and language therapists to easily identify children who might be at risk of reading difficulties and will highlight the importance of introducing phonological awareness tasks as part of therapy sessions' goals along with the language therapy goals.

Are there any possible disadvantages and risks?

In general, there are no physical risks. Children will participate in different tasks that include pictures, storytelling, and repetitions skills. The possible risks for children might be getting tired, distressed, or bored. In order to avoid these risks, short breaks will be included during each session. The child will be praised for their efforts and given a lot of encouragement throughout the session. At the beginning of the session the researcher will explain to the child what she is expecting from him/her to do and practice trials will be administered first.

Will my child's confidentiality be protected?

The child's confidentiality will be protected at all times. Each child will be assigned his/her anonymous code to protect his/her personal information. Linking files (i.e., hard copies) will be created to include children's data that will be attached to an anonymous code (i.e., referring to each participant). Those files will be stored securely and kept separately from the online data; thus, it will not be possible to share the child's personal information with any individual. All hard copy data will be stored for 5 years in a locked cabinet and destroyed when no longer needed. The online anonymized data, on the other hand, will include the anonymous code numbers of the participants and will be retained for the actual study, and future research.

What will happen to the results of this study?

The findings of this study will be presented in conferences and written up as part of a Ph.D. thesis and journal articles. Participants will not be identified in any presentations or publications.

The project has been reviewed by the appropriate Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you for considering this study and for taking time to read this information sheet. If you have any further questions/queries, please do not hesitate to contact us.

Prof Vesna Stojanovik – Supervisor
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Language, Language Impairments and Emergent Literacy
Information Sheet for Parents/Guardians of Children with DLD

We would like to invite your child to take part in a research study. Before you decide whether you are happy for your child to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish.

What is the purpose of the study?

The purpose of this study is to find out how language is related to early reading, and how language impairments may impact on the acquisition of reading skills in Arabic-speaking preschool children.

Why has my child been invited?

We have invited your child to take part in this study because he/she is an Arabic-speaking preschool child diagnosed with language impairments.

Does my child have to take part?

It is totally up to you and to your child to decide whether or not he/she will take part. If you and your child agreed to participate, we would ask you to keep this information sheet and to sign a consent form. You and your child are free to withdraw from the study at any time without providing any reasons.

What does the study include?

The study includes two phases: Phase 1 which will start in September 2019, and Phase 2 which will start in September 2020. During each phase, two test batteries will be administered: a *Language Assessment Battery* and an *Emergent Literacy Battery Test*. Each battery consists of different short tasks. Your child will be asked to participate in these tasks in order to assess his/her language and literacy skills.

During the testing period, your child will be asked to participate in two 45-minute sessions including short breaks. At the beginning, your child will be asked to participate in a non-verbal test in which he/she will be shown several puzzles and he/she will have to find the right piece to complete it. This task takes 15 minutes.

The Language Assessment Battery includes the tasks listed below. Each task takes 10 – 15 minutes to complete.
Receptive Vocabulary Subtest: The researcher will say a word and the child will point to one of the pictures that corresponds to the given word.

Sentence Repetition Subtest: The researcher will say a sentence and the child will be asked to repeat the sentence verbatim.

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The Emergent Literacy Battery Test includes the subtests listed below. Each task takes 10 – 15 minutes to complete.

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Letter Knowledge Subtest: The researcher will say a letter and the child will point to one of the letters' shapes that corresponds to the letter's name.

Single Word Reading: The researcher will show the child a single three-letters word and the child will read the word loudly.

Where and when will the study take place?

The sessions will take place in a quiet room in the King Saud University clinic during morning time.

Who will be present?

The tasks will be administered by the researcher herself, Ms. Zakiyah Alsiddiqi, who has experience in working with children. She is a certified Speech-Language Pathologist, and has been working with different types of paediatric language impairments in children.

What are the possible benefits of taking part?

The information we get will help us to understand the strength of the relationship between different language skills and emergent literacy skills in Arabic-speaking preschool children. Further, the information will help us understand how language impairments may impact the literacy acquisition in Arabic preschool children. This information is important as it will

help speech and language therapists to easily identify children who might be at risk of reading difficulties and will highlight the importance of introducing phonological awareness tasks as part of therapy sessions' goals along with the language therapy goals.

Are there any possible disadvantages and risks?

In general, there are no physical risks. Children will participate in different tasks that include pictures, storytelling, and repetitions skills. The possible risks for children might be getting tired, distressed, or bored. In order to avoid these risks, short breaks will be included during each session. The child will be praised for their efforts and given a lot of encouragement throughout the session. At the beginning of the session the researcher will explain to the child what she is expecting from him/her to do and practice trials will be administered first.

Will my child's confidentiality be protected?

The child's confidentiality will be protected at all times. Each child will be assigned his/her anonymous code to protect his/her personal information. Linking files (i.e., hard copies) will be created to include children's data that will be attached to an anonymous code (i.e., referring to each participant). Those files will be stored securely and kept separately from the online data; thus, it will not be possible to share the child's personal information with any individual. All hard copy data will be stored for 5 years in a locked cabinet and destroyed when no longer needed. The online anonymized data, on the other hand, will include the anonymous code numbers of the participants and will be retained for the actual study, and future research.

What will happen to the results of this study?

The findings of this study will be presented in conferences and written up as part of a Ph.D. thesis and journal articles. Participants will not be identified in any presentations or publications.

The project has been reviewed by the appropriate Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you for considering this study and for taking time to read this information sheet. If you have any further questions/queries, please do not hesitate to contact us.

Prof Vesna Stojanovik – Supervisor
Ms. Zakiyah Alsiddiqi – PhD Researcher

<u>Consent Form for Parents/Guardians</u>
Language Impairments and Emergent Literacy

- I agree for my child to participate in this study. I understand that my child's ----------

  ---------- participation in this study is voluntary and that I can withdraw at any time without having to give any reasons.
- I confirm that I have read the information sheet and have been given the opportunity to ask questions about the study. All my questions have been answered to my satisfaction. ☐
- I understand that all personal information will remain confidential to the investigators and arrangements for the storage and eventual disposal of any identifiable material have been made clear to me. ☐
- I will receive an extra copy of this consent from and the information sheet. ☐
- I understand that my child will be tested twice (i.e., September 2019 and September 2020) during the research project, and that I will be contacted by the investigator before the final testing period. ☐

Signature: ----------

Name: ----------

Date: ----------

Parents' Questionnaire

Language, Language Impairments and Emergent Literacy

Participant's name:

Date of birth: Age:

Person completing the form: Relationship to the participant:

Thank you for participating in this study. Please answer the following questions as accurately and carefully as you can. This information is necessary for the validity and reliability of the study.

1. Education level of the parents: indicate the highest level

   - Father: Elementary ☐ , Middle ☐ , High ☐ , Technical School ☐ , College ☐ , Graduate School ☐ .
   - Mother: Elementary ☐ , Middle ☐ , High ☐ , Technical School ☐ , College ☐ , Graduate School ☐ .

2. Vocational History: Please indicate each parent's job:

   - Father: ----------
   - Mother: ----------

3. Average household monthly income:

   ☐ Less than 14,000 ☐ 14,000 – 20,000 ☐ 20,000 – 25, 000 ☐ 25,000 – 30,000

   ☐ More than 30,000.

4. Is there another language spoken at home besides Arabic?

   ☐ No ☐ Yes. Which other language (s)? ----------

5. Was your child born prematurely?

☐ No ☐ Yes. Week of delivery ----------.

6. Is there a family history of medical, genetic, and/or speech and language disorder?

☐ No

☐ Yes. Please provide details below.

---

7. Please write the approximate age when your child accomplished the following skills:

Skill	Age (months/years)
Sat	
Crawled	
Walked	
Spoke 1st word (e.g., mama, nana)	
Combined two words (e.g., mama go)	
Made requests (e.g., give me)	
Followed simple commands (e.g., give me ball)	

8. Does your child have any difficulty understanding you?

☐ No ☐ Yes. Please provide details below.

---

9. Is your child's speech difficult to understand?

☐ No ☐ Yes. Please provide details below.

---

10. Do you find it difficult to understand your child's speech?

☐ No ☐ Yes. Please provide details below.

---

11. Has your child ever had any of these problems?

- Hearing loss: ☐ Yes ☐ No
- Frequent ear infections: ☐ Yes ☐ No
- Seizure: ☐ Yes ☐ No
- Severe head injury: ☐ Yes ☐ No
- Other (specify): ----------

12. Does your child attend any of the following? (Please tick the relevant box)

☐ Kindergarten

☐ Preschool

☐ 1st grade

13. Please name the school or the nursery that your child attends.

---

14. Does your child have any difficulties in school?

☐ No ☐ Yes. Please provide details below.

---

15. Has your child been exposed to books at home?

☐ Yes ☐ No

16. Does he/she show interest in books?

☐ Yes ☐ No

17. How many books does your child have in his/her home-library? (Please tick the relevant box); an average of:

☐ 5 books or less ☐ 5 – 7 books ☐ 7 – 10 books ☐ more than 10 books

18. How often do you read with your child at home?

☐ Regularly ☐ Occasionally ☐ Rarely ☐ Never

19. What does your child have at home? Please choose all that apply.

☐ Letter Books ☐ Picture book ☐ Magnetic alphabet

☐ Crayons ☐ iPad

20. Is there anything else that you think is relevant and you want to share with us about your child?

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دراسة عن اللغة، اضطرابات اللغة وأساسيات القراءة
ورقة معلومات موجهة إلى أولياء الأمور/ المعلمات

السلام عليكم ورحمة الله وبركاته،

نود دعوة طفلكم للمشاركة في دراسة بحثية، وقبل أن تتخذوا قرارا بقبولكم مشاركة طفلكم أو لا، وبسبب أهمية فهم سبب إجراء هذا الدراسة البحثية و ما قد تخرج به، الرجاء التكرم بقراءة المعلومات الواردة في هذه الورقة بعناية.

ما هو الهدف من البحث؟

يهدف البحث إلى دراسة مدى تأثير المهارات اللغوية على تعلم أساسيات القراءة لدى الأطفال، وكيفية تأثير اضطرابات اللغة على نمو وتطور أساسيات القراءة لدى الأطفال السعوديين من عمر ٤ – ٦ سنوات.
من خلال البحث سيتم مقارنة أداء الأطفال ذوي تطور اللغة الطبيعي مع أداء الأطفال المتأخرين لغويا أو ذوي اضطرابات اللغة في تلك المهارات وذلك لتحديد المهارات اللغوية التي لها أثر فعال على تطور أساسيات القراءة.

لماذا تم دعوة طفلي للمشاركة؟

فقد دعونا طفلك للمشاركة لأن هو/هي طفل أو طفلة تتكلم اللغة العربية، في عمر ٤ – ٦ سنوات.

هل يجب لطفلي أن يشارك/تشارك في الدراسة؟

القرار تماما يرجع لك ولطفلك فلكم الحرية التامة في أخذ القرار من دون أي مساءلة، و في حال تمت الموافقة على المشاركة الرجاء الحرص في أخذ ورقة المعلومات بعد قراءتها و توقيع ورقة الموافقة على المشاركة.

ما الذي سوف يحدث في حال شارك/شاركت طفلي في الدراسة؟

سوف يطلب من طفلك المشاركة في مهام وألغاز لغوية قصيرة وقراءة بعض الكلمات على مدار جلستين مدة كل منهما لا تزيد عن ٤٥ دقيقة تتضمن فترات راحة قصيرة. كما أنه سوف يتم اختبار الطفل على فترتين خلال فترة الدراسة، بحيث تكون بداية الفترة الأولى في شهر سبتمبر من عام ٢٠١٩م ، وبداية الفترة الثانية في شهر سبتمبر من عام ٢٠٢٠م، وخلال الفترتين سوف يتم نفس المهام والاختبارات.

تشمل الجلسة الأولى قياس المهارات اللغوية والتي تتضمن اختبارات مختلفة تتراوح مدة كل منها ما بين ١٠ – ١٥ دقيقة، تهدف إلى قياس مدى استيعاب الطفل لمفردات مختلفة وذلك بأن يطلب منه الإشارة الى الصور التي تسميها الباحثة، وقياس مهارات الطفل اللغوية التعبيرية وذلك بأن يطلب من الطفل تكرار بعض الجمل القصيرة، وأن يروى قصة ويعبر عن صور تعرضها الباحثة له، وأن يسمع لقصة قصيرة ترويها الباحثة ومن ثم إجابة أسئلة مختلفة تدور حول القصة، و كذلك يهدف الاختبار الى قياس ذاكرة الطفل اللغوية وذلك بأن يطلب منه تكرار كلمات لا معنى لها.

أما الجلسة الثانية فتشمل قياس مهارات أساسيات القراءة والتي تتضمن اختبارات مختلفة تتراوح مدة كل منها ما بين ١٠ – ١٥ دقيقه، تهدف إلى اختبار الوعي الصوتي لدى الطفل، وذلك بأن يطلب من الطفل تجزئة بعض الكلمات التي تعرض عليه من قبل الباحثة إلى أصوات لغوية، ودمج الأصوات اللغوية الى كلمات، وحذف بعض الأصوات من الكلمات.
بالإضافة أنه سيتم قياس مهارات أساسيات القراءة عن طريق اختبار تعرفه على الأحرف الأبجدية بمختلف أشكالها وقياس

مستوى قراءته لكلمات بسيطة، فسيطلب من الطفل أن يشير الى الحرف أو يسمي الحرف الذي يعرض عليه من قبل الباحثة، وأن يتهجى بعض الكلمات البسيطة.

من الذي سوف يقدم الاختبار ويحضر أثناء إجراء الدراسة؟

سوف تقوم الأستاذة/زكية أحمد الصديقي على إجراء الدراسة وهي أخصائية معتمدة في اضطرابات اللغة والنطق لها خبرة في التعامل مع الأطفال ذوي تأخر واضطرابات اللغة بمختلف الحالات.

هل توجد أي مخاطر نتيجة إجراء الدراسة؟

لا توجد أي مخاطر بدنية تنتج عن إجراء الدراسة، وعادة ما يستمتع الأطفال بالمهام التي تقدم إليهم.

هل سوف تتم حماية أسرار وخصوصية طفلي؟

بالتأكيد، فمن المهم لدينا أن تتم المحافظة على أسرار وخصوصية طفلك، وسوف نحمي كافة المعلومات التي تتعلق به. وسيكون ذلك بأن يعطى لكل طفل رقم معين خاص به وعلى أساسه سوف يتم استحداث ملف يشمل معلومات الطفل والرقم الخاص به من دون الرجوع الى معلوماته الشخصية كاسمه وغيرها.

كيف يمكنني الإحاطة علما بنتائج الاختبار؟

إذا أردت معرفة نتائج الدراسة، فيمكنك على الرحب والسعة الاتصال بنا هاتفيا أو عبر البريد الالكتروني المذكورين في أعلى الصفحة.

من الذي ينظم هذه الدراسة و من يقوم على تمويلها؟

ينظم هذه الدراسة جامعة ريدينج في بريطانيا، ويتم تمويلها من قبل جامعة الملك سعود في المملكة العربية السعودية.

إذا كنت ترغب في أن يشارك طفلك بهذه الدراسة، يرجى التكرم بتعبئة أحد استمارات الموافقة وإعطائها الى مدرسة الصف أو إلى الباحثة. ولكم جزيل الشكر على اهتمامكم بدراستنا وعلى إعطائنا جزء من وقتكم لقراءة ورقة المعلومات.

المشرفة: د. فيسنا ستوجانوفيك
الباحثة: أ. زكية أحمد الصديقي

المشرف: د. فيسنا ستوجانوفيك
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بريد الكتروني: v.stojanovik@reading.ac.uk **مدرسة علم النفس وعلوم اللغة الإكلينيكية**
قسم علوم اللغة الإكلينيكية

الباحث: ب. زكية أحمد الصديقي مبنى هاري بت
هاتف: 07940542840 إيرلي جيت
بريد إلكتروني: z.a.alsiddiqi@pgr.reading.ac.uk ريدينج RG6 6AL

دراسة عن اللغة، اضطرابات اللغة وأساسيات القراءة
ورقة معلومات موجهة إلى أولياء أمور أطفال ذوي اضطراب اللغة النمائي

السلام عليكم ورحمة الله وبركاته،

نود دعوة طفلكم للمشاركة في دراسة بحثية، وقبل أن تتخذوا قرارا بقبولكم مشاركة طفلكم أو لا، وبسبب أهمية فهم أسباب إجراء هذا الدراسة البحثية و ما قد تخرج به، الرجاء التكرم بقراءة المعلومات الواردة في هذه الورقة بعناية.

ما هو الهدف من البحث؟

يهدف البحث إلى دراسة مدى تأثير المهارات اللغوية على تعلم أساسيات القراءة لدى الأطفال، وكيفية تأثير اضطرابات اللغة على نمو وتطور أساسيات القراءة لدى الأطفال السعوديين من عمر ٤ – ٦ سنوات.
من خلال البحث سيتم مقارنة أداء الأطفال ذوي تطور اللغة الطبيعي مع أداء الأطفال المتأخرين لغويا أو ذوي اضطرابات اللغة في تلك المهارات وذلك لتحديد المهارات اللغوية التي لها أثر فعال على تطور أساسيات القراءة.

لماذا تم دعوة طفلي للمشاركة؟

فقد دعونا طفلك للمشاركة لأن هو/هي طفل أو طفلة تتكلم اللغة العربية، في عمر ٤ – ٦ سنوات، و قد شخص/شخصت بتأخر لغة أو اضطرابات لغة.

هل يجب لطفلي أن يشارك/تشارك في الدراسة؟

القرار تماما يرجع لك ولطفلك فلكم الحرية التامة في أخذ القرار من دون أي مساءلة، و في حال تمت الموافقة على المشاركة الرجاء الحرص في أخذ ورقة المعلومات بعد قراءتها و توقيع ورقة الموافقة على المشاركة.

ما الذي سوف يحدث في حال شارك/شاركت طفلي في الدراسة؟

سوف يطلب من طفلك المشاركة في مهام وألغاز لغوية قصيرة وقراءة بعض الكلمات على مدار جلستين مدة كل منهما لا تزيد عن ٤٥ دقيقة تتضمن فترات راحة قصيرة. كما أنه سوف يتم اختبار الطفل على فترتين خلال فترة الدراسة، بحيث تكون بداية الفترة الأولى في شهر سبتمبر من عام ٢٠١٩م ، وبداية الفترة الثانية في شهر سبتمبر من عام ٢٠٢٠م، وخلال الفترتين سوف يتم نفس المهام والاختبارات.

تشمل الجلسة الأولى قياس المهارات اللغوية والتي تتضمن اختبارات مختلفة تتراوح مدة كل منها ما بين ١٠ – ١٥ دقيقة، تهدف إلى قياس مدى استيعاب الطفل لمفردات مختلفة وذلك بأن يطلب منه الإشارة الى الصور التي تسميها الباحثة، وقياس مهارات الطفل اللغوية التعبيرية وذلك بأن يطلب من الطفل تكرار بعض الجمل القصيرة، وأن يروى قصة ويعبر عن صور تعرضها الباحثة له، وأن يسمع لقصة قصيرة ترويها الباحثة ومن ثم إجابة أسئلة مختلفة تدور حول القصة، و كذلك يهدف الاختبار الى قياس ذاكرة الطفل اللغوية وذلك بأن يطلب منه تكرار كلمات لا معنى لها.

أما الجلسة الثانية فتشمل قياس مهارات أساسيات القراءة والتي تتضمن اختبارات مختلفة تتراوح مدة كل منها ما بين ١٠ – ١٥ دقيقه، تهدف إلى اختبار الوعي الصوتي لدى الطفل، وذلك بأن يطلب من الطفل تجزئة بعض الكلمات التي تعرض عليه من قبل الباحثة إلى أصوات لغوية، ودمج الأصوات اللغوية الى كلمات، وحذف بعض الأصوات من الكلمات.

بالإضافة أنه سيتم قياس مهارات أساسيات القراءة عن طريق اختبار تعرفه على الأحرف الأبجدية بمختلف أشكالها وقياس مستوى قراءته لكلمات بسيطة، فسيطلب من الطفل أن يشير الى الحرف أو يسمي الحرف الذي يعرض عليه من قبل الباحثة، وأن يتهجى بعض الكلمات البسيطة.

من الذي سوف يقدم الاختبار ويحضر أثناء إجراء الدراسة؟

سوف تقوم الأستاذة/زكية أحمد الصديقي على إجراء الدراسة وهي أخصائية معتمدة في اضطرابات اللغة والنطق لها خبرة في التعامل مع الأطفال ذوي النمو الطبيعي، وأطفال ذوي تأخر واضطرابات اللغة بمختلف الحالات.

هل توجد أي مخاطر نتيجة إجراء الدراسة؟

لا توجد أي مخاطر بدنية تنتج عن إجراء الدراسة، وعادة ما يستمتع الأطفال بالمهام التي تقدم إليهم.

هل سوف تتم حماية أسرار وخصوصية طفلي؟

بالتأكيد، فمن المهم لدينا أن تتم المحافظة على أسرار وخصوصية طفلك، و سوف نحمي كافة المعلومات التي تتعلق به. وسيكون ذلك بأن يعطى لكل طفل رقم معين خاص به وعلى أساسه سوف يتم استحداث ملف يشمل معلومات الطفل و الرقم الخاص به من دون الرجوع الى معلوماته الشخصية كاسمه وغيرها.

كيف يمكنني الإحاطة علما بنتائج الاختبار؟

إذا أردت معرفة نتائج الدراسة، فيمكنك على الرحب والسعة الاتصال بنا هاتفيا أو عبر البريد الالكتروني المذكورين في أعلى الصفحة.

من الذي ينظم هذه الدراسة و من يقوم على تمويلها؟

ينظم هذه الدراسة جامعة ريدينج في بريطانيا، ويتم تمويلها من قبل جامعة الملك سعود في المملكة العربية السعودية.

إذا كنت ترغب في أن يشارك طفلك بهذه الدراسة، يرجى التكرم بتعبئة أحد استمارات الموافقة وإعطائها الى مدرسة الصف أو إلى الباحثة. ولكم جزيل الشكر على اهتمامكم بدراستنا وعلى إعطائنا جزء من وقتكم لقراءة ورقة المعلومات.

المشرفة: د. فيسنا ستوجانوفيك
الباحثة: أ. زكية أحمد الصديقي

المشرف: د. فيسنا ستوجانوفيك
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بريد الكتروني: v.stojanovik@reading.ac.uk **مدرسة علم النفس وعلوم اللغة الإكلينيكية**
قسم علوم اللغة الإكلينيكية

الباحث: ت. زكية أحمد الصديقي مبنى هاري بت
هاتف: 07940542840 إيرلي جيت
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دراسة عن اللغة، اضطرابات اللغة وأساسيات القراءة
استمارة موافقة لأولياء الأمور

1. أؤكد بأنني قد قرأت ورقة المعلومات التي تشرح الدراسة، وأنني على علم عن أسباب إجراء الدراسة. كما أنه قد تم إتاحة الفرصة لي لطرح أسئلة حول الدراسة وتمت الإجابة عن جميع الأسئلة و التي طرحت بكل تعاون واهتمام. هذا وأوافق على إجراء الترتيبات المبينة على وجه التفصيل في ورقة المعلومات ومشاركة طفلي في هذا المشروع.

2. كما أنني أؤكد تفهمي بأن مشاركة طفلي في هذا المشروع مسألة تطوعية تماما وأن لنا الحق أنا وطفلي في الانسحاب من الدراسة في أي وقت بدون أي مساءلة أو تبرير، وكذلك أؤكد فهمي أن مشاركة طفلي في الدراسة لن يتسبب في أي أثر سلبي على تقديم المحتوى التربوي الذي يتلقاه طفلي أو الذي يمكن أن يتلقاه.

3. هذا إلى جانب أنني أتفهم أن كافة المعلومات الشخصية سوف تظل سرية لدى الباحثة، وقد استوضحت الترتيبات من أجل تخزين أية مادة محددة أو التخلص منها في النهاية.

4. أوافق على أنه سوف يختبر طفلي على فترتان خلال فترة الدراسة وذلك في الأوقات التالية: بداية الفترة الأولى في شهر سبتمبر من عام ٢٠١٩م ، وبداية الفترة الثانية في شهر سبتمبر من عام ٢٠٢٠م.

5. سوف يتم تسليمي نسخة إضافية من استمارة الموافقة بعد توقيعها بالإضافة الى ورقة المعلومات.

6. أوافق على مشاركة طفلي في هذه الدراسة.

اسم الطفل: ----------	تاريخ الميلاد: ----------	التوقيع: ----------
اسم الشخص المحرر الموافقة: ----------	التاريخ: ----------	التوقيع: ----------
اسم الباحثة: ----------	التاريخ: ----------	التوقيع: ----------

المشرف: د. فيسنا ستوجانوفيك
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قسم علوم اللغة الإكلينيكية

الباحث: ث. زكية أحمد الصديقي مبنى هاري بت
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دراسة عن اللغة، اضطرابات اللغة وأساسيات القراءة
استبيان أولياء الأمور

اسم الطفل: ----------

تاريخ الميلاد: ---------- العمر: ----------

اسم الشخص الذي قام بتعبئة الاستبيان: ----------

صلة القرابة مع الطفل: ----------

نشكر لكم موافقتكم لمشاركة طفلكم في هذه الدراسة. فضلا قراءة الأسئلة أدناه والإجابة عليها بوضوح ودقة. المعلومات التي تفيدنا بها مطلوبة لصحة هذا البحث.

1. الدرجة العلمية لولي الأمر: الرجاء تحديد أعلى مستوى علمي وصلتم إليه

الأب: ☐ الابتدائية ☐ المتوسطة ☐ الثانوية ☐ دبلوم ☐ بكالوريوس ☐ دراسات عليا

الأم: ☐ الابتدائية ☐ المتوسطة ☐ الثانوية ☐ دبلوم ☐ بكالوريوس ☐ دراسات عليا

2. وظيفة ولي الأمر:

الأب: ----------

الأم: ----------

3. معدل دخل الأسرة الشهري:

☐ أقل من ١٤٠٠٠ ☐ ١٤٠٠٠ _ ٢٠٠٠٠ ☐ ٢٠٠٠٠ _ ٢٥٠٠٠

☐ ٢٥٠٠٠ _ ٣٠٠٠٠ ☐ أكثر من ٣٠٠٠٠

4. هل هناك أي لغة إضافية تحكى في المنزل غير العربية؟

☐ لا

☐ نعم. ماهي تلك اللغة/اللغات؟ ----------

5. هل كان طفلك خديج؟

☐ لا ☐ نعم. ولد طفلي في الأسبوع ----------

6. هل هناك أي تاريخ مرضي، وراثي، أو اضطرابات لغوية في العائلة؟

☐ لا

☐ نعم. الرجاء تحديد المشكلة وتفصيلها أدناه.

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7. الرجاء تحديد عمر طفلك عند اكتسابه للمهارات التالية:

القدرات	العمر (السنة/الشهر)
الجلوس من دون مساعدة	
الحبي	
المشي	
نطق كلماته الأولية (مثل: ماما، نانا)	
نطق جملة من كلمتين (مثل: ماما راح)	
الطلب، كأن يقول: "هاتي"	
تنفيذ الأوامر البسيطة (مثل: هات الكورة)	

8. هل لدى طفلك أي صعوبات في الفهم والاستيعاب أثناء تواصلك معه؟

☐ لا

☐ نعم. الرجاء تحديد المشكلة وتفصيلها أدناه.

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9. هل لدى طفلك أي صعوبات في النطق؟

☐ لا

☐ نعم. الرجاء تحديد المشكلة وتفصيلها أدناه.

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10. هل تواجه صعوبة في فهم كلام طفلك؟

☐ لا

☐ نعم. الرجاء تحديد المشكلة وتفصيلها أدناه.

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11. هل عانى طفلك من أي مشكلة من المشكلات التالية:

- ضعف السمع ☐نعم ☐ لا
- تكرار التهابات الأذن ☐ نعم ☐ لا
- تشنجات ☐ نعم ☐ لا
- إصابات في الرأس ☐نعم ☐ لا
- أخرى، الرجاء التحديد: ----------

12. في أي مرحلة دراسية طفلك الآن:

☐ حضانة

☐ روضة/تمهيدي

☐ الصف الأول

13. اسم الحضانة أو المدرسة التي يذهب إليها طفلك:

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14. هل يواجه طفلك أي صعوبات المدرسة؟

☐ لا

☐ نعم. الرجاء تحديد المشكلة وتفصيلها أدناه.

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15. هل تعرض طفلك للقصص والكتب في المنزل؟

☐ نعم ☐ لا

16. هل يبين طفلك حبه وشغفه للكتب والقصص؟

☐ نعم ☐ لا

17. كم مجموع عدد كتب وقصص طفلك في المنزل؟ (تقريبيا)

☐ ٥ كتب أو أقل ☐ ٥ – ٧ كتب ☐ ٧ – ١٠ كتب ☐ أكثر من ١٠ كتب

18. كم عادة تقرأ لطفلك كتابا/قصة في المنزل؟

☐ باستمرار ☐ أحيانا ☐ نادرا ☐ أبدا

19. ما الذي يمتلكه طفلك في المنزل؟ الرجاء تحديد كل ما يمتلكه.

☐ كتاب للأحرف ☐ كتاب صور ☐ أحرف مغناطيسيه ☐ ألوان ☐ ايباد.

20. هل لديك أي معلومات أخرى تخص طفلك تود أن تضيفها؟

Appendix B: Pilot Study

One pilot study was conducted to check the feasibility of the adapted measures, evaluate the appropriateness of the materials and stimuli, and establish an appropriate and functional procedure to elicit responses from young children. The study also provided preliminary data on children's performance on all adapted and newly developed measures: Arabic language battery and Arabic emergent literacy battery.

A total of ten children were recruited through family and friends' connections. Parents of children who were in the interest age range (i.e., 4; 0 – 6;11 years old) were sent the study's information sheets, parental and child consent forms, and demographic questionnaires including parental education level, parental occupation, family income, and development history (see Appendix A). All parents of potential participants were asked to sign the consent forms, fill demographic and developmental history questionnaires if they accepted the request to participate. All participants were typically developing, monolingual Arabic speaking children. Their age ranged from 4;0 to 6;00 years old. Three children were 4 years old (i.e., 4 – 4;9), four children were 5 years old (i.e., 5;7 – 5;9) and the final three children were 6 years old. All participants were required to complete the general cognitive ability and VSTM tests, the Arabic language battery, and the Arabic emergent literacy battery.

Overall, the pilot study showed that children needed two sessions to complete all administered tasks. Yet, the number of sessions may vary depending on their age and motivation. Since most children (4 – 5 years old) were only exposed to the spoken Arabic (SpA) dialect, the author decided to administer all tasks with SpA. This will help in controlling for the diglossia influence on emergent literacy tasks. Overall, observation of children's performance indicated that instructions were clear, and all tasks were culturally and aged appropriate.

Appendix C: Developmental Trajectories assessing emergent literacy skills and increasing CA in TD and DLD groups with participants' labels

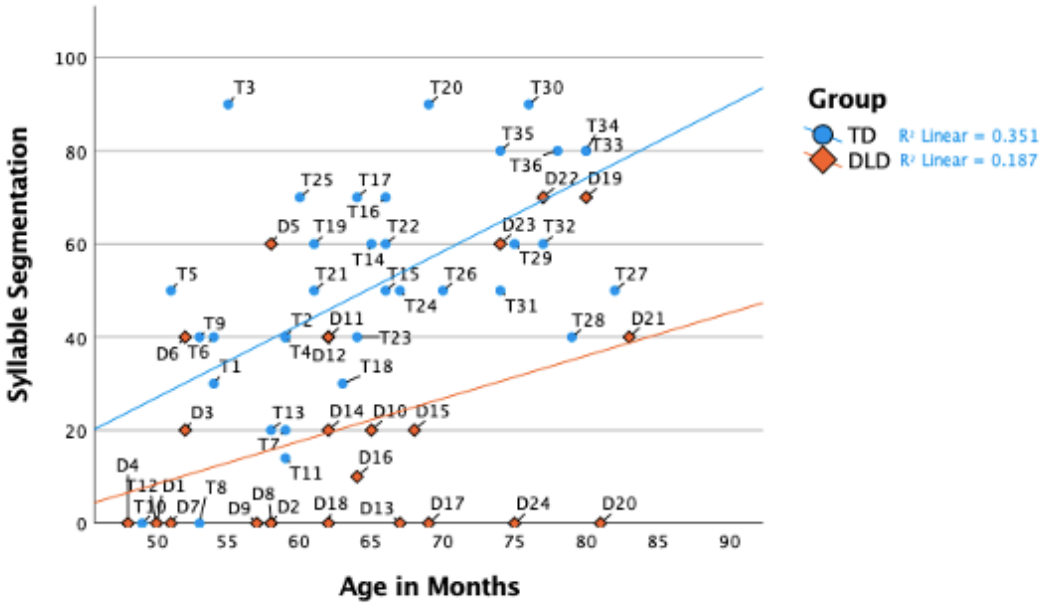

Figure 1. *Syllable segmentation performance and chronological age in TD children and children with DLD.*

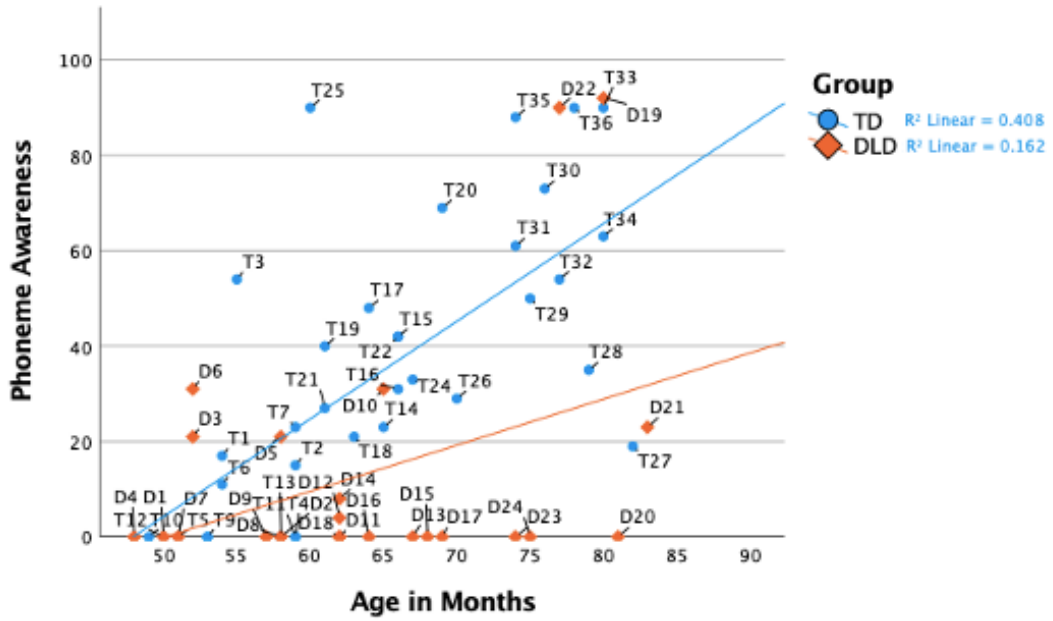

Figure 2. Phoneme Awareness performance and chronological age in TD children and children with DLD.

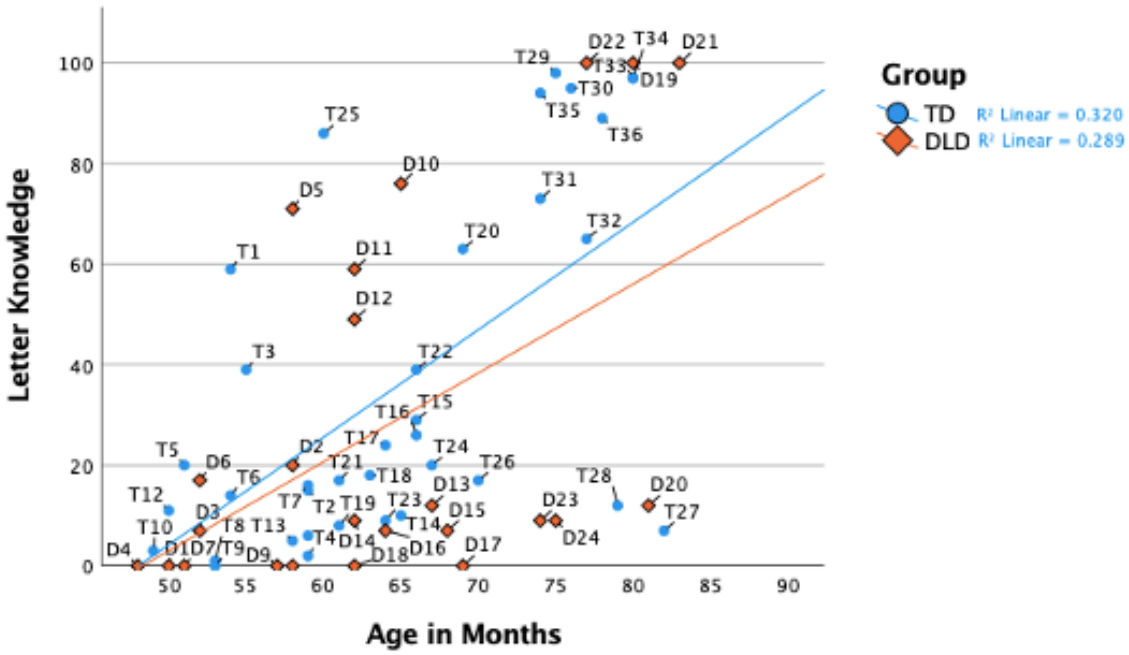

Figure 3. *Letter Knowledge performance and chronological age in TD children and children with DLD.*

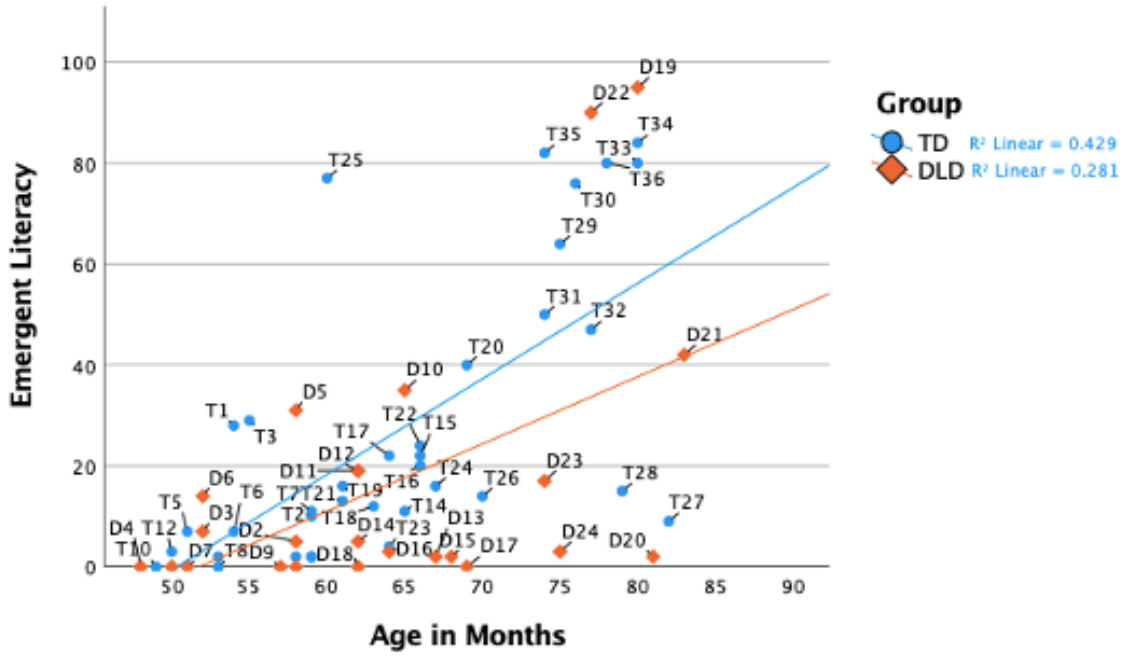

Figure 4. Emergent literacy performance and chronological age in TD children and children with DLD.

Appendix D: Items of the Arabic Picture Vocabulary Test

No.	IPA	Words	No.	IPA	Word
1	jiʃrab	drink-Present-3MS	45	faras elbaħr	seahorse
2	baibi:	baby	46	batˀi:χ	watermelon
3	baqarah	cow	47	d͡ʒoaz elhind	coconut
4	ʕain	eye	48	jisˀʕad	Climb-Present-3MS
5	jirkaðˀ	run-Present-3MS	49	hudhud	hoopoe
6	bait	house	50	tifħasˀ	examine-Present-3FS
7	tigraʔ	read-Present-3FS	51	qamħ	wheat
8	saikal	bicycle	52	titˀlaʕ	go out-Present-3FS
9	basˀ	bus	53	la:ma:	llama
10	bissah	cat	54	ʃuwajiah	little
11	wardah	flower	55	tˀawu:s	peacock
12	da:ʔirah	circle	56	jiħa:sib	Process payment-Present-3MS
13	muknisah	broom	57	ħamiðˀ	sour
14	ħima:r	donkey	58	buryi:	screw
15	sˀabu:n	soap	59	jifattiʃ	Inspect-Present-3MS
16	ħaʃi:ʃ	grass	60	jiga:bil	Interview-Present-3MS
17	χaʃabi:	wooden	61	qalʕah	castle
18	sˀufairah	whistle	62	ħank	chin
19	ʃamʕah	candle	63	towbi:χ	scold
20	tiħfar	dig-Present-3FS	64	χanzi:r barri	wild boar
21	tˀabl	drum	65	χaznah	safe
22	ʔisˀbaʕ	finger	66	muhaðab	polite
23	θuʕba:n	snake	67	jisbaħ	Swim-Present-3MS
24	tiʃig	tear-Present-3FS	68	tˀabi:b	doctor
25	jinitˀ	jump-Present-3MS	69	muntafiχ	inflated
26	ragabah	nick	70	masˀnaʕ	factory
27	sˀilsˀa:l	playdough	71	tiliscop	telescope
28	maki:nah χijatˀah	sewing machine	72	mithadim	demolished
29	ʕuʃ	nest	73	jaltahim	devour
30	dainasˀoar	dinosaur	74	Faχu:r	proud
31	mala:bis	clothes	75	fitˀr	mushroom
32	muftaris	wild	76	baiða:wi	oval
33	ðail	tail	77	tasˀa:dum	crash
34	muʃawik	spiky	78	kaʕb	ankle
35	ħalazoan	snail	79	jiʃawih	Distort-Present-3MS
36	jigi:s	measure-Present-3MS	80	tibu:s	kiss-Present-3FS
37	tiʃu:f	watch-Present-3FS	81	mumariðah	nurse
38	jirfas	kick-Present-3MS	82	ʔaħfa:d	grandchildren
39	mitfa:d͡ʒʔah	surprised-F	83	burd͡ʒ	tower
40	ħu:t	whale	84	gita:r	guitar
41	sˀaja:d	hunter	85	taʕba:nah	tired-F
42	kanɣar	kangaroo	86	ðabʕ	hyena
43	tiqtˀaf	Pick-Present-3FS	87	ʃa:ħinah	truck
44	χaja:li:	fictional	88	taʕawun	cooperation

Table continued overleaf

No.	IPA	Words	No.	IPA	Word[1]
89	mka͡ʃir	frown			
90	sra:d͡ʒ	lantern			
91	jaʕwi:	howl-Present-3MS			
92	ħma:r waħʃi:	zebra			
93	qimah	peak			
94	d͡ʒarra:ħ	surgeon			
95	fasʔu:lja:	beans			
96	rasɣ	wrist			

[1] Shaalan, S. (2010). *Investigating Grammatical Complexity in Gulf Arabic Speaking Children with Specific Language Impairment (SLI)*. [Doctoral Dissertation, University College London UCL]. UCL discovery https://discovery.ucl.ac.uk/id/eprint/20472

Appendix E: Items of the Arabic Expressive Vocabulary Test-2

No.	IPA	Word	No.	IPA	word
1	tufa:ħ	apple	45	misma:r	nail
2	ta:kil	Eat-Present-3FS	46	nimr	tiger
3	χija:r	cucumber	47	fa:ðʔi:	empty
4	Ku:rah	ball	48	ʔalwa:n	colours
5	bantʔaloan	pants	49	tʔabba:χ	chef
6	da:ʔirah	circle	50	mustaʃa	hospital
7	Kabi:rah	big	51	sʔabu:n	soap
8	jad	hand	52	ʃa:ħinah	truck
9	ʕasʔfu:r	bird	53	matʔar	rain
10	ʃurtʔi:	policeman	54	taʕba:n	Sick-M
11	madrasah	school	55	jisʔ:ħ	Cry-Present-3MS
12	mufta:ħ	key	56	d͡ʒida:r	wall
13	moaz	banana	57	θald͡ʒ	ice
14	jiʃrab	Drink-Present-3MS	58	na:jim	Sleep-
15	tʔamatʔim	tomato	59	maksu:r	broken
16	ba:lonah	balloon	60	χa:tim	ring
17	ʃantʔah	purse	61	ħajawanat	animals
18	muθallaθ	triangle	62	θigi:l	heavy
19	ħa:r	hot	63	furn	oven
20	ʔuðun	ear	64	safi:nah	ship
21	d͡ʒamal	camel	65	jitʔi:ħ	Fall-Present-3MS
22	tʔabi:bah	Doctor-F	66	muʕajan	diamond
23	ɣurfah	room	67	jisbaħ	Swim-Present-3MS
24	magasʔ	scissors	68	qasʔi:r	short
25	tamr	dates	69	muʕasʔbah	angry
26	jitħammam	Shower-Present-3MS	70	dʔufadaʕ	frog
27	χas	lettuce	71	tiʃim	Smell-Present-3FS
28	kita:b	book	72	helikobtar	helicopter
29	qami:s	blouse	73	ʃa:l	scarf
30	murabbaʕ	square	74	ɣassa:lah	Washing machine
31	ħazi:n	Sad-M	75	duχa:n	smoke
32	ragabah	nick	76	kafar	wheel
33	gird	monkey	77	fawakah	fruits
34	muʕallim	teacher	78	ħaʃara:t	insects
35	barr	Desert	79	tasgi:	Water-Present-3FS
36	ʔibrah	needle	80	hila:l	crescent
37	ʔala:b	toys	81	dʔadi:dah	new
38	χoaχ	peach	82	ku:ʕ	elbow
39	tinitʔ	Jump-Present-3FS	83	jisʔi:d	Catch-Present-3MS
40	basʔal	onion	84	tiʃu:f	Watch-Present-3FS
41	murd͡ʒaiħah	swing	85	tχajitʔ	Stitch-Present-3FS
42	kaikah	cake			
43	qitʔa:r	train			
44	kanab	sofa			

Appendix F: Items of the Arabic Sentence Imitation Test

No.	Sentences
1	ʃa:f mħammad ʔiχwanah fi almadarsah Mohammed saw his brothers in school
2	ħatˀat elbint daftarha ʕala etˀawlah The girl put her notebook on the table
3	ilwalad lawwan rasmat ʔaχu:h eld͡ʒadi:dah The boy coloured his brother's new drawing
4	hiya sabaħat maʕa χa:lha esˀaɣi:r She swam with her little uncle
5	muʕallimat elʕulum tiʃraħ eldars litˀa:liba:t The science teacher is explaining the lesson to the students
6	jiʃu:t najif elku:ra bisurʕa lisˀidi:gah Naif quickly kicks the ball to his friend
7	taʕi:ʃ ezarafa fi: hathi elɣa:bah elχaðˀrah The giraffe lives in this green forest
8	Howa jiħib jiʃrab elħali:b bil farawla He likes to drink strawberry milk
9	Rama elkalb ku:rti: bilmasbaħ The dog threw my ball in the pool
10	ʔumi: ħatˀat ʃantˀatha ʕala elkanab My mum put her purse on the sofa
11	Hu akal ħalawta o ʃarab elʕasˀi:r He ate his candy and drank the juice
12	ilbis:ah ramat ku:rtak filmasbaħ The cat threw your ball in the pool
13	ilgird ħatˀ ʃantˀitak fog elʃad͡ʒarah The monkey put your bag on the tree
14	ʔaiʃ atˀa:lib katab ʕala esab:u:rah What did the student write on the board?
15	ʔaiʃ ʔumhum tˀabχatluhum ams What did their mum cook for them, yesterday?
16	Mi:n etˀa:lib elli ʕaqabah elmuʕallim Who is the student who was punished by the teacher?
17	Mi:n ʔiχtik kallamat min sˀaħba:tha Who did your sister call from her friends?
18	ʔaj fusta:n libsat elbint gabl ʔusbu:ʕ Which dress did the girl wear a week ago?
19	ʔaj ku:rah ʔaχað elmudarrib maʕah linna:di: Which ball did the coach take with him to the club
20	eʃurtˀi: ma gidar jimsik elħara:mi: The policeman could not catch the thief
21	Ma ħallat etˀa:libah wad͡ʒib erijaðˀija:t The student did not do the math homework
22	ʔana ʃift χams tˀaja:ra:t titˀi:r fog I saw five planes flying above
23	sabħat elbatˀa:t esˀaɣi:ra:t filbuħaijrah The little ducks swam in the lake

Table continued overleaf

No.	Sentences
24	ʕala etˀawlah sitah kutub kabi:rah On the table are six big books
25	ilʔasad ʃa:f esˀajadi:n jisˀidu:n fi elɣa:bah The lion saw the hunters hunting in the forest
26	Sabaħu: esabaħi:n fi elmasbaħ The swimmers swam in the pool
27	Kil elʔaqla:m mowd͡ʒu:dah fi elka:s All the pens are in the cup
28	ilkaikah ellaði:ðah enwaklat bilʔams The delicious cake was eaten yesterday
29	enʕatˀa etˀaa:lib eʃa:tˀir ʃaha:da tafawiq The excellent student was awarded certificate of excellence
30	ilba:b ilwalad elkabi:r sakkarah The door, the big boy has closed it.
31	iltuffa:ħa iði:b eld͡ʒu:ʕa:n akalha The apple, the hungry wolf has eaten it.
32	ild͡ʒad ga:l elfi:l illi ʔakal ilmoazah The grandfather said that the elephant ate the banana
33	ʃift ilbint ilkibi:rah illi d͡ʒat mitʔaχir I saw the big girl who came late
34	laħag ilwalad ilkalb illi ilbissah ʕaðˀitah The boy chased the dog that was bitten by the cat
35	tisa:big Nu:rah ʔaχu:ha illi rama ilku:rah Nora is racing her brother who threw the ball
36	mama fakkarat inna χa:lid na:m badri My mother thought that Khalid has slept early.
37	ilʔarnab fakkar inna ilʔasad ma ħajisˀidah The rabbit thought that the lion will not catch him

Appendix G: Items of Arabic Emergent Literacy Battery

Table 1. *List of Words Used in the Syllable Segmentation Task*

Stimuli No.	Word	Syllables	No. of Syllables
1.	/dunja:/ **world**	/dun-ja:/	2
2.	/ʔisˁbaʕ/ **finger**	/ʔisˁ-baʕ/	2
3.	/muʕallim/ **teacher**	/mu-ʕa-llim/	3
4.	/bai:t/ **house**	/bai:t/	1
5.	/muknisah/ **broom**	/muk-ni-sah/	3
6.	/ilmaktabah/ **library**	/il-mak-ta-bah/	4
7.	/ilkahrabaʔi:/ **electrician**	/il-kah-ra-ba-ʔi:/	5
8.	/bu:q/ **trumpet**	/bu:q/	1
9.	/d͡ʒa:ðibij:ah/ **gravity**	/d͡ʒa:-ði-bi-j:ah/	4
10.	/ilmaħkamah/ **court**	/il-maħ-ka-mah/	5

Table 2. *List of Words Used in the Phoneme Isolation Tasks*

Stimuli No.	IPI Words	phoneme	FPI Words	phoneme
1.	/wardah/ **flower**	/w/	/ħali:b/ **milk**	/b/
2.	/ja:smi:n/ **jasmine**	/j/	/galam/ **pen**	/m/
3.	/lambah/ **lamp**	/l/	/maʕd͡ʒu:n/ **toothpaste**	/n/
4.	/nimr/ **tiger**	/n/	/sˁilsˁa:l/ **dough**	/l/
5.	/kursi:/ **chair**	/k/	/samak/ **fish**	/k/
6.	/ʕain/ **eye**	/ʕ/	/saj:a:ra:t/ **cars**	/t/
7.	/quf:a:z/ **gloves**	/q/	/mufta:ħ/ **key**	/ħ/
8.	/ʃam ʕah/ **candle**	/ʃ/	/ku:sa:/ **courgette**	/a:/
9.	/χija:r/ **cucumber**	/χ/	/θald͡ʒ/ **ice**	/d͡ʒ/
10.	/ħala:wah/ **candy**	/ħ/	/sama:ʔ/ **sky**	/ʔ/
11.	/ɣurfah/ **room**	/ɣ/	/tamr/ **date**	/r/
12.	/ðˁifr/ **nail**	/ðˁ/	/χubz/ **bread**	/z/

Note. IPI = initial phoneme isolation, FPI = final phoneme isolation.

Table 3. *List of Words Used in the Phoneme Deletion Tasks*

Stimuli No.	IPD Words	CV	Response	FPD Words	CV	Response
1.	/ku:b/ **cup**	CVC	/u:b/	/bint/ **girl**	CVCC	/bin/
2.	/ħsˤa:n/ **horse**	CCVC	/sˤa:n/	/ti:n/ **fig**	CVC	/ti:/
3.	/masa:r/ **path**	CVCVC	/asa:r/	/baʕi:d/ **far**	CVCVC	/baʕi:/
4.	/da:r/ **house**	CVC	/a:r/	/ʕalam/ **flag**	CVCVC	/ʕala/
5.	/mo:z/ **banana**	CVC	/o:z/	/dars/ **lesson**	CVCC	/dar/
6.	/ʃma:ɣ/ **scarf**	CCVC	/ma:ɣ/	/bait/ **house**	CVC	/bai/
7.	/qitˤa:r/ **train**	CVCVC	/itˤa:r/	/χafi:f/ **light**	CVCVC	/χafi:/
8.	/kta:b/ **book**	CCVC	/ta:b/	/ʃams/ **sun**	CVCC	/ʃam/
9.	/ʃa:l/ **scarf**	CVC	/a:l/	/d͡ʒa:b/ **brought**	CVC	/d͡ʒa:/
10.	/saħa:b/ **cloud**	CVCVC	/aħa:b/	/ʃarab/ **drink**	CVCVC	/ʃara/
11.	/θija:b/ **clothes**	CVCVC	/ija:b/	/tˤard/ **package**	CVCC	/tˤar/
12.	/tra:b/ **sand**	CCVC	/ra:b/	/ju:m/ **day**	CVC	/ju:/

Note. IPD = initial phoneme deletion, FPD = final phoneme deletion, CV = consonant vowel structure.

Table 4. *List of Words Used in the Decoding Task*

Stimuli No.	Word
1.	/ʕalam/ **flag**
2.	/ʃams/ **sun**
3.	/baħar/ **sea**
4.	/galam/ **pen**
5.	/zarʕ/ **plant**
6.	/nahar/ **river**
7.	/kurah/ **ball**
8.	/qamar/ **moon**
9.	/d͡ʒazar/ **carrot**
10.	/fi:l/ **elephant**
11.	/ʔasad/ **lion**
12.	/χubz/ **bread**
13.	/d͡ʒamal/ **camel**
14.	/faʔr/ **mouse**
15.	/na:m/ **slept**
16.	/samak/ **fish**
17.	/matˤar/ **rain**
18.	/ħu:t/ **whale**
19.	/ʔuðun/ **ear**
20.	/ʃaʕar/ **hair**

Appendix H: Items in the Nonword Repetition Test 2

Stimuli No.	Items	Syllables/Clusters
1.	/Kad.lus/	2/ MCL
2.	/Ka.da.fal/	3/ 0CL
3.	/Su.ki.dafs/	3/ FCL
4.	/Sa.tul/	2/ 0CL
5.	/Da.falb/	2/ FCL
6.	/Das.tul/	2/ MCL
7.	/Da.kmus/	2/ MCL
8.	/Sad.lu.naf/	3/ MCL
9.	/Sa.tulb/	2/ FCL
10.	/Suk.dif/	2/ MCL
11.	/Suk.bi.daf/	3/ MCL
12.	/Du.ki.masd/	3/ FCL
13.	/Ka.musd/	2/ FCL
14.	/Ka.du.las/	3/0CL
15.	/Ka.da.falb/	3/ FCL
16.	/Duk.li.mas/	3/ MCL
17.	/Ku.dif/	2/ 0CL
18.	/Sa.du.naf/	3/ 0CL
19.	/Da.lus/	2/ 0CL
20.	/Ku.si.ban/	3/ 0CL
21.	/Sad.nuf/	2/ MCL
22.	/Das.tulb/	2/ FCL
23.	/Da.sum.talb/	3/ FCL
24.	/Su.ki.daf/	3/ 0CL
25.	/Kad.mu.las/	3/ MCL
26.	/Sa.bun/	2/ 0CL
27.	/Kad.ba.fal/	3/ MCL
28.	/Sa.bunf/	2/ FCL
29.	/Ku.si.banf/	3/ FCL
30.	/Da.nuf/	2/ 0CL

Note. MCL = medial cluster, FCL = final cluster, 0CL = no cluster.

[2] Shaalan, S. (2010). *Investigating Grammatical Complexity in Gulf Arabic Speaking Children with Specific Language Impairment (SLI)*. [Doctoral Dissertation, University College London UCL]. UCL discovery https://discovery.ucl.ac.uk/id/eprint/20472