# THE MORPHOLOGICAL COMPLEXITY OF L1 ARABIC-SPEAKING CHILDREN

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#### Abstract

Spelling poses a challenge to Arabic-speaking learners due to the complexity of the morphological and orthographic system in Arabic. Arabic morphology has been argued to play a critical role in spelling since its morphological operations are built on a system consisting of a root that is interlocking into different patterns of vowels to form different categories of words. In addition, Arabic orthography is considered to be loyal to the morphographic principle (Ravid, 2012), where morphemes correspond to graphic representation regardless of the pronunciation, especially in the non-vowelized texts.

This study made a detailed classification of spelling errors in a word dictation task, based on morphological structures, undertaken by 107 Typically-developing learners (TD) and learners with learning disabilities (LD) attending the same schools. All participants ranged in age from 7 years, 3 months to 15 years, 2 months (grades 2 to 8). The spelling task was made up of 400 common words representing all morphological forms in different conjugations and grammatical classes. The results indicated that learners made three types of errors: errors with respect to the root, errors with respect to the word pattern, and errors with respect to both the root and the word pattern. The results also showed that TD and LD learners follow a similar pattern of complexity even though the LD group produced more errors than the TD group. The results revealed that MA and PA exhibited significant positive regression (b= 9.398, 16.106 respectively) with spelling, indicating that learners with higher scores in PA and MA have higher scores in spelling.

The results argued for the crucial contribution that morphological awareness makes towards the general spelling abilities among learners and provide additional evidence for the nonlinear growth of morphological knowedge in spelling. In addition, spelling errors suggested that the spelling process goes in a hierarchical way where words can be accessed and processed either according to the root or according to the stem. Intact verbs are processed according to their root and word pattern. Some weak verb forms, whose radicals undergo modifications, are processed according to their stem, while those whose radicals are fully represented in the spoken word, are processed according to their root and word patterns. Therefore, roots or stems are firstly accessed and attached to basic word patterns (the grapheme without diacritics and affixes). Thereafter, prefixes

and, then, suffixes are attached to the word pattern and, finally, diacritics are accessed and attached to the word pattern.

### Dedication

إلى والدي ووالدتي حفظهما الله والبسهما ثياب الصّحة والعافية....

إلى زوجتي العزيزة.....

إلى حبيب الله, عبادة, بيلسان, كندة, و كنان.....

إلى كل من وقف الى جانبي في هذه الرّحلة الطويلة...... مع أطيب أمنيات الحب والسعادة

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#### Abbreviations

ADJ	Adjective
AP	Active participle
ASV	Active voice strong/intact verbs
AWV	Active voice/ weak verbs
AUV	Augmented verbs
AVRTV	Active voice regular triliteral intact verb
AVRQV	Active voice regular quadriliteral intact verb
AVTDV	Active voice triliteral-doubled verb root
AVQDV	Active voice quadriliteral-doubled verb
AVIHV	Active voice initially-hamzated verb
AVMHV	Active voice medially-hamzated verb
AVFHV	Active voice finally-hamzated verb
AVVWIR	Active voice/ verbs with a weak initial radical
AVHV	Active voice hollow verb
AVDWV	Active voice defective with waw verb
AVDYV	Active voice defective with yaa? Verb
AVSDWV	Active voice seperated doubly-weak verb
AVADWV	Active voice adjacent doubly-weak verb
BPP	Broken plural of paucity
BPM	Broken Plural of multitude
DER	Derivations
DIM	Diminutive
EN	Elative noun
FOE	Form of exaggeration
GI	Gerunds/ verbal nouns of instance
GM	Gerunds/ verbal nouns with initial miim
GNTR	Gerund/ verbal nouns of non-triliteral root

GS	Gerunds/ verbal nouns of state
IN	Instrumental noun
LD	Learners with learning disabilities
MA	Morphological awareness
MSA	Modern Standard Arabic
NOUN	Nouns
NPT	Nouns of place and time
РА	Phonological awareness
РР	The passive participle
PSV	Passive voice strong/ intact verbs
PVADWV	Passive voice adjacent doubly-weak verb
PVDWV	Passive voice defective with waw verb
PVDWYV	Passive voice defective with yaa? Verb
PVFHV	Passive voice finally-hamzated verb
PVHV	Passive voice hollow verb
PVIHV	Passive voice initially-hamzated verb
PVMHV	Passive voice medially-hamzated verb
PVRTIV	Passive voice regular triliteral intact verb
PVRQIV	Psssive voice regular quadriliteral intact verb
PVSDWV	Passive voice seperated doubly-weak verb
PVVWIR	Passive voice verbs with a weak initial radical
PWV	Passive voice/ weak verb
RA	Relative adjective
SFPN	The sound feminine plural noun
SMPN	The sound masculine plural noun
TA1	Triliteral augmented by one letter
TA2	Triliteral augmented by two letters
TD	Typically-developing learners

TRG	Triliteral root verbal nouns/ Gerunds
VN	Verbal nouns/ Gerunds

#### **Chapter One**

#### Introduction

#### **1.0 Introduction**

The development of skills in reading and writing in any language requires, on the part of the learner, some knowledge of the sound system of the language concerned (phonological knowledge), knowledge of the writing conventions (orthographic knowledge), and knowledge of how words are formed in the language (morphological knowledge). Skills in reading and writing inevitably entail familiarity with the spelling conventions of a language. The accepted view among scholars (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985; Bahr et al., 2012) is that young learners require a combination of phonological, orthographic, and morphological knowledge to successfully acquire spelling skills.

Spelling is a complex developmental skill that involves "encoding linguistic forms into written forms. The linguistic units- phonological strings, morphemes, and words- are provided by the spoken language" (Perfetti, 1997, p. 22). Therefore, acquiring spelling is considered to be a challenging process for learners as it relies on learners' knowledge of phonological, orthographic, and morphological structures that develop in coordination with other cognitive and psycholinguistic abilities. In the last few decades, a growing body of literature has investigated the contribution of phonological, orthographic, and morphological knowledge to spelling along different acquisition timelines and highlighted the importance of this knowledge even though it may vary on the timeline of mastering (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985; Bahr et al., 2012). The role of sound-based processes or phonological knowledge has received much attention among scholars exploring essential components of the spelling system across languages (see, for example, Stanovich, 1988 and Goswami, 2000). The role of morphology and other components, on the other hand, has not received as much attention.

Overall, studies investigating the role of morphological knowledge in spelling proposed that morphological knowledge, the implicit knowledge of morphology, contributes significantly to spelling development and spelling accuracy (e.g., Treiman and Cassar, 1996; Carlisle, 1988; Deacon and Bryant, 2006). The explicit morphological knowledge reflected in morphological awareness tasks has been found to correlate significantly with spelling competency and other literacy skills (e.g., Schiff and Raveh, 2007; Apel and Lawrence, 2011; Nagy et al., 2003). Although there is theoretical support for the contribution of phonology to reading and spelling abilities in the very early years (e.g., Berninger et al., 2010), morphological knowledge was found to have more influence on the literacy acquisition beyond the early years and mainly in the upper elementary years of schooling (eg., Tyler and Nagy, 1989; Nagy, et al., 2006).

#### 1.1 Background of the study

Spelling is recognized as an important part of a literacy program and plays a crucial role in helping learners to succeed and get through schooling years. Therefore, mastering this skill improves learners' abilities in reading and writing while failure in acquiring spelling skills, on the other hand, can limit learners' productivity in reading and writing and affect their general academic achievement.

Overall, there is no agreement on the best way to teach spelling for young learners. Some spelling strategies adapted the phonemic approach (e.g., Treiman, Cassar, and Zukowski, 1994) where the focus was on understanding the relationship between the letters and their corresponding sounds in order to perform spelling successfully. This approach works well with regular words, i.e., words that are spelled the way they are pronounced, while words that are spelled differently from their pronunciation like 'yacht' pose a difficulty with this approach. The whole-word approach, which is mainly used in teaching spelling in Arabic, is another one and relies on memorizing word spellings and ignoring their phonological and morphological structures. In this approach, learners are given lists of words to practice without clear instructions on how to learn them. Another approach is the morphemic approach which depends on teaching morphographs, the smallest meaningful unit in writing, such as prefixes, suffixes, roots, etc., and teaching principles and rules that are followed in combining morphographs to spell words properly. For example, the word *uncovered* comprises of the prefix *un*, the base *cover*, and the suffix *ed*. Using morphographs in teaching spelling, the morphemic approach has many benefits in comparison with other

approaches. In English, Simonsen and Gunter (2001, p. 101) indicated that "teaching students to spell morphographs and teaching the rules for combining morphographs will allow students to spell a far larger set of words accurately than by teaching individual words through rote memorization of weekly spelling lists". This approach may work well with Arabic language since morphographic units (roots and word patterns) are the main components in Arabic words and can capture the internal structure of Arabic words such as vocalization and affixes.

Some studies on spelling (e.g., Bryant, Nunes, & Bindman, 1999; Henry, 1993; Moats, 1998; Snowling, 2000) postulated that teaching morphemic patterns of the language as a strategy in teaching spelling can significantly improve reading and spelling among learners due to the important role of morphological units in accessing orthographic forms during spelling (Bryant et al., 1999). In the morphemic approach, learners are taught to focus on the morphographs, which usually have the same spelling in different words, and the rules used in combining a variety of morhographs such as prefixes, suffixes, roots and patterns that can be applied to hundreds of words.

Arabic morphology has been argued to play a critical role in spelling due to the uniqueness of the morphological and the orthographic systems in Arabic (e.g., Saiegh-Haddad, 2013; Asadi et al., 2016). Arabic morphology "exhibits rigorous and elegant logic" (Ryding, 2005, p. 45) since its morphological operations, unlike English and other Indo-European languages, depend mainly on discontinuous morphemes. It comprises, mainly, of a system consisting of a root that is interlocking into different patterns of vowels to form different categories of words.

Traditionally, the study of Arabic morphology focuses on two essential issues: how words are formed (derivational morphology) and how they relate to syntax (inflectional morphology) such as markings for gender, number, case, tense, etc. (Ryding, 2005). Roots are abstract entities that convey the semantic information in the Arabic word, and often are of triliteral or quadriliteral consonants, i.e., comprises of three or four consonants. In addition, word patterns are "a fixed phonological/prosodic template that specifies the surface phonological structure and the morphosyntactic properties of the resultant lexical item" (Saiegh-Haddad, 2013, 171). They are constructed of short vowels built onto roots; short vowels are interleaved between the root consonants to produce different word entities (grammatical functions) and, at the same time, do

not disrupt the orthographic order of the consonantal root. Thus, the consonantal root and the word pattern cannot be used in isolation; they need to be combined in order to construct a real word.

Arab grammarians, traditionally, used the root فعل [fS1] - a basic meaning of 'to do' - to represent the three consonants of the Arabic root as a generic one to exemplify the root and word patterns. So, in derived words,  $\stackrel{\perp}{=}/f/$  represents the first letter of the root,  $\stackrel{\perp}{=}/f/^1$  represents the second letter, and  $\stackrel{\perp}{\downarrow}/l/$  is the last letter of the root. For example the root  $\stackrel{\perp}{=}$  [ktb] 'to write' is represented by the root [fS1]. /k/ is represented by /f/, /t/ is represented by /S/, and /b/ is represented by /l/. Thus, to derive the active participle of the root [ktb], we need to know the word pattern of the active participle which is [faaSil] and, therefore, we replace [fS1] with the consonants of the root [ktb] and keep the long and short vowels /aa/ and /i/. Thus, the derived output word is [kaatib] 'writer' which conforms to the word pattern [faaSil].

A word pattern, therefore, is thought to consist of at least two morphemes, a root and a pattern. For example, the word pattern فاعل [faaSil] 'doer', which indicates the active participle, comprises of the root [fSI] 'notion of doing' and the pattern 'aa-i'. The Arabic roots, commonly, consist of three or four consonants while the pattern usually consists of vowels (Alrajehi, 1973; Ryding, 2005). For example, the root consonant ش ر ب [f-r-b] indicates something related to drinking. Table 1.1 displays some word patterns and words related to this root.

 $<sup>1/</sup>S/(\xi)$  is a voiced pharyngeal fricative. It is a typical Arabic consonant and does not exist in English or other languages.

Word pattern	Surface word	Meaning
[faʕila] فَعِلَ	[ʃariba] شَرِبَ	Drink+perfective
CaCiCa		
[yafʕalu] يَفعَلُ	[yaʃrabu] يَشْرَبُ	Drink+imperfective
yaCCaCu		
[?ifʕal] إفعَلْ	[ʔiʃrab] إشرَبْ	Drink+imperative
?iCCaC		
[faaʕil] فاعِلْ	[ʃaarib] شارِبْ	Drinker
CaaCiC		
[fuʕila] فُعِلَ	[juriba]] شُرِبَ	Was drunk
CuCiCa		
[fuʕl] فُعْلْ	[∫urb] شُرْبْ	Drinking
CuCC		
[mafSuul] مَفعول	[maʃruub] مَشروب	A drink
maCCuuC		

Table 1.1: Words constructed from the same consonantal root ∫-r-b

As noted in table 1.1, Arabic nouns, derivations and verbs are constructed from the roots by attaching them to the proper word pattern to generate a stem and, thereafter, attaching prefixes and suffixes. For example, the Arabic stem شَرِبَ [ʃariba] 'he drank' is constructed from the root morpheme {ſrb} 'notion of drinking' and the pattern morpheme 'a-i-a'. The two morphemes are arranged according to the word pattern j فَعِلَ [faSila] /CaCiCa/ (consonant-vowel sequence). Thus, شَرِبَ [ʃariba] 'he drank' conforms to the word pattern [faSila].

Therefore, in order to derive or inflect words from the root {*f*-r-b}, vowels are interleaved with the predetermined word pattern. The order of the root consonants follows the word pattern and

depends on how vowels are intertwining with the root. Prefixes, suffixes, and infixes can be added to word patterns to reflect different grammatical classes.

A morphological form, which represents a specific morphological category such as verbs, nouns, verbal nouns/ gerunds, etc., can have different word patterns or varieties, especially in nouns and derivations. For example, the morphological form for a triliteral root verbal noun can have several word patterns such as shown in Table 1.2:

No.	Word pattern		Example	Gloss		
1	[faʕal] فَعَل	CaCaC	taʕab تَعَبْ	Tiredness		
2	[faʕl] فَعْل	CaCC	fath فَتْح	Opening		
3	[fuʕaal] فُعَال	CuCaaC	SuSaal سُعَال	Coughing		
4	[fuʕuul] فُعُول	CuCuuC	quduum قُدُومْ	Incoming		
5	[fisaalah] فِعَالَة	CiCaaCah	filahah فِلاحة	Ploughing		
6	[fuʕlah] فُعْلَة	CuCCah	humrah حُمْرَة	Redness		

Table 1.2: Word patterns for the morphological form of triliteral root verbal noun/ gerund

	Word Pattern							
	[mafʕala] مَفْعَلَة	[faaSil] فاعِل	[faʕala] فَعَلَ	[fuSila] فُعِلَ				
Root	maCCaCa <sup>2</sup>	CaaCiC	CaCaCa	CuCiCa				
کتب	مَكْتَبة	کاتِب	كَتَبَ	ڬؙؾؚڹؘ				
ktb	[Maktaba]	[Kaatib]	[Kataba]	[Kutiba]				
'to write'	ʻa library'	'a writer'	'he wrote'	'was written'				
درس	مَدرَسة	دارِس	دَرَسَ	دُ <b>ر</b> ِ سَ				
drs	[madrasa]	[daaris]	[darasa]	[Durisa]				
'to study'	ʻa school'	'a student'	'he studied'	'was studied'				

<sup>&</sup>lt;sup>2</sup> Consonant- vowel sequences and affixes correspond to the pattern

Table 1.4: The most common word patterns of triliteral (1-10) and quadriliteral verbal forms (11-14) in Arabic

No.	Word pattern	Semantic information	Example and gloss
1	fasala] <sup>3</sup> فَعَلَ	Active	[xaraja] خرج
	CaCaCa		to leave
2	[faʕʕala] فعّل	Causative, intensive	جرّ ج [xarraja]
	CaCCaCa		to make somebody go out
3	[faaʕala] فاعَل	Reciprocal/ causative	[aaraka] شارك
	CaaCaCa		to participate
4	[?afʕala] أفعل	Causative/ factitive,	[axraja] أخرج
	<u><b>?a</b></u> CCaCa		to expel
	Prefix: ?a		
5	[tafaʕʕala] تفعّل	Reflexive and intensive	[taxarraja] تخرّ ج
	<u>ta</u> CaCCaCa		to graduate
	Prefix: ta		
6	[tafaaSala] تفاعل	Reflexive/ reciprocal	[tanafasa] تَنافسَ
	<u>ta</u> CaaCaCa		to compete with
	Prefix: ta		
7	[PinfaSala] انفَعَلَ	Intransitive, reflexive or	[?inkasara] انگسترَ
	<u><b>?in</b></u> CaCaCa	passive	was broken
	Prefix: [ ن- ] n (i: is a		
	prosthetic vowel <sup>4</sup>		
8	[PiftaSala] افتَعَلَ	Reflexive, voice/ reciprocal	[?jtamaʕa] اجتمع
	<u><b>?i</b>Cta</u> CaCa		agreed on, met
	Prefix [ ! ] ?i		
	Infix: [ـــــّــ] t(a)		

 $<sup>^{3}</sup>$  فعَل (faSala) is the base form in Arabic. It can be developed by adding consonants, prolongation of vowels, prefixation or infixation to construct other verbal forms.

<sup>&</sup>lt;sup>4</sup> The prosthetic vowel is omitted in the imperfect tense.

Table 1.4 (continued): The most common word patterns of triliteral (1-10) and quadriliteral verbal forms (11-14) in Arabic

9	[?ifSalla] افعلّ	Intensive, usually used with	[?ihmarra] احمرّ						
	?iCCaCCa	colours and defects	became red						
	?i- prosthetic								
10	[?istafSala] استفعل	Reflexive, request	[?istabSada] استبعد						
	?i <u>st</u> aCCaCa	something	exempted						
	Prefix: st								
	?i: prosthetic								
	Common quadriliteral verbal forms								
11	[tafaʕlala] تَفَعْلُلَ	Reflexive	[tafalsafa] تَفَلَّسَفَ						
	taCaCCaCa		talked philosophically						
12	[faʕlala] فَعْلَلَ	Accusative and intensive	[baʕƏara] بَعْثَرَ						
	CvCCaCa		scattered						
13	[?ifSanlala] افْعَنْلَلَ	Reflexive/ voice	[?ifrankasa] افْرَنْقَعَ						
	?iCCanCvCv		went away						
14	[?ifSalalla] إفْعَلَلّ	Intensive intransitive verb	[?iqshaʕarra] اِڤْشَعَرّ						
	?iCCaCaCCa		To shiver, shudder						

Grammatical relations between words in Arabic sentences are controlled by the full use of case marking (Watson, 2002). Case is considered one of the most challenging categories in Arabic because it "depends on rules of syntax for its implementation, and second, in many ways it is redundant" (Ryding, 2005, p. 166). Arabic has three cases: nominative (لرفع) rafif), accusative (برفع nasb), and genitive (جر) jarr). Arabic verbs exhibit six grammatical categories (tense/aspect, person, voice, mood, gender, number) as demonstrated in Table 1.5.

Table 1.5: Some conjugations of the regular triliteral intact verb الصحيح السالم الثلاثي for the consonantal root: ktb 'to write' in singular and plural forms:

	Plural			Singular		
Imperative	Imperfect	Perfect Imperative		Imperfect	Perfect	Person
	نَكْتُبُ	كَتَبْنَا		أكْتُبُ	كَتَبْتُ	
-	[Naktubu]	[Katabnaa]	-	[?aktubu]	[Katabtu]	1 <sup>st</sup> Masc./Fem.
	We are writing	We wrote		I am writing	I wrote	
أَكْتُبْنَ	تَكْتُبْنَ	ػؘؾؘڹ۠ؿؘؗ	أكْتُبِي	ؾؘػ۠ؿؙؠؚڽڹؘ	كَتَبْتِ	
[?uktubna]	[Taktubna]	[Katabtuna]	[?ukubi]	[Taktubiina]	[Katabti]	2 <sup>nd</sup> Fem.
Write	You are writing	You wrote	Write	You are writing	You wrote	

Verb conjugations in the previous table demonstrate orthographic regularity for the words constructed from the same consonantal root since they are captured by predetermined word patterns. Case endings are usually represented in writing Arabic words except in the case taking the form of short vowels which are optional. Case endings may occur as prefixes, suffixes, infixes or all of these in the same pattern. The presence or the absence of these graphemes carry the inflectional marker for person, gender, and number. For example, the prefix ?a- in (?aktubu] 'I am (masc./fem.) writing', and na- in (itakic) [naktubu] 'we are (masc./fem.) writing' carry the inflectional marker for person, number, and gender. The prefix ya- (Yaktubu] 'He is writing' carries information about the third person. If the verb has the prefix ta-(Taktubu] 'she is writing', this prefix indicates singular, third person feminine or singular second person masculine. Therefore, adding the suffixes -tu and -na to the past tense verb and the prefixes ?a- and na- to the present tense verb refers to the first person and indicates no gender distinction. Graphemes for gender distinction are only used in verbs that refer to second or third person. Therefore, adding or removing an affix or a combination of both the prefix and the suffix indicates different grammatical information about person, number, gender, tense/aspect, voice, and mood.

In addition, nouns and adjectives exhibit four categories (gender, number, case, definiteness) as shown in Table 1.6, while pronouns exhibit four categories (person, gender, number and – to a limited extent – case) (Ryding, 2005).

Table 1.6: Nominal case markings

Noun: مُعلم muSalim (a teacher):

	Nominative Accusative				Genitive			
No ender	Indefinite	Definite	Indefinite	Definite	Indefinite	Definite		
Ŭ								
Singular F. M.	[muʕalimun] مُعلمّ [muʕalimatun] مُعلِمةٌ	[Al-muSalimu] المعلِمُ [Al- [muSalimatu] المعلمة	[muSaliman] مُطِماً [muSalimatan] مُعلمةً	[A]- muSalima المُعلَمَ [A]- muSalimata المُعلِمةً	[muSalimin] معلم [muSalimatin] مُعَلِمةٍ	[Al-muSalimi المُعَلِم [Al- muSalimati] المُعَلِّمَةِ		
Dual F. M.	[muSalimaani] معلمان [muSalimataani ] معلمتان	[Al- muSalimaani] المُعلمان Al- [muSalimataani ] المُعلمتان	[muSalimaini] مُعلِمَيْن [muSalimataini] معلمتَيْنِ	[Al- muSalimaini المُعلمين [Al- muSalimatain i المعلمتين	[muSalimaini] مُعلميْن [muSalimataini] معلمتَيْنِ	[Al- muSalimaini] المُعَلمين [Al- muSalimataini ] المعلمتين		
Plural F. M.	[muʕalimuuna] مُعلِمونَ [muʕalimaatun] مُعَلِماتٌ	[Al-muSalim- uuna] المُعلمونَ [Al- muSalimaatu] المُطِماتُ	[muSalimiina] معلمینَ [muSalimaatin] معلماتِ	[A]- muSalimiina المُعلمينَ [A]- muSalimaati المعلماتِ	[muSalimiina] مُعلمينَ [muSalimaatin] مُعلِماتِ	[Al- muSalimiina] المعلمينَ [Al- muSalimaati] المعلماتِ		

In Arabic, nouns have three cases: nominative, accusative and genitive. Orthographically, these three cases are expressed by changing the vowel that occurs after the final consonant such as in [Al-muSalimu] 'a teacher' in the nominative case. In the accusative case, the final consonant is followed by the vowel /a/ المُعَلِمَ [Al-muSalima] and followed by /i/ [Al-muSalimi] in the genitive case.

In addition, nouns in Arabic have three forms: singular, dual and plural. Dual and plural forms are indicated by adding affixes. The dual form of a noun is made by adding the inflectional suffixes -

aan in the nominative case (e.g., [Al-muʕalimaan] المُعلمان), and -ain in the accusative and genitive cases such as in [Al- muʕalimain] . The dual form of feminine nouns is made by applying the previous rule such that [muʕalimatun] مُعلِمةٌ (teacher-Sg.Fem-Nom.) becomes [muʕalimataan] معلمتان in the nominative case or [muʕalimatain] معلمتان

The sound plural form of the masculine noun is written by adding the suffix -uun to the singular form to refer to the nominative case (e.g., [muSalimuun] (مُعلمونَ) and the suffix -iin to refer to the accusative or genitive cases (e.g., [muSalimiin]). On the other hand, the suffix -aat is added in the place of the case suffix of the singular feminine noun (e.g., -tun (the nominative suffix, -tan (the accusative suffix), and -tin (the genitive suffix). For example, the sound feminine plural of [muSalimatun] مُعلِماتٌ (a teacher-Sg. Fem-Nom) is [muSalimaatun] مُعلِماتٌ in the nominative case and [muSalimaatin] in the genitive and accusative cases.

Syntactically, an Arabic sentence tolerates using both verb-subject-object (VSO) and subject-verbobject (SVO) word orders depending on which is more important, the doer (subject) or the action (verb). Full agreement is only achieved in the SVO word order while VSO word order exhibits a partial agreement as shown in examples (a) and (b).

(a.) VSO word order	(b.) SVO word order
أَكُلَ الأَوَلَادُ التَّفَاحَ	الأوَلَادُ أَكْلُوا التَّفَاحَ
?akala ?al?awlaadu ?attuffaħa	?al?awlaadu ?akaluu ?attuffaħa
Ate.3SG. MASC the-boys-NOM the apples-ACC	The-boys- NOM ate.3PL.MASC the apples-ACC
'the boys ate the apples'	'the boys ate the apples'

As a result, some Arab grammarians (e.g., Benmamoun, 2000) claim that SVO word order is the basic order in Arabic. The existence of the SVO and VSO orders encourage Arab grammarians to divide Arabic sentence into "nominal and verbal sentences: a sentence is verbal if the subject does not precede the verb, regardless of the linear position of other elements in the sentence; whereas a sentence is nominal if the subject precedes the verb". (Mohammad, 2000, p. 50). Accordingly, SVO word order is used to form nominal sentences while VSO order is used to produce verbal sentences.

Phonologically, the standard Arabic phonological system has twenty-eight (28) consonant phonemes and six vowel phonemes (see Table 1.7); three long vowels ( $\xi$ ,  $\xi$ ,  $\xi$ ) aa, uu, ii) and three short vowels that are represented by diacritical marks placed above or under the letter as shown in Table 1.8.

Table 1.7: Modern Standard Arabic consonants	(adapted from	Holes, 2004	and Ryding 2005)
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	Manner of Articulation														
			Plosive		Nasal		Fricative		Affricate		Approximant		Trill	Clide	Olluc
	Labial		b	Ļ	m	م								w	و
	Labiodental						f	ف							
	Interdental	Plain					ө ð	ٹ ذ							
on		Emphatic					ð٢	ظ							
ticulati	Alveolar	Plain	t d	ت د	n	ن	s Z	س ز					ر r		
ice Of Ar		Emphatic	$t^{\varsigma}$ $d^{\varsigma}$	ط ض			sç	ص							
Pla	Alveo-palatal						ſ	ش	dz	ج					
	Palatal										1	J		j	ي
	Velar		k	ك			x Y	÷ ع							
	Uvular		q	ق											
	Pharyngeal						ћ ና	ट १							
	Glottal		3	ç			h	٥							

	Front		Central	Back	
High	i/ ii	ي/ ـِ		u/ uu	و / <u>-</u> ُ
Mid					
Low	a/ aa	<u>-</u> / ١			

Table 1.8: Modern Standard Arabic vowels

Some Arabic consonants have no equivalents in English and even in other languages as demonstrated in Table 1.9. However, most Arabic consonants are fairly similar to their counterparts in English as shown in Table 1.10.

Table 1.9: Typical Arabic consonants that have no equivalents in English and even in other languages (Adapted from Schultz et al., 2000, and Awde & Samano, 1999)

Place of articulation	Arabic form	IPA	Pronunciation guide
Pharyngeals	ح	ħ	Like [h] produced with friction
	٤	ç	Like [a] articulated in the pharynx with friction
Uvular fricatives	ż	γ	Like Parisian [r] in renaissance
	Ċ	x	[ch] in loch (Scottish English)
Emphatic consonants	ص	sç	Like [s] with emphasis
	ض	ds	Like [d] with emphasis
	ط	ts	Like [t] with emphasis
	벽	ð <sup>ç</sup>	Like voiced [th] pronounced with emphasis
uvular stop	ق	q	Like [k] pronounced with emphasis

No	Arabic form	Name of the letter	Transliteration	Pronunciation guide
Con	sonants			
1	\$	Hamza	I	['a] in arm, ['i] in inn, ['oo] in ooze
2	ب	Baa'	В	[b] in big
3	ت	Taa'	Т	[t] in tea
4	ث	Thaa'	Th	[th] in three
5	٣	Jiim	J	[g] in gentle
6	Ż	khaa'	Kh	[ch] in loch (Scottish English)
7	د	Daal	D	[d] in door
8	ذ	Dhaal	dh	[th] in then
9	ر	Raa'	R	[r] in Scottish English, room
10	j	Zaay	Ζ	[z] in zero
11	س	Siin	S	[s] in sun
12	ش	Shiin	Sh	[s] in sure
13	ف	Faa'	F	[f] in fog
14	يى	Kaaf	K	[k] in key
15	J	Laam	L	[1] in long
16	م	Miim	М	[m] in monkey
17	ن	Nuun	N	[n] in noon
18	٥	Haa'	Н	[h] in hot
Lon	g Vowels			
19	و	Waaw	w, uu	[oo] in school, [w] in weld
20	ي	Yaa'	y, ii	[ee] in deer, [y] in yell
21	1	Alif	Aa	[a] in far

Table 1.10: Arabic consonants and long vowels that have equivalents in English (adapted from Schultz et al., 2000, and Awde & Samano, 1999)<sup>5</sup>

 $<sup>^5</sup>$  Some English sounds do not exist in Arabic such as /o/, /p/, /v/, /1/, /3/, /g/, and /ŋ/.

Orthographically, Arabic orthography is considered as loyal to the morphographic principle (Ravid, 2012) where morphemes correspond to graphic representation regardless of the pronunciation. Therefore, the morpho-orthographic structure of the written Arabic words is expected to play an important role in spelling development and spelling competency.

Arabic is read and written from right to left and uses an alphabetic writing system consisting of twenty-eight (28) consonant letters and three long vowels represented by the letters Alif ' +' which represents 'aa' sound (e.g. نَمْلُ اللهُ عَنْ اللهُ مُللهُ اللهُ مُللهُ اللهُ الل

Arabic is often written without diacritics, which represent short vowels, especially in the modern Arabic press and fiction as shown in (1). Therefore, skilled and adult readers are expected to read texts without short vowels and need to use contextual clues or morphological structures in order to fill in the missing vowels to pronounce words correctly while a vowelized version or fully diacritized version, as shown in (2), is commonly used in children's and schools' books, religious and some literary materials. (1): An example of a non-vowelized text:

إن المشكلة الأساسية التي نواجهها اليوم عند قراءة أي نص مكتوب باللغة العربية أو القيام بترجمته هي غياب الحركات التي تلعب دورا هاما ليس فقط في القراءة الصحيحة لكلمة أو عبارة، وإنما لترجمتها أيضا.

'The main problem that we face nowadays when reading any Arabic text or translating it is the absence of diacritics that play an important role not just in the accurate reading but also in translating it'.

(2): An example of a vowelized text:

إِنَّ الْمُسْكِلَةَ الأَسَاسِيَّةَ أَلَّتِي نُوَاجِهُهَا البَوْمَ عِنْدَ قِرَاءَةِ أَيِّ نَصٍّ مَكْتُوبٍ بِاللُّغَةِ العَرَبِيَّةِ أَوْ الْقِيَامُ بِتَرْجَمَتِهِ هِيَ غِيَابُ الحَرَكَاتِ الَّتِي تَلْعَبُ دَوْرًا هَامًا لَيْسَ فَقَطْ فِي القِرَاءَةِ الصَّحِيحَةِ لِكَلِمَةٍ أَوْ عِبَارَةٍ، وَإِنَّمَا لِتَرْجَمَتِهَا أَيْضًا.

As a result, Arabic is considered to have a shallow orthography (one-to-one correspondence between graphemes and phonemes) when diacritics are used, and a deep orthography when diacritics are absent. For example, كَتَبَ [kataba] 'he wrote', and 'لفينَ' [kutiba] 'was written' are two words that have different meanings although they have the same grapheme representation when they are written without short vowels.

In Jordan, children are first exposed to Modern Standard Arabic (MSA) upon beginning first grade where it is the language of school instruction. In the early years of schooling, children use books with fully vowelized orthography including both letters and diacritics. They are taught to read and write words with short vowels. In advanced grades, the use of diacritics is reduced. In general, Arabic writing uses short vowels in children's and schools' books, religious texts and poetry while newspapers, books, magazines lack short vowels. Therefore, Arabic orthography poses another challenge to spelling since surface orthography seldom represents short vowels and that increases the ambiguity of the written text.

Arabic has unique orthographic features. For example, each Arabic letter has a basic shape and varies according to the position in the word because letters are not written in an independent form

(3):

ن	/n/
ŀ	/b/
Ľ	/t/
Ċ	/0/

Therefore, the orthographic features of the written Arabic add more difficulties to learning spelling specially by young learners since they may affect the timing and processing of retrieving the orthographic features (Eviatar & Ibrahim, 2000; Taha, 2013).

Despite the important role of morphological structures in Arabic spelling (e.g., Azzam, 1993; Abu-Rabia and Taha, 2004), much of the Arabic literature on spelling ignores the morphological dimensions and pays particular attention to analyzing and categorizing spelling errors among learners in a way that reflects the potential models of the spelling process, and mainly the phonetic/non-phonetic approach. This approach worked as a theoretical background for diagnosing and analyzing spelling errors (e.g., Caramazza, 1988; Rapcsak, et al. 2007; Hanna, et al. 1966). It also highlighted the learning of phoneme-grapheme correspondences while the critical role of the morphological structure in spelling has not been considered as an important factor. As a result, spelling errors were, mainly, classed into phonetic and phonological errors and, consequently, most of the results of Arabic studies indicated that phonetic errors were the predominant errors among Arab learners (e.g., Abu-Rabia and Taha, 2004 and 2006; Abu-Rabia and Sammour, 2013). In addition, previous work has been limited to investigating spelling components in various combinations (e.g., Silliman et al., 2006; Bahr et al., 2012) but little research exists concerning the role of morphology in spelling, independent of phonology and orthography. Spelling performance in Arabic has received more attention in the context of reading

and oral language development (e.g., Omar, 1973; Mohammad, 2005; Abu-Rabia and Taha, 2004; Abu-Rabia, 2007), while there are not comparable studies on spelling competency in the context of writing. Furthermore, many studies have devoted vast attention to the investigation of noun pluralization in Arabic dialects (e.g., Aljenaie, 2001; Daana, 2009; Moawad, 2006) while little attention has been given to other morphological forms such as verbs and derivations.

Another challenge to learning spelling in Arabic and one which necessitates using morphological structures in teaching spelling is the fact that Arabic speakers are familiar with two forms of Arabic: the literary Arabic (Modern Standard Arabic) and Arabic local dialects that exist in almost every country. MSA (written and oral forms) acts as a universal form of language that is used and understood in formal communication, and in media such as radio, TV, books and newspapers. It is also used and taught in universities and schools at all stages of education. Spoken dialects, on the other hand, are just used in daily life communication. Therefore, Arabic is considered a diglossic language that indicates the presence of two or more varieties of the language, spoken and written (Coulmas, 1996).

Maamouri (1998) has shown that MSA and local dialects exhibit some general phonological, syntactic, and lexical differences such as:

1- MSA is a highly inflectional language with case endings for number, gender and tense while local dialects are likely to ignore most of the inflections and case endings.

2- MSA follows a VSO (verb-subject-object) word order while the dialects tend to follow a SVO (subject-verb-object) word order.

3- Short vowels are heavily used in the inflectional system of MSA while local dialects tend to ignore these vocalic representations in most cases.

4- Morphologically, MSA has morphological distinctions of number (singular, dual, and plural) and gender (masculine and feminine) while most local dialects are prone to avoid using the dual form of words and some other forms such as the feminine plural in some dialects such as the Tunisian Arabic.
5- Local dialects may exhibit more complex vocalic structure than the MSA such as having two additional vowels (/e / and /o/).

In the last three decades, an increasing number of studies (e.g., Carlisle, 1987; Tsesmeli & Seymour, 2006) have investigated the spelling development of children with atypical spelling development. These studies postulated that children with learning disabilities (LD) have difficulty in learning morphological rules, especially with regards to written tasks involving inflectional and derivational morphology when compared to younger typically developing (TD) children matched on reading and spelling age.

Students with LD have in general an average or above average intelligence (Hallahan and Kauffman, 2000; Whitaker, 2004); therefore, learning disabilities are considered as hidden disabilities. Many learners with LD experience difficulties in spelling, reading, and writing. The growing number of LD students in schools worldwide - for example, 15% of the US population (LD online, 2013)- highlights the importance of analyzing their spelling errors in order to reveal underlying deficits in spelling and provide valuable information about cognitive mechanisms, instructional practices and strategies that would most likely prevent and remediate spelling problems.

Cross-linguistic research studies investigating spelling development among LD learners have argued that these children tend to follow a delay pattern, which indicates a delay in spelling development, rather than a qualitative deviance in spelling performance, e.g., Abu-Rabia and Taha (2004) for Arabic, Jiménez et al. (2008) for Spanish, and Protopapas et al. (2013) for Greek. A delay pattern indicates that LD learners follow a similar pattern of complexity even though they may make more errors than TD learners.

In Jordan and since 1987, the Ministry of Education has adopted policies and guidelines for implementing and developing inclusive education for students with LD in mainstream schools (Ministry of Education, 2017). The regular classrooms are commonly comprised of both TD and LD students. LD students can benefit from special support services provided by teachers specialized in LD (Alkhateeb, 2007). To achieve inclusive education for learners with LD in

regular classrooms, 826 resource rooms - "A placement between the regular classroom and the special self-contained class; a setting that students enter for specific periods of time on regularly scheduled basis" (Bataineh, Dababneh and Baniabdelrahman, 2010, p. 32)- were launched in different mainstream schools all over Jordan in 2012 (Ministry of Education, 2017). These rooms were intended to support LD students to meet their developmental and educational requirements in regular classrooms. For this reason, it seems very important to investigate spelling error patterns of both LD and TD students in order to better understand the spelling development and strategies that are used by language learners (Steffler, 2001; Nunes et al., 1997), so that appropriate classroom instruction and strategies in teaching spelling for both groups could be developed.

### 1.2 Statement of the problem

In Jordan and many other Arab countries, learners usually start formal learning of spelling in the first grade (around 6 years old) and it is taught as a part of Arabic language class where two books are used (reading and grammar) to teach reading, grammar, spelling and writing. Spelling instruction depends, mainly, on memorizing and repetition of the spelling of words (Abu-Hamour, 2013) which was found to be an inefficient strategy for learning words due to the fact that spelling requires some linguistic abilities such as morphological knowledge (Berninger and Wolf, 2009).

Alhaddad (2014, p. 211) described the traditional way used in teaching writing and spelling in Jordanian schools by saying that "teachers draw a word on the blackboard and ask the pupils to pronounce the word. Then they ask them to copy the letters of the word down in their copybooks, which the pupils do many times on the page."

Studies investigating the efficiency of literacy instruction in Jordan have raised a concern about the challenges facing learners in reading, writing and spelling in Jordanian schools (Ministry of Education, 2009). Writing (including spelling) was found to be more problematic for learners in Jordan. Alhaddad (2014, p. 209) indicated that writing is "the skill that most students are least proficient in" and concluded that "the way in which writing is taught is believed to be a main factor for that" (p. 209) and therefore, "writing instruction in Jordanian classrooms should be much more effective" (p. 210)

In 2013, The Jordanian Minister of Education, Mohammad Thneibat, rang the alarm bell by announcing that 22% (around 100,000) of students in the first three elementary grades could not read (Jaber 2014) and, logically, that means they encounter a big difficulty in spelling and writing. Similarly, many reports indicated that even graduate students in Jordan have difficulties in spelling where academic and educational specialists attributed it to failure in the educational system and instruction in the elementary stages (e.g., Tomar, 2017). In order to improve learners' skills in reading, spelling, and writing, the Ministry of Education in Jordan has allocated a large proportion of the classroom time in grades one through four to teach reading and writing Arabic (Alhaddad, 2014).

Some Arab scholars (e.g., Jaber, 1989; Shehta, 1986; AL Shalaan, 2007; Alhaddad, 2014) have attempted to attribute spelling difficulties among young learners to different factors such as ineffective teaching methods and classroom instruction, high load of curriculum requirements, and teachers' and students' attitude toward the learning process and other factors related to the learner himself such as visual and auditory skills. It is conspicuous that these studies have given more attention to the conditions and factors surrounded the learning process, which may have an impact on the general educational outcomes, while the linguistic factors and mainly the morphological structure, which plays an important role in acquiring spelling, have not been seriously investigated.

Spelling in Arabic poses significant challenges to language learning for both young and old learners and especially for students with LD due to the morphological and orthographic complexity in the Arabic writing system, in addition to the diglossic situation in Arabic.

The Arabic orthography system represents consonants and the three long vowels ( $\varphi$ ,  $\varphi$ ,  $\dot{\varphi}$ /aa, uu, ii) by letters, while short vowels are marked by small diacritics. Consequently, consonantal roots are fully represented in the orthographic system while vocalic components (short vowels) of the word patterns, which are represented by diacritics, are optional in writing. Thus, Arabic orthography varies in transparency between phonemic-graphemic relation depending on whether short vowels are used or not. In sum, the optional system of diacritics in the Arabic orthography leads to two forms of orthography: a shallow orthography where short vowels are represented by diacritics and a deep orthography when short vowels are absent (Abu-Rabia, 1996, 1997; Azzam, 1989).

Consequently, the Arabic learner needs to use morphological structure to read or spell unvowelled words due to the ambiguity that is caused by the absence of the short vowels (Saiegh-Haddad, 2013; Elbeheri et al., 2011). Saiegh-Haddad (2013, p. 172) pointed out that "while opaque in the relationship between the orthographic form of the word (letters only) and its full phonological structure, the unvowelled orthography is highly transparent in the relationship between the orthography is highly transparent in the relationship between the orthography is highly transparent in the relationship between the orthography is highly transparent in the relationship between the orthographic form of the word and its morphological structure: root and word-pattern". In the same direction, Elbeheri et al. (2011, p. 125) suggested that "there is an overriding tendency of Arabic orthography to give precedence to morphological and syntactic clues over phonological transparency, leading to a preference for non-vowelized text, particularly after initial literacy learning school grades".

In addition, and as a result of the diglossic situation in Jordan, phonological variations can occur between the spoken dialect and MSA and that may challenge the traditional instruction used in teaching spelling, especially the ones depending on the phonological information of the word or memorizing the spelling of the word. For example, ضرب [daraba] 'hit' in MSA is articulated as memorizing the local dialect, and أطرب [qalam] 'a pen' in MSA is articulated as [galam], [?alam], or [kalam] in some places in Jordan; the phoneme /q/ in MSA can be articulated as /?/, or /g/, or /k/ in Jordan depending on the place where they live or come from.

These phonological variations add more difficulties to learners particularly in the early years. Therefore, "the use of the morphological word pattern to recover the standard Arabic phonological form might be particularly important in such instances especially as the word-pattern captures the phonological structure of the word" (Taha and Saiegh-Haddad, 2017, p. 35).

In sum, and with respect to the Arabic case, attention should be given to implementing morphographemes and morphological structures in asessing and improving spelling abilities. Therefore, this study takes the responsibility to incorporate and take advantage of the complexity of the main common morphological forms and their sub-categories, including their word patterns, in spelling.

# 1.3 Purpose of the study

Given the impact of morphographic knowledge on spelling (e.g., Senechal & Kearnan, 2007) and the role of the Arabic morphology in the orthographic representation of Arabic words, the current study aimed to incorporate the systematic and sequential development of morphological forms and word patterns in literacy programmes in the elementary years of schooling to properly assess spelling difficulties and provide appropriate strategies and instruction inside classrooms to improve spelling abilities.

The study uses morphological forms, roots and word patterns as units in describing morphological complexity and adapts the developmental definition of morphological complexity which concerns the hierarchy of acquisition of morphological forms (for example, inflections versus derivations, verbs versus nouns, active voice versus passive voice, etc.) among young learners, i.e., the emergent and mastered morphological structures. In addition, it investigates the morphological component in spelling independent of phonology and orthography among LD and TD learners to determine the complexity in which morphological forms are mastered among learners and, thereafter, develop a tool, which depends on morphographs, to assess the spelling abilities and provide adequate strategies to overcome spelling difficulties.

The researcher is unaware of any Arabic study investigating the morphological complexity in spelling across LD and TD learners in spite of the rich morphological structure of Arabic and evidence in support of the crucial role of morphological units, roots and patterns in the arrangement of the mental lexicon (Purnet, Béland, & Idrissi, 2000; Boudelaa and Marslen-Wilson, 2001; Idrissi and Kehayia, 2004). In addition, this study gives more attention to the performance of learners with LD and compares their performance with TD learners.

# **1.4 Research questions**

The present study provides much needed data on the complexity of the morphological component in spelling among LD and TD learners. This study seeks to address the following questions:

1). To what extent does morphological awareness contribute to spelling competency among learners in Jordan, and how does this compare with the contribution from phonological awareness?

2). What morphological patterns of complexity (e.g., intact verbs, weak verbs, augmented verbs, passive voice, active voice, etc.) do LD and TD learners follow in spelling? Do LD and TD learners follow the same pattern?

#### **1.5 Rationale for the study**

Knowledge of predictable morphological forms depending on the morpho-orthographic analogy can play a role in improving the spelling processes and spelling new words (e.g., Moats, 1983; Berninger et al., 2010; Deacon and Kirby, 2004; Ravid and Schiff, 2006). Knowing and using the predetermined word patterns in spelling can "alert the speller to the letter...which is likely to be missed if the reader relies only on grapheme-phoneme correspondence rules and on the pronunciation of the word in spoken Arabic" (Taha and Saiegh-Haddad, 2017, p. 35). Consequently, and due to the distinguishing features of Arabic morphology, and mainly the morphological analogy and its potential role in facilitating the spelling processes, it seems of high importance to investigate the complexity or the hierarchy which learners follow in acquiring morphological forms and word patterns in spelling. This hierarchy could be also of value in understanding, assessing and monitoring spelling difficulties among young learners.

Mophographic principles, which consider the root and the word pattern as the basic units in the word, can provide an effective strategy in Arabic which is considered a very systematic language based on root-pattern morphology. Most Arabic words are formed from triliteral and quadriliteral roots by attaching these roots to predetermined word patterns. Therefore, morphographic units or roots and word patterns in Arabic are the best that can capture the internal structure of Arabic words such as vocalization, diacritics, phonetics and allomorphic variations. Therefore, using morphographs in teaching spelling offers an opportunity to provide graphemic regularities that cannot be offered by phonological approaches in Arabic.

The rest of the thesis is organized as follows: Chapter two presents a background review for theoretical frameworks of non-concatenative morphology applied to Arabic morphology, and the controversy regarding the lexical (morphemic) status of the consonantal root in Arabic. It also reviews the main theoretical approaches on lexical representation and processing of Arabic morphology such as the morpheme-based theory (e.g., Taft and Forster, 1975), stem/ word-based theory (e.g., Benmamoun, 1999, 2003), and the dual-access theory (e.g., Caramazza et al., 1988; Schreuder and Baayen, 1995). In addition, the chapter provides details of the main common morphological forms in Arabic which are investigated in this study in terms of the quantity and quality of the complexity, i.e., number and type of morphological forms to reference the hierarchy in which morphological forms are mastered among young TD and LD learners. The chapter ends with a review of the linguistic components of spelling and theories of spelling development and the contribution of linguistic components (phonology, orthography and morphology) to spelling outcomes.

Chapter three details the methodology of the study. Chapter four presents the results of the study while chapter five discusses the results and interprets their theoretical implications. It also provides the educational and clinical implications of the study and suggestions for further research.

# Chapter Two Morphological Complexity

## **2.0 Introduction**

Learning to read and spell requires learners to store information of the word forms in the mental lexicon and access and process them later when needed. Sandra (1994) indicates that the mental lexicon involves two basic components: a memory store that has the representation of the word and the mechanism that is involved in retrieving the word's representation. In the same direction, Marslen-Wilson et al. (1994) found it crucial to distinguish between the lexical entry for a given word and its access representation. They defined the lexical entry as "the modality-independent core representation of a word's syntactic and semantic attributes as well as its abstract phonological properties" (p. 4) while access representation, on the other hand, is "the modality-specific access representation, which provides the perceptual target for lexical access, defining the route whereby information in the sensory input is linked to a given lexical entry" (p. 4).

Other approaches postulate, however, that both models could interact during representation and accessing of the word in the lexicon (e.g., Caramazza et al., 1988; Schreuder and Baayen, 1995).

A considerable amount of literature in the context of oral production has been published on morphological processing in Semitic languages and particularly Arabic (e.g., Bat-El, 1994; Issa, 2006; Safi-Stagni, 1995; Prunet et al., 2000). These studies attempted to offer a better understanding of the underlying representation and processing of Arabic words in the mental lexicon - "the listener's mental representation of what words sound like and what they mean" (Marslen-Wilson et al., 1994, p. 3)- during spoken, reading and spelling tasks and, consequently, provide an understanding of the potential underlying deficits in reading and spelling.

Traditionally, Semitic languages are known to comprise of a consonantal root and a word pattern. As a result, the lexical (morphemic) status of the consonantal root and the word pattern in Semitic languages, and particularly Arabic, has been debated. Some studies (e.g. Bat-El, 1994; Ussishkin, 1999; Ratcliffe, 1997) focusing on morpho-phonological and morpho-syntactic phenomena suggested that Arabic words are mentally represented according to their full surface form rather than their underlying consonantal roots. Other studies such as that of Benmamoun (1999, 2003) postulated that Arabic words are represented according to their imperfective stems ignoring the role of the root and the word pattern. However, other studies such as Boudelaa and Marslen-Wilson (2001), Issa (2006), Prunet, et al. (2000), and Idrissi & Kehayia (2004) have presented evidence supporting the lexical (morphemic) status of the consonantal root for Arabic and its crucial role in identifying and representing Arabic words. These studies highlighted the centrality and the important role of the root and the word pattern as distinct lexical entities in the mental representation and processing of Arabic words (e.g., Boudelaa & Marslen-Wilson, 2001, 2011, 2014). The next sections shed light on the lexical representation and processing of Arabic words (e.g., Boudelaa & Marslen-Wilson, 2001, 2011, 2014).

# 2.1 Lexical representation and processing of Arabic morphology

Overall, there are two main views of the mental representation and processing of Arabic words which have implications for the patterns of errors in reading and spelling. One view is the morpheme-based theory and the second is the stem-/ word-based theory.

The next section sheds light on the main two contending views of Arabic morphology and other related hypotheses (the dual-access hypothesis, and the connectionist hypothesis) and how a surface form relates to the underlying representation.

# 2.1.1 The morpheme-based theory

According to morpheme-based theory, words are mentally represented and analyzed according to their morphological components. Therefore, complex words are mentally decomposed before any access occurs (e.g., Boudelaa, 2014). This hypothesis first appeared in the pioneering work of Taft and Forster (1975). They argued that morphologically complex words are analyzed prior to their lexical access and, therefore, morphemes are represented separately and independently in the mental lexicon, i.e., roots, and derivational and inflectional affixes are represented as independent units. Henderson (1986, cited in Henderson, 1989) summarized the main assumptions of the model of Taft and Forster (1975) as shown in 2.1.

Table 2.1: The main assumption of Taft and Forster's model (1975)\*

# Parsing assumptions

- P1 All possible affixes are detected and marked.
- P2 Parsing solutions are tested serially and recursively, beginning with the most fully stripped-down solution.
- P3 All parsing attempts operate on an orthographic representation of the word, prior to and as a mandatory preliminary to lexical search.

#### **Access assumptions**

- A1 The lexical entry code is an orthographic description of the root.
- A2 After a root entry has been located, some unspecified process of affix checking takes place.

#### Lexical-representation assumptions

- LR1 All words that share a root are represented in the lexicon under that single root heading.
- LR2 Root entries are created for bound as well as free roots, including some monogamous (i.e. unique combination, unproductive) roots.
- LR3 The manner in which a particular complex form (e.g. root + affixes) is represented under the root heading is not specified. Presumably complex forms may be fully listed in some modality or merely represented as the conjunction of root with a set of affixation rules.

#### **Developmental assumptions**

D1 The means by which analytical lexical representations are acquired is unspecified. The crucial question is: what are the necessary conditions for the creation of a root entry?

\* This table is borrowed from Henderson (1989, p. 360), based on Henderson (1986)

Taft (2004) highlighted again the importance of the morphological decomposition in complex words. He proposed the obligatory decomposition in the early stages of processing as shown in figure 2.1. He postulated that the frequency of usage of the stem influences the processing at the early stage while the frequency effect of the full form takes place in the last stage of processing.



Figure 2.1: Taft's view of the obligatory decomposition (Taft, 2004, p. 746)

In addition, Taft (2004) made a distinction between two morphological forms according to their semantic information. The first form has constant semantic information and is not affected by decomposition such as 'seeming' and 'mending' while the second form is influenced by decomposition and may lose its original meaning such as 'feathery' (lightness) which cannot be expressed through the semantic information of its stem 'feather' and its suffix 'y'. 'Feathery' will lose its actual meaning by decomposing it to (feather- y) and, therefore, could mean feather-like shape. To resolve such a conflict, Taft (2004) suggested that lemma will be involved in the activation for the whole word form 'feathery' to provide the semantic information for its morpheme sized units (feather and y). Therefore, he explained that 'it may be that the word is

decomposed and that there are then two pathways to the full information about the word: recombination via functional information associated with its individual constituents, and activation of a precompiled whole-word representation via the constituents. In this way, there would be two parallel pathways, but rather than these being a whole-word and a decomposition route, they would be a whole-word and a recombination route" (p. 763).

Similar to this model, roots and patterns in Arabic language have been, traditionally, regarded as distinct morphemes that are constructed in a non-linear way to form words. Accordingly, this approach holds that Arabic surface forms revolve around two essential morphemes: a consonantal root, which conveys the semantic information, and a word pattern, which indicates the morphosyntactic and phonological information of the word. Therefore, and similar to the morpheme-based hypothesis, many Arabic studies have addressed the role of morphological structures in word recognition within the framework of the root and pattern model (e.g., Mahfoudhi, 2007; Boudelaa and Marslen-Wilson, 2004 (b)).

In line with Taft (2004), Boudelaa (2014), based on priming experiments, suggested the obligatory morphological decomposition (OMD) in Arabic, a root and pattern based account, which proposed that both the root and the word-pattern play a crucial role in lexical representation and processing of Arabic words. This model suggested that Arabic words are organized in the mental lexicon according to their morphemic components "whereby their roots and word patterns are accessed as lexical entries" (Boudelaa, 2014, p.47) as shown in figure 2.2.



Figure 2.2: Schematic representation of the Obligatory Decomposition view of Arabic spoken and written word recognition borrowed from (Boudelaa, 2014, p. 48)

Figure 2.2 demonstrates that the word [maktab] 'an office' undergoes a process of obligatory morphological decomposition whereby the root {ktb} 'notion of writing' and the word pattern {mafSal} are accessed as lexical entries.

The morpheme-based hypothesis and the obligatory decomposition seem to be the most adequate view that can explain the processing of Arabic words due to the fact that Arabic morphology is mainly based on a root-pattern morphological system. Consequently, such approaches can offer an opportunity to interpret the underlying deficits involved in spelling, i.e., spelling difficuties could be due to difficulties in accessing the consonantal root or the word pattern. This view has received a considerable amount of evidence which converges to support that Arabic words are mentally represented, accessed and processed according to their morphemic components, i.e. the root and the word pattern. Therefore, and following this model, the current study uses the root and the word pattern as the main units in describing morphological complexity in spelling and, as a result, any difficulties in spelling are due to difficulties in accessing the root or the word pattern. It also adapts the developmental definition of morphological complexity which is concerned with the hierarchy of acquisition of morphological forms (for example, inflections versus derivations,

verbs versus nouns, active voice versus passive voice, etc.) among young learners, i.e., the emergent and mastered morphological structures.

The next sections review some external evidence for the distinct morphemic existence of the root and the word pattern in the mental lexicon, i.e., evidence in support of the morphemic-based theory which justifies our adoption for the root and the word pattern as the main units of morphological complexity in Arabic spelling. Such evidence comes from studies of aphasics, slips of the tongue, and Arabic hypocoristics.

### 2.1.1.1 Evidence from aphasic speech

Studies investigating speech errors of Arab aphasics argued further for the morpheme-based theory and added new evidence for the crucial role of the root and the word pattern in the mental lexicon and, consequently, the decomposed representation of morphological structures.

Safi-Stagni (1991, 1995) investigated speech production of an Arab agrammatic. She found inconsistency in his performance on simple and complex morphological forms. She also noted that errors occur at the level of the word pattern selection while consonantal roots were intact in the speech output as shown in (4). For example, in (4-a), the patient pronounced the target word المعنا [balayna] 'we reached' as المعني [balayti] 'you-SING.FEM. reached' where the consonantal root بلغتي [blay] was preserved while the patient failed to select the appropriate word pattern [faSalna] /CvCvCna/. As a result, she postulated that the aphasic's difficulty involved attaching the inflectional affixes to the stem.

Safi-Stagni (1991) concluded that Aphasic's errors highlighted the "significance of the morphological structure during processing, and second indicates that words are not processed as wholes If they were processed as wholes, his performance would be the same on simple as well as on complex forms" (Stagni, 1991, p. 102).

Та	rget	Root	Aphasic's production	
a-	balayna "we reached"	bly	balaγti "you (fem. sing.) reached" Balaγa "he reached"	
b-	ħaḍartum "you (masc. Pl.) attended"	ħḍr	ħaḍarna "we attended"	
c-	xaražat "she went out"	xrž	xaraža "he went out"	

(4): Agrammatic's errors at the level of word pattern selection (Safi-Stagni, 1995, p. 102)

In the same way, Prunet et al. (2000) investigated the nature of the units stored in the mental lexicon of Arabic speakers. They examined the language production of an Arab bilingual aphasic who suffered from impairment in oral expression and comprehension in both Arabic and French. The aphasic patient produced metathesis errors where the order of the consonantal root was affected while word patterns were preserved as shown in 5.

(:	5):	Aphasic	's metathesis	errors at the	level of th	e consonantal	l root (Prur	net et al., 2000:	p. 613)
· ·		1						,	1 /

Ta	rget	Output	Target gloss	Task
a-	Sušb	šu\$b	grass	reading aloud
b-	fašil	šafil	failed	reading aloud
c-	ma-žhuud	ma-jžduuh	effort	repetition
d-	faašil	šaafil	failing	repetition
e-	baħr	ħbr	sea	writing to dictation
f-	mi-nțaq-a	m-tnq-t	region	writing to dictation
g-	naxl	xanl	palm trees	picture naming (written)
h-	ṣaħaa?if	safaa?iħ	newspapers	picture naming (oral)

For example, in (2.3-h), the aphasic reads the target word صحائف [ṣaħaa?if] 'newspapers' as صفائح [ṣafaa?iħ] where he failed to access the proper order of the consonantal root صحف {ṣħf} while the

vocalic pattern was preserved (CaCaaCiC). As a result, they postulated that roots and word patterns exist as lexical units and, therefore, are mentally represented and processed separately. They indicated that "the existence of roots as lexical units implies the existence of morphemes as lexical units and therefore favors morpheme-based models of morphology, or at least models that can store morphemes on distinct tiers." (Prunet et al., 2000, p. 436).

# 2.1.1.2 Slips of the tongue

Slips of the tongue are speech errors in spontaneous speech. Dell (1986, p. 284) defined slips of the tongue as "an unintended, nonhabitual deviation from a speech plan" (Dell, 1986, p. 284). It provides us with important information about the underlying processes and mechanisms of speech production (Fromkin, 1973). Berg & Abd-El-Jawad (1996) conducted an analysis of phonological speech errors in Arabic, English and German and found that slips of the tongue in Jordanian Arabic (JA) occur within root consonants regardless of their position within the word or the syllable structure as shown in (6).

(6): Slips of the tongue in Arabic

Target Root		Root	Error	Target gloss	
a-	yurfa	γrf	ruɣfa	a room	
b-	ħilim	ħlm	miliħ (salt)	dream	
c-	wadS	wdS	wasd (a promise)	situation	

Berg & Abd-El-Jawad (1996) considered these findings as evidence for the lexical status of the Semitic root and they postulated that such metathesis errors occur after root consonants have been attached to the word pattern.

In an earlier study by Abd El Jawad and Abu Salim (1987), they investigated slips of the tongue produced by Jordanian speaking Arabic respondents and found that root consonants in speech errors exhibited the complete exchange of positions with all root consonants in the neighbouring word while the vocalic morphemes were preserved as shown in (7).

	Target	Slips of the tongue	Gloss of the target
a-	kalam-ha ṣaħiiħ	ṣaħaaħ-ħa kaliim	her talk is correct
b-	nabiil u kamaal	kamiil u nabaal	nabiil and kamaal ( proper names)
c-	ħasan iŝqeer	ŝaqar iħseen	hassan Shuqair (a proper name)
d-	matluub taabiSaat	matbuus taalibaat <sup>6</sup>	wanted typists

(7): Slips of the tongue at the level of the consonantal root (Abd El-Jawad & Abu-Salim, 1987, p. 149)

Such observations from slips of the tongue in Arabic argue further for the distinct existence of the root and the word pattern in the mental lexicon, therefore, arguing for the morphemic status of the root and the word pattern and, consequently, their crucial role in spelling acquisition and development.

# 2.1.1.3 Arabic hypocoristics

Hypocoristics is a widespread phenomenon in colloquial Arabic and is used for personal names, especially with young children, to express affection toward them. They involve some modifications in the name such as using diminutive forms of the name. This phenomenon adds to the evidence for the significant role of the root and the word pattern in processing Arabic words since they reference the distinct status of the root and the word pattern in the lexicon.

Davis and Zawaydeh (2001) investigated a common hypocoristic pattern in Jordanin-Arabic speakers and noted that only the consonantal root of the output form of the name exists in hypocoristic form, ignoring morphologicl structure of the name as shown in (8).

<sup>&</sup>lt;sup>6</sup> The semantic information is completely changed in the speech error. It means typed (fem.) students.

#### (8): Hypocorisites in Arabic

Full name		Root	Hypocoristic	
a-	basma	bsm	bassuum	
b-	<b>?ibtisaam</b>	bsm	bassuum	
c-	Muħammad	ħmd	ħammuud	
d-	ħamid	ħmd	ħammuud	

Furthermore, Davis and Zawaydeh (2001) investigated hypocoristics that involve a medial glide (weak root) as a part of the root. They noted that hypocoristic forms are based on the consonantal root of the full form of the name rather than the underlying one as shown in (9).

(9): Hypocoristics of names with a medial glide

	Full name	Root	Hypocoris	tic
a-	Sayda	٢wd	Sayyuud	* <b>?</b> awwuud
b-	mufiida	f y d		*fayyuud, *muffuud
c-	diima	d w m		*dayyuum, *dawwuum
d-	?nwar	nwr	nawuur	

For instance, the full name 'Sayda' is derived from the underlying root {Swd} and, theoretically, the hypocoristic should be 'Sawwuud', but that doesn't exist in Jordanian Arabic hypocoristic. They used the hypocoristic form 'Sayyuud' which reflects the consonants of the surface form /Syd/ but not the underlying one /Swd/. Accordingly, they proposed that " hypocoristic formation does in fact make reference to the consonantal root as it appears in the prosodified full name and thus reflects an output-to-output derivation" (Davis & Zawaydeh, 2001, p. 516).

In contrast to Davis and Zawaydeh (2001), Issa (2006) presented another hypocoristic pattern in Arabic and argued against an output-to-output formation process in hypocoristic forms. He presented hypocoristic forms where the underlying consonantal root surfaced on the hypocoristic output ignoring the morphological structure of the full surface name as in (10).

Full name		Root	<b>Hypocoristic</b>	
a-	fayez	fwz	?bul-fuwz	
b-	nayel	nwl	?bun-nuwl	
c-	hayel	hwl	?abul-huwl	

(10): Hypocoristic forms reflecting the underlying consonontal roots (Issa, 2006, p. 43)

The previous external evidence for the morphemic status of the root and the word pattern in Arabic words highlighted the crucial role of these morphemes in lexical representation and processing of Arabic words. Therefore, considering roots, word patterns and the rules used in combining them can have a positive impact on assessing and teaching spelling in Arabic and, consequently, improving spelling performance among Arab learners.

#### 2.1.2 The stem/ word-based theory

The stem/ word-based theory is another main view of Arabic morphology, beside the morphemebased theory, which has implications for the mental representation and processing of Arabic words. This approach claims that words are stored and processed according to their stems in long term memory, excluding the effect of morphological complexity on processing and representation. Therefore, it does not allow morphological operations (accessing and processing) on units smaller than a word. It argues that all words whether simple or complex are processed and represented in the same way regardless of their morphological components (Butterworth, 1983) and, therefore, the mental lexicon is full of word lists with their pronounciations. Such approaches received some supports from psycholinguistic studies. For example, Brunai et al. (2008) noted that skilled sixthgrade and adult readers perform similarly in reading aloud simple and complex morphological words, and that was considered as a support for the stem/ word access for both simple and complex morphological structures. Other studies (e.g., Haiko et al., 2011) postulated that whole-word access develops as reading competency improves and that might reflect the fact that accessing whole words may take place in a later stage after learning the morpholographics of the language.

The stem/ word approach fails to accommodate the uniqueness of the Arabic morphology and orthography since, traditionally, the morphology of Arabic words is known to comprise of a root

and a word pattern; it involves, mainly, a system consisting of a root that is interlocking into different patterns of vowels to form different categories of words. Thus, this approach failed to explain findings of many studies arguing for the lexical status of the root and the pattern in Arabic words, such as those of Berg and Abd-Al-Jawad (1996) and Prunet et al. (2000). However, this approach received some supports from studies on Hebrew (a Semitic language) such as those of Bat-El (1994) and Ussishkin (1999) who proposed that Semitic words are represented according to their full surface forms in the mental lexicon rather than their morphemic components (root and template). Bat el (1994, p. 593) argued that "the process of stem modification never requires a consonantal root, and therefore such a unit is not relevant to the grammar; it does not exist". In the same direction, Ussihkin (1999) postulated that "denominal verbs are formed from bases that already exist as independent words (typically nouns) in the language" (p. 403) and, therefore, "the notion of root must be abandoned in Modern Hebrew, at least for the case of denominal verb formation" (p. 435). In the same way, Benmamoun (1999: 2003) considered the imperfective stem as the basic unit in processing Arabic words and, therefore, a word such as مُعلِّم [musaLLim] 'a male teacher' is formed by adding the prefix م- [mu~] to the imperfective stem علّم [SaLLim] and not as the morphemic based theory would suggest by interlocking the root {SLM} onto the word ./mufassil] /muCaCCiC/.

### 2.1.3 The dual-access theory

The dual-access theory combines the morpheme-based theory and the stem/ word-based theory and proposes a dual mechanism to describe the processing and representation of complex morphological words. This hypothesis has been developed as a result of the incapacity of the two previous models, the morpheme-based theory and the stem/ word-based theory, to clarify the potential processing of complex words. It takes advantage of these models and postulates that morphologically complex forms can be either accessed by decomposing the word form into its morphological components or by accessing the word's full surface form.

Caramazza et al. (1988) proposed the Augmented Addressed Morphology (AAM) which combines both the whole-word representation and the fully decomposed representation theory. It assumes that a word activates in parallel both the whole-word representation and the decomposed components of the complex word (i.e. roots and affixes). This model considers accessing the whole form as the default manner, which is claimed to be faster than the decomposed one, to access familiar and common words while unfamiliar and non-words are accessed by decomposing their components.

Schreuder and Baayen (1995) introduced the Meta-Model for Morphological processing to handle morphologically complex inputs (words or speech) where both the whole-word form and the decomposed units interactively converge on the potential representation. This model has three levels, i.e., "segmentation into affixes and stems, licensing based on appropriateness of morpheme combination, and composition based on semantic and syntactic properties of the constituents" (Schreuder & Baayen, 1995, p. 149).

Some factors such as word frequency and transparency of semantic information may play a role in the mental processing and representation of words in the dual-access hypothesis. For example, Baayen et al. (1997) and Schriefers et al. (1992) have shown that base frequency facilitates word accessing when the full surface form is held constant while, on the other hand, the whole word plays the role of facilitator when base frequency is held constant. In the same vein, Frauenfelder & Schreuder (1992) claimed that transparency of semantic information plays a crucial role in facilitating the proper route for accessing and processing the morphological form in the Morphological Race Model (MRM) in which both full decomposition and whole word-form hypothesis work in parallel. As a result, choosing a specific lexical representation reflects whether semantic information is activated via the full form or via the individual morpheme-sized units.

In line with the dual access theory, Mimouni, Kehayia and Jarema (1998) examined the word recognitor of both regular (suffixed) and irregular singular and plural noun forms in Algerian-Arabic speaking normal and aphasic participants using an auditory morphological priming experiment.

The irregular plural form is constructed by modifying the internal structure of the word itself (e.g., kitaab] ' abook'  $\rightarrow \dot{\Sigma}$  [kutub] 'books'), while the regular plural form is formed by adding

suffixes to the end of the singular form (e.g., مُهَندِس [muhandis] 'an engineer' →مُهَندِسون [muhandisuun] 'engineers'.

Their results indicated that response time for singular and broken plural forms was faster than for the suffixed regular plural forms. They suggested that the suffixed plural form took a longer time since accessing this form requires decomposing the word into its components of stem and affixes. Furthermore, their results indicated that the singular form was accessed faster than the broken plural form which might reflect the centrality of the singular form in accessing broken plural forms, i.e., broken plurals are accessed through singular forms. As a result, they concluded that their results have shown "a differential processing of the two forms, indicating whole word access for broken plurals and decomposition into word and suffix for suffixed plurals" (Mimouni, et al., 1998, p. 63).

In the same vein, Abu Rabia & Taha (2004) proposed a dual model to account for the spelling process among native Arabic speakers as shown in figure 2.3.



Figure 2.3: Model of spelling errors suggested by Abu Rabia & Taha (2004, p. 684)

According to this figure, the phonological route (A, B, D, and F), where the phonological loop is mediated by the specific phonology of the spoken word, is used to process spelling of unfamiliar words (mapping the phonemes into graphemes directly). On the other hand, the lexical route (C, E), which contains the morpho-orthographic information (pattern morphemes and root morphemes), is used to spell familiar words and words that cannot be spelled depending on phoneme- grapheme correspondence. Therefore, in case of any deficiency in the lexical route, the word will be processed via the sublexical routes (A, B, D, and F) and, consequently, semiphonetic and dysphonetic errors are likely to occur when learners do not rely on lexical knowledge (morphoorthographic knowledge) or, simultaneously, the phonological routes are not developed. This model focused more on phonetic errors and attempted to offer an understanding of their occurrence. It also highlighted the impact of orthographic and morphological knowledge on spelling errors and their role in improving correct spelling. As a result, and to overcome the spelling errors among young learners, they recommended: "1) early intervention in exposure to literary Arabic should help overcome the diglossia effect, 2) equip children from early ages with morphological knowledge of Arabic, 3) equip children from early ages with knowledge of vowelized reading and vowelized writing due to the heavy cognitive load required to process vowelized Arabic script" (Abu-Rabia & Taha, 2004, p. 686). Such recommendations can be only achieved by a systematic teaching of morphological forms from early on based on the hierarchy of morphological complexity in spelling. The outcomes of the current study can hopefully provide the hierarchy of the complexity that learners should follow from early on to overcome spelling difficulties and the diglossic effect.

### 2.1.4 The connectionist theory

Connectionist models (e.g., McClelland & Rumelhart, 1981, 1982; Seidenberg & McClelland, 1989) propose that morphological structures and language are mentally represented and processed like other cognition abilities where cognitive processes occur as cooperative and competitive interactions between processing nodes. Connectionist models use abstract network models to simulate neural computation found in the human brain including processing, pronunciation of new words or sounds, recognition skills, transitions from beginning to skilled reading, and performance

on lexical decision and naming tasks. Seidenberg & McClelland, (1989) explained that "lexical memory does not consist of entries for individual words; there are no logogens. Knowledge of words is embedded in a set of weights on connections between processing units encoding orthographic, phonological, and semantic properties of words, and the correlations between these properties" (Seidenberg & McClelland, 1989, p. 560).

Accordingly, processing a word results from the interaction between processing nodes that could be independent such as in localist models (McClelland & Rumelhart, 1981, 1982) or dependent on other nodes such as in distributed models (Seindenberg & McClelland, 1989). These processing units are structured into groups. Some groups encode the input while others encode the response to that input. For example, in the learning process of a word, one group may encode the orthographic information, another may encode phonological aspects, and a third one may encode the semantic information of the word. The rest of the groups, which are sometimes called "hidden" units, play a role in internal representation and facilitating communication between input units and output units. Thus, processing the information of a word involves many nodes as shown in 2.4.



Figure 2.4: General framework for lexical processing in connectionist models (Seidenbug & McClelland, 1989, p. 526)

Figure 2.4 shows that processing a word such as 'make' is mediated by connections between both hidden and representational units where arrows represent the interactive connections between units on different levels. Morphological structures are not explicitly represented in this model and are supposed to be understood as a result of the interaction between several units or nodes.

In contrast to previous lexical models, connectionist models deal with all word types (regular and irregular) in the same way. They propose that information of words (spellings, pronunciations, and meanings) is not mentally stored in separate stores. Therefore, accessing does not depend on the morphological structure of the word; rather "lexical information is computed on the basis of the input string in conjunction with the knowledge stored in the network structure, resulting in the activation of distributed representations" (Seidenberg & McClelland, 1989, p. 560). Thus, the concept of lexical access does not play a crucial role in the connectionist models.

In Arabic, Boudelaa and Marslen-Wilson (2004) attempted to understand the processing of Arabic words within this theory. They proposed a model of Arabic lexical processing where four lexical units govern lexical representation and processing of Arabic words: the etymon, "which is a two-consonantal units that conveys semantic meaning" (p. 293), the root, the word pattern, and the CV-Skeleton. He proposed a pattern of activation which occurs across a set of units or nodes during the representation of words. Therefore, the underlying representation of a word such as i [batar] 'cut off' will not be analyzed according to its lexical units; a root, an etymon, a word pattern, and a CV-Skeleton, "instead it will consist of a pattern of activation over several units or nodes" (Boudelaa and Marslen-Wilson, 2004(a), p. 294). Arabic, which is a root-based morphology language, might present more challenges to the connectionist theory since morphology has no explicit representation within this model and that needs more investigations in this regard.

In sum, the morpheme-based theory and the stem/ word-based theory seem to be the main two approaches which contend to account for the underlying representation and processing of Arabic words. However, the morpheme-based theory, which can be understood within the framework of the traditional root and pattern view, has received a considerable amount of evidence supporting the crucial role of the root and the word pattern in the lexical representation and processing of Arabic words (e.g., Purnet, Béland, & Idrissi, 2000; Boudelaa and Marslen-Wilson, 2001; Idrissi

and Kehayia, 2004), and, therefore, these morphemes should be implemented in any approach used to teach and improve spelling abilities among young Arabic-speaking learners.

The next section sheds light on the main morphological forms and their word patterns in Arabic where word patterns play a role in combining roots and patterns (short vowels) to form different categories of words.

# 2.2 Arabic morphology

### **2.2.0 Introduction**

Arabic belongs to the Semitic language family that forms the north-eastern sub-family of the Afro-Asiatic languages, including Ancient Egyptian, Coptic, Cushitic, Berber, and Chadic (Vycichl, 1975). Around 400 million people speak Arabic in 2012 (Wikipedia, 2016). It is also one of the six official languages in the United Nations alongside English, French, Spanish, Russian, and Chinese.

The Arabic alphabet is also considered the second largest alphabetical system, after Latin, used around the world. Kaye (1990) indicated that "after Latin, the Arabic alphabet is number two because it was or is used to write a vast number of different languages such as Persian, Urdu, Pashto (all Indo-Iranian), Hausa (the Chadic sub-branch of Afroasiatic), Swahili (Bantu), Turkish (Altaic), Malay (Austronesian) and over a hundred others" (Kaye, 1990, p. 179). Nowadays, Arabic is the official language in most North African countries and parts of West Asian. It is also used as a second language throughout Muslim countries.

Since the rise of the Arabic language, old Arab grammarians studied الصرف [Al. şarf] 'morphology' and 'syntax' together as one linguistic field. Investigating [Al. şarf] 'morphology' independently from [Al.naħw] 'syntax' goes back to the works of 'Sibawaihi' (died in 793 AD) who wrote (Kitaab Sibawaih] 'The book of Sibawaihi' in Kufa (Iraq now). Thereafter, the Kufan grammarian Abul-ħasan Aħmad wrote كتاب التصريف [Kitaab at-taṣriif] 'The book of morphology' which was developed by Ali- bin ħasan Al-Aħmar (died in 809 AD) (Âkesson, 2001). Old Arab grammarians defined الصرف [Al Sarf] 'morphology' as the science that discusses the structure of the word and changes that may affect its structure when creating a new word (Alrajehi 1973).

Traditionally, Arabic morphology focuses on nouns and verbs, nothing else, because they can be conjugated into different forms. Therefore, الصرف [Al Sarf] 'morphology' does not deal with prepositions, particles and pronouns because they cannot be conjugated; rather, they always appear in one form, and also it does not deal with foreign names and loanwords (non-inflected nouns) such as use as a consistent and a predictable relationship between roots and word patterns in forming words. Therefore, the current study considered these units (root and word pattern) as morphographic units in Arabic due to their crucial role in forming new words and governing the relationship between the components of the word. Roots provide the semantic information for the word pattern while word patterns capture the internal structure of Arabic words in spelling such as vocalization, diacritics, phonetics and morphemic characteristics in different whoological environments.

The next section reviews Arabic word formation and the main morphological terms in Arabic such as morphemes, allomorphs, and roots. It also reviews the most common morphological forms and their word patterns that are used as rules in forming words based on Alrajehi (1973). These forms are investigated in this study in terms of the quantity and quality of the complexity, i.e., number and types of morphological forms to reference the hierarchy acquisition of acquired and developing morphological forms and their word patterns among young TD and LD learners.

# 2.2.1 Arabic word formation: Concatenative and non-concatenative morphology

# 2.2.1.0 Introduction

Concatenative and non-concatenative morphology represent the two forms of morphological operations in languages that produce words by adding affixation. Concatenative morphology involves mainly suffixation and prefixation in a linear way in order to form new words, while nonconcatenative morphology deals with the formation of new words by modifying the internal structure of morphemes and does not involve putting morphemes together in a linear way.

Haspelmath and Sim (2010) highlighted the difference between the two systems by pointing out that "Concatenative is when two morphemes are ordered one after the other, and non-concatenative, which is everything else" (p. 34). Most languages of the world such as Indo-European languages (English, French, Italian, etc.) are considered to be concatenative; they add affixes in a linear way to create words while the system of non-concatenative morphology is far from being this simple and straightforward. It undergoes modifications in the internal structure of word elements such as infixation, truncation, ablaut, and reduplication. These changes are coordinated with a change in grammatical function such as the English verb 'run, ran'.

Although the main morphological process mode in Arabic word formation is a non-concatenative process, a concatenative process is used to form some lexical items. In the non-concatenative fashion, Arabic words tend to do changes on the internal structure of the stem, which comprises of the root and the pattern, as shown in example (11).

(11): Non-concatenative operations in Arabic plural nouns

a- Word: کُتُب Kitaab 'a book' → کُتُب [k<u>u</u>t<u>u</u>b] 'books' Root: كُتُب ktb CV pattern: CiCaaC → CuCuC

In concatenative fashion, the affixes are attached to the stem, root and pattern to indicate a grammatical function as in (12):

(12): Concatenative processes in Arabic

a- مُدَرِسون [Mudaris] 'a teacher' مُدَرِسون
b- تَتَبَ [Kataba] 'he wrote' [Katab<u>uu]</u> 'they wrote'

Watson (2002, p, 132) indicates that "Arabic has two morphological levels. Level one, which affects the stem of the word predominantly, can be said to correspond roughly to the nonconcatenative (or infixal) morphology; and level two, which does not affect the stem of the word, works predominantly by adding affixes to the beginning and end of the word stem".

### 2.2.1.1 Approaches to non-concatenative Arabic morphology

Semitic languages, and mainly Arabic, pose a strong challenge to so-called linear models of word formation. The classical view of the Arabic morphology holds that Arabic surface forms consist of a root and a word pattern. On the other hand, several studies (e.g., McCarthy, 1979, 1981; McCarthy & Prince, 1990) have proposed some morphological approaches to shed light on processes involved in the formation of words in non-concatenative morphology such as Autosegmental and Prosodic theory. The coming sections sheds light on these approaches.

# 2.2.1.1.1 Autosegmental approach

McCarthy (1979, 1981) and depending on autosegmental phonology for tone and vowel harmony (Goldsmith, 1976), presented an alternative account for the classical Arabic morphology (the root and the pattern account). He suggested that Arabic surface word comprises of three morphemes: first, the consonantal root which conveys the semantic information and is defined as "the fundamental lexical unit of the language" (McCarthy & Prince, 1990, p. 2). The second morpheme is the vocalic morpheme consisting of vowels, into which the root consonants are interleaved, and conveys the syntactic information, while the third morpheme is the skeleton which serves as a canonical template of bare Consonants and Vowels notated as CV. This approach postulates that morphemes are not represented linearly and suggests that "the string of segments is uninterrupted, but the morphological analysis is given by another simultaneous level of representation." (McCarthy 1979, p. 221). Accordingly, the surface form of  $\tilde{Z}$  [kataba] 'wrote' is claimed to comprise of the root morpheme {ktb}, the vocalic morpheme {a-a-a} and the skeletal morpheme {CVCVCV}. Example (13) illustrates the autosegmental representation for  $\tilde{Z}$ 





\* Arabic characters are written from right to left, as opposed to the left to right conventions of English

The autosegmental approach postulates that the three tiers (skeletal, the consonantal and vocalic melodies tiers) are connected by association lines even though they occur in different lanes following the well-formedness conditions which require:

- a- "Every CV skeletal slot must be associated with at least one melody element and every melody element must be associated with at least one appropriate C or V slot.
- b- Association lines must not cross." (Spencer, 1991, p. 137)

# 2.2.1.1.2 Prosodic theory of non-concatenative morphology

McCarthy (1981) and McCarthy & Prince (1990) proposed the prosodic theory to express what cannot be expressed in the autosegmental theory such as reduplication, root and pattern systems, circumscription, truncation, etc. It claims that "the templates of reduplicative or templatic morphology are defined in terms of the authentic units of prosody: the mora, the syllable, the foot, and the phonological word" (MCcarthy& Prince, 1990, p. 3) and "demands that the vocabulary of templates is the same as the vocabulary of prosody in general, including stress, syllabification,

epenthesis, compensatory lengthening, rhyme, counting rules, and poetic meter" (MCcarthy & Prince, 1990, p. 3).

Therefore, the prosodic morphology gets a benefit of hierarchically built prosodic units (McCarthy & Prince, 1990). These prosodic units are ordered in a hierarchical way from top to bottom as shown below:

Phonological word	W
Foot	F
Syllable	σ
Mora	μ

Accordingly, the phonological word comprises of at least one foot that contains at least one stressed syllable. McCarthy & Prince (1990) indicated that Arabic has three main syllables (CV, CVV, and CVC); a syllable could be a heavy or light. The heavy one comes with a consonant followed by a long vowel (CVV) such as [kaa] in [mak] in (TVC) writer or a consonant followed by a vowel and closed by another consonant (CVC) such as [mak] in [mak] in [maktab] 'office'. On the other hand, the light syllable comprises of a consonant followed by a short vowel (CV) such as [kaa] in [maktab] 'wrote'. In this representation, the light syllable (CV) receives one mora ( $\mu$ ), while the heavy syllable requires two moras ( $\mu\mu$ ) (McCarthy & Prince, 1996) as shown in (14).

(14): light and heavy syllables in prosodic theory



In comparison between the two approaches (the autosegmental and the prosodic theory) a word such as كاتِب [kaatib]'writer' would be represented in the autosegmental theory as having three

different morphemes: the consonantal root {ktb}, the vowel melody {aa-i}, and the templatic morpheme (CV skeleton) {CVVCVC} as shown in (15).

(15): The autosegmental representation for /kaatib/ (writer)



On the other side, and according to the prosodic theory, the same word [kaatib] 'writer' is represented as a sequence of two heavy syllables and, therefore, will be represented as shown in (16).

(16): The prosodic representation for /kaatib/ 'writer'



#### 2.2.1.2 Arabic morphemes

A morpheme represents the minimal unit of meaning in a language. The word مُدرسان [mudarisaan] 'two male teachers' consists of two morphemes: مدرسـ [mudaris-] 'a male teacher' and المان - [-aan] a suffix which indicates the dual masculine form of the noun. Two forms of morphemes can exist in words: free and bound morphemes. Free morphemes can stand by themselves and form individual words such as مدرس [mudaris] 'a male teacher'. Bound morphemes, on the other hand, cannot stand alone and are often attached to free morphemes such as the suffix الحالي [-aan] in كتابان [kitaabaan] 'two books' which indicates the dual form of the book. Thus, a word can comprise one morpheme or more such as درارع [muzaris] 'a farmer' and ولا [walad] 'a boy' which have one morpheme while المزارعون [almuzaris] (the male farmers' and المزارعون [alwaladaan] 'the two boys' have three morphemes (al-walad-aan; al-muzaris-uun).

Generally, morphemes should be distinct from one word to another and should add in some way to the semantic information of the whole word (Carstairs-McCarthy, 2002). For example, some affixes in English add extra meaning to their base and indicate specific semantic information as shown in (17).

(17): Common semantic categories of affixes in English

Semantic category	Example
Personal affixes	writ <u>er</u> , employ <u>ee</u>
Negative and privative affixes	<u>un</u> happy, <u>in</u> attentive
Prepositional and relational affixes	overfill, outrun
Quantitative affixes	hand <u>ful</u> , help <u>ful</u>
Evaluative affixes	book <u>let</u> , <u>mega</u> store
Adapted from (Rochelle, 2009)	

Four types of morphemes are classified according to their position in the word (see (18)); suffixes follow the main part of the word (e.g., مسلمین [muslim<u>iin]</u> 'muslims'), prefixes precede it (e.g., [yaktubu] 'he writes'), infixes occur inside the base or the root such as كاتَبَ [kaataba] 'he wrote to somebody'. Additionally, Arabic has circumfixes; affixes that are attached on both sides of the base morpheme such as in يكتب [yaktubu] 'they are writing'.

Types of	affix	Examples		
Suffix:	follows the base	[muSalim- <b>uun]</b> (MASC. teachers) معلمون		
Prefix	precedes the base	يَلعب [ya-lʕab] [he plays]		
Infix	occurs inside the base	ijahada] 'he worked hard' (base: جيد [jahada]		
Circumfix	x occurs on both sides	<b>يكتبون [ya</b> -ktub- <b>uun]</b> 'they are writing' (base: kataba)		

## 2.2.1.2.1 Allomorphic variation and their realization on the surface forms

Allomorphs represent phonologically distinct variants of the same morpheme (Rochelle, 2009) where pronunciations depend on the phonological context of the morpheme (Carstairs-McCarthy, 2002). For example, the plural [s] in English could be pronounced as [z] in 'dogs', [s] as in 'hats', and could be pronounced as [iz] such as in 'horses'. Another example is the ending of the regular past tense in English which is often spelled [–ed]. Sometimes, it is pronounced as [t] such as in 'packed', [d] as in 'bagged', and sometimes pronounced as [əd] as in 'waited'.

Arabic exhibits a rich allomorphy system in both noun and verb formation which poses another challenge to young learners in spelling. Arabic weak roots, which comprise a long vowel in their lexical roots, undergo some kinds of allomorphy. These roots, typically, consist of one of the weak radicals of allomorphy. These roots, typically, consist of one of the weak radicals [w] or [w] or both in the root (e.g., ieq. nwm) 'notion of sleeping', ieq. qwm) 'notion of standing' and they may not surface in the full form of the word. These roots exhibit no allomorphy if their weak radicals surface on the final form such as ieq. wfq] 'made straight/correct' from the root (e.g., (wfq)) 'being successful' where g [w] surfaced on the form ieq. qwarfaqa]. On the other hand, the weak radicals may not surface on the final output in other forms such as use has a low of the weak radicals may not surface on the final output in other forms such as [ieq. waffaqa] 'agreed' instead of [ieq. waffaqa] where the g [w] surfaced as [ieq. waffaqa] forms such as [ieq. waffaqa] 'agreed' instead of [ieq. waffaqa] where the [ieq. waffaqa] (we surface as [ieq. waffaqa]) (instead of [ieq. waffaqa] where the [ieq. waffaqa] (if [ieq. waffaqa]) (is the the value of the weak radicals may not surface on the final output in other forms such as [ieq. waffaqa] (instead of [ieq. waffaqa]) (is the form [ieq. waffaqa] (is the form [ieq. waffaqa]).

<sup>[</sup>f] ف has a geminated وفِّق <sup>7</sup>

not و [w]. Such allomorphy occurs because "the glide undergoes regressive assimilation from the word pattern consonant immediately following it, and an allomorphic form obtains" (Boudelaa & Marslen-Wilson, 2004, p. 107). Glide elision is another allomorphy type, which "systematically applies when the glide is flanked by two homorganic vowels" (Boudelaa and Marslen-Wilson, 2004 (b), p. 107). For example, قام [qaama] 'stand up' and أخوف [xaafa] 'frightened' represent surface forms of the underlying forms أقومَ [qawama] and

In the same vein, Arabic broken plural nouns are highly allomorphic where each singular noun pattern may have more than two plural forms. For instance, a singular noun that follows the word pattern فغل [fas1] /CvCC/ would have one or two plural forms as demonstrated in (19).

(19): Broken plural forms of the singular pattern CV	CC
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Singular	<b>CV Pattern</b>	Plural	Pattern	Gloss
Wazn	CvCC	?awzaan	?aCCaaC	measures
Kalb	CvCC	kilaab	CiCaaC	dogs
Sayn	CvCC	Suyuwn, ?aSyun	CuCuwC, ?aCCuC	eyes

Adapted from Cavalli-Siforza & Soudi (2007)

Ratcliffe (1997) noted that principal masculine stems involve allomorphic variations in plural forms as shown in (20).
CvCC	>>	?aCCaaC, CuCuuC, CiCaaC
CvC	>>	?aCCaaC
CvvC	>>	?aCCaaC, CiiCaan
CvCCvC	>>	CaCaaCiC
CvvCvC	>>	CaCaaCiC, CaCaCat, CuCCaaC, CuCuuC
CvCvvC	>>	CaCaaCiC, CiCaaC, ?aCiCCat, CuCaCaa?, ?aCCiCCaa

(20): Plural allomorphy of masculine noun stems (Ratcliffe, 1997, p. 164)

Therefore, and given the impact of the allomorphic variation on the surface forms of Arabic words, early exposure to morphological forms and learning the word patterns and the rules describing how to combine roots with them will help learners to understand the effect of allomorphic variation on the surface forms in spelling such as in the word pattern الفتّعال [?iftaSala] where the will surface as [t] الفتّعال [?ittafaqa] 'agreed' instead of المتحافي [?iwtafaqa].

The mechanism of selecting a specific allomorph for a word rather than another one is still one of the most extensively debated topics in the allomorphy research. Nevins (2011) indicated that "a much harder and unresolved question is the mechanism for allomorph selection, where many theoretical alternatives are good at capturing some generalizations but in doing so may fail to capture others" (p. 24).

Wolf (2008) has shown three mechanisms of allomorphy systems: first, purely a morphological system where allomorphy choice is decided solely by morphology such as the present tense form of the English irregular verb [gow], but [went] in the past tense form. The second system, the purely phonological one, is determined by phonological conditions such as indefinite articles 'a' and 'an' where selecting the allomorph is dependent on the first sound of the following noun ('a door' vs. 'an orange'). The third system combines between the previous two systems and determines the appropriate allomorph depending on phonological and morphological context.

Similarly, Haspelmath & Sim (2010) referred to three conditioning systems, i.e. "the conditions under which different allomorphs are selected" (Haspelmath & Sim, 2010, p. 25). These conditioning systems include phonological, morphological and lexical conditioning.

In Arabic, allomorphic variations, which affect the surface realization of words, draw attention to the importance of the underlying representation and processing of Arabic words (e.g., Boudelaa and Marslen-Wilson, 2004, 2001; Davis & Zawaydeh, 2001; Issa, 2006). It raises a question regarding the lexical (morphemic) status of the consonantal root in Arabic. For example, a word such as ينه [?ittafaqa] 'agreed', which is constructed from the root in Arabic. For example, a word surfaced as [t] instead of [w], raises questions of whether ينه [?ittafaqa] is represented according to its surface form [?ittafaqa] or according to its underlying representation [?iwtafaqa]. Understanding the underlying (mental) representation, accessing and processing of words can help in understanding the underlying deficits in reading and spelling and, therefore, establish a theoretical background that can help in designing appropriate assessment tools and educational curriculum to overcome spelling difficulties.

#### 2.2.2 Morphological forms in Arabic

The studies presented thus far provided evidence in support of the crucial role of the root and the word pattern as distinct lexical entities in the underlying representation and processing of Arabic words and their significant contribution to spelling. For example, Boudelaaa and Marslen-Wilson (2015) examined the processing of morphologically complex forms in Arabic words using cross-modal priming experiments. Their results highlighted the importance of morphological components in processing words and argued further for the independent representation of root and word pattern morphemes in the mental lexicon. They concluded that:

"The consistent recurrence in the language of roots and word patterns with similar meanings and similar grammatical implications means that they provide salient and relevant contingencies for the language learner to extract. As a result, the process of decomposing surface forms into roots and words patterns emerges naturally as an operation that helps the learner to make the right generalisations about the relevant units of the language, and where these generalisations are specified at the levels of abstraction induced by the non-concatenative properties of Arabic word formation" (p. 978).

The main popular approaches in analyzing spelling errors and strategies used in teaching spelling in Arabic stemmed from two distinct systems: a "whole word" which treats words as wholes and a "correspondence" system which relies on the relation between phonemes and graphemes. A dual system approach combined the previous two systems and categorized spelling errors into phonetic/non-phonetic errors. It is conspicuous that these approaches have focused more on phonetic aspects of the spelling while the morphemic structure of the word was not seriously considered. Therefore, in order to better understand spelling errors and provide accurate teaching strategies, one should focus more on learners' developmental acquisition and mastering of morphological knowledge and the ability to use this knowledge in spelling.

Results from several studies have indicated the importance of morphological knowledge in storing the morpho-orthographic information of written words in the mental lexicon (e.g., Berninger et al., 2010; Deacon and Kirby, 2004; Ravid and Schiff, 2006) indicated that learners could develop their skills and abilities to retrieve the orthographic representation of words through exposure to written forms of words and their components that conform to the lexical representation of words. Therefore, teaching the rules of morpho-orthographic structures explicitly can enhance the implicit memory, facilitate retrieving of words, and improve spelling abilities (Holmes and Carruthers, 1998).

Overall, there seems to be some evidence to indicate that children develop their morphological knowledge of words from early on and expand it with age and this becomes an important predictor of spelling accuracy in the future (e.g., Casalis, Deacon, & Pacton, 2011). Therefore, this project was undertaken to design a developmental tool to reference spelling difficulties and provide a systematic educational strategy based on the learning complexity of morphological forms and their word patterns among TD and LD learners. It also promotes our understanding of the complexity of morphological forms and their role in developing spelling abilities.

The coming section provides a thorough understanding of the main morphological forms with their conjugations and devotes a particular attention to the way these forms are represented in the Arabic orthography. The organization of these forms is based on Alrajehi (1973) who organized these forms into verbs, derivations, verbal nouns/ gerunds and nouns in a simple and easy way. English translation for most Arabic morphological terms in this study is borrowed from Sawalha & Atwel (2013).

### 2.2.2.1 Verbs

Arabic verb falls into two main classes: intact and weak verbs. Intact verbs [?al-fiSil ?al-Saħiiħ], often called strong verbs, contain no long vowels ([aa], و[uu], or [ii]) in their lexical roots and are classified into regular intact الصحيح السالم [?al-Saħiiħ ?al-salim], doubled verb [?al-muḍaSaf], and hamzated verb المهموز [?almuḥaSaf]. In the orthographic representation, consonants and long vowels are represented by letters while short vowels, which are represented by diacritics, are often ignored.

A regular intact verb الصحيح السالم [al-Saħiiħ ?al-salim] comprises of consonantal roots that are free of doubled consonants (second and third root consonants are the same), long vowels ([aa], [uu], or ([ii]) or the glottal stop [?]. It can be a triliteral or a quadriliteral verb root as shown in 2.2 and 2.3.

Doubled verb root الفعل المضعّف][?al-fifil ?al-mudaffaf], on the other hand, exhibits two identical consonants in the second and the third position of the triliteral-doubled verb root as shown in 2.4 and in the first and the third position of quadriliteral-doubled verb root as shown in 2.5. Orthographically, the doubling of a consonant is represented by a diacritical mark ( ) called شدّه (faddah] written above the consonant. The presence of faddah in the word orthography is crucial and should not be omitted as its absence causes ambiguity and a difficulty to recognize the word, especially among young learners, and that then requires the learner to rely on morpho-orthographic knowledge to recover the doubling consonant.

Table 2.2: Conjugations of the regular triliteral intact verb الصحيح السالم الثلاثي.

Root: کتب (ktb) 'to write'

	Dual			Dual		Singular			
Imperative	Imperfect	Perfect	Imperative	Imperfect	Perfect	Imperative	Imperfect	Perfect	person
-	نَكْتُبُ Naktubu	کَتَبْنَا Katabnaa	-	-	-	-	أكْتُبُ ?aktubu	کَتَبْتُ Katabt u	1 <sup>st</sup> m/ f
أَكْتُبْنَ ?uk- tubna	تَكْتُبْنَ Taktubna	كَتَبْثُنَّ Katab- tunna	أَكْتُبَا ?uktu- baa	تَكْتُبَانِ Taktubaani	کَتَبْتُمَا Katab- tumaa	أَكْتُبِي ?ukub i	تَكْتُبِينَ Taktubi ina	کَتَبْتِ Katabti	2 <sup>nd</sup> f
أكْتُبُوا Puktubu u	تَكْتُبُونَ Taktubuuna	کَتَبْتُمْ Katabtu m	أَكْثَبَا Puktuba a	تَكْثُبَانِ Taktubaani	کَتَبْتُمَا Katabtuma a	أكْتُبْ Puktu b	تَكْثُبُ Taktubu	کَتَبْتَ Katabta	2 <sup>nd</sup> m
-	يَكْتُبْنَ Yaktubna	کَتَبْنَ Katabna	-	تَكْتُبَانِ Taktubaani	کَتَبَتَا katabataa	-	تَكْثُبُ Taktub	كَتَبَتْ Katabat	3 <sup>rd</sup> f
-	یَکْنُبُونَ Yaktubuun a	کَتَبُوا Katabuu	-	یَکْتُبَانِ Yaktubaan i	کَتَبَا Katabaa	-	یَکْتُبُ Yaktub u	کَتَبَ Kataba	3 <sup>rd</sup> m

Table 2.3: Conjugations of the regular quadriliteral intact verb الصحيح السالم الرباعي.

	Plural			Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfe-ct	Active	person
-	نُتَرْجِمُ Nutarjimu	تَرْجَمْنَا Tarjam- naa	-	-	-	-	أُتَرْجِمُ ?utarjimu	تَرْجَمْتُ Tarja -mtu	1 <sup>st</sup> m/f
تَرْجِمْنَ Tarjimn a	تُتَرْجِمْنَ Tutarjimna	تَرْجَمْثُنَّ Tarjamtu nna	تَرْجِمَا Tarjima a	تُتَرْجِمَانِ Tutarjimaan i	تَرْجَمْتُمَا Tarjamtu -maa	تَرْجِمِي Tarjimi i	تُتَرْ جِمِينَ Tutarjimi ina	تَرْجَمْتِ Tar- jamti	2.f
تَرْجِمُوا Tarjimu u	نُتُرْجِمُونَ -Tutarjimu una	تَرْجَمْتُمْ -Tarjamt um	تَرْجِمَا Tarjima a	تُتَرْجِمَانِ Tutarjimaan i	تَرْجَمْتُمَا Tarjamtu -maa	تَرْجِمْ Tarjim	تْتَرْجِمُ Tutarjim	تَرْجَمْتَّ Tar- jamta	2. m
-	يُتَرْحِمْنَ Yutarjimna	تَرْجَمْنَ Tarjamna	-	تُتَرْحِمَانِ Tutarjimaan i	تَرْجَمَتَا Tarja- mataa	-	تُتَرْجِمُ Tutarjimu	تَرْجَمَتُ Tar- jamat	3.f
-	يُتَرْجِمُونَ Yutarjimuu -na	تَرْجَمُوا Tarjimuu	-	يُتَرْجِمَانِ Yutarjimaan i	تَرْجَمَا Tarjam- aa	-	يُتَرْجِمُ Yutarjim u	تَرْجَمَ Tarja -ma	3. m

Root: ترجم (trjm) 'to translate'

Table 2.4: Conjugations of the triliteral- doubled verb root الفعل المضعّف الثّلاثي.

Root: مرّ (mrr) 'to pass by'

	Plural			Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
-	نَمُرُ Namurru	مَرَرْنَا Mararnaa	-	-	-	-	أمُرُ amurru?	مَرَرْتُ Marartu	1 <sup>st</sup> m/f
أُمْرُرْنَ ?umrurna	تَمْرُرْنَ Tamruurna	مَرَرْثْنَّ Marartu- nna	مُرَّا Murraa	تَمُرَّانِ Tamurra- ani	مَرَرْتُمَا Marartu- maa	مُرّي Murrii	تَمُرّينَ Tamuriina	مَرَرْتِ Mararti	2.f
مُرُّوا Murruu	تَمُرُّونَ Tamurru- una	مَرَرْتُمْ Marartum	مُرَّا Murraa	تَمُرَّانِ Tamurra- ani	مَرَرْتُمَا Marartu- maa	مُرَّ Murra	تَمُرُّ Tamurru	مَرَرْتَ Mararta	2.m
-	ىَمْرُرْنَ Yamrurna	مَرَرْنَ Mararna	-	تَمُرَّانِ Tamurra- ani	مَرَّتَا Marrataa	-	تَمُرُّ Tamurru	مَرَّتْ Marrat	3.f
-	يَمُرُّونَ Yamurru- una	مَرُّوا Marruu	-	یَمُرَّانِ Yamurra- ani	مَرَّا Marraa	-	یَمُرُ Yamurru	مَرَ Marra	3.m

. الفعل المضعف الرّباعي Table 2.5: Conjugations of the quadriliteral- doubled verb root.

	Plu	iral		Dual			Singular	
Imperative	Active Perfect   berf. berf.		Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.
-	ئزلزلُ nuzalzilu	زلزلْنَا zalzalnaa	-	-	-	-	أُزَلزِلُ Puzalzilu?	زلزَلْتُ zalzalt u
زلزِلْنَ Zalzil na-	تُرْلزِلْنَ tuzalzilna	زلزڵؿۢڹٞ Zalzaltunn a	زلزِلَا Zalzila a	تُزلزلَانِ tuzalzı́laani	زلزڵؾؙٛمَا Zalzultuma a	زلزِلِي zalzili i	تُزلزلِينَ Tuzaĺziliin a	زلزلْتِ zalzalti
زلزلُوا Zalzi- luu	تُزلزلُونَ -Tuzaĺzilu una	زلزلْتُم zalzaltum	زلزلًا Zalzila a	تُزلزلَانِ tuzalzı́laani	زلزلْتُمَا zalzaltumaa	زلزلْ zalzil	تُزلزِلُ tuzalzilu	زلزڵتَ zalzalt a
-	يُزلزِلْنَ yuzalzilna	زلزلْنَ zalzalna	-	تُزلزِلَانِ tuzalzilaani	زلزلَتَّا zalzalataa	-	تُزلزِلُ tuzalzilu	زلزلَتْ zalzala t
-	يُزلزلُونَ Yuzalziluu -na	زَلزِلُوا zalzaluu	-	يُزلَزِلَانِ yuzalzilaan i	زلزلًا zalzilaa	-	يُزلَزِلُ yuzalzilu	زلزلَ zalzala

person

1<sup>st</sup> m/f

2.f

2. m

3.f

3. m

Root: زلزل (zlzl) 'to convulse'

Hamzated verb الفعل المهموز [?al-fiSil ?al-mahmuuz] is the third class of the intact verbs and exhibits a hamza (،) 'the glottal stop /?/' in the first, second, or the third consonant and classified into:

1- Initially-hamzated verb الفعل مهموز الفاء [?al-fifil mahmuuz ?al-faa?]: The hamza (،) 'the glottal stop /?/' occurs in the first position of the root as demonstrated in 2.6.

2- Medially-hamzated verb مهموز العين [?al-fifil mahmuuz ?al-fayn]: The hamza (۶) 'the glottal stop /?/' exists in the second position of the root as shown in 2.7.

In the orthography, most cases of the hamza in the verbal forms have a 'seat' in the form of an alif [aa] conforming to the word patterns used, i.e., the hamza is not used separately in the orthographic representation of these forms. Table 2.6: Conjugations of the initially-hamzated verb الفعل مهموز الفاء.

Root: أخذ {?axð} 'to take'

	Plu	ral		Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
	نَأْخُذُ	أخَذْنَا					آخُدُ	أخَذْتُ	1 <sup>st</sup>
-	Na?xudu	?axadnaa	-	-	-	-	Aaxudu	?axadtu	m/f
خُذْنَ Xudna	تَأْخُذْنَ Ta?xudna	أَخَذْثُنَّ ?axadtunna	خُذا Xudaa	تَأْخُذَانِ Ta?xudaani	أَخَذْتُمَا ?axadtumaa	خُذِي Xudi	تَلْخُذِينَ Taʔxudi- ina	اَخَذْتِ Paxadti?	2.f
خُذُوا	تَأْخُذُونَ	أخَذْتُمْ	خُذًا	تَأْخُذَانِ	أخَذْتُمَا	خُذْ	تَأْخُذُ	أخَذْتَ	2
Xuduu	Ta?xuduuna	?axadtum	Xudaa	Ta?xudaani	?axadtumaa	Xud	Ta?xudu	?axadta	2.m
	يَأْخُذْنَ	أخَذْنَ	-	تَأْخُذَانِ	أخَذَتَا		تَأْخُذُ	أَخَذَتْ	2.0
-	Ya?xudna	?axadna		Ta?xudaani	?axadataa	-	Ta?xudu	?axadat	3.I
-	يَأْخُذُونَ Ya?xuduna	أَخَذُوا Paxaduu	-	يَأْخُذَانِ Ya?xudaani	أُخَذَا ?axadaa	-	يَأْخُذُ Ya?xudu	أُخَذَ ?axada	3.m

Table 2.7: Conjugations of medially-hamzated verb مهموز العين

Root: سأل {S?al} 'to ask'

	Plural			Dual		Singular			
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Person
-	نَسْأَلُ nas?alu	سَأَلْنَا Sa?alnaa	-	-	-	-	أَسْأَلُ Pas?alu	سَأَلْتُ Sa?alt u	1 <sup>st</sup> m/f
إِسْأَلْنَ ?is?aln a	تَسْأَلْنَ Tas?alna	سَأَلْتُنَّ Sa?altunn a	إسْأَلاَ ?is?ala a	تَسْأَلاَنِ Tas?ala- ani	سَأَلْتُمَا Sa?altuma a	إسْأَلِي ?is?ali i	تَسْأَلِينَ Tas?aliin a	سَأَلْتِ Sa?alti	2.f
إِسْأَلُوا Pis?alu u	تَسْأَلُونَ Tas?aluun a	سَأَلْتُمْ Sa?altum	إسْأَلا ?is?ala a	تَسْأَلانِ Tas?alaan i	سَأَلْتُمَا Sa?altu- maa	إسْأَلْ ?is?al	تَسْأَلُ Tas?alu	سَأَلْتَ Sa?alt a	2. m
-	يَسْأَلْنَ Yas?alna	سَأَلْنَ Saʔlna	-	تَسْأَلاَنِ Tas?alaan i	سَأَلَتَا Sa?alataa	-	تَسْأَلُ Tas?alu	سَأَلَتْ Sa?ala t	3.f
-	يَسْأَلُونَ Yas?aluun a	سألوا Sa?aluu	-	يَسْأَلأَنِ Yas?alaan i	سَأَلاَ Sa?alaa	-	يَسْأَلُ Yas?alu	سَأَلَ Sa?ala	3. m

3- Finally-hamzated verb root مهموز اللام [?al-fisil mahmuuz ?al-lam]: The hamza (،) 'the glottal stop /?/' occurs as the third consonant of the root as shown in 2.8.

Table 2.8: Conjugations of the finally-hamzated verb مهموز اللام

Root: قَرَأ (Qr?a) 'to read'

	Plu	ral		Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
-	نَقْرَأ Naqra?u	قَرَ أَنَا Qara?naa	-	-	-	-	أَقْرَأُ Paqra?u	قَرَأْتُ Qara?t u	1 <sup>st</sup> m/f
اِقْرَأْنَ ?iqra?n a	تَقْرَأْنَ Taqra?na	قَرَ أَتُنَّ Qara?tunn a	إقْرَآ Piqra a	تقرآنِ Taqra?aani	قَرَ أَتُمَا Qara?tuma a	إقْرَئِي iqra?i i	تَقُرَئِينَ Taqra?i -ina	قَرَأْتِ Qara?ti	2.f
اقْرَوُوا ?iqra?u u	تَقْرَؤُونَ Taqra?uuna	قَرَ أَتُمْ Qara?tum	إقْرَآ Piqra a	تقرآنِ Taqra?aani	قَرَ أَثْمَا Qara?tuma a	إِقْرَأُ ?iqra?	تَقْرَأُ Taqra?u	قَرَأْتَ Qara?t a	2. m
-	يَقْرَأْنَ Yaqra?na	قَرَأْنَ Qara?na	-	تقرآنِ Taqra?aani	قَرَأَتَا Qara?ataa	-	تَقْرَأ Taqra?u	قَرَأَتْ Qara?a t	3.f
-	يَقْرَؤُونَ Yaqraʔuun a	قَرَؤُوا Qara?uu	-	يقرآن Yaqra?aan i	قرآ Qara?aa	-	يَقْرَأَ Yaqra? u	قَرَأَ Qara?a	3. m

On the other hand, a verb is considered as "a weak" الفعل المعتل [?al-fiSl ?al-muStal] if the root comprises of one or more of the weak radicals (ا [aa], و [w/ uu], and و [y /ii]). They are called weak beacause weak radicals are dropped or modified in some conjugations. Therefore, these forms present a challenge to young learners since the consonantal root are not always fully represented orthographically in the surface form. For example, the imperfect tense from the root: و (qu/wl} 'to say' is أَقُولْ الله [?aquulu] 'I am saying' where the consonantal root is fully represented in the orthographic form while the radical [u] is represented as [aa] in the active perfect tense forms the root is fully represented as [aa]. Therefore, previous exposure to these forms can play a role in retrieving the orthographic forms of these words.

In Arabic, there are four different classes of weak verbs: a verb with a weak initial radical الفعل [?al-fisi ?al-mioaal], a verb with a hollow verb root الأجوف [?al-?aʒwaf], a defective verb root الفعل اللفيف [?al-naaqis] and a doubly weak verb الفعل اللفيف [al-fisi al-lafiif].

Verbs with a weak initial radical الفعل المثال [?al-fisl ?al-mioaal] start with a vowel. The initial radical 'و' [w], which is an essential part of the root, may disappear in the surface orthographic form of some morphological forms such as in the present tense and other forms as shown in 2.9.

الفعل المثال[w] و Table 2.9: Conjugations of the weak verb with initial waw

reout j juar to par	Root:	وضع	$\{wdS\}$	'to	put'
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	Plural			Dual			Singula	•	
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
-	نَضَعُ nadaʕu	وَضَعْنَا wadaSnaa	-	-	-	-	أَضَىَّعُ Padaʕu	وَضَعْتُ wadastu	1 <sup>st</sup> m/f
ضَعْنَ	تَضَعْنَ	وَضَعْثُنَّ	ضمعا	تضمعان	وَضَعْثُمَا	ضَعِي	تَضمَعِينَ	وَضَعْتِ	Эf
da§na	tadaSna	wadaStunna	daʕaa	tadaSaani	wadaStumaa	daSii	tadaSiina	WadaSti	2.1
ضَعُوا	تَضَعُونَ	وَضَعْتُمْ	ضَعًا	تضمعان	وَضَعْتُمَا	ضَعْ	تَضَعُ	وَضَعْتَ	2
daʕuu	tadaSuuna	wadaStum	daʕaa	tadaSaani	wadaStumaa	daS	tadaSu	wadaʕta	2.m
	يَضَعْنَ	وَضَعْنَ		تضمعان	وَضَعَتًا		تَضَعُ	وَضَعَتْ	2 5
-	yadaSna	wada§naa	-	tadaSaani	wadaSataa	-	tadaSu	wadaSat	3.1
-	يَضَعُونَ yadaSuuna	وَضَىَّعُوا wadaSuu	-	يَضنَعَانِ yadaʕaani	وَضَعَا wadaSaa	-	يَضَىًغُ yadaʕu	وَضَعَ WadaSa	3.m

Hollow verb الأجوف [?al-?aʒwaf], on the other hand, have a vowel in the second root consonant. In some conjugations, الأجوف [w] or إلى [w] or [y] are replaced by [[aa], a long or a short vowel, or a hamza 'glottal stop /?/' as shown in 2.21 (Ryding, 2005).

# Table 2.10: Conjugations of the hollow verb الأجوف

Root: قول (qwl) 'to say'

	Plural			Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
-	نَقُولُ Naquulu	َقُلْنَا Qulnaa	-	-	-	-	أَقُولُ Paquulu?	قُلْتُ Qultu	1 <sup>st</sup> m/f
قُلْنَ	تَقُلْنَ	قُلْثُنَّ	قُولاً	تَقُو لأنِ	فُلْتُمَا	قُولِي	تَقُولِينَ	قُلْتِ	2 €
Qulna	Taqulna	Qultunna	Qulaa	Taqulaani	Qultumaa	Quulii	Taquuliina	Qulti	2.1
قُولُوا	تَقُولُونَ	قُلْتُمْ	قُولاً	تَقُولاَنِ	قُلْتُمَا	قُلْ	تَقُولُ	قُلْتَ	2
Quuluu	Taquuluuna	Qultum	Qulaa	Taqulaani	Qultumaa	qul	Taquulu	Qulta	2.111
	يَقُلْنَ	قُلْنَ		تَقُولان	قَالَتَا		تَقُولُ	قَالَتْ	2.6
-	Yaqulna	Qulna	-	Taqulaani	Qaalataa	-	Taquulu	Qaalat	3.1
	يَقُولُونَ	قَالُوا		يَقُو لاَنِ	قًالاً	-	يَقُولُ	قَالَ	2
-	Yaquuluuna	Qaaluu	-	Yaquulaani	Qaalaa		Yaquulu	Qaala	3.m

The third class of weak verbs is called defective verb النّاقص [?al-naaqis] because the final consonant of the root is a vowel. In Arabic, there are two types of defective verbs: defective with waw verb (?al-naaqis ?al-waawi] and defective with yaa? verb النّاقص الواوي ?al-naaqis?al-yaa?i].

Defective with waw verb has the waw 'و' [w/uu] as the last consonant of the root as shown in 2.11 while defective with yaa? verb النّاقص اليائي [?al-naaqis ?al-yaa?i] has the yaa? 'ي' [y/ii] as the last consonant of the root as shown in 2.12.

Table 2.11: Conjugations of the defective with waw verb النّاقص الواوي.

Root: دعو (dsw) 'to invite'

	Plural	-		Dual			Singula	r	
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
_	نَدْعُو	دَعَوْنَا	-	-	-	-	أَدْعُو	دَعَوْتُ	1 <sup>st</sup>
	nadYuu	daSawnaa					PadYuu	Daʕawtu	m/f
أدْعُونَ	تَدْعُونَ	دَعَوْ ثُنَّ	أدْعُوَا	تَدْعُوَانِ	دَعَوْتُمَا	أدْعِي	تَدْعِينَ	دَعَوْتِ	Эf
udSuuna	tadSuuna	daSawtunna	udSuwaa	tadSuwaani	daSawtumaa	udSii	tadSiina	daSawti	2.1
أدْعُوا	تَدْعُونَ	دَعَوْتُمُ	أدْعُوَا	تَدْعُوَانِ	دَعَوْتُمَا	أدْعُ	تَدْعُو	دَعَوْتَ	2
udSuwaa	tadSuuna	daSawtum	udSuwaa	tadSuwaani	daSawtumaa	udSu	tadSuu	daSawta	2.m
	يَدْعُونَ	دَعَوْنَ		تَدْعُوَانِ	دَعَتَا		تَدْعُو	دَعَتْ	<b>2</b> £
	yadSuuna	daSawna	-	tadSuwaani	daSataa	-	tadSuu	daʕat	5.1
-	یَدْعُونَ yadSuuna	دَعَوْا daʕawaa	-	يَدْعُوَانِ yadSuwaani	دَعَوَا daʕawaa	-	یَدْعُو yadʕuu	دَعَا daʕaa	3.m

Table 2.12: Conjugations of the defective with yaa? verb النّاقص اليائي.

Root: نَسي (nsy} 'to forget'

Plural				Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
-	نَنْسَى Nansa	نَسِينَا Nassiinaa	-	-	-	-	أَنْسَى Pansa	نَسِيتُ Nasiitu	1 <sup>st</sup> m/f
ٳڹ۫ڛؘؽڹؘ	تَنْسَيْنَ	نَسِيتُنَّ	إنْسَيَا	تَنْسَيَانِ	نَسِيتُمَا	إنْسَيِي	تَنْسَيْنَ	نَسِيتِ	Эf
Insayna	Tansayna	Nasiitunna	Insayaa	Tansayaani	Nasiitumaa	Insay	Tansiina	Nasiiti	2.1
اِنْسَوْا	تَنْسَوْنَ	نَسِيتُم	إنْسَيَا	تَنْسَيَانِ	نَسِيثُمَا	اِنْسَ	تَنْسَى	نَسِيتَ	2
Insawaa	Tansawna	Nasiitum	Insayaa	Tansayaani	Nasiitumaa	Insa	Tansa	Nasiita	2.m
-	يَنْسَيْنَ Yansavna	نَسِينَ Nasiina	-	تَنْسَيَانِ Tansavaani	نَسِيَتَا Nasivataa	-	تَنْسَى Tansa	نَسِيَتْ Nasivat	3.f
-	يَنْسَوْنَ Yansawna	نَسُوا Nasuu	-	يَنْسَيَانِ Yansayaani	نَسِيَا Nasiyaa	-	یزستی Yansa	نَسِيَ Nasiya	3.m

Fourthly, a doubly weak verb [al-fisl al-lafiif] has a root consisting of two weak radicals and classified into seperated doubly-weak verb and adjacent doubly-weak verb. The seperated doubly-weak verb [al-fisl al-lafiif al-mafruuq] has two weak radicals in the first and the last position of the root separated by a consonant as shown in 2.13 while an adjacent doubly-weak verb الفعل اللفيف المقرون [al-fisl al-lafiif al-maqruun] exhibits two adjacent weak radicals, the second and the third position of the root as shown in 2.14.

Table 2.13: Conjugations of separated doubly-weak verb اللفيف المفروق.

Root: وقى (wqa) 'to protect'

Plural				Dual			Singular		
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Person
	نَقِي Naqi	وَقَيْنَا Waqayna	-	-	_	-	أقِي Paqii	وَقَيْتُ Waqaytu	1 <sup>st</sup> m/f
قِينَ Qiina	تَقِينَ Taqiina	وَقَيْثُنَّ waqaytunna	قِيا Qiyaa	تَقِيَانِ Taqiyaani	وَقَيْتُما Waqaytumaa	قِي Qii	تَقِينَ Taqiina	وَقَيْتِ Waqayti	2.f
ةُوا Quu	تَقُونَ Taquuna	وَقَيْتُم Waqaytum	قِيا Qiyaa	تَقِيَانَ Taqiyaani	وَقَيَتُماً Waqaytumaa	ق Qi	تَقِي Taqii	وَقَيْتَ Waqayta	2.m
-	يَقِينَ Yaqiina	وَقَيْنَ Waqayna	-	تَقِيَانِ Taqiyaani	وَقَتَّا Waqataa	-	تَقِي Taqii	وَقَتْ Waqat	3.f
-	يَقُونَ Yaquuna	وَقَوْا Waqaw	-	يَقِيَانِ Yaqiyaani	وَقَيَا Waqayaa	-	يَقِي Yaqii	وَقَّی Waqa	3.m

Table (2.14): Conjugations of adjacent doubly-weak verb الفعل اللفيف المقرون.

Root: روى (rwa) 'to tell'

	Plural			Dual		Singular			
Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	Imperative	Imperfect	Active perf.	person
_	<b>ن</b> َرْوِي	رَوَيْنَا	_	_	_	_	أرْوِي	رَوَيْتُ	1 <sup>st</sup>
	Narwii	Rawainaa	_	-	-	_	?arwii	Rawaytu	m/f
<b>اِرْوِينَ</b>	تَرْوِينَ	رَوَيْتُنَّ	اِرْوِيَا	تَرْوِيَانِ	رَوَيْتُمَا	اِرْوِي	تَرْوِينَ	رَوَيْتِ	Эf
irwiina	Tarwiina	Rawaytunna	Irwiyaa	Tarwiyaani	Rawaytumaa	irwii	Tarwiina	Rawayti	2.1
اِرْوُوا	تَرْوُونَ	رَوَيْتُمْ	اِرْوِيَا	تَرْوِيَانِ	رَوَيْتُمَا	اِرْوِ	تَرْوِي	رَوَيْتَ	2
irwuu	Tarwuuna	Rawaytum	Irwiyaa	Tarwiyaani	Rawaytumaa	irwi	Tarwii	Rawayta	2.111
	يَرْوِينَ	رَوَيْنَ		تَرْوَيَانِ	رَوَتًا		تَرْوِي	رَوَتْ	2 £
-	Yarwiina	Rawayna	-	Tarwiyaani	Rawataa	-	Tarwii	Rawat	5.1
-	يَرْوُونَ Yarwuuna	رَوَوْا Rawauu	-	يَرْوِيَانِ Yarwiyaani	رَوَيَا Rawayaa	-	يَرْوِ <i>ي</i> Yarwii	رَوَى Rawa	3.m

In sum, orthographic representation of Arabic verbal forms is determined by word patterns. Consonantal roots of morphological forms are fully represented in the orthographic form, except in some cases of weak verbs, while vocalic patterns are partially represented depending on whether long or short vowels are used. Short vowels are represented by diacritics and are often omitted in orthographic representation.

### 2.2.2.2 Augmented and unaugmented verbs

In addition to the verb classifications given above, Arabic verbs can also be divided into augmented and unaugmented verb forms (Alrajehi, 1973). Arabic verbs are mainly based on three or four consonantal roots where many verbs can be produced by interlocking these roots into different word patterns. The simplest word pattern of the triliteral verb root is فَعْلَ [faSala], while the pattern فَعَلَ [faSala] forms the basic pattern of the quadriliteral verb root. These two forms are the simplest forms in Arabic and are called unaugmented verbs only the original characters of the root. All other verb forms which are morphologically more complex are called augmented verb is either unaugmented if it is made up of the original characters of the root or augmented by one or more letters. The additional letters, whether consonants or long vowels, are represented in the orthographic representation of the word.

Triliteral augmented root verbs المزيد الثَّلاثي [al-maziid Al-oulaaoi] are constructed by adding one, two or three letters to the basic form of the verb or by duplicating the second character of the basic pattern. For example, the basic pattern فَعَلَ [faSala] 'to do' could be augmented by one letter such as السِتَقْعَلَ [?afSala], two letters such as الفعَلَ [?infaSala], or augmented by three letters such as [?istafSala]. Table 2.15 demonstrates examples of triliteral augmented verbs.

مزيد الثلاثي بثلاثة أحرف Augmented by three letters Basic form: غَفَرَ [ɣafara] 'forgave'		attern	مزيد الثلاثي بحرفين Augmented by two letters Basic form: كَسَرَ 'broke'		attern	مزيد الثلاثي بحرف واحد Augmented by one lette Basic form: حَرَبَ [xaraʒa 'eject'		مزید اا ne letter [xaraʒa]	ttern		
Imperative	Imperfect	Perfect	Wod P	Imperative	Imperfect	Perfect	Word F	Imperative	Imperfect	Perfect	Patt
استغوْرُ Istaghfir	ئىستىغۇر Yastaghfiru	استغفر Istaghfir	استقفل Pistafrala	انکسِرُ Inkasir	ېنكىر Yankasiru	انکسَر Inkasara	انْقَعَل infa£ala	أخرخ Paxrij	يُخرخ Yuxriju	أخرج Paxraʒa	افعل PafYala

Table 2.15: Triliteral augmented-root verbs المزيد النَّلاثى [al-maziid Al-thulaathi]:

In addition, quadriliteral augmented root verbs المزيد الرباعي [al-maziid al- rubaasi] are formed by adding one or two letters to the basic form as shown in 2.16. The form with one augmented letter follows the pattern تَقَعْلَلَ [tafaslala] by adding 'ت' [t] at the beginning of the root while the form with two augmented letters follows one of two patterns; الفُعلَلَ [ifsalala] by adding '!' [a] and geminating the last character of the verb root, and الفُعنَالَ [ifsanlala], which is not frequently used in Arabic, by adding '!' [a] and 'ن' [n] to the verb root.

Moreover, Arabic language uses the emphatic nuun 'نَ' [nn] as a suffix with verbs to highlight the action and to indicate future tense such as لأذاكرَنَّ [la?uðakiranna] 'will be studying'. In the orthographic representation, this form presents a challenge to young learners since the emphatic nuun [nn] is represented by adding the diacritic ( المندة ( المندة ( أولام)] (faddah] written above the consonant instead of the double consonant sound. Therefore, the presence of shadah is essential in spelling to avoid ambiguity.

مزيد الرباعي بحرفين Augmented by two letters Basic form:لَمَأَنَّ [t̪amʔana] 'reassured'			Word Pattern	<del>دد</del> Aug Basic form:	Word Pattern		
Imperative	Imperfect	Perfect		Imperative	Imperfect	Perfect	
اِطْمَأْنِنْ Iţmaʔnin	يَطْمَئِنُّ Yațma?innu	لِطْمَأَنَّ Iţma?anna	افْعلَلَ ifSalalla	تَدَحْرَجْ Tadaaħraʒ	يَتَدحرَجُ Yatadaāħraʒu	تَدحرَجَ Tadaaħraʒa	تَفَعْلَلَ tafaSlal

Table 2.16: Quadriliteral augmented-root verbs المزيد الرباعي:

### [al- maşaadir] المصادر [al- maşaadir]

Arabic verbal nouns are called مصادر [maşaadir] 'sources' (the singular form is مصادر maşdar) and play the function of gerunds or nominalizations in Indo-European languages. Old Arab grammarians dedicated much valuable work to study the charcteristics of verbal nouns and their relationship with verbs. For instance, there was a big debate between the two main traditional grammar schools, the Kufis and the Basris (belong to Kufa and Basra in Iraq), regarding the relationship between these two forms. The kufians argued that verbal nouns are derived from verbs while the Basrians believed that verbal nouns originate from nouns (Alrajehi, 1973; Kihm, 2015). Generally, the verbal noun المصدر indicates the action involved in the verb but not the time that is implied in the verb. This section focused on how to derive verbal nouns.

Verbal nouns are divided into triliteral root verbal nouns المصادر الثلاثية [al-maşdadr al-oulaaoi] and verbal nouns of non-triliteral root عرب المثلاثي [al-maşaadir yair al-oulaaoi]. Triliteral root verbal nouns are not governed by a general rule but most of them follow the pattern أفعُولة fusuulah]. Table 2.17 shows common patterns of triliteral root verbal nouns.

المصادر الثلاثية Table 2.17: Common patterns of triliteral root verbal nouns

فَعَل faSal	فَعْل faSl	فَعْيل faSiil	فُعَال fuʕaal	فَعَلان faSalaan	فِعَالة fiʕaalah	فَعُولة fuSuula h	فَّغُول fuSuul	فَعَل faʕal	فُعْنَة fuSlah	attern
ثَعْبُ	فَتَح	<del>م کپی</del> ل	شخال	ظَيان	فِلاحة	یپروسک	<sup>فئرو</sup> مْ	خرج	خمَرُ ۃ	Word
taSab	fath	Şahiil	Sufaal	Yalayaan	filaħa	yubuusa	muduum	Saraz	humra	
tiredness'	'opening'	neigh'	'coughing'	'boiling'	^ploughing	'dryness'	guicoming'	lameness'	'redness'	

On the other hand, verbal nouns of non-triliteral root مصادر غير الَّثلاثي [al-maşaadir yair al-oulaaoi] can have one of ten forms:

1- Verbal nouns of quadriliteral root المصدر الرباعي [al-maşdar al-rubaasi]: They follow the patterns
[faslala] (e.g., نَلْزَلَة [basthara] 'disarrange' and زَلْزَلَة [zazalah] 'trembling') or إفعلال [fislaal]
(e.g., زَلْزَال [zilzaal] 'earthquake' and وسُواس (wiswaas) 'obsession').

2- Verbal nouns of triliteral root augmented by a hamza letter 'e' 'glottal stop /?/' بالمرزد (al-maşdar al-oulaaoi al-maziid bi al-hamza]: In this form, the verbal noun follows the pattern [?ifSaal] if the medial consonant of the root is intact, i.e., not a vowel (e.g., إكْرام [?ikraam] 'honoring', and إخراج [?ikraaʒ] 'expulsion'). In addition, the verbal noun follows the pattern إدارة [?ifSalah] (e.g., إخراج [?iqaamah] 'indwelling/ residency', and إدارة [?idaarah] 'Management') if the medial consonant is a vowel. In the orthography, the hamza at the beginning of the verbal noun have a 'seat' in the form of an alif '!' [aa] conformed to the word patterns [?ifSalah].

3- Verbal nouns of triliteral root augmented by doubling the second root letter مصدر الثلاثي المزيد [al maşdar al-oulaaoi al-maziid bi tadSiif al- Sayn]: This form follows the pattern تَقْعِيل العين [taf?iil] (e.g., تضعيف العين [takbiir] 'magnification', and توحيد [tawhiid] 'unification') if the third character of the root is intact as in نقع [faSSala] (e.g., كبر [kabbara] 'magnify', and وحد [tanmiyya] وحد [tarbiyya] 'upbringing', and follows the pattern تقعيل [taf?iil] تتميّة (tarbiyya] 'upbringing', and joing' if the third character is a vowel (e.g., ربّي [rabbaa] 'brought up', and 'magnif'.

 4- Verbal nouns of triliteral root augmented by alif 'l' [aa] مصدر الثلاثي المزيد بالألف (maşdar aloulaaoi al-maziid bi al-alif]: These forms of verbal nouns usually follow the patterns أوعال [fiSaal] and مفاعلة (mufaaSalah) (e.g., نقاش / مُناقَشَة (niqaash /munaaqashah) 'discussion', and قتال مُقاتلة [qitaal/ muqaatalah] 'fight').

5- Verbal nouns of quinqueliteral root مصدر الخماسي [maşdar al-xumaasi]: The verbal noun of quinqueliteral root changes according to its basic verb. For example, the verbal noun follows the pattern تَقَعْلُ [tafaSlul] if the basic verb root follows the pattern النُفَعْل [tafaSlul] if the basic verb root follows the pattern النُفَعْل [?infaSal] if the basic verb root follows the pattern النُفَعْل [?infaSal] if the basic verb root follows the pattern المعالي المعالي

تفغي	افعِلال	افتيعال	انفعال	تَفَعْلُل	Word
tafaSSii	<b>?if</b> Silaal	<b>?ifti</b> Saal	<b>?infi</b> Saal	tafaSlul	Pattern
[taħaddii] تحدّي 'challenge' تَحَدّى [Taħadda] Word pattern: تَعْمَى	احمِرار [?iħmiraar] 'redness' Verb: احمرَ [?iħmarra] Word pattern: [?ifsalla]]	امْتِثْال [?imtioaal] 'Obedience' Verb: امتثل [?imtaoala] Word pattern: افْتَعَل [?iftasal]	انکِسار [?inkisaar] 'refraction' Verb: انکسر [?inkasara] Word pattern: انفُعل [?infaʕal]	تَدَحْرُج [Tadaħruʒ] 'rolling' Verb: تَدَحرَجَ [tadaħraʒa] Word pattern: [tafaʕlal] تَفَعْلَل	Verbal noun

مصدر الخماسي Table 2.18: Verbal noun of quinqueliteral root

6- Verbal nouns of six-letter roots مصدر السداسي [maşdar al-sudaasi]: These forms are not very common in Arabic and often follow the patterns: افعنلال [?ifsinlaal] (e.g., افرنقاع [?ifsinlaal] (e.g., المعدار [?ifsinlaal] (e.g., المعدار [?ikfahara]); banging' from the verb [?ifsinlaal] (e.g., الفيلال (e.g., الفيلال (e.g., المعدار); from the verb [?ikfaharra]), الفيو عال (?ifsinlaal] الفيو عال (?ifsinlaal] (e.g., المعدار [?ishishaab] 'grassy' from the verb المعدار [?ishishaab] (e.g., المعدار [?ishishaab] 'grassy' from the verb المعدار [?ishawshaba]), المعدار [?ifsinlaal] (e.g., المعدير المعدار [?ishawshaba]), المعدار [?ifsinlaal] (e.g., المعدير المعدار), and the pattern [?istifsinlaal] (e.g., المعدير المعدار), and the pattern [?istifsinlaal] [?istifsinlaal] (e.g., المعدار), المعدار [?istiraaj], المتدار [?istiraaj], المعدار [?istiraaj], 'Extraction').

7- Verbal nouns with initial miim [m] المصدر الميمي [al-maşdar al-miimi]: This form is constructed by adding initial ميم [miim] [m] at the beginning of the word. In the case of triliteral root verb, this form is constructed according to the pattern مَفْعَل [mafSal] (e.g., مَشْرَبْ (mafrab) 'drinkables, drink'; verb: مَشْرَبْ (fariba]) and according to the pattern مَفْعِل [mafSil] if the first character of the root is a vowel (e.g., مَوْعِد [mawSid] 'date or appointment'; verb: وَعَدَ [waSada]). In the case of non-triliteral verb roots, the verbal noun follows the pattern أخرَجَ [mufSal] (e.g., مُفْعَلَ [muxraʒ] 'exit'; verb: أخرَجَ [?axraʒa]).

8- Verbal nouns of profession المصدر الصناعي [al-maşdar al-şinaasi]: This type of verbal noun refers to an industry or profession and is formed by adding a doubled 'يَ- '[iyy] followed by 'i-'[ta] (taa? marbuuta), which is often pronounced as /h/, to the end of the verbal noun such as واقعيّة [waqiSiyyah] 'realistic', عالميّة (salamiyyah] 'related to global', and [قوميّة] qawmiyyah 'national'.

9- Verbal nouns of instance مصدر المرّة [maşdar al-marrah]: The verbal noun of instance is used to indicate that an action has occurred just once. It is constructed according to the pattern قَطْلُة [faSlah] in the case of the triliteral root verb such as جَلسَة [3alsah] 'One session' and قَطْلُة (waqfah] 'one-stop'. In the case of a non-triliteral root verb, the verbal noun of instance is constructed by adding the feminine termination 'a.' [ta] (taa? marbuuta), which is often pronounced as /h/, to the end of the verbal noun such as تسبيحة [tasbiiħah] 'one praise' and أنظار (tal acquire) [acquire) [

10- Verbal nouns of state مصدر الهيئة [maşdar al-hay?ah]: A verbal noun of state is a noun that describes the conditions of an action. It is only constructed from a triliteral root verb and follows the pattern [fislah] such as جلسة [jilsah] 'posture' and مشية [miʃyah] 'way of walking'.

# [al-mustaqaat] المشميعة [al-mustaqaat]

# [ism al-faaSil] اسم الفاعل 2.2.2.4.1 Active participle

An active participle is a noun that is derived from a verb to describe the doer of the action. For example, كاتب [kaatib] 'a writer' is an active participle that describes the person who did the writing. It is constructed according to the pattern فاعل [faasil] in the case of the triliteral root verb such as ياعل [kaatib] 'a writer' (verb: العب [kaatib]), and إنج [Faahim] 'Somebody who understood' (verb: فَهَمَ [fahima]). If the second letter of the root

is '!' [aa], a hamza '،' (a glottal stop /?/) is added to the active participle form (e.g., بائع [Baa?iß] 'seller'; verb: بائغ [qaal], and تال [qaa?il] 'somebody who said'; verb: قال [qaala]).

In the quadriliteral root verb, the active participle form is constructed similar to the imperfect verb form with exchanging the imperfect prefix with ميم [m] and adding a short vowel /i/ to the letter precedes the final character of the root. For example, مُلاكِم [mulaakim] 'a boxer' formed from the imperfect verb مُتَقَدّم [yulaakim] 'boxing', and مُتَقَدّم [mutaqaddim] 'who is progressing' from the imperfect verb يَتَقَدّم [yataqaddam] 'progressing'.

## [Şeigh al-mubaalayah] صيغ المبالغة [Şeigh al-mubaalayah]

Forms of exaggeration are derived from verbs to indicate, with exaggeration, the active participle. They are constructed only from triliteral root verbs and have five common word patterns as shown in 2.19.

	Word Pattern			Word Pattern			Word Pattern
حَذِرْ [ħaðir] 'cautious'	فَعِڻ faʕil	أكۇل [?akuul] 'eater'	شکور [∫akuur] 'a person who is thanking'	فَعُول faʕuul	سفَاح [Saffaaħ] 'killer'	علاَم [ʕallaam] ʿa person who knows facts'	فعّال faʕʕaal
		نصير [Nașiir] 'supporter'	عليم [Saliim] 'a person who knows facts'	فَعِيل faSiil	مِسماح [mismaaħ] 'a person who is forgiving'	مِقَدَّام [Miqdaam] 'bold'	مِفْعَال mif <b>Saa</b> l

Table 2.19: Common word patterns for form of exaggeration صيغة المبالغة

The word pattern أفعّال [fassal] uses ( عند ( fassal] أشدّه ( fassal] is ( faddah] goes on the second consonant to represent a double consonant sound. Learners are expected to use this diacritic to reference morphophonological information and meaning.

# [al-sifah al-muſabbaha] الصفة المشبهة [al-sifah al-muʃabbaha]

Adjective is a noun that is derived from an intransitive verb to indicate and describe the active participle. Adjective has some common patterns as shown in 2.20.

	Word Pattern		Word Pattern		Word Pattern
شُجاع		حَسَن		فَرِح	
'brave'	فُعال	[ħasan] 'handsome'	فعَل	[fariħ] 'habby'	فَعِل
[∫uʒaaʕ]	fuSaal		faSal		faSil
		جبان		أحمَر	
		[ʒabaan] 'coward'	فُعال	[?aħmar] 'red'	أفعَل
			faSaal		?afSal
		وقور		عطشان	
		[waquur] 'respected'	فعول	[ʕaț∫aan] 'thirsty'	فعُلان
			faSuul		faSlan

الصفة المشبهة Table 2.20: Common patterns of adjective

## ?ism al-mafSuul اسم المفعول ?ism al-mafSuul

The passive participle is a noun derived from an imperfect transitive verb and indicates something or someone affected by the action. It is commonly constructed according to the pattern مفعُول [mafSuul] such as مكتوب [maktuub] 'is written', مقول [maquul] 'is said'.

# 2.2.2.4.5 Nouns of place and time الزمان والمكان (?ismaa al-zamaan wa al-makaan)

Nouns of place and time indicate time and place of action. Both nouns share some forms and are constructed from the same patterns. Nouns of triliteral root verb are formed according to patterns مَعْرِضُ (mafsil) or مَعْرِضُ [mafsil] or مَعْرِضُ [mafsil] مَعْرِضُ (mafsil] or مَعْرِضُ (mafsil] a place to overnight in'; verb: مَعْرِضُ [yabiitu], and مَعْرَبُ [mafsil] مُعْرَبُ (mafsil] a place to drink water or drinks'; verb: يَبْسِتُ [yafrabu].

On the other hand, nouns of place and time constructed from quadriliteral root verbs follow the imperfect verb form by exchanging the imperfect prefix with 'ميم' [m] and a short vowel ضمة 'أ'[damma] /u/ and adding a short vowel قتحة [fatħa] 'î'/a/ to the letter precedes the final character of the root. For example, مُخرَج [muxraʒ] 'exit'; verb: أخرَجَ [?axraʒa], and أنتقى 'assembling place'; verb: التقى [?iltaqa].

# [?ism al-?aalah] اسم الآلة [?ism al-?aalah]

It is a noun derived from a transitive triliteral root verb to indicate nouns of instruments or tools. It has some common patterns such as مِفعال [miSaal] (e.g., مِفتاح [miftaah] 'a key'; verb: مَنْحَل [fataha]), مِسطَرة [mifSal] (e.g., مِفْعَلَة (farata]) مِفْعَلَة (mifSalah] (e.g., مِفْعَل [mifSalah] (e.g., مِفْعَل [mifSalah] 'a ruler'; verb: مُسطَرة (sațtarah] 'a ruler'; verb: سَطَرَ [sattarah] 'a ruler'; verb: مَسطَرَ [faSaalah] (e.g., مَسطَرَ [faSaalah] (e.g., مَفْعَل [faSsaalah] 'a ruler'; verb: مُسطَر [saqa]), and [mistarah] 'a ruler'; verb: مَسَلَ (e.g., مَسَلَ (e.g., مَسَلَ (e.g., مَسَلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مُسْلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مَسَلَ (e.g., مَسْلَ (e.g., مُسْلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مَسْلَ (e.g., مُسْلَ (e.g., مَسْلَ (e.g., مُسْلَ (e.g., مُسْلَ

### [?ism al-tafdiil] اسم التفضيل 2.2.2.4.7 Elative noun

In Arabic, elative nouns are constructed according to the pattern أَفْعَلُ [?afsalu] to indicate a comparative and superlative relation when comparing things or persons. They are mainly derived from triliteral root verbs such as أَقُولُ [?aqwalu] 'say more', أَصْغَرُ [?aşɣaru] [smaller]. In addition, there are three common forms that don't follow the pattern أَفْعَلُ [?afsalu]; خيرً [xayrun] 'better than', أَفْعَلُ [farrun] 'worse than', and حبّ [ħabba] 'love more'.

# 2.2.2.4.8 Exclamation forms اسم التعجب [?ism at-tasa33ub]

In Arabic, excalamtion has two forms; ما أَفْعَلَ [maa ?afʕala] and أفعِلْ بَ [?afʕil bi] and they are derived from triliteral root verbs such as:

(maa ?ajmala] 'what a beautiful!'

?ajmil bi] 'what a beautiful!' أَجْمِلْ ب

Both forms are considered as derivations even though they are verbs because they are nonconjugated verbs and work similar to nouns (Alrajehi, 1973).

# [?al-?asmaa?] الأسماء [?al-?asmaa?]

Arab grammarians divided nouns into four categories: الاسم المقصور [?al-?ism al-maqsuur] 'a noun with shortened ending', الاسم الممدود [?al-?ism al-manduud] 'a noun with extended ending', الاسم الصحيح [?al-?ism al-manquus] 'a noun with curtailed ending', and الاسم الصحيح 'sound noun'.

A noun with shortened ending الاسم المقصور [al-?ism al-maqsuur] is a declensional noun that ends with ي [?alif maqsuura] such as in the proper names: المصطفى [?alhuda], المصطفى [?almuştafa], الفتى [?alfata]. Such forms are constructed from triliteral intransitive verbs that end with a vowel letter. They are called shortened nouns because the last ي [?alfata]. Such formed and does not get full pronunciation as the long vowel [?al].

A noun with extended ending الاسم الممدود [al-?ism al-mamduud], on the other hand, ends with a hamza glottal stop ، [?] preceded by a long vowel [aa]. In contrst to shortened nouns, nouns with an extended ending are fully pronounced such as in ستماء [samaa?] 'sky'.

The third class of nouns is nouns with a curtailed ending الاسم المنقوص [al-?ism al-manquus] which ends with a long vowel ي [yaa] /-ii/ preceded by a short diacritic '?' [i] such as in إلقاضي [?alqaaqiii] 'the judge'. In the orthographic representation, if the noun with a curtailed ending is indefinite indefinite and not annexing مُضاف [moḍaaf], the last ي [yaa] /-ii/ of the noun is omitted in nominative and genitive cases and مُضاف [tanwin kasir] (-) /-in/ is added to the letter that precedes the omitted letter. Examples 1 and 2 show that the last [-ii] in the indefinite noun cases and أن (-ii) and geneitive (example No. 1) and geneitive (example No. 2) cases and تروين كسر [tanwin kasir] (-j)/-in/ is added to the letter omitted letter [yaa] /-ii/.

1- هذا قاضي [haaða qaadin] 'this is a judge-NOM.'

2- مَرَرْتُ بِقاضِ [marartu bi qaadin] (passed-I (suffix)-Nom. by a judge-GEN.) 'I passed by a judge

Sound noun الاسم المقصور [?al-?ism al-ṣaħiiħ), on the other hand, is neither الاسم الصحيح a noun with shortened ending nor الاسم الممدود a noun with extending ending, nor الاسم المنقوص a noun with curtailed ending. Examples of sound nouns are رجل [raʒul] 'man', كتاب, [kitaab] 'a book', and غرفة [yurfah] 'a room'.

#### [?al-zumuus] الجموع 2.2.2.4.10 Plurals

Arabic has two main forms of plurals: the sound plurals الجمع السّالم [?al-ʒamʕ as- saalim] and the broken plurals جمع التّكسير [ʒamʕ at-taksiir]. The sound plural is the regular plural in Arabic and compares with the English regular plural. This plural has two main forms: the sound masculine plural noun المذكر السّالم [ʒamʕ al-muðakkar as- saalim] and the sound feminine plural noun جمع المذكر السرّام [ʒamʕ al-muðakkar as- saalim] المؤنت سالم

The sound masculine plural noun refers to a group or groups of three or more human males or mixed groups of males and females. It is formed by adding the suffix -[-uun] to the singular noun in the nominative case and بين [-iin] in the accusative and genitive cases as shown in (21):

(21):

Singular	<b>Plural Nominative</b>	Plural Accusative and Genitive
مُهندّس	مُهندّسون	مُهندّسين
[muhandis] 'an engineer'	[muhandisuun] 'engineers'	[muhandisiin] 'engineers'

On the other side, the sound feminine plural noun refers to a group or groups of three or more of human females. It is formed by deleting the feminine termination [ta] [rat-taa? al marboota] at the end of the singular feminine noun and adding the suffixes التاء [-aatun] in the nominative case and التاء [-aatin] in the accusative and genitive cases to the singular noun as in (22).

(22):

Singular	Plural Nominative	Plural Accusative and Genitive
مُهندسة	مهندساتٌ	مهندساتٍ
[muhandisah] 'an engineer'	[muhandisaatun] 'engineers'	[muhandisaatin] 'engineers'

Broken plural is the second form of plurals in Arabic and represents the irregular form and is similar to English plurals "man/ men", and "foot/ feet". It involves internal modifications rather than adding suffixes to the end of the noun as in sound plurals. Arab grammarians divided broken

plurals into two main types: plural of paucity جمع القلة [ʒamʕu al-qillah] and plural of multitude جمع [ʒamʕu al-kaərah] (Alrajehi, 1973).

Plural of paucity indicates a number of people or things from three up to ten. This form has four common patterns as shown in (23):

(23): Common patterns for plural of paucity

Pattern	[fiSlah] فِعلَة	[?afSilah] أفعِلة	[?afSaal] أفعال	[?afSul] أفعُلْ
	فتية	أطعمة	أثواب	أنْجُم
	[Fityah] 'young boys'	[?atSimah] 'foods'	[?thwaab] 'thobes'	[?anjum] 'stars'
	[fata] فتى ::Sing	[ṭaʕaam] طعام :.	[thawb] ثَوب :.Sing	[najm] نجم :.Sing

In addition, plural of multitude indicates a group of people or things that are more than three and may exceed ten. This form of plurality has twenty-three common patterns in Arabic as shown in 2.21.

Table 2.21: Common patterns for plura	al of multitude in Arabic جمع الكثرة
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أفعِلاء	فعلان	فيعلان	فِعَال	فعلى	فعَلَة	فُعَل	فُعْل
[?afSilaa?]	[fuSlaan]	[fiSlaan]	[fiSaal]	[fuSla]	[fuSalah]	[fu§§al]	[fuSl]
أقوياء	بُلدان	حيتان	صِعاب	قتلى	غُزَاة	صُوّم	سُمْر
[?aqwiyaa?]	[buldaan]	[ħiitaan]	[șiSaab]	[qatlaa]	[yuzaat]	[Şuwwam]	[Sumr]
'strong	'countries'	'Whales'	'difficulties'	dead	'Invaders'	'fasters'	'browns'
persons'	Sing.	Sing.	Sing.	people'	Sing.	Sing.	Sing.
Sing.	[balad] بَلَدْ	حَوت	[saʕb] صَعْب	Sing.	[yazin] غازٍ	[şaʔim] صائِمْ	أسمَر
[qawii] قَوِي		[ħuut]		قتيل	· ·		[?asmar]
				[qatiil]			
فُعُل	فواعِل	فُعَلة	فعلة	فُعُول	فعلاء	فعالِل	فِعَل
fuSul	fauaaSil	fuSalah	fiSalah	fuSuul	fuSalaa?	faSaalil	fiSal
عُمُد	زوابع	كَتَبَة	دِببَة	ئمور	كُرَماء	صَحائِفْ	کِسَر
[ Sumud]	[zauaabis]	[Katabah]	[Dibabah]	[Numuur]	[kuramaa?]	[ṣaħaaʔif]	[kisar]
'columns'	'whirlwinds'	'writers'	'bears'	'tigers'	'generous'	'newspapers'	'small
Sing.	Sing.	Sing.	Sing.	Sing.	Sing.	Sing.	pieces'
عِماد	زَوبَعَة	کاتِب	[dub] دُبْ	نَمِرْ	کَرِيم	صَحِيفة	Sing.
[Simaad]	[zaubaʕah]	[kaaib]		[namir]	[kariim]	[şaħiifah]	کِسرَۃ
							[kisrah]
		فعالِي	فْعَال	فعالى	فعالِيَ	فْعَل	فعائِل
		faSaali	fuSSaal	faSaala	faSaalii	fuSal	fa <b>Saa</b> ?il
		صحارٍ	كُتّاب	صحارى	کراسيّ	غُرَف	بَراثن
		[Ṣaħaarin]	[Kuttab]	[Ṣaħara]	[Karaasii]	[ɣuraf]	[Baraaoin]
		'deserts'	'writers'	'deserts'	'chairs'	'rooms'	'claws'
		Sing.	Sing.	Sing.	Sing.	Sing.	Sing.
		صتحراء	[kaatib] کاتِب	صتحراء	ػؙڔڛؚؠٞ	[ɣurfah] غُرِفَة	بُرِثَنْ
		[șaħraa?]		[șaħraa?]	[kursii]		[burøun]

# [at-taşyiir] التصغير 2.2.2.4.11 Diminutive

Arabic language uses diminutive forms to indicate some purposes such as smallness, contempt, and a short time period. Diminutive nouns have three main patterns: لَعَيْلُ [fuʕail] (e.g., نُهَبُر [nuhair] 'small river'; noun: مُسَيْجِد [fuʕaiʕil] (e.g., مُسَيْجِد [musaiʒid] 'a small mosque'; noun: [masʒid]), and نُعَيْعِل [fuʕaiʕiil] (e.g., مُسَيْجِد [ʕuṣaifiir] 'a small bird'; noun: مُسَجِدْ The short vowels of diminutives are often omitted in the orthographic representation.

# [an-nisbbah] النّسبة [an-nisbbah]

Relative adjective is an adjective form constructed from nouns by adding the suffix -[-iyyun] in the masculine and  $-i_{-iyyatun}$  in the feminine to the end of the noun to indicate affiliation of something such as place of origin, nationality, or ethnic names as in (24). Shadah ( $-i_{-iyyatun}$  [faddah] is also used here in the orthographic representation on the final consonant of the word to indicate the relative adjective.

(24): Relative adjective

Noun	<b>Relative Adjective (Masc.)</b>	Relative adjective (Fem.)
'Jordan' [?al-?urddun] 'Jordan'	'Jordanian' [?urdduniyyun] أردنيٌّ	'Jordanian' [?urdduniyyatun] أردنيّة
yaum] 'day' [yaum] پوم	yaumiyyun] 'daily'] يوميُّ	yaumiyyatun] 'daily'] يَومِيّةٌ

### 2.2.3 Previous studies on morphological complexity in Arabic

A growing body of literature investigating the acquisition of morphological structures in spelling among children (e.g., Bourassa et al., 2006, Silliman et al., 2006) highlights the importance of morphological knowledge in spelling and attributes spelling difficulties to failure in making full use of morphology (e.g., Carlisle, 1987; Treiman and Cassar, 1996). In the same vein, Nagy and Anderson (1984) found that half of the words in English school materials that fifth graders read and learn every year in the USA are derivational and inflectional forms and that emphasizes the importance of teaching morphological forms in the early stages.

In general, studies that have been conducted on morphological acquisition in Arabic are sparse and a large body of these studies appeared as unpublished doctoral dissertations (e.g., Badry, 1983 (cited in Badry, 2009); Daana, 2009; Moawad, 2006; Aljenaie, 2001). Nearly all of these studies have devoted vast attention to investigation of noun pluralization in Arabic dialects in the context of oral production (e.g., Aljenaie, 2001; Daana, 2009; Moawad, 2006; Moawad, 2006) while little attention was given to other morphological structures in Arabic.

One of the earliest studies on Arabic acquisition is that of Omar (1973) who conducted a study in the context of oral production on a group of Egyptian children ranged in age from six months to fifteen years old. Omar (1973) found that young Egyptian children tend to acquire some morphological structures in stages and according to specific chronological ages. The researcher found that young children started using singular forms at the age of 2;6 while plural and dual forms took place at later stages of language acquisition; the irregular broken plural form was found difficult even for older children to produce. In addition, children tended to avoid irregular plurals by over-generalizing simple feminine plural suffix markers (-aat) which were used in place of irregular plurals.

More recent studies have focused more on mastering the plural forms among young learners in Arabic. For example, Ravid & Farah (1999) investigated the acquisition of two forms of noun plurals in Palestinian-Arabic; the regular sound plural form and the irregular broken plural form. Their results indicated that sound feminine noun plurals were mastered by three year olds while learning sound masculine and broken plurals were gradually learnt until the age of five years old. In the same context, Ravid & Hayek (2003) compared the knowledge of Palestinian Arabic-speaking children of the sound feminine plural (SFP) suffixed by /–a:t/ (e.g., burdan<u>a:t</u> 'oranges') to other number forms; the dual (e.g., burdante:n 'two oranges') and the collective forms (e.g., burda:n 'oranges'). They found that "plurals - represented by the category of SFP– and duals are easier to learn than collectives; but there are also indications that duals are losing their morphological status and that collectives are perceived by young children as related to plurals" (Ravid & Hayek, 2003, pp. 25- 26). Similarly, Daana (2009) proposed that Jordanian Arabic-

speaking children tend to use the regular feminine plural form before the forms of regular masculine plural and the irregular broken plural.

Aljenaie (2001) investigated the speech of Kuwaiti Arabic-speaking children and noted that, similar to other language learners, Kuwaiti children produce suffixed markers of gender and number earlier than prefixed ones (tense/ aspect). The results also revealed that children tend to use the masculine marking of the verb before the feminine one. They also found that children at the age of 2;0 to 2;6 used verbs with perfective markings earlier than imperfective markings. Moreover, children tended to use the third person singular marking before the second person and plural affixes. In a recent study, Aljenaie et al. (2011) examined the acquisition of noun number marking, dual and plural noun forms in Kuwaiti Arabic-speaking young learners and found that children produced regular feminine sound plural forms from early on and more frequently than masculine sound plural, and broken plural forms. Children overgeneralized feminine sound plural forms to be used in place of masculine and broken plural forms.

In another study on Saudi-Arabic dialect, Moawad (2006) investigated the rate and order in which Saudi learners acquire (comprehending and producing) the gender (feminine and masculine) and number system (singular, dual, and plural) and their agreement with adjectives and verbs. The outcomes of the study indicated that children tended to use noun grammatical forms earlier than the verbal ones. The results also have shown that the acquisition of Arabic gender and number systems occur late. In addition, and similar to other studies on Arabic, she found that feminine collective forms are acquired earlier than the masculine collective forms. Based on the performance by age groups, she concluded that comprehension and production of gender, number, and the agreement of adjective and verbs with subjects occur in a hierarchical order as shown in 2.22.

Table 2.22: Hierarchical complexity of comprehension and production of the gender, number systems and the agreements of adjectives and verbs with subjects. This table is adapted from Moawad (2006, pp. 313-315)

Age	Production	Comprehension	
(years)			
	Singular nouns	Noun gender	
8	Sound plurals	Singular form	
	Collective feminine	Dual form	
	Singular adjective		
	Singular verbs		
8-10	Gender system		
	Dual nouns	Plural form	
10	Collective masculine	Collective masculine	
	Dual adjectives		
	Dual verbs		
	Plural nouns	Adjectives	
12	Broken plurals	Verbs	
	3-10 quantified nouns	Collective feminine	
	Plural adjectives		
+12	Plural verbs		
	+11 quantified nouns		

In sum, most of the available studies on Arabic indicate that sound feminine noun plurals are mastered earlier than sound masculine and broken plurals. Ravid & Farah (1999) postulated that the early acquisition of sound feminine plurals indicates that "it is not the sound pluralization device in general that is easier than the broken plural, but rather the feminine sound plural that is easier to learn than both the sound masculine and the broken plurals" (p. 200), while Ravid and Hayek (2003) suggested that feminine collective forms are mastered earlier than the masculine ones since the feminine sound forms are used instead of masculine forms in many local dialects.

Moawad (2006: 192), however, attributed the late mastery of masculine collective forms to the fact that "feminine forms embody a unit referent, and are therefore easier to acquire and produce than masculine forms that embody a collective referent".

Badry (2004, 1983; cited in Badry, 2009) examined oral production of Moroccan-Arabic speaking children aged between 3;5 - 9;9 years old. She found that children tend to follow hierarchial stages in acquiring verbal and nominal form derivations. First, they produce causative patterns, and then the reciprocal, followed by the middle voice patterns. She also found that some broken irregular plural forms and mainly those based on defective roots, which comprise of glides, are produced later than forms based on consonantal roots. In addition, she noted that children at all ages used the basic word pattern in Arabic [faSala] "to express several semantic and syntactic relations in spite of the availability, in their repertoire, of more specialized verbal patterns" (Badry, 2004, p. 140; cited in Badry, 2009, p. 5).

### 2.2.4 Summary

This section has shed light on Arabic studies that have investigated the acquisition of Arabic morphology. It has shown that many Arabic studies on the acquisition of morphology have been conducted in the context of oral production and also focused on the acquisition of the noun plural system (e.g., Aljenaie, 2001; Daana, 2009; Moawad, 2006) while other morphological forms such as different types of verbs, verbal nouns, and derivations have attracted less attention. Therefore, this situation necessitates further research considering all common morphological forms in Arabic to reference morphological complexity in spelling. The morphological complexity is intended to offer an opportunity to understand the hierarchy that learners tend to follow in learning and acquiring spelling.

In contrast to previous studies, this study investigated the morphological complexity of most common morphological forms in Arabic (e.g., nouns, verbs, plurals, adjectives, passive and active voice verb forms, etc.) in the context of writing. It investigated morphological errors from early on (the second grade) to reference morphological complexity in spelling and assess the development of morphological knowledge among grade levels.

Shalhoub-Awwad and Leikin (2016) used cross-modal priming of words that have the same root in common to investigate the impact of the Arabic root in the visual word recognition process in reading among second grade and fifth grade Arabic-speaking learners. Their results emphasized the role of the root in the processing and representation of Arabic words from early on and indicated that Arabic typically developing readers depend on the root morpheme during visual word recognition. Consequently, they recommended that learners receive "direct instruction of morphological knowledge in elementary school by raising awareness to the meaning of linguistic derivation of the root morpheme and by exposure to it" (Shalhoub-Awwad and Leikin, 2016, p. 307). Accordingly, morphographs, which are represented by roots and word patterns, seem to be the best candidate that can capture the internal structure of the Arabic words in reading and spelling regardless of the phonological environments. Consequently, teaching word patterns as a part of literacy programmes is suggested to improve spelling performance.

This study adopted the word pattern and the root as the basic morpho-graphemic units in Arabic words that young learners should be exposed to and taught from early on in a systematic way based on the complexity hierarchy to improve spelling abilities.

The results of this study will help to define the order in which morphological structures are mastered in spelling and at what age among young learners. This complexity hierarchy is intended to be the base to assess learners' main difficulties in spelling based on the complexity of morphological forms, and provide systematic instructional and educational/ therapeutic strategies to target spelling difficulties. The main and minor morphological forms that have been reviewed are shown in (25):

(25):

**Derivations** 

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### Verbs

• Verbal nouns/gerunds

# Triliteral root verbal nouns

- Verbal nouns of non-triliteral root
- Verbal nouns with initial miim
- Verbal nouns of profession
- Verbal nouns of instance
- Verbal nouns of state
- Active participle
- Forms of exaggeration
- Adjective
- The passive participle
- Diminutive
- Relative adjective
- Nouns of place and time
- Instrumental nouns
- Elative nouns
- Exclamation forms
- Nouns
- Plurals

The next section sheds light on linguistic components of spelling and spelling development among children with learning difficulties.

## 2.3 Spelling development

## 2.3.1 Linguistic components of spelling

Research in spelling has acknowledged the importance of linguistic abilities (phonology, orthography, and morphology) in spelling development (Carlisle, 2000; Nagy et al., 2006; Walker & Hauerwas, 2006). The following sections briefly review spelling components and their contribution to spelling outcomes.

- Strong/ intact verb
  - Hamzated verb
  - Doubled verb
  - Regular intact verb
- Weak verb
  - Verbs with a weak initial radical
  - Hollow verb
  - Defective verb
  - Doubly weak verb
  - Unaugmented and augmented verbs
  - Emphatic nuun

### 2.3.1.1 Phonological awareness

Phonological awareness is the ability to attend to, identify, discriminate, blend, segment and manipulate sounds at the sentence, word, syllable, and phoneme level. Konza (2011, p. 1) defined phonological awareness as "a broad term, referring to the ability to focus on the sounds of speech as distinct from its meaning: on its intonation or rhythm, on the fact that certain words rhyme, and on the separate sounds. When children play with language by repeating syllables; they are demonstrating an awareness of the phonological element of rhyme".

Phonological awareness has been extensively investigated (e.g., Bradley & Bryant, 1983; Goswami & Bryant, 1990) and widely accepted as crucial knowledge required for developing reading and spelling. Several studies highlighted the important role of phonological awareness in early spelling development (e.g., Ehri et al., 2001) and have consistently found a significant correlation between phonological awareness and early spelling competency. Phonological awareness was found to be a significant predictor for spelling development as well as spelling difficulties in many alphabetic writing systems (e.g., Caravolas, 2004; Bird et al., 1995). Similarly, Nation & Hulme (1997) assessed the phonological skills of seventy-five children from first, third and fourth grades in the United Kingdom and investigated the relationship between these skills and spelling and reading abilities. Their results suggested a high correlation between phonological awareness, and mainly phonemic segmentation, with reading and spelling. Phonemic segmentation skill was found to be improved with age and was strongly correlated with spelling performance. Consequently, the ability to manipulate sound contents of words lead to successful phoneme to grapheme encoding which is considered an essential competency in spelling (Bourassa & Treiman, 2001).

In Arabic, Abu -Rabia & Taha (2006) studied spelling skills of native Arabic-speaking children in grades 1-9 in Palestine and noted that phonological errors were the most frequent errors among other linguistic error categories. Their study suggested that such errors could be the result of a failure in translating specific phonemes into graphemes and a confusion between short and long vowels. Phonological errors were present and similar in percentage across all grades. Such results highlight the importance of phonology in Arabic spelling and lead to the conclusion that phonology

poses a challenge to spelling development in Arabic because the relationship between the orthographic form of the word and its full phonological structure varies in transparency depending on whether short vowels (diacritics) are used or not.

### 2.3.1.2 Orthographic awareness

Orthographic awareness indicates the learner's ability to access and use the mental representation of words in written form. It is "knowledge for the correct way to write language" (Apel, 2011, p. 592). Studies investigating linguistic knowledge contributing to the development of spelling found that orthographic knowledge plays an important role in spelling development (e.g., Walker & Hauerwas, 2006; Ise & Schulte-Körne, 2010).

Many studies have highlighted the impact of orthographic depth on spelling performance and spelling acquisition, finding that shallow orthographies tend to have a simple phoneme-grapheme correspondence while deep orthography tends to have a more complex relationship between phoneme and grapheme. According to the "Orthographic Depth Hypothesis" (Katz & Frost, 1992), it was suggested that shallow orthographies make it easier for children to learn to read and write when compared to deep orthographies because in shallow orthographies the sound-symbol correspondence is isomorphic. Georgiou et al. (2012) studied the longitudinal predictors of literacy acquisition in three languages varying in orthographic depth (English - deep orthography in both reading and spelling, Finnish - shallow orthography in both reading and spelling, Greek - shallow orthography in reading and relatively deep orthography in spelling). The study comprised of 82 English-speaking, 70 Greek, and 88 Finnish children from preschool stage (the age of 5.5 years old) until grade 2. Their results indicated that orthographic depth of the language plays an important role in literacy development. For example, letter knowledge and rapid automatized naming were the significant predictors of spelling in both English and Greek where both languages exhibit deep orthography in spelling, while, on the other hand, letter knowledge was the only predictor of non-word decoding in both Greek and Finnish which exhibit a shallow orthography in reading. Consequently, Greek and English, which have deep orthography, exhibited a similar model for spelling, while Finnish and Greek languages (both orthographies are shallow in reading) have a similar model for non-word decoding. Therefore, the researchers concluded that "the

orthography children are learning to read is an important factor that needs to be taken into account when models of reading or spelling development are being generalized across languages" (p. 342).

Arabic orthography varies in transparency between phonemic-graphemic relation depending on whether short vowels (diacritics) are used or not. Therefore, two forms of orthography are used in Arabic, a shallow orthography when short vowels are represented by diacritics and a deep orthography when short vowels are not used in writing (Abu-Rabia, 1996, 1997; Azzam, 1989). Azzam (1993) investigated spelling errors among 6 to 11 year-old native Arabic-speaking children in primary stages. Her findings indicated that misspellings persist throughout all primary stages and involved mainly inappropriate sound-symbol associations, additions, omissions and handwriting problems. The results also indicated that the acquisition of spelling in Arabic requires at least the orthographic skills where learners need to develop their knowledge. Furthermore, Mohamed et al. (2010) evaluated the development of spelling of 111 native Arabic learners of the first three grades in Egypt and concluded that students first adopt alphabetic and orthographic skills for spelling in the Arabic orthography which is consistent with Frith's (1985) developmental framework of written language where a learner needs to go through logographic, alphabetic, and orthographic phases.

In a recent study, Taha (2016) examined the correlation between reading, spelling and orthographic performance among typically developing native Arab students in north Palestine from second, fourth, and sixth grades. Students were individually tested on reading vowelized real words, spelling real words and an orthographic decision task, which was conducted by asking the participants to choose the correct orthographic pattern of a written word from three suggested homophone patterns, to examine the orthographic decision task lagged behind the spelling and reading performances in younger groups while the older group displayed no significant differences between the performance in the spelling and the orthographic decision tasks as shown in 2.5. Therefore, Taha (2016, p. 11) concluded that "it seems that reading and spelling

development in Arabic is mainly affected by non-lexical process in its early stages of acquisition, while lexical and orthographic representations play an essential role in later stages".

Such studies highlight the importance of the orthographic knowledge in Arabic spelling and necessitate the need for more research studies in this topic.



Figure 2.5: The performance in reading, spelling and orthographic tasks across grades (Taha, 2016, p. 7)

#### 2.3.1.3 Morphological awareness

Morphological awareness indicates learners' "conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate that structure" (Carlisle, 1995, p. 194). Recently, considerable research effort has been directed toward the correlation between morphological awareness and spelling development among young learners. Cross-linguistic research highlights the role that morphological knowledge play in improving spelling competency (e.g., Levin et al., 2001; Abu-Rabia & Taha, 2004; Rispens, 2008). Such findings emphasize the
crucial contribution morphological knowledge makes towards the general spelling abilities in the early ages of learning (see Carlisle, 2000, 1996, 1987; Bourassa et al., 2006; Green et al., 2003).

Nagy et al. (2003: 730) postulate that morphological awareness may contribute to both reading and spelling in:

"(a) providing insight into the writing system, (b) enabling readers to read and spellers to produce longer words more accurately and fluently, (c) contributing to syntactic parsing (reading) or packaging (writing), (d) increasing children's ability to decontextualize language and process it analytically, and (e) facilitating written and oral vocabulary learning, which in turn affects reading and writing acquisition."

Treiman and Cassar (1996) showed that morphology affects spelling of final consonant clusters in English among US English-speaking learners of 5- 9 years old. For example, spelling of a sound such as /n/ is more accurate in <u>tuned</u> than in <u>brand</u> since children knew that the stem 'tune' ended with /n/ and that helps them to spell /n/ of the two-morpheme word better than the /n/ of a one-morpheme word. In the same line, Carlisle (1988) found that US English-speaking children of 10-14 years old were more accurate in spelling derived forms in English if they knew how to spell their roots. Therefore, teaching morphological knowledge should be considered in the early stages and particularly in rich morphological languages such as Arabic language which, mainly, relies on two basic components (the root and the pattern) in forming new words.

Deacon and Bryant (2006) affirmed the previous results by indicating that 7- 9 year-old children of southern England would possibly be able to spell words correctly if they were a part of an inflected word (such as 'turn-turning'). Casalis et al. (2011) provided evidence from the French language to support the crucial role of morphological awareness in improving spelling competency. They examined the relationship between morphological awareness and spelling performance and found that morphological awareness is "associated with spelling performance regardless of whether (or not?) morphological information is involved in the items to be written" (p. 509) and, therefore, it was suggested that "the greater a child's awareness of morphology, the more accurately (and possibly fluently) he or she will spell" (p. 509).

In general, available Arabic studies on morphological awareness focused on the relationship between morphological awareness and general profiles of spelling (e.g., Taha & Saiegh-Haddad, 2016, 2017; Abu Rabia & Taha, 2006) while investigating the relationship between morphological awareness and spelling performance on Arabic morphological forms has not received much attention.

# 2.3.2 Spelling development in the special populations

Psycholinguists deem it important to investigate spelling error patterns in order to better understand the spelling development and strategies that are used by language learners (Steffler, 2001; Nunes et al., 1997). In the last three decades, an increasing number of studies (e.g., Carlisle, 1987; Tsesmeli & Seymour, 2006) have investigated the spelling abilities of children with atypical spelling development to reveal underlying deficits in spelling and provide valuable information about its cognitive mechanisms, instructional practices and strategies that may benefit these children.

To understand a learner's spelling development, scholars have studied spelling from different perspectives. Some studies (e.g., Nelson, 1980, cited in Moats, 1983) focused on the developmental aspects of spelling acquisition, and argued that morphological errors reflect the developmental level and achievement level of the child and, consequently, these errors could be explained in terms of normal psycholinguistic developmental processes. On the other hand, the underlying deficits reflected by the underlying representation and processing of words was another interest for psycholinguists. For example, Sterling (1983) suggested that inflected forms are learned by rule while derived forms are learned as whole and independent words. As a result, two models were suggested to explain the process of spelling: a 'whole word' system, and a 'correspondence' system, which is dependent on knowledge of the constant relationships between sounds and letters.

In the same line and based on spelling errors of patients with acquired alexia and agraphia, Rapcsak et al. (2007), depending on the dual-route equation introduced by Coltheart and colleagues (Coltheart et al., 2001; Castles et al., 2006), postulated that the dual-route model (see figure 2.6)

could accurately predict reading and spelling performance in patients with acquired alexia and agraphia.



Figure 2.6: Dual-route cognitive model of reading and spelling. PG: phoneme-grapheme, GP: grapheme-phoneme conversion (Rapcsak et al., 2007, p. 2520)

According to this model, two interactive distinct routes are used to process reading and spelling: the lexical and non-lexical routes as shown in 2.6. The lexical route relies on the whole-word retrieval process without phonological mediation, i.e., regardless of the letter-sound relationships, and it can process all common and irregular words. This route takes advantage of the activation of word-specific orthographic and phonological memory information. In contrast with the lexical route, the non-lexical route relies on the phoneme-grapheme correspondence rules and it can process non-words. Therefore, spelling errors are expected to occur as a result of a difficulty in one of the two routes and that gives rise to a specific type of errors depending on the defective route.

### 2.3.2.1 Learning disabilities

American National Joint Committee on Learning Disabilities defined learning disability as:

"a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span. Problems of self regulatory behaviours, social perception, and social interaction may exist with other handicapping conditions (for example, sensory impairment, mental retardation, serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences)" (Swanson et al., 2013, p. 26).

The growing number of LD in schools worldwide (for example, 15% of the US population) (LD online, 2016) highlights the importance of analyzing their spelling errors in order to reveal underlying deficits in spelling and provide valuable information about its cognitive mechanisms, instructional practices and strategies that will benefit these children.

In the last few decades, an increasing number of studies have investigated the spelling abilities of children with atypical spelling development (e.g., Carlisle, 1987; Tsesmeli & Seymour, 2006). These studies postulated that children with learning disabilities have difficulty in learning morphological rules, especially with written tasks involving inflectional and derivational morphology, when compared to younger children matched on reading and spelling age. Other comparison studies of LD and TD (e.g., Moats, 1983) proposed that LD and TD learners follow some similar developmental patterns in reading and spelling skills. Therefore, it was hypothesized that LD students display a delayed pattern of morphological errors than the TD students, but both groups will go through similar sequences of morphological development. In contrast, Lennox and Siegel (1994) proposed that learners with poor spelling skills show a deviant pattern in learning to

spell rather than a delay in their spelling development which suggests that children with poor spelling skills may perform differently from the younger typically developing spellers with regards to developmental patterns.

Silliman et al. (2006) investigated the spelling error patterns of twenty-four English-speaking children in USA, aged 6 to 11 years old, divided into three groups: a group with learning disabilities matched to a chronological-aged-matched group and a spelling-age matched group. They found that children within a chronological-aged-matched group had fewer spelling errors in all linguistic categories while the group with learning disabilities performed similarly to the younger spelling-aged- matched group. The group with learning disabilities made more omission of inflectional morphology, including omission of tense marking, plurals, and present progressive tense. Silliman et al. (2006) concluded that children with learning disabilities are "delayed in spelling development rather than following a deviant developmental process" (p. 93) and they affirmed "the critical role of morphology as the mediator between and form and meaning" (p. 94). In addition, Clarlisle (1994) found that both typically developing learners and learners with LD at the second to third grade level perform similarly in using morphologically complex words although they differed in number of words and quality of writing, especially in imaginative writing. Consequently, some researchers (e.g., Carlisle, 1996) suggested that the second and third graders could reflect a transitional period in which the children are learning inflected forms and are beginning to use derived forms in their spontaneous writing.

The developmental patterns of spelling among LD learners were questionable as to whether these learners follow a delay or a deviant developmental pattern compared to TD. This question will be addressed in the current study and mainly the developmental patterns of morphological forms in Arabic which, to my knowledge, has not been tackled in a previous study.

The most common specific disabilities of LD are dyslexia, which affects reading abilities, and dysgraphia, a learning disability that affects writing abilities. People with LD can have both reading and writing deficits.

### 2.3.2.1.1 Dyslexia

The most widely accepted definition of dyslexia is the one that was adopted by the International Dyslexia Association (IDA) in 2002 and used by the American National Institute of Child and Human Development (NICHD). They defined dyslexia as:

"a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge." (IDA, 2002).

Diamanti et al. (2014) examined the spelling of derivational and inflectional suffixes among three groups of 10–13-year-old Greek children: a group with dyslexia, a group with spelling levelmatched, and a group with age-matched children. Participants were asked to spell adjectives, nouns, and verbs in dictated word pairs and sentences. The results have shown that children with dyslexia performed similarly to spelling level matched group except in verb inflections while their performance was worse than age-matched group in all cases. They concluded that the performance of children with dyslexia exhibits a delay rather than deviant performance which could be due to weakness in acquiring morphological information and/or applying these rules to spell word suffixes. In the same vein, Bourassa et al. (2006) examined spelling performance of two English-speaking groups: a group of children with dyslexia and a group with younger typical children. Results indicated that both groups produced quite similar spellings. They concluded that "dyslexic children experience many of the same kinds of difficulties in learning to spell and make errors on many of the same linguistic structures as typically developing children" (p. 713).

Investigating spelling errors of LD and mainly dyslexics in Arabic is still growing and most of the available studies examined the general spelling profiles while investigating morphological structures has not received as much attention. For example, Abu-Rabia and Taha (2004) compared

reading and spelling errors of dyslexic Arabic readers with two groups of typically developing readers: a young readers' group and an age-matched group. All learners were tested on reading and spelling of texts, isolated words and pseudo words. The results indicated that both dyslexic and young learners performed similarly in percentages and quality. A high percentage of errors were phonetic due to "the limited orthographic lexicon" (Abu-Rabia & Taha, 2004, p. 651) and limited knowledge of spelling rules.

In the same vein, Abu-Rabia & Samour (2011) investigated spelling errors of bilingual Arabic-English dyslexics (eight graders) compared to a group of spelling-matched level sixth and fifth graders. All participants were tested on spelling isolated words in Arabic and English. Both dyslexic and spelling-level-matched group made similar spelling error profiles. The majority of the spelling errors in Arabic were due to poor knowledge of spelling rules and substituting emphatic consonants with their plain counterparts while most of spelling errors in English were due to substitution between letters that exhibit phonological similarities, letters that may represent the same phoneme, omission of letters, and poor knowledge of writing conventions.

### 2.3.2.1.2 Dysgraphia

Dysgraphia is another common learning disability that "affects writing abilities. It can manifest itself as difficulties with spelling, poor handwriting and trouble putting thoughts on paper. Because writing requires a complex set of motor and information processing skills, saying a student has dysgraphia is not sufficient. A student with disorders in written expression will benefit from specific accommodations in the learning environment, as well as additional practice learning the skills required to be an accomplished writer" (NCLD, 2006).

Dysgraphia exhibits some common types such as dyslexic dysgraphia where handwriting is illegible; spelling is poor while drawing and copying of written words are supposed to be within normal. The second common type is the motor dysgraphia where spelling is normal while writing and copying are performed with difficulties. Spatial dysgraphia is another type which is characterized by illegible handwriting, difficulties with copying and drawing while oral spelling is normal (IDA, 2000).

Compared to dyslexia, investigating spelling errors among learners with dysgraphia has received far less research attention than dyslexia. Studies on dysgraphia have raised the question of the role of orthographic transparency in spelling performance. Some researchers (e.g., Ardila, 1991) proposed that dysgraphia does not exist in transparent languages such as Italian and Spanish since words and non-words can be cognitively processed and written equally by either the lexical or the non-lexical route and, therefore, if one route is impaired, the accessing and processing will be taken by the other route. On the other hand, and opposed to Ardila (1991), different cases with dysgraphia and dyslexia were reported in transparent languages such as by luzzi et al. (2003) in Italian and by Ramana & Weekesb (2005) in Turkish who reported a deep dysgraphic patient with semantic errors and inability to write non-words. Their results indicated that "the effect of orthographic transparency on the translation of phonology to orthography is minimal at least in a proficient biscriptal Turkish-English speaker" (Ramana & Weekesb, 2005, p. 67).

In addition, other studies have analyzed dysgraphic spelling errors from a developmental perspective. For example, Hanley et al, (1992) examined spelling errors of a young man, Allan, who has had a surface dysgraphia manifested by a severe spelling impairment since childhood, and has a spelling age of around nine years. His spelling errors involved phonological mistakes such as doubling letters by repeating a consonant (e.g., alcoholl, ennergy, propper). It also involved omissions (e.g., efort, pil, weding), writing [ph] as [f] (e.g., photograf), and confusing 'g' and 'j' (e.g., engoy). He also tended to commit errors when using vowels such as using 'ey' instead of 'y' (e.g., analogey, fancey) and confusing 'e' with 'i' (e.g., pritty instead of pretty, and carpit instead of carpet). Further, he used illegal phoneme to grapheme conversions in writing (e.g., discrace instead of disgrace, angial instead of angel, freend instead of friend, and gould instead of gold).

Allan's performance was explained in the light of the developmental framework of Frith (1985). According to this framework, written language development is comprised of different phases: logographic, alphabetic, and orthographic strategy and, therefore, Allan's performance indicated that he successfully reached the alphabetic phase of spelling development but failed to enter the orthographic stage. Therefore, they concluded that the patient(s) "find it difficult to associate a specific grapheme with a particular phoneme in words that are not spelt via the most common

phoneme-to-grapheme correspondence" (p. 306) and, therefore, "Allan has failed to develop an orthographic lexicon for spelling" (p. 306).

Such studies emphasize the importance of orthographic transparency in spelling development. In Arabic, this issue poses a challenge to spelling since Arabic can have both shallow orthography when diacritics are used and deep orthography when they are absent. This study asked learners to write words with full diacritics (shallow orthography) that can be compared with the outcomes of tasks without diacritics in the future.

### 2.3.3 Theories of spelling development

Several models of spelling development have been proposed to explain the development of the linguistic components of the spelling system among young learners (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985; Bahr et al., 2012). The late model and the early model are the most popular models in the literature of spelling development. The late model was so named since it postulates that morphological knowledge is the last linguistic component to be mastered in learners' spelling development and, consequently, is not available to early spellers. The early model postulates that the morphological knowledge contributes to both early and later spelling development and, therefore, it was called the early model. The main difference between these two models is the timing of a learner's acquisition of the morphological component. These two types of models are described below:

### 2.3.3.1 The late model

The late model is also known as stage or phase theory (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985) because they propose that children move through hierarchical stages in the development of spelling skills as shown in table 2.23 which shows developmental stages in spelling proposed by key researchers.

stage	Gentry	Henderson	Ehri	Beers	Zutell	Bear
1	Precommunicat- ive	Preliterate		Prephonetic		Preliterate/ prephonem-ic
2	Semiphonetic	Letter-name	Semiphonet- ic	Early phonetic	Letter-name sound correspondences	Prephonetic/ semiphonetic
3	Phonetic		Phonetic	Phonetic		Letter-name
4	Transitional	Within-word patterns	Morphemic	Structural	Structural patterns	Within-word patterns
5		Syllable juncture			Inflectional patterns	Syllable juncture
6	Correct/ conventional	Derivational constancy		Meaning/ derivational	Derivational patterns	Derivational constancy
7				correct		

Table 2.23: An overview of developmental stages in spelling proposed by key researchers (borrowed from Young 2007, p. 206)

This section will shed light on the main models of stage theory proposed by Ehri (1986), Gentry (1982), and Henderson (1985).

Gentry's theory (1982) proposes five stages of spelling development to be acquired through early academic learning: firstly, the pre-communicative stage when the child starts using strings of letters that lack meaning in writing. Secondly, the semi-phonetic stage where the child begins to understand the letter-sound correspondence. In the third stage, the phonetic stage, the child uses a letter or a group of letters to represent every speech sound. Thereafter, in the fourth stage, the transitional stage, the child becomes more aware of the conventional spellings and demonstrates some morphological awareness in his/her spelling. In the fifth and last stage, the child develops morphological knowledge and starts to use morphological information such as prefixes, suffixes, etc., in his/her spelling. Similarly, Henderson (1985) postulates that spelling development occurs as a lifelong process and that it goes through five phases: preliterate, letter-name spelling, withinword patterns, syllable juncture, and derivational constancy; these phases are functionally parallel

to Genry's (1982). In contrast, Ehri (1986) proposes three phases of development: semi-phonetic, phonetic, and morphemic. In the semi-phonetic phase, the child relies on the sound knowledge of the letter to spell. Thereafter, in the second phase, he/she begins to use all or most of the sounds in spelling. In the morphemic phase, the child displays knowledge of word regularities and uses morphological information in his/her spelling. Table 2.24 shows a comparison of the primary late model stages suggested by Ehri (1986), Gentry (1982), and Henderson (1985).

All of these models suggest that linguistic knowledge is acquired in the following order: phonological, orthographic, and morphological knowledge, thus, morphological knowledge is always assumed to be the last component of linguistic competence for children to master. Recently, some studies on English spelling (e.g., Silliman et al., 2006; Reece & Treiman, 2001; Bahr et al., 2012) have criticized the stage theories and argued against specific stages of spelling development. They argue that all three linguistic components (phonology, orthography, and morphology) interact at all levels of spelling development rather than occurring in specific phases. Treiman & Bourassa (2000) suggested that "the problems of stage theories are due to the failure of such theories to take into account the complexities of phonological, orthographic, and morphological knowledge as they relate to spelling development" (Treiman & Bourassa, 2000, p. 23).

	Gentry (1982)	Henderson (1985)	Ehri (1986)
Stage	Precommunicative	Preliterate	Semiphonetic
1	Children start using strings of random letters that lack meaning and representation of the sound knowledge.	Children differentiate between writing and pictures. They scribble, draw and write some letters. They don't understand that writing represents speech.	Children rely on the sound knowledge of the letter to spell.
Stage	Semiphonetic	Letter-name spelling	Phonetic
	They begin to understand the letter-sound correspondence and try to spell words using this correspondence such as representing (you) with one letter (u).	They use letters to represent each sound in the target word.	They begin to use all or most of the sounds in spelling.
Stage	Phonetic	Within-word patterns	Morphemic
	They use a letter or a group of letters to represent every speech sound without applying orthographic rules.	They learn orthographic patterns such as using short and long vowels and using past tense morphemes such as –ed and unfamiliar words.	They display knowledge of word regularities and use morphological and orthographic information in their spelling.
Stage	Transitional	Syllable juncture	n/a
-	They begin to apply orthographic and morphological knowledge to spellings and become more aware of the conventional spellings and demonstrate some morphological awareness in their spelling.	They begin to use spelling rules such as doubling of consonants.	
Stage	Correct Spelling	Derivational constancy	n/a
2	They demonstrate an understanding of spelling rules and develop morphological knowledge and start to use morphological information such as prefixes and suffixes in their spelling.	They begin to know roots, their meanings and their derivations throughout life.	

Table 2.24: A comparison of the primary late model stages

# 2.3.3.2 The early model

In contrast to late model or stage models, the early model postulates that morphological knowledge starts from early on and increases throughout spelling development. Children coordinate and implement different linguistic knowledge (phonology, orthography and morphology) at different stages in spelling acquisition. Moreover, it argues that all three linguistic components (phonology, orthography, and morphology) interact simultaneously at all stages of spelling development rather than occurring in specific phases. Consequently, learners learn and use morphological knowledge at different points in spelling acquisition rather than waiting to achieve phonological and orthographic knowledge (e.g., Treiman & Bourassa, 2000).

Consistent with this view, Sulzby's (1996) repertoire theory of language development suggests that learners use morphological knowledge besides other linguistic abilities in spelling from early on; however, learners may rely more on morphological knowledge or other knowledge at different stages in spelling development. In the same vein, the most recent model that has been proposed to explain the linguistic components of the spelling system, the 'Triple Word-Form Theory', first proposed by Silliman et al. (2006) and later modified by Bahr et al. (2012), proposed that both phonology and orthography do not develop independently of the morphological component. Bahr et al. (2012) investigated spelling errors among English-speaking students taken from narrative and expository writing samples of 888 typically developing students in grades 1–9. Errors were categorized into phonological, orthographic, and morphological errors were noted across all grades. Therefore, they postulated that normal spelling development "reflects nonlinear growth and that it takes a long time to develop a robust orthographic lexicon that coordinates phonology, orthography, and morphology" (Bahr et al., 2012, p. 1).

Figure 2.7 shows the presence of the morphological errors from early on in the study of Bahr et al. (2012) where the basic morphological knowledge appears to develop simultaneously with other linguistic skills (phonology and orthography).



Figure 2.7: Non-linear growth of linguistic components in spelling (Bahr et al., 2012, p. 1593).

In addition, Figure 2.7 shows that orthographic and phonological error rates decrease as grade increases while, on the other hand, the frequency of morphological errors increases with grade where most of the increase is completed by grade 5. The researchers attributed the increasing rate of morphological errors among older children to "a combination of word-formation issues combined with vocabulary growth" (Bahr et al., 2012, p. 1596).

# 2.3.4 Summary

It is generally accepted that the basis of learning disabilities (e.g., dyslexia and dysgraphia) in alphabetic languages share the same neurological causes; however, languages have different structures of morphology, phonology and orthography which play an essential role in spelling development (IDA, 2000).

Most studies analyzing spelling errors have been carried out in languages using the Roman alphabet and rarely conducted in other orthographies like Arabic. Conducting a study on a highly morphological language with a unique orthographic system such as Arabic (a Semitic language) is likely to enrich the literature of spelling error analysis especially with regards to the morphological complexity in spelling.

One of the main goals of analyzing spelling errors of the morphologically-based spelling task among typically developing children was to establish a reference point to compare morphological complexity in spelling of learners with atypical spelling development and, mainly, learners with LD. Some studies proposed that learners with atypical spelling development are delayed in spelling development rather than following a deviant pattern of development (e.g., Silliman et al., 2006), while other research studies postulated these learners follow a deviant pattern in spelling development (e.g., Lennox and Siegel, 1994). This study is intended to shed light on the potential development patterns of morphological forms in spelling across TD and LD learners to decide if teaching strategies and assessment of spelling, based on the morphological complexity, are appropriate for both groups specially in classes which include both of TD and LD.

Little research exists investigating the morphological component in spelling, independent of phonology and orthography. In Arabic, this topic has generally been limited to word recognition studies (see Boudelaa & Marslen-Wilson, 2005; Mahfoudhi, 2007). This absence of information necessitates further investigations of the morphological component in spelling which is considered as a principal part of the orthographic lexicon among Arabic-speaking learners (Abu Rabia & Taha, 2004). Such studies can help to better understand difficulties and challenges in spelling and, therefore, plan appropriate educational and therapeutic strategies when a child encounters a difficulty with spelling acquisition. Saiegh-Haddad (2013) has investigated the spelling of the letter [t] in Arabic among young Arabic-speaking learners throughout the first to fifth-graders and indicated that "just as morphology is an indispensable part of the orthographic representation of words, it is a key psycholinguistic component in spelling in Arabic; even very young first graders use morphological insights in spelling irregular letters" (2013, p. 15). In the same vein, a recent study by Asadi et al. (2016) investigated the contribution of some cognitive and linguistic factors to spelling among native Arabic-speaking learners from first to sixth grade and found a high correlation between morphological knowledge/ awareness measures and spelling in all grades.

Due to the impact of the morphological knowledge on spelling and due to the diglossic nature of Arabic language, which creates some phonological variations between MSA and local dialects, this study considered morphological forms based on the root and word pattern as the main units in morphological complexity. Consequently, teaching the root and the word pattern, which represent the main morpho-orthographic structures in Arabic, and the rules on how to combine them will help learners to make use of morphological knowledge in retrieving morpho-orthographic patterns and improve their spelling performance.

# **Chapter Three**

### Methodology

# **3.0 Introduction**

Given the effects of Arabic morphology on the orthographic representation of Arabic words, this study was designed to investigate the complexity hierarchy that young learners tend to follow in learning morphological forms. In addition, the study sought to examine the extent to which morphological awareness contributes to the spelling performance compared to phonological awareness which has been extensively investigated in the literature (see, for example, Stanovich, 1988; Goswami, 2000).

# **3.1 Particiants**

The formal education system in Jordan includes ten years of free compulsory education for children ages 6-16 (grades 1-10) and two years of either secondary academic or secondary vocational schooling. In addition, children ages 3-5 can optionally join 1-2 years of pre-school education which is run by private institutions.

Generally, TD and LD learners attend the same classes in regular schools in Jordan where LD learners receive extra special education services provided by resource rooms in the same regular schools. In 2012, 12-18% of the children enrolled in regular schools suffered from LD (UNICEF 2007) where they encounter academic difficulties and challenges mainly in reading, spelling, and mathematics.

Two groups of participants took part in the study, referred to as TD and LD learners (N=107) (see Table 3.1). Sixty-nine (69) TD learners ranged in age from 7 years, 3 months to 14 years, 7 months (grades 2 to 8) with an average age of 10 years, 6 months participated in this study. Thirty-four were boys and thirty-five were girls. Each grade exhibited an equal representation of male and female learners (N=5) except grade 7. TD learners are defined as those who have been reported by

their teachers to be of normal academic performance and have no history of receiving special education assistance.

	Typically Developing Children			Learning Disabled Children				
Class	Average Age	Males	Females		Males	Females	Average Age	Total
2 <sup>nd</sup>	7.7	5	5					10
3 <sup>rd</sup>	8.8	5	5					10
4 <sup>th</sup>	9.6	5	5		3	3	10.2	16
5 <sup>th</sup>	10.6	5	5		5	5	11.3	20
6 <sup>th</sup>	11.5	5	5		5	3	11.9	18
7 <sup>th</sup>	12.5	4	5		4	3	13.4	16
8 <sup>th</sup>	13.8	5	5		4	3	14.0	17
Total	10.6	34	35		21	17	12.2	107

Table 3.1: Details of the participants

The LD group were classmates of the TD learners and they comprised thirty-eight (38) participants (21 males and 17 females) ranged in age from 10 years to 15 years, 2 months (grades 4 to 8), with an average age of 12 years, 2 months.

LD learners have been already identified as having specific learning disabilities in reading, spelling, and writing skills by a resource room teacher and have met the criteria of the Jordanian Ministry of Education for having learning disabilities. They have also received a comprehensive evaluation based on the Ministry of Education regulations in Jordan. This group included some learners who had repeated grades. The LD learners attended resource rooms which provide remedial and special education services and were located within the same public schools. Generally, resource rooms follow the 'pull out' mode where a student is temporarily pulled out from his/ her regular class for a period of time, varying from one to three class periods each day.

All participants were native speakers of Arabic and were recruited in two governmental single-sex schools in Irbid city, in north Jordan where Arabic is the mother tongue of the students. All participants were attending mainstream schools that have resource rooms and came from the same

area of Irbid. They also came from middle socio-economic classes. All learners had no sight, hearing, or serious health problems.

In contrast to TD learners, the sample of LD learners started from the fourth grade (10 year olds) rather than the second grade (8 year olds) since the assessment of learners at risk for learning disabilities starts at the fourth grade in Jordan. Many research studies indicated that the acquisition of morphological knowledge among learning disabled students lags behind that of their typically developing peers (Carlisle, 1987). For example, Moats (1983) postulated that matching learners with atypical spelling to their chronologically age-matched peers does not show additional information regarding their spelling patterns or characteristics. Therefore, such a sample could provide an opportunity to compare LD performance with their younger typically developing peers, in addition to their chronologically-age matched peers.

Permission to administer the research tasks on the schools' children was first obtained from the ethical committee at Rhodes University (see Appendix A-1, page 225) and, then, the Ministry of Education, Jordan (see Appendix A-2, page 226). Participants who agreed to participate in the study were informed about the study and were requested to sign the consent form beside their parents'/ guardians' signature. Consent forms were typed in both Arabic and English. A copy of this consent letter and the details are attached in Appendix B (page 227). All forms were approved by the Rhodes University Ethics Committee.

### **3.2 Materials**

The current study was designed to explore the following research questions:

1). To what extent, does morphological awareness contribute to spelling competency among learners in Jordan, and how does this compare with the contribution from phonological awareness?

2). What morphological patterns of complexity (e.g., intact verbs, weak verbs, augmented verbs, passive voice, active voice, etc.) do LD and TD learners follow in spelling? Do LD and TD learners follow the same pattern?

Due to the lack of standardized measures in Arabic language, the researcher specifically developed three tasks in Modern Standard Arabic (MSA), which is commonly used in school books and instructions, for the purposes of this work.

In order to answer the first research question concerning the extent to which MA contributes to the spelling performance compared to PA, the descriptive statistics for all measures were calculated, thereafter, correlation and multiple regression analyses were utilized to examine the relationship between MA and PA with spelling performance on morphological forms.

The morphological awareness task was designed to investigate the relationship between learners' morphological awareness and their performance on spelling morphological forms. In addition, the impact of MA on spelling was compared with the impact of PA on spelling through the phonological awareness task which has been widely studied (e.g., Bradley & Bryant, 1983; Goswami & Bryant, 1990) and found to contribute significantly to early spelling development (e.g., Ehri et al., 2001).

Therefore, both tasks sought to shed light on the impact of both types of awareness and to find which one has more influence on the spelling performance in Arabic. Learners were individually required as far as possible to give a proper response to the testing items in the PA and MA tasks. Two points were awarded for the correct response, one point for the near correct response, and a zero point for the incorrect response. The maximum possible score was 50. This scoring system out of 3 points was chosen to help us to understand if the learner demonstrates a thorough or a partial understanding of the required skill, or his/ her response indicates inadequate understanding of the skill.

Statistically, the Pearson correlation test using SPSS is the most commonly used analysis to measure the strength of the relationship between variables. The sample correlation coefficient, denoted 'r' and ranges from -1 to +1, measures strength and direction of the linear relationship between two given variables. A correlation value between 0 and +1 indicates a positive relationship in which an increase in one variable leads to an increase in the other one. A negative association, however, is an inverse relationship between two variables in which one variable increases as the

other decreases, and vice versa. Zero value indicates no relationship between the two variables. The strength of the relationship is expressed by the extent to which the Pearson correlation coefficient is close to +1 or -1, positively or negatively (Field, 2009).

The third task was the the morphologically-based spelling task which was designed to investigate the developmental complexity of morphological forms among learners in spelling. In addition, and in order to examine the internal consistency of the tasks and decide their reliability, Cronbach's alpha was conducted; Cronbach's alpha reliability coefficient normally ranges between 0 and 1.

In what follows I present these tasks in the same order as they were presented to the learners in the study. All participants completed the same tasks in MSA.

# 3.2.1 Phonological awareness task

This oral task was designed to assess learners' ability to identify and manipulate sound units of oral language. It comprised of twenty-five testing items and ten practice items to ensure that learners understood the requirements of the task (see Appendix C, page 229) for a copy of the Phonological Awareness Task). The task was intended to assess the essential skills of phonological awareness, which were presented randomly in the task, and included the following skills:

### 3.2.1.1 Phoneme identification

This measure was used to assess the learner's ability to identify a phoneme in different positions. Two phonemes ([s], and [[]]), which were chosen randomly, were used in this measure. The experimenter pronounced a word and then asked the learner to identify a phoneme in the first, or the final position of the word. For example, the experimenter pronounced the word the word [s] سيّارة 'a car', and then asked the learner to identify the first phoneme in the word which is [s].

### 3.2.1.2 Rhyme detection

This measure was designed to assess the ability to identify words that rhyme. Several studies have revealed a significant correlation between rhyme detection and spelling (e.g., Goswami, 1988; Bryant et al., 1990) since the "words that rhyme or begin with the same sound, when written, often

have spelling sequences of letters in common (e.g., cat and hat)" (Bryant et al., 1990, p. 436). This measure was assessed through two testing items. One item was by presenting a word to the learner, who was then asked to give another word that rhymes with it. For example, the experementer said the word رنان [rannaan] 'sonorous' and then asked the learner to find a rhyming word (e.g., نان [fannaan] 'artist', مناز [ħanna:n] 'warm-hearted'). Another testing item was conducted by reading three words loudly and the learner needed to find out the word that has odd rhyming. For example, the experimenter said the words ضيف [daif] 'a guest', أو المائر (taa?ir) 'a bird' and the learner needed to find the odd one which is المائر.

### 3.2.1.3 Phoneme/ syllable deletion

This task was intended to assess the learner's phonemic awareness which involoves the ability to manipulate spoken words by deleting a specific phoneme or syllable. This task asked the learner to delete a syllable or a phoneme from the initial, medial or final position in a word and, then, was required to say the remaining sound sequences. For example, in a syllable deletion, the experimenter read out a word item such as أستاذ [?ustaað] 'a teacher', and then asked the learner to repeat the whole word. Thereafter, the learner needed to omit the first syllable sound - \_\_\_\_\_ [?us], and say the rest of the sound sequences [ta:ð].

# 3.2.1.4 Blending phonemes/ syllables

This task was administered to assess the learner's ability to blend or combine discrete sound units together in order to create a syllable or a word. This skill was highlighted in several studies and was considered to be a powerful predictor of spelling development (e.g., Torgesen and Davis, 1996; Hecht and Close, 2002). In this task, basic sound elements of a word were presented orally and the learner was asked to blend the sounds and identify the target word. For example, the experimenter pronounced the syllables من, ت, صر [mun-ta-şir/] 'a winner' and, then, the learner needed to combine these sounds to identify the target word. 'a winner'.

# 3.2.1.5 Segmenting phonemes/ syllables

Segmenting phonemes/ syllables plays an important role in spelling development. Treiman and Baron (1983) indicated that the correlation between phonemic-analysis skill and spelling sound rule indicates "a causal link from phonemic analysis to spelling-sound-rule learning" (Treiman and Baron, 1983, p. 388). This measure required the learner to segment a word into syllables or phonemes. For example, the experimenter pronounced the word much analysis (mismaar] 'a nail' and, then, asked the learner to segment the word into syllables or [mismaar]'a nail'.

### 3.2.1.6 Combination of pattern and root

Word formation of Arabic words is, mainly, based on phonological patterns and consonantal roots. For example, the word کاتب [kaatib 'writer' is constructed by embedding the consonantal root {kt-b} into the phonological word pattern {CaaCiC} that indicates the doer of the action of writing. Therefore, this task was administered to assess the learner's ability to combine consonantal roots with word patterns (morphological and phonological knowledge) to create words.

For example, the learner was asked to pronounce words while omitting either a consonant sound of the root or a vocalic sound of the word pattern - such as pronouncing معلقة [maçlaqa] 'a spoon' while omitting ق[q] which is the second consonant of the root علق [çlq]. Another example is the word item نجارة [tiʒaarah] 'trade' which follows the pattern فعالة [fiçaalah] /cvcvvcvh/ where the learner was required to say it while omitting [ [aa] which is a part of the word pattern.

#### **3.2.2 Morphological awareness task**

Morphological awareness is considered as crucial knowledge that contributes to the development of literacy as it involves both analytical and synthetic aspects of word formation rules (Carlisle, 2000). It was very important to assess and compare the learners' explicit and implicit knowledge of morphology. Explicit knowledge of morphology is represented by a morphological awareness task which is "consciously accessed, allowing verbalization and generalization of knowledge across situations". On the other hand, the implicit knowledge of morphology is represented by the spelling task which "underlie(s) practical skills devoid of conscious understanding; a person has an ability to do something but cannot explain his or her success" (Critten, Pine, & Messer, 2013, p. 2). Therefore, performance on a MA task and a morphologically-based spelling task will indicate the relationship between the two levels of morphological knowledge, implicit and explicit knowledge.

This task required the learner to, orally, generate a proper morphological form of a given word to complete a sentence. It comprised of twenty-five testing items in addition to practice items to ensure that learners understood what was required (see Appendix D, page 234, for the full test).

Some of the testing items were adapted from Carlisle (2000) and others were created by the researcher such as the task of morphological measures. The morphological awareness task was comprised of four subtests and was intended to assess the learner's morphological skills as shown below:

# 3.2.2.1 Morphological decomposition

This test was used to assess the learner's ability to decompose a word into its constituent morphemes. In this task, the learner was asked to use the base of a given affixed word by deleting affixes. For example, the learner heard an item word such as مدرسة [madrasa] (ma(prefix for noun of place)-dras(base)-a(feminine suffix)) 'a school', followed by a sentence with a missing word.

(مدرسة) ----- سامي في المكتبة

[-----Sami fi ?al maktaba]

---- Sami (a proper name) in the library (Sami----- in the library)

The learner was then asked to complete the sentence by using the given item word to generate the proper derived form of the target word which is درس [darasa] 'studied'.

#### 3.2.2.2 Derivational morphological awareness

This task was administered to determine learners' ability to manipulate derivations and to understand the relationship between different morphological forms of a word, in addition to the ability to generate new derivations of a word. (Kieffer & Lesaux, 2007).

Morphological derivation is another skill where the learner was required to generate a target word from a base word by adding affixes. For example, the researcher pronounced the base word سبح [sabaħa] 'swam' and asked the learner to use this word to generate a proper word by adding affixes to fit the blank in the sentence:

أحمد----- بارع

```
[?aħmad ----- baari?]
```

Ahmad (a proper name) is a skillful..... (The answer is Sabbaaħ 'a swimmer')

The learner needed to construct the active participant form from the base form سبح [sabaħa] 'swam' by geminating the consonantal root + [b] and adding the infix L [aa] to the base form; [sabba:ħ] 'a swimmer'.

# 3.2.2.3 Awareness of morphological patterns

This task was designed to assess learners' ability to generate words according to the given root and pattern. In this task, the experimenter pronounced the root and the pattern of a word separately, and the learner was asked to combine them in order to generate the target word. For example, the experimenter asked the learner:

ما الكلمة الناتجة من الجذر (زلزل) والمبنى (فِعلال)؛ الكلمة الناتجة هي (زلزال)

What is the word that is derived from the root زلزل {zlzl} 'convulse' and follows the pattern فِعلال [fi?laal], /CiCCaaC/? The answer is زلزال [zilzaal] 'earthquake'.

# 3.2.2.4 Plural forms

This task was designed to assess the learner's ability to construct plural forms of nouns; the sound (regular form) and broken plurals (irreglar form). The learner was required to give plural forms of sound and broken plurals in Arabic. For example, what is the plural form of محاسب [muħaasib] 'accountant'? محاسبون (muħaasibuun] 'accountants', what is the plural form of محاسبون [waraqa] 'a paper'? أوراق ?awraaq] 'papers'.

### 3.2.3 The morphologically-based spelling task

The morphologically-based spelling task is an isolated word spelling task that served as a measure of spelling ability. This dictated spelling task was designed to measure the student's accuracy in spelling morphological forms and not for speed, and also to determine the morphological complexity across grades and groups.

All participants conducted this task in Arabic script and were instructed to use diacritics in their writing in order to ensure an accurate and direct comparison of the development of all morphological forms across grade and group levels. 107 learners out of a total of 116 learners completed this task. The sample was reduced when nine of the learners were eliminated from the data analysis due to absences and also some LD learners were unable to write full words.

For the purpose of the current study, the morphologically-based spelling task was made up of 400 common real words representing all morphological forms in different conjugations and grammatical classes; the examiner can choose these words from lists comprising of 700 words. These words were distributed and coded into eight (8) main morphological forms, which were then further classified into minor coded forms as can be seen in Table 3.2. Each morphological form comprised of words that express different grammatical notions such as tense/aspect, person, voice, mood, gender, number, case and definiteness (see Appendix E, page 239, for some lists of these words).

Words were randomly distributed into thirty-five testing sheets. Each sheet had a serial number and was divided into twenty numbered boxes as shown in Table 3.3. Numbers of the boxes referenced the target words and their morphological forms. A copy with a complete list of words and their reference numbers was used by the experimenter to read out target words as displayed in Table in 3.4.

Table 3.2: Main morphological forms of the morphologically-based spelling task (see Appendix F, page 259, for the full list of main and minor morphological forms)

No.	Morphological	Translation in English	IPA	Code used in
	form in Arabic			the study
1.	الأفعال المتحيحة المبنية	Active voice intact verbs	?al-?afSa:l ?aṣ-ṣaħi:ħa	ASV
	للمعلوم			
2.	الأفعال الضعيفة	Active voice weak verbs	?al-?afSa:l ?aḍ-ḍaSi:fa	AWV
3.	الأفعال المزيدة	Augmented verbs	?al-?afSa:l ?al-mazi:da	AUV
4.	الأفعال الصّحيحة المبنية	Passive voice intact verbs	?al-?afSa:l ?aṣ-ṣaħi:ħa ?al-	PSV
	للمجهول		mabnijja lil-majhu:l	
5.	الأفعال الضعيفة المبنية	Passive voice weak verbs	?al-?afSa:l ?al-ḍaSi:fa	PWV
	للمجهول			
6.	المشتقات	Derivations	?al-mu∫taqa:t	DER
7.	الأسماء	Nouns	?al-?asma: ?	NO
8.	المصادر	Verbal nouns	?al-maşşa:dir	VN

المجموعة: ( ) ص ( ) ع		الاسم: الصف:	
Group: TD() LD()		Class:	Name:
4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13
20	19	18	17

Table 3.3: A sample of a learner's copy of the morphologically-based spelling task

Page No. (1)

Word الكلمة	Word الكلمة	Word الكلمة	Word الكلمة
نَضَعُ	أكِلْتُ	قَرَ أَتُ	كَتَبْتُ
AVVWIR	PVIHV	AVFHV	AVRTIV
4	3	2	1
إقامة	إخراج	غَلَيان	إدارة
GNTR	GNTR	TRG	GNTR
8	7	6	5
أَقُولُ	وَضَعْنَا	قُلْتُ	وَضَعْتُ
AVHV	AVVWIR	AVHV	AVVWIR
12	11	10	9
ڠؙۯؘڣ	فِتِية	أطعِمة	أثواب
BPM	BPP	BPP	BPP
16	15	14	13
مُفتتح	معرض	مَولِدْ	مُخْرَج
РР	NPT	NPT	РР
20	19	18	17

Table 3.4: A sample of the experimenter's copy of the morphologically-based spelling task

Page No. (1)

The morphologically-based spelling task was administrered in groups that ranged in size from five to ten participants. Firstly, the experimenter ensured that all learners were on the same page. For example, the experimenter said: page number one, box number one, and thereafter he read out the target word with full consideration for the proper pronunciation of diacritics. Each word item was first read aloud, then repeated two more times. Learners were instructed to write the target words they heard with diacritics on their sheets. The experimenter collected each sheet whenever a single sheet was completed.

# **3.3 Procedures**

The data were collected during the months of March and April of 2016. It took place during the regular school hours in coordination with the classroom teacher and the school management. Each testing session was about 45 minutes and each participant needed over five testing sessions on different days to complete the tasks.

All tasks were conducted on the school campus, namely, the resource room and the library. The whole testing procedure was completed within a period of five weeks. Tasks were presented in a fixed order across all learners (phonological awareness, morphological awareness, and morphologically-based spelling task). All tasks were conducted by the researcher, the school's specialist in learning disabilities and two other graduate students who were trained in administering the tasks. Experimenters administered practice items before each task . In order to ensure consistent presentation of the tasks, all tasks were presented in the same order: the phonological and morphological awareness tasks were firstly administered individually. After two days, learners conducted the morphologically-based spelling task.

### **3.3.1 Scoring procedure**

Target words in the morphologically-based spelling task were coded and classified in terms of morphological forms. For the purpose of this study, the 44 most common morphological forms in Arabic were categorized into eight (8) main morphological forms, which were then further classified into minor forms. Each target word falls under only one main morphological form and one minor form.

The aim of the morphologically-based spelling task was to define the hierarchy in which morphological forms were mastered across grade and group levels rather than focusing on types of spelling errors among learners. Therefore, an error was defined as any error or misspelling that changes the structure and/or the meaning of the morpological form. Such errors could involve letters and diacritics in terms of sequencing, additions, omissions, reversals, inversions, incorrect sound-symbol associations, segmentation, or directionality. Diacritics were considered in scoring if they were necessay to make a word unambigious. Therefore, leaving diacritics in a word was considered as an error if their absence made the word ambigious such as in the passive voice form. For example,  $\frac{2}{k}$ /kataba/ 'wrote' and  $\frac{1}{k}$ /kutiba/ 'was written' have the same grapheme and are only differentiaed when using diacritics. Therefore, diacritics are necessary in this case.

Each word in the spelling task received a score out of three: three points for the correct spelling, i.e, without any errors, two points if the spelling comprised of one error, and one point for two errors, while spelling with more than two errors received a zero point.

The number of scores associated with each morphological form was calculated to determine the total score in each form across grades and groups. Total scores of all morphological forms for each participant across grades and groups were summed up to determine the general performance in the morphologically-based spelling task.

In order to allow a direct comparison between all morphological forms across grades and groups to reference the complexity of morphological forms, data were normalized across learners. Following the procedure presented by Biber et al. (1998), the totals for each morphological form were divided by the total number of words in the form and then multiplied by the average number of words in each morphological form which was nine in the present study. In addition, spelling error profiles were qualitatively investigated and difficulties were explained in terms of the root and the word pattern difficulties.

#### 3.4 Data analysis

The statistical analysis was carried out using SPSS v22 (Statistical Package for the Social Sciences) to answer the research questions. First of all, reliability was established at the beginning of the statistical analysis by examining the level of internal consistency reliability of tests to ensure that all items in tests measured the same construct within the measure. Cronbach's alpha coefficient ( $\alpha$ ) was performed to determine the level of internal consistency reliability among phonological and morphological awareness tasks and the morphologically-based spelling task.

Correlation analysis, and particularly, the Pearson product moment correlation coefficient and multiple regression analysis were conducted to investigate the strength of the correlation and the relationship between morphological and phonological awareness and spelling accuracy, in addition to the potential contribution of morphological and phonological awareness skills to spelling performance among young learners.

Multivariate analysis of variance (MANOVA) was conducted to examine main effects and interactions between the two groups (LD and TD) and grade levels (two to eight) regarding learners' performance in spelling morphological forms. Next, post-hoc analyses were performed to compare spelling performance in each morphological form separately.

Descriptive statistics were employed to describe the performance complexity of participants on the morphologically-based spelling task. Descriptive statistics were also utilized to examine the non-linear growth of the morphological knowledge through the spelling performance and the morphological patterns of complexity that LD and TD learners tend to follow.

In addition, separate t-test procedures were performed to determine performance differences between LD and TD groups in spelling and effects of gender. The results of the statistical analyses are presented in the following chapter.

#### **Chapter Four**

### Results

# **4.0 Introduction**

It was apparent from the study that both MA and PA make a significant contribution to spelling performance in Arabic. There was a significant positive correlation between MA and PA with spelling performance where increases in one task were correlated with increases in the other one. Qualitatively, an investigation into the nature and causes of spelling errors made by young Arabic-speaking learners suggested three types of spelling errors: errors involving the proper use of the root, errors involving the word pattern, and errors involving both the root and the word pattern.

What is interesting in the findings is that both TD and LD learners produced similar patterns of morphological complexity even though LD learners made more spelling errors. Both groups encountered more difficulties in passive voice forms followed by active voice forms while, on the other hand, both groups spelled nouns, verbal nouns and derivations more accurately than verbal forms (active and passive voice). These results extend our knowledge of the complexity that TD and LD learners tend to encounter in mastering morphological forms which has a significant impact on spelling performance.

The statistical analysis demonstrated that tasks used in the current study are reliable and have high internal consistency. The alphas for the morphological and phonological awareness tasks and the morphologically-based spelling task were  $\alpha = .71$  and  $\alpha = .98$  respectively. These results indicated that alpha scores exhibited a good level in morphological and phonological awareness tests  $\alpha = .71$ , and a high internal reliability and consistency in the morphologically-based spelling test. The finding is consistent with Gliem & Gliem (2003) who suggested that "the closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale" (Gliem & Gliem, 2003, p. 87). The next sections provide details of the results obtained in this study.

# 4.1 The relationship between MA and PA with spelling performance

Based on the descriptive statistics for PA, MA and spelling (see 4.1) a Pearson product-moment correlation coefficient was computed in order to assess the relationship between the performance on PA, MA and the spelling task.

Table 4.1: Descriptive statistics of phonological awareness test, morphological awareness test, and total scores of spelling tests

	Mean	Std. Deviation	Ν	
Total Score in Spelling	767.4579	261.07157	107	
Score in Morphological	35.8286	10.54155	105	
Awareness Test				
Score in Phonological	35.6038	8.79684	106	
Awareness Test		0.1.000		

**Descriptive Statistics** 

The overall results of the Pearson correlation analysis revealed a positive, significant correlation between the MA, PA, and the spelling task. Correlation coefficients between variables are presented in Table 4.2.

A moderate, positive correlation was found between the performance on MA task and spelling performance, r=0.676, n=105, p < .000. This means that increases or decreases in one variable are correlated with changes in the other variable as demonstrated in figure 4.1.

Table 4.2: The Pearson product-moment correlation coefficient of all measures

		Spelling	Score in Morphological	Score in Phonological
		Tolai	Awareness rest	Awareness rest
Spelling Total	Pearson Correlation	1	.676**	.742**
	Sig. (2-tailed)		.000	.000
	Ν	107	105	106
Score in Morphological Awareness Test	Pearson Correlation	.676**	1	.560**
	Sig. (2-tailed)	.000		.000
	Ν	105	105	105

Correlations

\*\*. Correlation is significant at the 0.01 level (2-tailed).



Figure 4.1: A scatterplot summarizes the correlation results between MA and spelling

Morphological knowledge involves understanding the meaning of roots and word patterns, analyzing words into their main component morphographs and manipulating them in a rule-base manner to construct new words or to change their grammatical categories (Gaustad, 2000). This implicit knowledge is used and represented through orthography and called morphographs (Maggs et al., 1981). For example, understanding the meaning of the consonantal root  $\xi \downarrow [zrS]$  'the notion of planting' and word patterns that can be used to construct different words, such as  $j \downarrow [aaSil]$  to indicate active participle, can help learners to properly represent the main two morphographemes, the root  $\xi \downarrow [zrS]$  and word patterns, in the orthography.

Due to rich morphology and unique orthography in Arabic, which pose challenges to spelling among Arabic learners, any model to be used in teaching spelling needs to capture orthographic changes, which can happen in morphologically complex words, vocalization such as diacritics and phonetic aspects and morphological aspects of the word. In Arabic words, the main morphogrameic units include the root and the word pattern which are tied directly to specific semantic and synatcic information. Direct instruction of morphographemic units in Arabic (root and word pattern) can help learners to understand that Arabic words are constructed of two main morphographemes, the root and the word pattern, and that lessens the number of words that learners should memorize in spelling by generalizing a specific word pattern to produce many words with different semantic and grammatical information. In addition, using morphographemes in teaching spelling replaces the focus on phonemic elements such as vocalizations and diacritics which can be captured by morphographemic components.

The results of the correlation between PA and spelling, on the other hand, have also shown a positive correlation between the performance on PA task and spelling, r = 0.742, n = 106, p < 0.000 as summarized in the scatterplot in figure 4.2.


Figure 4.2: A scatterplot summarizes the correlation results between PA and spelling

With respect to the relationship between MA and PA, a Pearson product-moment correlation coefficient indicated a positive, significant correlation, r = 0.560, n = 105, p < 0.000, as summarized in in figure 4.3.



Figure 4.3: A scatterplot summarizes the correlation results between MA and PA

Overall, there was a positive, statistically significant correlation between the three variables of PA, MA, and spelling. In other words, learners who perform well in PA or MA tend to receive higher scores in spelling. Table 4.3 shows scores of some students in PA, MA and spelling where we can see a clear correlation between PA, MA and spelling.

The results of the Pearson product-moment correlation coefficient suggested that MA and PA consistently and significantly co-vary with the measure of spelling. Similarly, the relationship between PA and MA exhibited a statistically significant correlation with each other.

Student	Group	Grade	PA	MA	Spelling
AA	TD	2	31	30	27
MOH	TD	3	36	40	33
Н	TD	4	34	42	32
MH	TD	5	38	48	44
AH	TD	6	34	27	32
IM	TD	8	46	48	45
RU	LD	4	26	10	14
HAN	LD	5	19	13	16
MAL	LD	6	38	28	27
RAG	LD	7	36	40	33
ZE	LD	8	35	33	35

Table 4.3: Samples of learners' scores in PA, MA, and spelling

Since both phonological awareness and morphological awareness tasks exhibited a statistically high significant correlation with spelling performance, a multiple regression analysis was utilized to examine the relative contributions of morphological and phonological awareness to spelling performance among young learners.

Multiple linear regression is the most common form of linear regression analysis and functions as a predictive analysis. It is used to predict the relationship between one dependent variable from two or more independent variables (predictors). The regression equation was therefore used to test whether MA and PA (independent variables) were able to significantly predict spelling performance (dependent variable) among young learners. Using the enter method, the significant regression equation indicated that MA and PA accounted for 65.4% (the R<sup>2</sup> value × 100) of the variance in spelling (R<sup>2</sup>= .654, F(2,102)=96.538, p < .000). It was found that both MA ( $\beta$  = .376, p <.001) and PA ( $\beta$  = .536, p <.001) significantly predicted spelling competency as shown in the SPSS output in table 4.4.

Table 4.4: The descriptive statistics and analysis results of the multiple regression analysis

	Model Summary <sup>b</sup>								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson				
1	.809ª	.654	.648	156.37510	1.143				

a. Predictors: (Constant), Score in Phonological Awareness Test, Score in Morphological Awareness Test

b. Dependent Variable: Total of Categories

	ANOVAª								
Model		Sum of Squares	df	Mean Square	F	Sig.			
1	Regression	4721334.784	2	2360667.392	96.538	.000 <sup>b</sup>			
	Residual	2494223.445	102	24453.171					
	Total	7215558.229	104						

a. Dependent Variable: Total of Categories

b. Predictors: (Constant), Score in Phonological Awareness Test, Score in Morphological Awareness Test

	Unstandardized Coefficients		Standardized Coefficients			Collinea Statisti	rity cs			
Model	В	Std. Error	Beta	t	Sig.	Tolerance	VIF			
1 (Constant)	-144.825	67.563		- 2.144	.034					
Score in Morphological Awareness Test	9.398	1.755	.376	5.354	.000	.687	1.456			
Score in Phonological Awareness Test	16.106	2.111	.536	7.629	.000	.687	1.456			

#### **Coefficients**<sup>a</sup>

a. Dependent Variable: Total of categories

The two predictors (MA and PA) also exhibited significant positive regression (b= 9.398, 16.106 respectively) with spelling, indicating that learners with higher scores in PA and MA tend to have higher scores in spelling; thus, as MA score increases, spelling score increases; as PA score increases, so spelling increases as well. From the magnitude of the t-statistics we can see that PA (t(102)= 7.629, p < .001) had, comparatively, a higher impact on spelling than MA (t (102)= 5.354, p < .001). This result may reflect the fact that vowelization (phonological structure) forms an important aspect of the word pattern, which comprises of the consonantal root and the vocalic pattern, and captures the phonological structure of the word (Taha and Saiegh-Haddad, 2017).

The results indicated that as MA (b= 9.398) increases by one score, total spelling increases by almost 9.4 scores, while as PA (b=16.106) increases by one score, total spelling increases by 16.06 points as explained in scatterplots 4.4 and 4.5.



Figure 4.4: A scatter plot summarizes the positive regression between MA and spelling, and is fitted with a linear line indicating the positive relationship



Figure 4.5: A scatter plot summarizes the positive regression between PA and spelling, and is fitted with a linear line indicating the positive relationship

#### 4.2 The morphological complexity in spelling

The relationship between the complexity patterns of TD and LD in spelling was determined by the complexity hierarchy of morphological forms mastered by young learners based on the morphologically-based spelling task. Spelling errors were classified according to a classification system which included most common forms of Arabic morphology. Spelling performance of 107 learners including 38 children with LD, Grades 4-8, and 69 TD learners, grades 2-8 were assessed with a dictated word list representing the most common morphological forms in Arabic.

Spelling errors were mainly classified into eight (8) major morphological forms: active voice/ intact verbs (ASV), active voice/ weak verbs (AWV), augmented verbs (AUV), passive voice/ intact verbs (PSV), passive voice/ weak verb (PWV), derivations (DER), nouns (NOUN), and verbal nouns (VN). In addition, major forms were further classified into 44 minor forms. Therefore, a spelling error could be classified into one of the eight major forms and one of the 44 minor forms. The current study found that learners, and mainly LD and young learners, tend to make frequent errors involving emphatic sounds, glottal stops, writing the consonant or diacritics at the end of words and the correct order of consonants and vowels in word patterns. Learners are likely to represent emphatic consonants with their counterparts of non-emphatic consonants such as using [s] instead of [s] or [c] or [c] instead of [c] was tended to be replaced by [c] will or [c].

Overall, spelling error profiles across morphological forms in our study indicated that learners (TD and LD) made three types of errors: errors with respect to the root, errors with respect to the word pattern, and errors with respect to both the root and word pattern as shown in tables 4.5, 4.6, and 4.7. For example, a learner wrote the word pattern is constructed from the consonantal root ... [b-q-r] and according to the word pattern [fuSailah]. The learner wrote the target word as رَقِيبَة [ruqaibah] where he made an error with respect to the correct order of the consonantal root and, therefore, the whole meaning was changed to mean 'a young watch woman'.

No.	Target	Word Pattern	Root	Output	Target Gloss
1	مأكول	مفعول	?-k-l	مكول	Was eaten
	[ma?kuul]	[mafSuul]		[Makuul]	
2	بُقيرة	فُعَيلَة	b-q-r	رقيبة	A small cow
	[buqairah]	[fuSailah]		[ruqaibah]	
3	كَتَبْتَ	فَعَلْتَ	k-t-b	کابت	You wrote
	[katabta]	[faSalta]		[kabit]	
4	نقرأ	نَفْعَلُ	q-r-?a	نقرو	We are reading
	[naqra?u]	[nafSalu]		[naqruu]	
5	یُدعی	يُفعل	d-S-w	[Siidi] عيدي	He was invited
	[yudʕa]	[yufʕal]		[yaʕdah] يعدة	

Table 4.5: Spelling errors made with respect to the root

On the other hand, an error with regards to the word pattern indicates that the learner accessed and represented the root properly while he made an error in choosing the word pattern, such as writing [yassalah] ' awashing machine' as غسال [yassalah] ' awashing machine' as أ

The most frequent spelling errors were made with respect to the word pattern and with respect to both root and word pattern. Such errors were expected due to the crucial role of the word pattern, which comprises of at least two morphemes, a root and a pattern, and determines the semantic and the grammatical function of the word output. The word pattern also arranges the root consonants in a specific sequence and controls how vowels intertwine with the root and, therefore, constructing words of different categories.

No.	Target	Word Pattern	Root	Output	Target Gloss
1	أكثُبْ	أفْعُلْ	k-t-b	وكتوب	write (Imperative)
	[?uktub]	[?ufSul]		[waktuub]	
2	أخرج	أفعَلَ	x-r-3	اخرج	Ejected
	[?axraʒa]	[?afSala]		[axraʒa]	
3	مُكْرَم	مُفعَل	k-r-m	مُكْرام	Was generously treated
	[mukram]	[mufSal]		[mukraam]	
4	کبّرَ	فَعَل	k-b-r	كبورة	Say Allah is Great
	[kabbir]	[fassil]		[kbuurah]	
5	غَسّالة	فعّالة	γ-s-l	غسال	Washing machine
	[yassalah]	[fassaalah]		[yassaal]	

Table 4.6: Spelling errors made with respect to the word pattern

No.	Target	Word Pattern	Root	Output	Target Gloss
1	مُمرّضات	مُفعّلات	m-r-ḍ	مُمارِظات	Nurses
	[mumariḍaat]	[mufaffilaat]		[mumariðaat]	
2	صدّيق	فِعِّيل	ş-d-q	سِدِيق	Honest
	[șiddiiq]	[fissiil]		[sidiiq]	
3	سُئِلْتُ	فُعِلْتُ	s-?-1	سولتو	I was asked
	[su?iltu]	[fuSiltu]		[suuiltuu]	
4	قرأتُ	فعلتُ	q-r-?	قراتا	I read
	[qara?tu]	[fuSiltu]		[qaraataa]	
5	تأخُذُون	تفعلون	?-x-ð	تاخذن	You are taking
	[ta?xuðuuna	[tafSaluuna]		[taaxuðna]	

Table 4.7: Spelling errors made with respect to both the root and word pattern

The other less frequent type of spelling error was related to the root such as writing the wrong order of the consonants in the root, omitting, and inserting extra consonants to the root as shown in Table 4.7.

On the basis of learners' performance profiles, three groups of learners were created: the group of the general complexity patterns of morphological forms comprising the entire samples of the participants, the TD group, and the LD group. The complexity patterns were also discussed with respect to group and grade level.

The results of the data collection for this question were analyzed based on averages of scores and standard deviations across groups and grades (Appendix G, page 262, shows the averages and standard deviations of TD and LD learners' scores on each spelling test across grades). These scores were used to examine the performance of each individual grade across LD and TD groups. The findings in this table show that TD achieved higher scores than their counterparts; however, both TD and LD followed almost the same pattern of complexity.

# 4.2.1 The general complexity patterns of morphological forms in spelling

Table 4.8 shows the descriptive statistics for the performance of all participants on each major morphological form. These data indicated that learners had more difficulty in passive voice forms in both intact and weak forms (PSV, PWV). Passive voice is constructed according to the word pattern (fuSila] where it undergoes internal vowel change(s). Orthographically, the passive verb starts with a short vowel i [damma] which is represented by a small comma over the letter ( $\frac{1}{2}$ ) and pronounced like the /u/ in 'put'. Therefore, the orthographic representation for both active and passive forms looks the same if we ignore diacritics. Consequently, the diacritics, and mainly the damma, is represented orthographically in the passive form to disambiguate it from the active form. For example,  $i \in j$  [darasa] means 'studied', while  $i c \in j$  [durisa] indicates the passive voice and means 'was studied'. Orthographically, PWV comprises of weak radicals (1 [aa], g [w/ uu], and means 'was studied'. Orthographically, PWV comprises of weak radicals (1 [aa], g [w/ uu], afraid' from the root  $j \in [xwf]$  ' notion of fear' where the second radical g [w] did not surface on the final form.

-												
					95% Confidence							
	Ν	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum				
PSV	107	12.5647	6.48407	.62684	11.3220	13.8075	.90	23.68				
PWV	107	14.0389	6.44601	.62316	12.8034	15.2743	1.00	26.36				
ASV	107	16.8040	6.56854	.63500	15.5451	18.0630	1.69	25.93				
AWV	107	17.9780	6.07670	.58746	16.8133	19.1427	1.36	25.47				
AUV	107	18.1379	5.96689	.57684	16.9942	19.2815	1.90	26.10				
NOUN	107	18.8799	6.45755	.62428	17.6422	20.1176	2.75	26.63				
VN	107	19.4953	5.89564	.56995	18.3653	20.6253	5.11	26.86				
DER	107	20.9189	5.75221	.55609	19.8164	22.0214	2.98	29.46				

Descriptives/ TOTAL Learners

Table 4.8: The general performance of all participants on the major morphological category

Learners found a moderate difficulty in spelling ASV, AWV, and AUV. Orthographically, ASV contains no long vowels in their lexical roots such as نَرَسَ [kataba] 'wrote', and نَرَسَ [darasa] 'studied'. AWV, however, comprises of long vowels which may not surface on the orthographic representation such as المالة [qaala] 'said' from the root قول [qwl] 'notion of saying' where the second radical surfaced as [aa] instead of و [w]. AUV adds one or more orthographic characters to the basic word pattern of triliteral verb root فَعَلَ [faSala] or the basic word pattern of the quadriliteral verb root خرج [faSala] such as adding [?a] to the basic triliteral verb root خرج [?axraʒa] 'to eject'.

On the other hand, derivations (DER), verbal nouns (VN), and nouns (NOUN) received the highest scores among learners as shown in figure 4.6.



Note: ASV= Active voice/ intact verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal Nouns

Figure 4.6: General complexity of morphological forms

Orthographically, these forms are constructed according to specific word patterns. For example, a derivation form such as the active participle is constructed based on the word pattern فاعك[faaSil] in the case of the triliteral root verb such as لاعب [laaSib] 'a player' (root: العب [ISb]). In the quadriliteral root verb, the active participle form is constructed similarly to the imperfect verb form by exchanging the imperfect prefix with منبح [m] and adding a short vowel /i/ to the letter preceding

mulaakim] 'a boxer' is the result of combining مُلاكِم [mulaakim] 'a boxer' is the result of combining the root {lkm} with the word pattern {mufaa{il}. On the other hand, forms of exaggeration have many word patterns where the form افعّال [fassaal] is very common and uses ( 🖤 ) شدّه ( المعالي fassaal] is very common and uses ( the second consonant to represent a double consonant sound such as علام [Sallaam] 'a person who knows facts' (root: علم [Slm] 'notion of knowledge'. Shadah ( 🖤 ] علم [addah] is also used in the orthographic representation on the final consonant of some nouns to indicate the relative adjective form such as أردني [?urdduniyyun] 'Jordanian' which is constructed from the noun الأردني [?al-[yaa] 'Jordan'. Some nouns end with a curtailed ending which end with a long vowel ي [yaa] ./-ii/ preceded by a short diacritic 'o' [i] such as in القاضِي [?al-qaadiii] 'the judge'. ي Orthographically, if the noun with the curtailed ending is indefinite and not annexing, the last [yaa] /-ii/ of the noun is omitted in nominative and genitive cases and تنوين كسر [tanwin kasir] (- , haaða] هذا قاضٍ haaða! مدا فاضٍ qaadin] 'this is a judge-NOM' where the last يا [-ii] in the indefinite noun قاضي [qaadii] 'a judge' is deleted. Verbal nouns, on the other hand, are derived mainly from triliteral root verbal nouns. [yubusa] يُبُوسَة fusuulah] such as أَعْوَلَة [yubusa] أَعْوَلَة fusuulah] such as 'dryness'. In some word patterns such as إقامة [?ifSalah] (e.g., إقامة [?iqaamah] 'indwelling/ residency', the hamza  $\in$  [?] 'the glottal stop' at the beginning of the verbal noun requires a 'seat' in the form of an alif '' [aa] conformed to the word patterns إفعال [?ifSaal] and إفعال [?ifSalah].

Therefore, the general complexity of the major and minor morphological forms (from easiest to most difficult) followed a pattern of:

1) Derivations (DER) was found to be the easiest form in spelling while the complexity of the minor forms of derivations followed a pattern of (see figure 4.7): a) Nouns of place and time (NPT), b) Elative noun (EN), c) The passive participle (PP), d) Adjective (ADJ), e) Active participle (AP), f) Form of exaggeration (FOE), g) Instrumental noun (IN).



Note: IN= Instrumental noun, FOE= Form of exaggeration, AP= Active participle, ADJ= Adjective, PP= The passive participle, EN= Elative noun, NPT= Nouns of place and time





Note: GI= Verbal nouns of instance, GWM= Verbal nouns with initial miim, GNTR= Verbal nouns of non-triliteral root, GS= Verbal nouns of state, TRG= Triliteral root verbal nouns

Figure 4.8: General complexity of verbal nouns

3) Nouns (NOUN). The minor forms followed a complexity pattern of (see figure 4.9): a) The sound feminine plural noun (SFPN) which is constructed by adding the suffixes المناف [-aatun] in the nominative case and [-aatin] in the accusative and genitive cases to the singular noun such as muhandisaatun] 'female engineers' in the nominative case. b) Broken plural of multitude مهندسات (BPM). This form involves internal changes rather than adding suffixes such as حيتان [ħiitaan] 'Whales' (Sing. حُوت [ħuut]) and followed the word pattern فعلان [fislaan]. c) The sound masculine plural noun (SMPN) and formed by attaching the suffix ون [-uun] to the singular noun in the [muhandisuun] مُهندّسون [-iin] in the accusative and genitive cases such as أيندّسون 'male engineers' (Sing. مُهَندِس [muhandis]) in the nominative case and [muhandisiin] 'male engineers' in the accusative and genitive case. d) Broken plural of paucity (BPP) such as أفعال thawb] (Sing.: أفعال [thawb]) where the plural form followed the word pattern أفعال [?afsaal] and exhibits some internal modification. e) Diminutive (DIM) which involves internal modifications rather than adding suffixes to the end of the noun such as نُهيْر [nuhair]'small river' (noun: نَهرْ [nahr]). f) Relative adjective (RA) such as يوميُّ [yaumiyyun] 'daily' where the suffix [-iyyun] is added to the end of the noun to indicate affiliation of something. Shadah ( 🖤 ) شدّه [faddah] is used on the final consonant and is considered as an essential part of the orthographic representation which should not be ignored in the orthography.



Figure 4.9: General complexity of noun forms

Note: RA= Relative adjective, DIM= Diminutive, BPP= Broken Plural of paucity, SMPN= The Sound Masculine Plural Noun, BPM= Broken Plural of multitude, SFPN= The Sound Feminine Plural Noun

4) Augmented verbs (AUV) where a triliteral verb is augmented by one letter (TA1) was found to be easier in spelling than a triliteral verb is augmented by two letters (TA2) as shown in figure 4.10. For example, جانل [zaadala] (he argued), where ' [aa] was added after the first consonant to the basic form زيما [zadala], represents TA1, while انكستر [inkasara] 'was broken' represents TA2 where two letters ' [aa] and ن [n] were added to the basic form كَسَرَ [kasara] 'broke'.



Figure 4.10: General complexity of triliteral augmented verbs

Note: TA1= Triliteral Augmented by one letter, TA2= Triliteral Augmented by two letters

5) Active voice/ weak verbs (AWV). It has six minor forms and followed the complexity pattern of (see figure 4.11): a) Active voice/ separated doubly-weak verb (AVSDWV) which comprises of two weak radicals in the first and the last position of the root separated by a consonant. For instance, وَقَى [waqa] 'protected' where the root consonant وَقَى [q] comes between the two radicals w] and الا [aa]. Orthographically, weak radicals are dropped or modified in some conjugations. b) Active voice/ hollow verb (AVHV) which comprises a vowel in the second position of the root consonant and often replaced by [aa], a long or a short vowel, or a hamza 'glottal stop /?/' such as قَالَ [qaala] 'he said' where the vowel و [w/uu] of the root قَالَ [qaala] is replaced by [aa]. c) Active voice/ a weak initial radical (AVVWIR). This form begins with a vowel which might not [dasii] ضنعى be represented orthographically in some conjugation such as the imperative form where the first vowel وضع of the root وضع (wds) 'to put' disappeared. d) Active voice/ defective with waw verb (AVDWV) which involves the weak radical waw '¿' [w/uu] in the last position of the root and, similar to weak verb roots,  $\mathfrak{g}[w/uu]$  may disappear in some conjugations. Fr example, in دَعَوْتُ [dasawtu] 'I invited', which is contructed from the root {dsw} 'to invite', the و [w/uu] is represented orthographically, while the الا/uu]is replaced by [aa] in the conjugation دَعَا [daSaa] he invited'. e) Active voice /defective with yaa? verb (AVDYV) which has the yaa? ي [y/ii] as the last consonant of the root and is dropped or modified in some conjugations such as the imperative form انسى [Insa] 'forget' where the last ي [y/ii] of the root انسى (nsy] 'to foget' was dropped. f) Active voice/ adjacent doubly-weak verb (AVADWV). This form has two adjacent weak radicals: the second and the third position of the root. Similar to weak verbs, radicals might be dropped or modified in some conjugations such as رَوَتْ [rawat] 'she told' (root: روى [rwa] 'to tell') where the last radical of the root ع [a] was dropped.



Figure 4.11: General Complexity of active voice weak verbs

6) Active voice/ intact verbs (ASV) which comprise of seven minor forms and follow a complexity pattern of (see figure 4.12): a) Active voice regular triliteral intact verb (AVRTIV) which is constructed from the triliteral root that is free of doubled consonants, long vowels or the glottal stop • [?]. Therefore, roots of these forms are fully represented in the orthography such as كَتَبَ [kataba] 'wrote' (root: (root: (ktb)] 'to write', and رَرَسَ [darsa] 'studied (root: رس) [drs] 'to study]. b) Active voice triliteral-doubled verb root (AVTDV) which contains no long vowels and has two identical consonants in the second and the third position of the root. The doubling of the consonant is represented by مَنَ [faddah] ( ) above the consonant in some conjugations such as [faddah] ( ) above the consonant in some conjugations such as [faddah] ( ) such as كَرَرْتُ (marral 'f passed'. c) Active voice regular (uadriliteral intact verb (AVRQIV). This form has roots made of four consonants and does not involve doubled consonants, long vowels, or the glottal stop = [?] such as  $\tilde{\chi}$  [tarʒamtu] 'I translated' (root:  $\tilde{\chi}$  [trʒm]) where the four root consonants are fully represented in the orthography.

d) Active voice initially-hamzated verb (AVIHV). It has a hamza (\*) 'the glottal stop /?/' in the first root consonant such as أَخَذْتُ [?axadtu] ' I took' (root: أَخَذُ [?axð] 'to take' where the hamza in the orthography involves a 'seat' in the form of an alif [aa] conformed to the word patterns used.

Note: AVADWV= Active voice/ adjacent doubly-weak verb, AVDYV= Active voice/ defective with yaa? Verb, AVDWV= Active voice/ defective with waw verb, AVVWIR= Active voice/ verbs with a weak initial radical, AVHV= Active voice/ hollow verb, AVSDWV= Active voice/ separated doubly-weak verb

e) Active voice medially-hamzated verb (AVMHV) where the hamza (\*) 'the glottal stop /?/' takes place in the second position of the root such as سَأَلتُ [sa?altu] 'I asked' (root: {s?al} 'to ask'. f) Active voice finally-hamzated verb (AVFHV). In this form, the hamza (\*) 'the glottal stop /?/' exists as the third consonant of the root such as قَرَأْتُ [qara?tu] 'I read' (root: {s?al} 'to read'. g) Active voice quadriliteral-doubled verb (AVQDV) which has two identical consonants in the first and the third position of quadriliteral-doubled verb root such as زانل [zalzala] ' he convulsed' (root: زلزل] [zalzala] 'to convulse').



Figure 4.12: General complexity of active voice/ intact verbs

Note: AVQDV= Active voice/ quadriliteral-doubled verb, AVFHV= Active voice/ finally-hamzated verb, AVMHV= Active voice/ medially-hamzated verb, AVIHV= Active voice/ initially-hamzated verb, AVRQIV= Active voice/ regular quadriliteral intact verb, AVTDV= Active voice/ triliteral-Doubled verb root, AVRTIV= Active voice/ regular triliteral intact verb

as دُعِيتُ [duʕiitu] 'I was invited' (root: دعو [dʕw] 'to invite'). f) Passive voice/ verbs with a weak initial radical (PVVWIR) such as وُضِعْتُ [wuḍiʕtu] 'I was put' (root: وضع [wdʕ] 'to put'.

8) Passive voice/ intact verbs (PSV) where the minor forms followed a complexity pattern of (see figure 4.14): a) Passive voice/ medially-hamzated verb (PVMHV) such as سَنَلْنَ [su?iltu] 'I was asked' (root: سَنَلْ [S?al] 'to ask'). b) Passive voice/ finally-hamzated verb root (PVFHV) such as asked' (root: المنال [S?al] 'to ask'). b) Passive voice/ finally-hamzated verb root (PVFHV) such as '[quri?tu] 'I was read' (root: أوَر نُنَ [Qr?a] 'to read'). c) Passive voice/ regular quadriliteral intact verb (PVRQIV) such as '[turʒima] 'was translated' (root: ترجم [trʒm] 'to translate'). d) Passive voice/ initially-hamzated verb (PVIHV) such as '[?auxiðtu] ' I was taken' (root: أَخِذْتَ [?auxð] 'to take'). e) Passive voice/ regular triliteral intact verb (PVRTIV) such as '[kutiba] 'was written' (root: كُتِبَ [kutiba] 'to write').



Figure 4.13: General complexity of passive voice/ weak verbs

Note: PVVWIR= Passive voice/ verbs with a weak initial radical, PVDWV= Passive voice/ defective with waw verb, PVADWV= Passive voice/ adjacent doubly-weak verb, PVDWYV= Passive voice/ defective with yaa? Verb, PVSDWV= Passive voice/ separated doubly-weak verb, PVHV= Passive voice/ hollow verb



Figure 4.14: General complexity of Passive voice/ intact verbs

# 4.2.2 The general complexity of morphological forms across individual grades

Average scores of the morphologically-based spelling test for each individual grade were also examined and compared to determine morphological complexity patterns across grades (see Appendix H, page 268) which shows the distribution of means for the major morphological forms across individual grades).

The overall descriptive data for grades indicated that, generally, grades share common patterns of morphological complexity. The data has shown that all grades have passive voice/ weak verb (PWV) and passive voice/ intact verbs (PSV) as the most difficult forms in spelling, while nouns (NOUN), verbal nouns (VN), and derivations (DER) were the easiest. Augmented verbs (AUV), active voice/ intact verbs (ASV), and active voice/ weak verbs (AWV) exhibited a moderate difficulty across grades. In contrast to all grades, grades 2 and 3 found passive voice/ weak verb (PWV) followed by passive voice/ intact verb (PSV) as the most difficult forms while other grades exhibited passive voice/ intact verb (PSV) and passive voice/ weak verb (PWV) respectively as the most difficult forms in spelling. Such findings may reflect the fact that early grades encounter

Note: PVMHV= Passive voice/ medially-hamzated verb, PVFHV= Passive voice/ finally-hamzated verb root, PVRQIV= Passve voice/ regular quadriliteral intact verb, PVIHV= Passive voice/ initially-hamzated verb, PVRTIV= Passive voice/ regular triliteral intact verb

difficulties in recognizing and spelling passive voice of weak verbs because in order to spell these forms a learner needs to use diacritics properly and, also, needs to be aware about changes and modifications that occur to the weak radicals specially when some radicals are dropped or changed in the orthographic representation.

The data has also indicated that all learners achieved the highest scores in derivations (DER) followed by verbal nouns (VN), except in grades 7 and 8 where derivations (DER) followed by nouns (NOUN) were the easiest forms. Such findings are expected since these forms do not heavily rely on diacritics as verbs and that may require less memory load and, therefore, accelerating the process of these forms, i.e., using diacritics require heavy memory load to access and process them. Figures 4.15 and 4.16 show the general morphological complexity in grades.



Figure 4.15: General complexity of morphological forms across grades

Note: ASV= Active voice/ intact verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ intact verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns



Figure 4.16: General complexity of morphological forms across individual grades

# 4.2.3 A comparison between TD and LD morphological complexity patterns

Both TD and LD learners attend mainstream schools. However, LD learners encounter more difficulties in reading, spelling and other academic fields than their TD counterparts. Therefore, and in order to better support LD learners, more research should be conducted to understand their difficulties and provide them with appropriate educational strategies. Teaching spelling in a classroom comprising of TD and LD learners necessitates understanding the complexity patterns that both learners tend to follow in order support them appropriately in the same classroom. Consequently, this section will shed light on their complexity patterns in spelling. Table 4.9 provides means and standard deviations for scores of morphologically-based spelling tasks for both TD (grades 2-8) and LD (grades 4-8) groups.

Table 4.9: Means	and standard	deviations	for scores	of morpho	logically-b	ased spelling	2 tasks
Table 4.9. Means	and standard	ucviations	tor scores	of morpho	logically-0	ased spenns	ziasks

-	Group Statistics										
	Group	N	Mean	Std. Deviation	Std. Error Mean						
ASV	TD	69	20.6069	3.84695	.46312						
	LD	38	9.8988	4.52428	.73394						
AWV	TD	69	21.4507	3.27421	.39417						
	LD	38	11.6722	4.77058	.77389						
AUV	TD	69	20.7471	3.83210	.46133						
	LD	38	13.4000	6.26588	1.01646						
PWV	TD	69	17.1933	5.02045	.60439						
	LD	38	8.3111	4.52384	.73386						
PSV	TD	69	16.3677	4.39740	.52939						
	LD	38	5.6594	2.99431	.48574						
DER	TD	69	23.7864	3.13581	.37751						
	LD	38	15.7121	5.79163	.93953						
NOUN	TD	69	22.1091	3.77724	.45473						
	LD	38	13.0164	6.20389	1.00640						
VN	TD	69	22.6789	3.63524	.43763						
	LD	38	13.7146	4.69798	.76211						

Group Statistics

It is notable that both TD and LD learners almost follow a similar pattern of complexity which goes in line with previous cross-linguistic research studies such as Jiménez et al. (2008) for Spanish (cited in Diamanti et al., 2014), Diamanti et al. (2014) for Greek and Curtain et al. (2001) for English. With respect to Arabic, I have not heard about any study investigating the morphological complexity in the context of writing; however, some previous studies were mainly based on the oral production of learners (e.g., Omar, 1973; Mohammad, 2000).

The statistical results indicated that both groups - TD and LD - found derivations (DER) and verbal nouns (VN) the easiest morphological forms in the morphologically-based spelling task. On the other hand, and giving the difficulty of using diacritics due to the heavy memory load required to process hem, passive voice/ intact verbs (PSV) and passive voice/ weak verbs (PWV) were found to be the most difficult forms for both groups. They only differed in the difficulty of augmented verbs (AUV). LD found active voice/ weak verbs (AWV) more difficult than augmented verbs (AUV), while TD performed better on active voice/ weak verbs (AWV) compared to augmented verbs (AUV) as shown in figures 4.17 and 4.18.



Figure 4.17: Morphological complexity across groups



Figure 4.18: Morphological complexity of TD and LD learners

Note: ASV= Active voice/ intact verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal Nouns

Therefore, TD and LD learners made primarily more errors within the passive voice/ intact verb (PSV) form followed by the passive voice/ weak verb form (PWV), while verbal nouns (VN) and

derivations (DER) received the highest scores of the respondents. As a result, the complexity of morphological forms for both LD and TD followed a pattern of complexity (from the easiest to the most difficult) of:

1- Derivations (DER) received the highest scores in spelling among TD learners (Mean= 23.7864, SD= 3.13581) and LD learners (M= 15.7121, SD= 5.79163). With respect to the minor forms, descriptive data was examined (see table 4.10) and indicated that TD found forms of exaggerations (FOE) followed by instrumental nouns (IN) as the most difficult forms in the spelling task while LD found the opposite; instrumental noun (IN) followed by forms of exaggerations (FOE) as the most difficult forms. Elative nouns (EN) and nouns of place and time (NPT) were the easiest forms in both groups as shown in figure 4.19.

Descriptives										
						95% Confider	ice Interval for			
				Std.	Std.	Me	an			
		Ν	Mean	Deviation	Error	Lower Bound	Upper Bound	Minimum	Maximum	
Active participle	TD	69	22.94	4.468	.538	21.86	24.01	12	39	
	LD	38	13.77	6.589	1.069	11.60	15.94	3	26	
Forms of	TD	69	22.12	4.223	.508	21.11	23.14	9	27	
exaggeration	LD	38	12.98	7.546	1.224	10.50	15.46	0	23	
Adjective	TD	69	22.92	5.301	.638	21.65	24.19	4	27	
	LD	38	16.48	6.887	1.117	14.21	18.74	1	27	
The passive	TD	69	24.16	3.922	.472	23.21	25.10	11	27	
participle	LD	38	16.15	6.270	1.017	14.09	18.21	0	25	
Nouns of place and	TD	69	26.41	4.814	.580	25.26	27.57	14	59	
time	LD	38	21.08	6.199	1.006	19.04	23.12	0	27	
Instrumental noun	TD	69	22.26	5.715	.688	20.89	23.63	6	27	
	LD	38	11.05	9.965	1.616	7.78	14.33	0	27	
Elative noun	TD	69	25.70	3.191	.384	24.93	26.46	18	27	
	LD	38	18.47	9.803	1.590	15.25	21.70	0	27	

Table 4.10: Descriptive data for derivation forms



Figure 4.19: Morphological complexity of derivation among TD and LD

Note: IN= Instrumental noun, FOE= Form of exaggeration, AP= Active participle, ADJ= Adjective, PP= The passive participle, EN= Elative noun, NPT= Nouns of place and time

2- Verbal nouns (VN) was the second easiest form for both TD (M=22.6789, SD= 3.63524) and LD (Mean= 13.7146, SD= 4.69798). Table 4.11 shows the descriptive data for the minor forms of VN. The TD followed a complexity pattern of: a) Verbal nouns of non-triliteral root (GNTR), b) Triliteral root verbal nouns (TRG), c) Verbal nouns of state (GS), d) Verbal nouns with initial

miim (GM), e) Verbal nouns of instance (GI), while, on the other hand, the LD followed a complexity pattern of: a) TRG, b) GS, c) GI, d) GNTR, e) GM (see figure 4.20).

Table 4.11: Descriptive data for verbal noun form	S
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Descriptives												
						95% Confidence Interval						
							ican					
				Std.	Std.	Lower	Upper					
		Ν	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum			
Triliteral root verbal	TD	69	23.40	3.273	.394	22.61	24.18	17	27			
nouns/ Gerunds	LD	38	16.93	5.876	.953	15.00	18.87	5	27			
Verbal nouns/ Gerunds of	TD	69	23.84	3.452	.416	23.01	24.67	10	27			
non-triliteral root	LD	38	13.32	5.880	.954	11.39	15.25	1	25			
Verbal nouns/ Gerunds	TD	69	22.83	7.495	.902	21.03	24.63	0	27			
with initial miim	LD	38	9.00	11.072	1.796	5.36	12.64	0	27			
Verbal nouns/ Gerunds of	TD	69	20.11	4.419	.532	19.05	21.17	11	27			
instance	LD	38	13.45	5.206	.844	11.74	15.16	2	23			
Verbal nouns/ Gerunds of	TD	69	23.22	5.651	.680	21.86	24.57	9	27			
state	LD	38	15.87	7.378	1.197	13.44	18.29	0	27			



Figure 4.20: Morphological complexity of verbal nouns among TD and LD

Note: GI= Verbal nouns of instance, GWM= Verbal nouns with initial miim, GNTR= Verbal nouns of non-triliteral root, GS= Verbal nouns of state, TRG= Triliteral root verbal nouns

3- Nouns (NOUN) was the third complex form for TD (M=22.1091, SD= 3.77724) and the fourth complex form among LD (M=13.0164, SD= 6.20389) (see table 4.12). NOUN has six minor forms; the sound masculine plural noun (SMPN), the sound feminine plural noun (SFPN), broken plural of paucity (BPP), broken plural of multitude (BPM), relative adjective (RA), and diminutive

(DIM). TD followed a complexity pattern of: a) BPP and SFPN with a same average, b) SMPN, c) BPM, d) DIM, e) RA. LD, on the other hand, followed a complexity pattern of: a) BPM, b) SFPN, c) SMPN, d) BPP, e) RA, f) DIM (see figure 4.21).

Table 4.12: Descriptive data of noun forms

Descriptives													
						95% Confidence Interval for Mean							
				Std.	Std.	Lower	Upper						
		N	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum				
The Sound Masculine	TD	69	23.13	5.399	.650	21.83	24.43	8	35				
Plural Noun	LD	38	14.57	7.844	1.272	11.99	17.14	0	27				
The Sound Feminine	TD	69	23.57	4.552	.548	22.47	24.66	12	33				
Plural Noun	LD	38	14.68	8.158	1.323	12.00	17.37	0	27				
BROKEN Plural of	TD	69	23.57	4.085	.492	22.58	24.55	14	27				
paucity	LD	38	13.38	7.691	1.248	10.85	15.91	0	24				
BROKEN Plural of	TD	69	23.03	3.357	.404	22.23	23.84	14	27				
multitude	LD	38	15.39	6.087	.987	13.39	17.40	2	26				
Relative adjective	TD	69	17.05	5.793	.697	15.66	18.45	5	27				
	LD	38	10.60	5.434	.882	8.81	12.38	0	18				
Diminutive	TD	69	22.30	6.835	.823	20.66	23.95	0	27				
	LD	38	9.47	8.614	1.397	6.64	12.31	0	27				



Figure 4.21: Morphological complexity of noun forms among TD and LD

Note: RA= Relative adjective, DIM= Diminutive, BPP= Broken Plural of paucity, SMPN= The Sound Masculine Plural Noun, BPM= Broken Plural of multitude, SFPN= The Sound Feminine Plural Noun

4- Active voice/ weak verb (AWV) was the fourth complex form for TD (m= 21.4507, SD= 3.27421), and the fifth complex form for LD (M= 11.6722, SD= 4.77058) (see table 4.13). AWV comprises of six minor forms; active voice/ adjacent doubly-weak verb (AVADWV), active voice/ defective with waw verb (AVDWV), active voice/

voice/verbs with a weak initial radical (AVVWIR), active voice/ hollow verb (AVHV), active voice/ separated doubly-weak verb (AVSDWV).

Descriptives

				Beeeing					
						95% Confidence			
						Interval			
				Std.	Std.	Lower	Upper		
		Ν	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum
ACTIVE VOICE Verbs with	TD	69	21.08	4.607	.555	19.98	22.19	9	27
a weak initial radical	LD	38	12.44	6.868	1.114	10.19	14.70	2	25
ACTIVE VOICE Hollow	TD	69	21.97	4.809	.579	20.81	23.12	10	29
verb	LD	38	13.66	6.022	.977	11.68	15.64	3	26
ACTIVE VOICE Defective	TD	69	23.10	3.915	.471	22.16	24.04	8	30
with waw verb	LD	38	8.68	6.432	1.043	6.57	10.80	0	21
ACTIVE VOICE Defective	TD	69	20.76	3.741	.450	19.87	21.66	11	27
with yaa? verb	LD	38	11.31	5.055	.820	9.65	12.97	2	23
ACTIVE VOICE Seperated	TD	69	22.79	4.271	.514	21.77	23.82	7	29
doubly-weak verb	LD	38	12.81	5.899	.957	10.87	14.74	0	23
ACTIVE VOICE Adjacent	TD	69	19.00	2.545	.306	18.38	19.61	13	24
doubly-weak verb	LD	38	11.13	3.929	.637	9.84	12.42	1	18

Table 4.13: Descriptive data of active voice/ weak verb forms

This pattern is particularly striking for AVDWV form (defective with waw verb), which has waw ' $\mathfrak{g}$ ' [w/uu] as the last consonant of the root and may disappear in the orthographic representation of some conjugations. For example, the  $\mathfrak{g}$  [w/uu] of the root  $\mathfrak{g} \mathfrak{g}$  (ds a) 'to invite' appears in  $\mathfrak{g} \mathfrak{g} \mathfrak{g}$  (da fawtu] 'I invited' while it is dropped in  $\mathfrak{g} \mathfrak{g} \mathfrak{g} \mathfrak{g}$  (da faal) 'he invited' and  $\mathfrak{g} \mathfrak{g} \mathfrak{g} \mathfrak{g} \mathfrak{g} \mathfrak{g} \mathfrak{g} \mathfrak{g}$  (du fiitu) 'I was invited'. Therefore, it was expected that LD, who are known to have serious difficulties in morphological skills, would find this form the most difficult one since it requires awareness about the changes and modifications that occur to the  $\mathfrak{g}$  [w/uu] that is reflected in the orthographic representation. In addition, they need to access the proper use of diacritics in these forms. Therefore, and as expected, LD found AVDWV as the most difficult form. They followed a pattern of (see figure 4.22): a) AVHV, b) AVSDWV, c) AVVWIR, d) AVDYV, e) AVADWV, f) AVDWV. TD, and they found AVDWV as the easiest form in spelling and followed complexity



patterns of a) AVDWV, b) AVSDWV, c) AVHV, d) AVVWIR, e) AVDYV, and f) AVADWV which exhibited the most difficult form.

Figure 4.22: Morphological Complexity of Active voice/ weak verb forms

Note: AVADWV= Active voice/ adjacent doubly-weak verb, AVDYV= Active voice/ defective with yaa? Verb, AVDWV= Active voice/ defective with waw verb, AVVWIR= Active voice/ verbs with a weak initial radical, AVHV= Active voice/ hollow verb, AVSDWV= Active voice/ separated doubly-weak verb

5- Augmented verbs (AUV) is the fifth complex form for TD (M= 20.7471, SD= 3.83210) and the third complex form for LD (M= 13.40, SD= 6.26588) (see table 4.14). In general, AUV exhibited a moderate complexity in both groups. It comprises of two minor forms; triliteral verb augmented by one letter (TA1), and triliteral augmented by two letters (TA2). TD and LD followed the same complexity pattern where TA1 was easier than TA2 as shown in figure 4.23.

Table 4.14: Descriptive data of augmented verbs

Descriptives											
						95% Confide for N	ence Interval lean				
				Std.	Std.	Lower	Upper				
		Ν	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum		
Triliteral Augmented by	TD	69	22.07	3.150	.379	21.32	22.83	12	27		
one letter	LD	38	14.11	6.721	1.090	11.90	16.31	0	24		
Triliteral Augmented by	TD	69	19.42	5.484	.660	18.10	20.74	5	26		
two letters	LD	38	12.69	6.841	1.110	10.45	14.94	1	23		



Figure 4.23: Morphological complexity of augmented verbs

Note: TA1= Triliteral Augmented by one letter, TA2= Triliteral Augmented by two letters

6- Active voice/ intact verbs (ASV) is the sixth complex form for both TD (M=20.6069, SD= 3.84695) and LD (M= 9.8988, SD= 4.52428) (see table 4.15).

Table 4.15: Descriptive data of active voice/ intact verb forms

				Descrip	11463				
						95% Coi	nfidence		
						Interval f	or Mean		
				Std.	Std.	Lower	Upper		
		Ν	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum
ACTIVE VOICE Regular	TD	69	22.93	3.493	.421	22.09	23.77	13	27
triliteral intact verb	LD	38	13.84	6.683	1.084	11.64	16.04	2	26
ACTIVE VOICE Regular	TD	69	20.66	4.750	.572	19.52	21.80	8	31
quadriliteral intact verb	LD	38	10.33	6.160	.999	8.30	12.35	1	25
ACTIVE VOICE Triliteral-	TD	69	20.22	4.149	.499	19.23	21.22	9	27
Doubled verb root	LD	38	12.17	4.263	.692	10.76	13.57	3	22
ACTIVE VOICE	TD	69	20.15	5.832	.702	18.75	21.55	2	27
Quadriliteral-doubled verb	LD	38	6.83	5.011	.813	5.18	8.47	0	20
ACTIVE VOICE Initially-	TD	69	21.39	4.086	.492	20.41	22.37	8	27
hamzated verb	LD	38	8.32	5.747	.932	6.43	10.21	0	21
ACTIVE VOICE Medially-	TD	69	20.11	5.787	.697	18.72	21.50	3	28
hamzated verb	LD	38	8.01	4.868	.790	6.41	9.61	0	22
ACTIVE VOICE Finally-	TD	69	18.78	4.403	.530	17.72	19.84	9	25
hamzated verb	LD	38	9.81	5.457	.885	8.01	11.60	1	22

Descriptives

TD followed a complexity pattern of: a) Active voice/ regular triliteral intact verb (AVRTV), b) Active voice/ initially-hamzated verb (AVIHV), c) Active voice/ regular quadriliteral intact verb (AVRQV), d) Active voice/ triliteral-Doubled verb root (AVTDV), e) Active voice/ quadriliteral-doubled verb (AVQDV), f) Active voice/ medially-hamzated verb (AVMHV), g) Active voice/ finally-hamzated verb (AVFHV), while LD followed a pattern of: a) AVRTV, b) AVTDV, c) AVRQV, d) AVFHV, e) AVIHV, f) AVMHV, g) AVQDV (see figure 4.24).





Figure 4.24: Morphological complexity of active voice/ intact verb forms

Note: AVQDV= Active voice/ quadriliteral-doubled verb, AVFHV= Active voice/ finally-hamzated verb, AVMHV= Active voice/ medially-hamzated verb, AVIHV= Active voice/ initially-hamzated verb, AVRQIV= Active voice/ regular quadriliteral intact verb, AVTDV= Active voice/ triliteral-Doubled verb root, AVRTIV= Active voice/ regular triliteral intact verb

7- Passive voice/ weak verb (PWV) is considered as the second most difficult morphological form in spelling for both LD (M= 8.3111, SD= 4.52384) and TD (M= 17.1933, SD= 5.02045) learners (see table 4.16).
Table 4.16: Descriptive data of passive voice/ weak verb forms

						95% Confidence				
								4		
				Std.	Std.	Lower	Upper			
		Ν	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum	
PASSIVE VOICE Hollow	TD	69	20.35	4.658	.561	19.23	21.47	8	27	
verb	LD	38	10.08	5.767	.936	8.18	11.97	0	25	
PASSIVE VOICE Defective	TD	69	16.12	7.434	.895	14.34	17.91	2	27	
with waw verb	LD	38	7.03	4.706	.763	5.49	8.58	0	18	
PASSIVE VOICE Verbs	TD	69	15.73	4.947	.596	14.55	16.92	5	26	
with a weak initial radical	LD	38	5.71	4.667	.757	4.18	7.25	0	17	
PASSIVE VOICE Adjacent	TD	69	14.57	6.614	.796	12.98	16.15	3	27	
doubly-weak verb	LD	38	9.87	5.532	.897	8.05	11.69	0	24	
PASSIVE VOICE Seperated	TD	69	18.91	8.614	1.037	16.84	20.98	0	54	
doubly-weak verb	LD	38	8.29	7.935	1.287	5.68	10.90	0	27	
PASSIVE VOICE Defective	TD	69	17.48	7.414	.893	15.70	19.26	5	27	
with yaa? Verb	LD	38	8.88	4.735	.768	7.33	10.44	0	18	

Descriptives

TD followed a complexity pattern of: a) PVHV, b) PVSDWV, c) PVDWYV, d) PVDWV, e) PVVWIR, f) PVADWV but LD group followed a pattern of: a) PVHV, b) PVADWV, c) PVDWV, d) PVSDWV, e) PVDWY, f) PVVWIR as shown in figure 4.25. Here, again, it seems the extent to which the weak radicals appear in the orthographic representation play a role in the complexity heirarchy. For example, PVHV (hollow verb), which comprises a weak radical in the second root consonant, is almost dropped and replaced by [aa], a long or a short vowel, or a hamza 'glottal stop /?/' in most conjugations. For instance, the weak radical \_ [w] of the hollow root 'fwf] 'notion of fear' disappears in most conjugations such as: 'fwf] 'I was afraid', 'fwf] 'she was afraid'. In addition, these passive forms are formed differently in local dialects which seem to have an impact on spelling these forms in MSA.





Figure 4.25: Morphological complexity of passive voice/ weak verb forms

Note: PVVWIR= PASSIVE VOICE Verbs with a weak initial radical, PVDWV= PASSIVE VOICE Defective with waw verb, PVADWV= PASSIVE VOICE Adjacent doubly-weak verb, PVDWYV= PASSIVE VOICE Defective with yaa? Verb, PVSDWV= PASSIVE VOICE Seperated doubly-weak verb, PVHV= PASSIVE VOICE Hollow verb

8- Passive voice/ intact verbs (PSV) was found as the most difficult form for both TD (M= 16.3677, SD= 4.39740) and LD (M= 5.6594, SD= 2.99431) in spelling task (see table 4.17).

Table 4.17: Morphological complexity of passive voice/ intact verb forms

						95% Confidence Interval for Mean			
				Std.	Std.	Lower	Upper		
		Ν	Mean	Deviation	Error	Bound	Bound	Minimum	Maximum
PASSIVE VOICE Regular	TD	69	18.91	5.854	.705	17.51	20.32	7	27
triliteral intact verb	LD	38	5.54	2.881	.467	4.60	6.49	0	11
PASSIVE VOICE Regular	TD	69	17.93	5.490	.661	16.61	19.24	3	26
quadriliteral intact verb	LD	38	5.83	4.699	.762	4.28	7.37	0	22
PASSIVE VOICE Initially-	TD	69	17.45	5.527	.665	16.12	18.77	5	27
hamzated verb	LD	38	7.43	3.858	.626	6.16	8.70	0	15
PASSIVE VOICE Medially-	TD	69	13.71	5.763	.694	12.33	15.10	1	24
hamzated verb	LD	38	3.75	2.943	.477	2.79	4.72	0	12
PASSIVE VOICE Finally-	TD	69	13.84	4.620	.556	12.73	14.95	3	23
hamzated verb root	LD	38	5.74	3.982	.646	4.43	7.05	0	17

Descriptives

As shown in figure 4.26, TD followed a complexity pattern of: a) Passive voice/ regular triliteral intact verb (PVRTIV), b) Passive voice/ regular quadriliteral intact verb (PVRQIV), c) Passive voice/ initially-hamzated verb (PVIHV, d) Passive voice/ finally-hamzated verb PVFHV), e) Passive voice/ medially-hamzated verb (PVMHV), while LD followed a complexity pattern of: a) PVIHV, b) PVRQIV, c) PVFHV, d) PVRTIV, e) PVMHV.

It is noted that learners made more errors within hamzated verbs, which involve a hamza (\*) 'the glottal stop /?/' in the first, second, or the third consonant. Learners found medially-hamzated verbs (PVMHV) more difficult than other forms. Such findings might be due to the fact that a hamza (\*) 'the glottal stop /?/' in medially-hamzated verbs require a seat either in the form of an alif [aa] such as أَسْنَالُ [tus?alu] 'she is asked' or in the form of nabira, which looks like  $\rightarrow$  [y], such as as a saked'. Therefore, this situation causes a confusion for learners in choosing the proper orthographic representation for the hamza.



Figure 4.26: Morphological Complexity of Passive Voice/ Intact Verb forms

## 4.2.4 Morphological complexity across TD and LD grades

Investigating morphological complexity across grades is of high importance in order to understand patterns of complexity in each grade and that can help in designing the appropriate assessment and educational/ therapeutic strategies to overcome spelling difficulties. This section will shed light on the performance of both TD and LD in each grade to understand the difficulties they encounter. See Appendix I, page 270, for the score averages for morphological forms across TD grades.

Generally, it was expected that individual grades would vary in their complexity patterns reflecting different conditions surrounding the educational process such as teaching instruction inside the classroom, teacher experience, and grade level, etc. However, the descriptive data of grades indicated that almost all grades share common patterns (see figure 4.27)



Figure 4.27: General morphological complexity across TD grades

Note: ASV= Active voice/ strong verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns

In sum, passive voice/ weak verb (PWV), and passive voice/ intact verb (PSV) were found to be the most difficult forms across grades while nouns (NOUN), verbal nouns (VN) and derivations (DER) were the easiest. Augmented verb (AUV), active voice/ intact verb (ASV), and active voice/ weak verb (AWV) exhibited a moderate difficulty. Grades were divided into three levels according to their complexity patterns: grade 2 and grade 3 as the first level, grade 4, grade 5, and grade 6 as the second level, and grade 7 and grade 8 represent the third level.

The data indicated that all learners achieved the highest scores in DER followed by VN except grade 7 and grade 8 where the easiest form was DER followed by NOUN. Grade 2 and grade 3 exhibited almost the same complexity pattern as shown in figure 4.28. Grades 2 and 3, in contrast to other grades, found passive voice/ weak verb (PWV), followed by passive voice/ intact verb (PSV) as the most difficult forms in spelling while verbal noun (VN) and derivation (DER) were the easiest forms in spelling. Also, it is notable that grade 2 found active voice/ weak verb (AWV) easier than nouns (NOUN), while grade 3 found the opposite; nouns (NOUN) were easier than active voice/ weak verbs (AWV). Concerning the second grade, NOUN was expected to be easier than AWV in spelling and that might reflect the intensive teaching of roots in the second grade.



Figure 4.28: Morphological complexity among TD grades 2 and 3

The pattern of complexity in grade 4 and above changed from PWV, as the most difficult form, followed by PSV, to PSV as the most difficult form followed by PWV, while VN and DER continue to be the easiest forms until grade 6. In these grades, NOUN was easier than AWV and ASV as shown in figure 4.29.

Note: ASV= Active voice/ strong verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns



Figure 4.29: Morphological complexity among TD grades 4, 5, and 6

Note: ASV= Active voice/ strong verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns

In grade 7 and grade 8, and similar to previous grades, learners found PSV followed by PWV as the most difficult forms, which could be due to difficulties in accessing the appropriate diacritics, while DER followed by AWV were the easiest in grade 7 and DER followed by NOUN in grade 8. In addition, AWV was found to be easier than NOUN in grade 7, which is similar to results in grade 2, while NOUN was easier than AWV in grade 8 as shown in 4.30. Therefore, diacritics play an important role in determining the complexity of the form. For instance, passive voice forms, which require diacritics to disambiguate it from other forms, tend to be more complex than other forms that can be understood without using diacritics.



Figure 4.30: Morphological complexity among TD grades 7 and 8

Note: ASV= Active voice/ strong verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns

LD complexity pattern was suggested to vary from TD due to the morphological difficulties that LD exhibit and the different teaching instruction they received in resource rooms. However, LD grades have shown common patterns of complexity and exhibited a similar pattern to the TD one as shown in figure 4.31.



Figure 4.31: Patterns of morphological complexity across TD and LD grades

In general LD grades, similarly to TD grades, found most difficulties in PSV and PWV, while VN, NOUN and DER were the easiest in most grades. LD grades (except grade 4), and in contrast to TD grades, have shown almost constant patterns of complexity as shown in figure 4.32 and 4.33. Such findings may reflect the fact that both groups process morphological information in the same way even though TD performed better than LD. Both groups were affected by the impact of diacritics and weak radicals in spelling.



Figure 4.32: Morphological complexity across LD grades

Note: ASV= Active voice/ strong verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns



Figure 4.33: Patterns of morphological complexity across LD individual grades

## 4.2.5 TD and LD learners and the impact of group and grade

In general, descriptive data has shown that LD learners made significantly more errors than the TD learners (see Figure 4. 34): LD (M= 11.42, SD =4.97); TD group (M= 20.62, SD =3.86). These differences were statistically significant.



Figure 4. 34: Performance of LD and TD on spelling morphological forms

An independent-samples t-test was conducted to compare performance on spelling morphological forms among LD and TD groups. Results indicated a significant difference in all spelling scores for TD and LD learners. P values for all tests= .000, < .05 (see Appendix J, page 272, for an independent samples test indicating a significant difference in spelling performance between TD and LD learners)

These results suggested that the group (TD and LD) has a clear effect on spelling performance; the current results suggested that spelling performance decreases when spelling tests conducted with LD rather than TD as demonstrated in figure 4.35. This outcome should be taken into consideration when designing assessment or providing teaching instruction for LD learners who struggle more than TD in spelling performance. They should learn the same sequence of morphological complexity but with modifications to fit their abilities.



Figure 4.35: Group effect on spelling performance

This finding indicated that the LD group produced more errors than the TD group on the morphologically-based spelling test, even though both TD and LD learners followed similar patterns of morphological complexity.

Groups and grades were all entered into the MANOVA independent variables and scores of spelling as dependent variables. First, we examined group and grade impacts on spelling the eight main morphological forms (Active voice/ intact verbs (ASV), active voice/ weak verbs (AWV), augmented verbs (AUV), passive voice/ intact verbs (PSV), passive voice/ weak verbs (PWV), derivations (DER), nouns (NOUN), verbal nouns (VN)). Our results, presented in Table 4.18, revealed that performance of LD and TD obtained a statistically significant MANOVA effect, a main effect was found based on group, Wilks' Lambda = .132, F(8, 88) = 72.253, p = .000, while grade obtained a statistically significant effect, Wilks' Lambda = .162, F(48, 437) = 4.073, p = .000. The results showed a statistically significant difference with a high effect size for group estimated at .868, which implies that 86.8% of multivariate variance of the dependent variables

was accounted for by group while grade, in contrast, obtained a smaller multivariate effect size estimated at .262.

With respect to the interaction between group and grade, results also revealed a significant interaction between the effects of the group and the grade on spelling morphological forms, Wilks' Lambda = 0.365, F (32,326) = 3.206, p = .000, p < .001. The multivariate effect size was estimated at .223, which implies that 22.3% of the multivariate variance of the dependent variables was accounted for by the interaction between group and grade factors. This result indicates that the performance on spelling morphological forms varies between LD and TD and among grades even though group has more effect than grades on spelling performance.

Table 4.18: Wilk's Lambda Test for the effect of group and grade on spelling performance

				1014	iti vai iate	1 0505			
Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>d</sup>
Group	Wilks' Lambda	.132	72.253 <sup>b</sup>	8.000	88.000	.000	.868	578.027	1.000
Grade	Wilks' Lambda	.162	4.073	48.000	437.059	.000	.262	154.801	1.000
Group * Grade	Wilks' Lambda	.365	3.206	32.000	326.123	.000	.223	93.547	1.000

Multivariato Toste

Due to the statistically significant differences between group and grade on the morphologicallybased spelling task, the Tukey post- hoc test was also used to examine the performance differences between group and grade levels on each morphological form. The comparison based on group and grade revealed a statistically significant difference in all morphological forms. On the other hand, the interaction between group and grade exhibited a statistically significant difference in AWV, PSV, DER, NOUN, and VN, while ASV, AUV, and PWV exhibited no significant differences. Further, the effect size was examined to define the percentage of variance that is accounted for by group and grade. With regards to group, the highest value of effect size was for ASV= .813 indicating that 81% of the variance is accounted for by group effect, whereas AUV received the lowest size effect where 52% of the variance was accounted for by group effect. In general, the effect size for ASV, AWV, AUV, PWV, PSV, DER, NOUN, and VN across groups was high, (partial  $\eta^2 = .813, .821, .525, .663, .788, .687, .670, and .735$  respectively). Table 4.19 summarizes the results from post hoc comparisons across groups, grades, and the interaction between them.

The performance across grades also received statistically significant differences in all morphological forms. The effect size across grades for ASV, AWV, AUV, PWV, PSV, DER, NOUN, AND, and VN was moderate to high (partial  $\eta^2 = .578, .615, .384, .484, 491, .503, .513$ , and .504 respectively). The interaction between group and grade also exhibited statistical differences in all morphological forms with small-to-moderate effect sizes.

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>i</sup>
Group	ASV	3131.065	1	3131.065	412.908	.000	.813	412.908	1.000
1	AWV	2581.014	1	2581.014	435.442	.000	.821	435.442	1.000
	AUV	1608.159	1	1608.159	104.859	.000	.525	104.859	1.000
	PWV	2385.653	1	2385.653	186.492	.000	.663	186.492	1.000
	PSV	2834.241	1	2834.241	353.724	.000	.788	353.724	1.000
	DER	1916.338	1	1916.338	208.490	.000	.687	208.490	1.000
	NOUN	2273.059	1	2273.059	192.918	.000	.670	192.918	1.000
	VN	2275.291	1	2275.291	263.659	.000	.735	263.659	1.000
Grade	ASV	986.273	6	164.379	21.677	.000	.578	130.064	1.000
	AWV	900.788	6	150.131	25.329	.000	.615	151.972	1.000
	AUV	908.059	6	151.343	9.868	.000	.384	59.209	1.000
	PWV	1138.992	6	189.832	14.840	.000	.484	89.037	1.000
	PSV	733.881	6	122.314	15.265	.000	.491	91.591	1.000
	DER	885.000	6	147.500	16.047	.000	.503	96.285	1.000
	NOUN	1178.380	6	196.397	16.668	.000	.513	100.011	1.000
	VN	833.753	6	138.959	16.102	.000	.504	96.615	1.000
Group *	ASV	60.815	4	15.204	2.005	.100	.078	8.020	.582
Grade	AWV	151.304	4	37.826	6.382	.000	.212	25.526	.987
	AUV	114.741	4	28.685	1.870	.122	.073	7.482	.548
	PWV	72.865	4	18.216	1.424	.232	.057	5.696	.428
	PSV	80.408	4	20.102	2.509	.047	.096	10.035	.693
	DER	241.398	4	60.350	6.566	.000	.217	26.263	.989
ļ	NOUN	164.030	4	41.007	3.480	.011	.128	13.921	.845
	VN	104.439	4	26.110	3.026	.021	.113	12.102	.784

Table 4.19: Effects of group and grade level on participants' spelling performance

Note: ASV= Active voice/ strong verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ strong verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal Nouns

Learning disabilities are proposed to be more common among school-aged boys than girls (Rutter et al., 2004). Therefore, the current study developed an interest in finding the potential effect of gender on the level of performance in the spelling, morphological and phonological awareness tasks. To examine this effect, independent-samples t-tests were conducted to compare the

performance of males and females on the phonological awareness task, the morphological awareness task, and the morphologically-based spelling task. In general, results indicated a significant difference in the performance of males and females with respect to the morphologically-based spelling test (see Appendix K, page 274) for gender's effect on morphologically-based spelling task as shown in table 4.23. There was a significant difference in ASV (t (105)= 2.094, p = .039, AUV (t(105)= 3.722, p=.000, PWV (t (105)= 2.209, p=029, and DER (t (105)= 2.653, p= .009, NOUN (t (105)= 2.396, p= .018, and VN (t (105)= 2.326, p= .022. These results suggest that gender really does have an effect on the spelling performance on morphological forms; learners' scores vary when tasks are conducted by males or females and that goes in line with many previous studies which highlighted the impact of gender on spelling (e.g., Allred, 1990; Olinghouse, 2008).

T-test results, however, indicated no significant differences in the performance of males and females on the morphological forms of AWV (t (105)= 1.804, p=.074, and PSV (t (105)= -.997, p=.321, which means that males and females performed similarly on AWV and PSV and differences are likely due to chance and not likely due to the gender impact.

With respect to the performance on phonological and morphological awareness tasks, results of the phonological awareness task indicated no significant differences in the scores for male (M=34.6909, SD=9.42980) and female (M=36.5882, SD=8.03536) participants; t (104)=1.11, p = .269. In the same way, results on the morphological awareness task exhibited no significant difference between male (M=37.6182, SD=9.13782) and female (M=33.86, SD=11.67416) participants; t (103)=1.845, p= .068. These results suggest that gender has no impact on participants' performance on phonological and morphological awareness tasks as shown in table 4.20.

Table 4.20: Gender's impact on phonological and morphological awareness tasks

	Lever Test Equal Variar	ne's for ity of nces	t-test for Equality of Means				1			
					Sig.			95% Co Interva	nfidence I of the	
						(2-	Mean	Std. Error	Differ	ence
		F	Sig.	t	df	tailed)	Difference	Difference	Lower	Upper
Score in Phonological Awarensess	Equal variances assumed	2.052	.155	- 1.111	104	.269	-1.89733	1.70817	-5.28468	1.49003
Test	Equal variances not assumed			- 1.117	103.284	.266	-1.89733	1.69787	-5.26455	1.46989
Score in Morphologica Awareness	Equal variances assumed	5.494	.021	1.845	103	.068	3.75818	2.03642	28057	7.79693
Test	Equal variances not assumed			1.824	92.692	.071	3.75818	2.06007	33289	7.84926

Independent Samples Test

# 4.3 Summary

The outcomes of the current study have shown that PA and MA exhibited significant correlation with spelling. In other words, PA and MA are suggested to play an important role in developing spelling abilities in Arabic. In the meantime, PA and MA exhibited a reciprocal relationship with each other; the performance of PA can predict the MA skills and vice versa.

The outcomes of this study highlighted the root and word pattern in identifying spelling errors. Spelling error profiles suggested that learners tended to make three types of errors: errors with respect to the root, errors with respect to the word pattern, and errors with respect to both root and word pattern. The overall results indicated that TD and LD learners followed a similar pattern of complexity even though LD made more errors than their counterparts. Learners encountered more difficulties in passive voice forms while active voice forms, including intact and weak verbs, formed a moderate difficulty for learners.

Overall, learners found nouns, derivations and verbal nouns easier than other forms in spelling. It is apparent that some factors played a role in determining the complexity of forms in spelling such as the load of diacritics and whether they are needed to disambiguate the form or not in the orthographic representation, especially in passive voice forms. In addition, the extent to which radicals (root letters) undergo changes and modification in the orthography plays a role in determining the complexity of the form; forms that tend to change their radicals in the orthography tend to be more complex. In addition, word frequency might have an impact on spelling performance especially with respect to word patterns that are rarely used in Arabic.

With respect to gender's impact on learners' performance, and in line with previous studies (e.g., Rutter, et al., 2004), the outcomes of this study found that girls outperformed boys in the morphologically-based spelling test, while gender did not affect performance in PA and MA.

#### **Chapter Five**

#### **Discussion and Conclusion**

## **5.0 Introduction**

Spelling in Arabic, and mainly in Jordan, is considered one of the major difficulties encountered by learners due to some factors which impact spelling performance such as the unique orthographical and morphological characteristics of Arabic, in addition to the diglossic situation in Arabic which creates phonological variations between MSA and local dialects. On the other hand, implementing inclusive education for students with LD in mainstream schools (Ministry of Education, 2017) poses another educational challenge to ensure that all learners receive appropriate language and spelling skills to support more advanced educational pursuits. Overall, teaching spelling in Arabic depends mainly on memorizing and repetition of the spelling of words (Abu-Hamour, 2013). Recent views of reading and spelling development highlight the role of other linguistic aspects, beyond phonological awareness, to include morphology (Berninger and Wolf, 2009).

In the rest of this chapter, findings of this study are discussed in relation to each research question. In addition, implications for practice and theory are presented and followed by the limitations of the current study, future research, and conclusion.

## 5.1 Theoretical implications

The current study investigated the complexity of common Arabic morphological forms in spelling among TD and LD learners to determine the hierarchy which young learners tend to follow in mastering morphological forms in the early years of schooling. The morphological complexity in spelling is determined by the morphologically-based spelling task which includes eight main common morphological forms and forty-four minor forms in which each spelling error falls under only one main morphological form and one minor form. The findings of spelling errors involve taking advantage of the main major theories of Arabic morphology, the morpheme-based theory (root and pattern theory) and stem-based theory, to provide a framework to understand processing of Arabic spelling.

Additionally, the current study examined the extent to which morphological awareness contributes to spelling accuracy compared to phonological awareness which has been intensively investigated in the literature (e.g., Ehri, 1986; Gentry, 1982; Bahr et al., 2012). In addition, the study investigated the effects of group, gender, and grade levels and the interactions between them on learners' performance in spelling morphological forms.

The purpose of investigating the first research question was to obtain more information regarding the morphological awareness abilities of TD and LD learners, compare those abilities with PA, and determine whether the morphological awareness abilities of learners explain their performance on spelling task. This was examined using two tasks for phonological and morphological awareness which comprised 25 items for each. Our finding revealed a positive, significant correlation between the MA, PA, and spelling. PA and MA exhibited significant positive regression with spelling, indicating that learners with higher scores in PA and MA tend to have higher scores in spelling<del>.</del>

These results extended previous findings of the contribution of PA and MA to spelling performance and development (e.g., Carlisle, 1988; Deacon et. al., 2009; Nunes & Bryant, 2006; Nunes et al., 2003). The findings confirm that the predictive value of spelling performance is related to PA and MA effect. Overall, research investigating the impact of MA on spelling is relatively new (Singson et al., 2000; Carlisle, 2000; Deacon & Kirby, 2004; Carlisle, 2003); therefore, these findings add further support to previous studies linking MA to spelling among TD and LD learners (e.g., Wolter, Wood and D'zatko, 2009; Rubin, 1988; Treiman & Cassar, 1996).

One interesting result that emerged from the current study indicated that PA had, comparatively, a greater impact on spelling than MA which is consistent with the majority of spelling studies (e.g., Ehri et al., 2001; Caravolas, 2004; Bird et al., 1995). Such a finding is not surprising since morphological operations in Arabic, and mainly the word pattern, are based on phonological patterns built onto consonantal roots. For instance, the word pattern, which is a prosodic template,

controls how vocalizations intertwine with the consonantal root in order to construct words of different categories. In addition, many studies indicated that morphological structure is used to recover phonological information in non-vowelized texts (Taha and Saiegh-Haddad, 2017). Therefore, to learn a morphological form, a learner is expected to know some phonological information about the word patterns. For example, in order to build a word such as كاتب [kaatib] 'a writer', the learner should insert the consonantal roots [ktb] and the vocalic pattern [aa-i] in the word pattern in non-vowelized texts such as newspapers and books based on his knowledge of the root and the prosodic word pattern. Consequently, we cannot separate phonology from morphological knowledge in Arabic words.

Theoretically, such findings, which imply the reciprocal relation between MA and PA from early on and their high tight correlation with their spelling development, pose a challenge to late models (stage or phase theories) of spelling development (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985). These theories propose that MA only contributes to spelling development late in the process and, therefore, it is not considered as an important factor in early spelling development. Moreover, it suggests that learners move through hierarchical stages in the development of spelling skills.

The findings of this study provide some empirical evidence to support some current theories of spelling development such as the early model of spelling, which suggests that morphological knowledge starts from early on and increases through spelling development. Also this model suggests that spelling development requires multiple linguistic awareness skills (morphology, phonology and orthography) that simultaneously interact across development rather than taking place in specific phases (e.g., Silliman et al., 2006; Reece & Treiman, 2001; Bahr et al., 2012).

Specifically, these findings are best explained by the "repertoire theory" of spelling development (Apel, Masterson and Niessen, 2004; Sulzby, 1996) which suggests that learners, from early on, have access to and utilize morphological knowledge at all stages of development. Accordingly, reliance on morphological knowledge in spelling is coordinated with other linguistic knowledge such as phonological and orthographic knowledge and may vary depending on the requirements of the spelling task.

In sum, this study argued further for the crucial contribution that morphological and phonological awareness make towards the general spelling abilities among beginner learners (see Carlisle, 2000, 1996, 1987; Bourassa et al., 2006) and provide additional evidence for the non-linear growth of morphological knowedge in spelling. In addition, this study suggests to incorporate morphological awareness from early on in the educational curriculm of young learners to improve their spelling abilities.

The second research question, which is the core of the study, examined the developmental complexity of morphological forms in spelling. Each spelling error was coded based on its morphological form across TD and LD groups. Morphological forms represented all common morphological forms in Arabic distributed into eight main forms which were comprised of forty-four minor forms. The main morphological forms were: active voice/ intact verbs (ASV), active voice/ weak verbs (AWV), augmented verbs (AUV), passive voice/ intact verbs (PSV), passive voice/ weak verb (PWV), derivations (DER), nouns (NOUN), and verbal nouns (VN).

Qualitatively, the findings of this study showed that spelling errors were mainly related to the root, word pattern or both root and word pattern. Theoretically, such findings provide further support for the distinct status of the root and the word pattern and, therefore, provide external evidence for the morpheme-based theories (e.g., Taft, 2004; Boudelaa, 2014). These theories argue that Arabic words are mentally represented and analyzed according to their morphological components, i.e., roots, and word patterns are represented and processed separately and independently in the mental lexicon.

A large and growing body of psycholinguistic studies on Arabic has provided strong evidence for the morpheme-based theory. For example, Boudelaa (2014) proposed the obligatory morphological decomposition (OMD) in Arabic which postulates that both the root and the word pattern play an important role in lexical representation and processing of Arabic words. In the same vein, studies on errors of aphasic Arabs such as Prunet et al. (2000) and Safi-Stagni (1991) argued further for the lexical status of the root and the word pattern in the mental lexicon. The findings also revealed that both TD and LD groups found derivations (DER), nouns (NOUN), and verbal nouns (VN) as the easiest morphological forms in spelling, while passive voice/ intact verbs (PSV) and passive voice/ weak verbs (PWV) were the most difficult forms for both groups. They only differed in the difficulty of augmented verbs (AUV). LD found active voice/ weak verbs (AWV) more difficult than augmented verbs (AUV), while TD performed better on active voice/ weak verbs (AWV) compared to augmented verbs (AUV) (see Appendix L, page 276) for the complete results).

Similarly, individual grades across TD and LD learners shared almost common morphological complexity patterns. The results revealed that passive voice/ weak verb (PWV), and passive voice/ intact verb (PSV) were found to be the most difficult forms across grades while nouns (NOUN), verbal nouns (VN) and derivations (DER) were found to be the easiest morphological forms. On the other hand, augmented verb (AUV), active voice/ intact verb (ASV), and active voice/ weak verb (AWV) exhibited a moderate difficulty as demonstrated in figure 5.1.



Figure 5.1: General morphological complexity across grades

Note: ASV= Active voice/ intact verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ intact verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal n ouns

In sum, learners encountered more difficulties in passive voice forms followed by active voice forms while, on the other hand, learners performed better on nouns, derivations and verbal nouns. Therefore, it seems that the extent to which the form needs diacritics to disambiguate it plays a role in determining the complexity hierarchy of forms. For example, diacritics are essential in the passive voice form to disambiguate it from the active one and, therefore, it is suggested that they require a heavy cognitive load to access and process diacritics.

Contrary to expectation, the results of the complexity indicated that learners perform better on weak verbs, which involve weak radicals in their roots and tend to undergo some changes and modifications in the orthographic representation, than intact verbs which are fully represented in the orthography. For instance, LD learners performed better on PWV than PSV; however, these forms are passive forms and require more diacritics and involve weak radicals. On the other hand, TD learners found PWV more complex than PSV in the first two grades while other grades found PWV to be easier. In addition, both groups (TD and LD) found the active voice forms of the weak verbs (AWV) easier than the intact verbs (ASV).

This finding was unexpected and, theoretically, suggests that weak verbs, in contrast to early findings, are not processed the same way as the intact verbs, i.e., they are not processed according to their root and word pattern. If we supposed that weak verbs are processed similarly to intact verbs and according to their morphemic units, root and word pattern, we would expect that the cognitive load for accessing and processing diacritics and decomposed components, in addition to the allomorphic variation that may affect weak verbs, would result in more errors and difficulties. Therefore, it is suggested a differential accessing and processing of the two forms, the weak and the intact verb forms. Thus, this finding for the weak verb seems to be incompatible with the morpheme-based theory of the Arabic mental lexicon.

There are two possible explanations for this result. Firstly, it seems that weak verbs are processed differently from intact verbs which promoted their proper accessing and processing. It is suggested that these forms are possibly to be processed according to their stem rather than their root. This suggestion aligned with the stem-based theory, which contrasts with the morpheme-based theory, and suggests that the root and the word pattern play no role in word formation and mental

representation of Arabic words (Benmamoun, 1999, 2003). It also proposes that the imperfective stem is the main unit used in deriving surface word forms.

Benmamoun (2003, p. 105) postulated that "the fact that lexical relations involve more than just the root but vowel length and derivational morphemes strongly indicates lexical relations, like in English, are established over words or lexemes" and therefore, he argued that "the imperfective is the default morphological verbal form in Arabic" (p. 109). Therefore, and according to the stembased model, a word such as مُعَلَم [muSallim] 'a teacher' is not processed according to its root and [SIm] and the word pattern مُعَلَم [muSallim] rather derived according to the imperfective verb يُعَلَّم [yuSalim] 'he teaches' by prefixation of the nominal prefix — [m] where the stem Sallim can be used to derive different words by adding suffixes and prefixes.

From the previous discussion, it can be seen that processing of some weak forms cannot be explained within the morpheme-based theory (root-word pattern model), and therefore it would be suggested that these forms are processed according to their stem where the perfective form, in contrast to Benmamoun (2003), play a role in the processing and representation. Given the fact that weak radicals are orthographically represented in some conjugations, it is proposed that the stem-based model is applied to weak verbs when some weak radicals are dropped in the orthography, while conjugations that represent their weak radicals in the orthographic representation are processed according to their root and word pattern, i.e., the morpheme-based theory. For example, forms that are based on the weak root  $\frac{1}{2} [qw/ul]$  'to say' such as  $\frac{1}{2} [qaul]$  'an utterance'', ' $\frac{1}{2} \frac{1}{2} [quulu]$  'say-IMP. PL.' are supposed to be processed according to their roots and word patterns while, on the other hand, words such as  $\frac{1}{2} [qaala]$  'he said',  $\frac{1}{2} [qiila]$  'was said', where the second weak radial  $\frac{1}{2} [w/u]$  was replaced by  $\lfloor [aa]$ . In the word  $\frac{1}{2} [qiila]$ , the second radical was changed to  $\frac{1}{2} = \frac{1}{2} [1]$  to follow the passive voice pattern.

Another explanation that might play a role in supporting our suggestion is that teaching instruction used in early schooling depends mainly on memorizing and teaching stems (perfective) and that seems to help learners to access and process weak verbs more accurately than intact verbs which may require another way of teaching. As a result, the findings of this study suggested combining the three theoretical models to understand the complex hierarchy of spelling errors and to shed light on the potential lexical representation and processing involved in spelling Arabic words: the dual-access hypothesis, the morpheme-based hypothesis, and the stem-based hypothesis. The findings of this study suggest that accessing weak verbs according to their stems does not ignore the word pattern.

We suggest a dual model which combines both morpheme-based and stem-based mechanisms to understand spelling errors that are based on morphological complexity. This study suggests that the spelling process goes in a hierarchical way where words can be accessed and processed according to either their root or according to their stem. Thereafter, the root or the stem is attached to the proper word pattern. At this stage, the accessing just involves the grapheme without diacritics and affixes. Afterwards, prefixes followed by suffixes are attached and, finally, diacritics are accessed and attached to the word pattern as demonstrated in figure 5.2. Weak verb forms, where radicals undergo changes or modifications, are represented according to their stem, while forms, where radicals are fully represented in the spoken word, are represented according to their root and word pattern.



Figure 5.2: A suggested model for processing Arabic spelling

Therefore, in a word such as معلمون [muSalimuun] 'teachers', the learner first accesses the root علم [Slm] and then attaches it to the basic word pattern (i.e., the grapheme without diacritics) فعل [faSil]. Thereafter, the prefix '\_\_[mu-] is attached followed by attaching the suffix نون [-uun]. Diacritics are accessed later and attached to the word pattern. In the case of weak verbs such as الله [qaaluu], where radicals are modified in the surface form, the perfective stem الله [qaala] 'said' rather than the root قول [qwl] is accessed and applied to the word pattern [faS] فعل [qala] فول [qwl] is attached followed by diacritics. Such a proposal postulates that spelling errors occur in a hierarchical way and may involve errors at the level of root/ stem, word pattern, prefixes, suffixes, or diacritics as demonstrated in figure 5.3.



Figure 5.3: Hierarchy of spelling errors in morphological forms

Abu Rabia and Taha (2004) proposed a model for spelling processing among native Arabic learners. This model was proposed mainly to explain and justify the predominance of phonetic errors in spelling. Their dual model adapted two routes for processing Arabic words; one relies on direct phoneme-grapheme encoding for unfamiliar words, and the other a lexical route for spelling familiar words. The lexical route involved morpho-orthographic information of the word. However, this route did not offer an explanation of how morphological knowledge, which was supposed to be an essential aspect of the orthographic lexicon, is accessed and processed in spelling. Contrasting with the previous view, our model suggests how to understand phonetics and phonological errors are due to environmental factors such as late exposure to MSA, diglossic situation and teaching instruction used in classroms. Therefore, it is proposed that these environmental factors may affect the accuracy and speed of processing spelling words; however, they are not involved in the processing itself.

The outcomes of this study indicated that young learners use all morphological forms in spelling from an early age. However, the complexity may vary according to grade level which is in contrast to some previous studies such as that of Carlisle (1996), who considered the period between first and fourth grade as a transitional period to shift from using inflections to learning derivations.

Consequently, the current study argues further for the non-linear growth of morphological knowledge in spelling development (e.g., Bahar et al., 2012) and argues against the late model in spelling development (e.g., Frith, 1985; Henderson, 1985; Nunes, Bryant, & Bindman, 1997) which proposes that learners use morphological information at a late stage after mastering the phonological and orthographic stages.

The present study also found that using inflectional forms were harder than derivational ones in spelling which is in contrast to some studies in the English language which indicated that young children acquire inflectional forms from early on while derivational ones are learned later (Deacon & Bryan, 2005; Carlisle, 1988; Tyler & Nagy, 1989). Hebrew (a Semitic language) is no exception, where derivational morphology was found to be harder than the inflectional one in oral and written tasks (Levin, Ravid and Rapaport, 2001). On the other hand, some studies investigating spelling errors among children with spelling deficits showed significant difficulty in using inflectional forms (e.g., Hauerwas and Walker, 2003) which is in line with our findings.

Limited studies have investigated the acquisition of Arabic where the interest was, mainly, on oral production (e.g., Omar, 1973; Mohammad, 2005). Some studies focused on the acquisition of plural forms in Arabic (e.g., Aljenaie, 2001; Daana, 2009), while a few other studies have investigated the acquisition of patterns of some morphological forms (e.g. Mohammad, 2005; Abdo & Abdo, 1986). Omar (1973) is one of the pioneer studies in the acquisition of oral language in Arabic. She conducted a study on a group of Egyptian children ranged in age from six months to fifteen years old. Omar (1973) found that children acquired some morphological forms in stages. For example, inflectional forms were mastered at the age of 2 years and 6 months, while plural and dual forms needed longer time to be mastered. In the same way, irregular broken plural form was difficult to produce even for older children. In contrast to Omar (1973), the outcomes of this study on spelling indicated that spelling develops in a non-linear way, i.e., children acquire and use morphological forms in spelling from early on rather than in stages. Additionally, inflectional forms were found to be more difficult than derivations. Therefore, the results of morphological acquisition in Arabic with regards to derivations and inflections may vary according to the context of production, i.e., oral and written forms.

In line with our results, Omar (1973) indicated that young learners tend to use plural forms at later stages of language acquisition where the feminine plural form was found to be easier than the irregular broken form. In general, our results and the available studies on Arabic acquisition, and specially studies in the context of the oral production, agree on the acquisition complexity of plurals where the sound feminine plural noun was found to be mastered earlier than the sound masculine plural noun, and irregular broken plural forms. For example, Daana (2009) found that Jordanian-Arabic speaking children tend to use the regular feminine plural form before the forms of regular masculine plural and the irregular broken plural. Similarly, Alijenaie et al. (2011) found that children use regular feminine sound plural forms from early on and more frequently than masculine sound plural and broken plural forms.

The findings of this study and previous studies indicate that the learning complexity of nouns and plurals in MSA and Arabic dialects in spelling and oral production exhibit almost the same pattern of complexity. The regular sound feminine noun plural is acquired earlier than the two other forms (masculine noun plural and broken plurals) in typically and atypically developing children.

On the other hand, some few Arabic studies investigated the complexity of word patterns of some morphological forms such as Mohammad (2005) and some other researchers cited in his study (e.g., Al Karkhi, 1998). Mohammad (2005) investigated the oral acquisition and comprehension of word patterns of noun and derivation forms among 320 young Jordanian-Arabic speakers aged from 4-11 years old. He examined the acquisition of word patterns of: active participle, noun of the instrument, name of place, dual and plural forms including masculine and feminine sound plurals, and broken plural forms. He found that children acquire active participle earlier than other forms where the word pattern [faSSaal] was the most productive pattern among young children followed by فاعول [faaSil], and فاعول [faaSil] فاعول [faSSaal] as the most productive most productive word pattern followed by فاعول [faaSil] فعال [mifSaal]] فاعول [mifSalah] as the most productive word pattern followed by منعال (fafSaal] as the most productive word pattern followed by منعال [mifSalah], and يفعال [mifSalah], and يفعال [mifSalah]. It was also found that older children use word pattern followed by منعال [mifSalah]. It was also found that older children use [mafSalah], as the most

productive pattern in nouns of place followed by مفعلة [mafSalah] مفعل [mifSal], and [mifSalah] while مفعلة [mifSalah] was the most productive pattern among young children followed by [mafSal], مفعلة [mafSal], and مفعل [mafSal], and pieze [mafSalah], and [mafSal], [mafSalah], and pieze [mafSalah], and [mafSal], [mafSalah], and [mafSal], [mafSalah], and pieze [mafSalah], [mafSalah], [mafSalah], and pieze [mafSalah], an

Abdo & Abdo (1986, cited in Mohammad, 2005) have investigated the development of the oral production of vocabulary words of two Egyptian-Arabic speaking children from the age of one year till the end of age five. They found that the two children acquired the morphological forms in the following order: noun of instrument (1.5-2 years), active participle (1.9-2.3 years), noun of place (2.5-3 years), and forms of exaggeration. Such hierarchy of derivations is at odds with our results where the morphological complexity displayed noun of place as the easiest morphological forms while noun of instrument as the most complex form in spelling. In the same vein, Al Karkhi (1998, cited in Mohammad, 2005) has investigated the development of some morphological forms among 160 Iraqi-Arabic speaking children. He found that children understand very well the active participle and the noun of instrument before the age of four, while noun of place is acquired beyond the age of seven years old which is in contrast to our results which indicate that noun of place was the easiest form of derivations in spelling. Therefore, such results of morphological complexity may indicate a variance between oral and written productions.

The results of the current study have also shown that learners tended to make frequent phonetic and phonological errors within the root and the word pattern framework involving emphatic sounds, glottal stops, writing the consonant or diacritics at the end of the word, the correct order of consonants and vowels in word patterns. It was observed that learners tended to replace emphatic consonants with their counterparts of non-emphatic consonants such as using  $\omega$  [s]

instead of [s] or [d] instead of [d] while the glottal consonant [?a] was tended to be replaced by [w] or [aa].

In this regard, phonetic and phonological errors received intensive attention from Arab scholars on spelling (e.g., Azzam, 1993, Abu-Rabia & Taha, 2004, 2006; Abu-Rabia and Sammour, 2013). These studies tended to categorize spelling errors into phonetic and phonological errors and, therefore, their outcomes indicated that phonetic errors were the predominant errors among learners. For instance, Abu-Rabia & Taha (2004, 2006), and Abu-Rabia and Sammour (2013) used almost the same phonetic and phonological categories in analyzing spelling errors such as phonetic errors, semiphonetic errors, dysphonetic errors, visual letter-confusion errors, irregular spelling rules, word omission, and functional words omission. Consequently, it was proposed that "phonology poses the greatest challenge to students developing spelling skills in Arabic" (Abu-Rabia & Sammour, 2013, p. 60). However, these studies indicated that learners tend to use morphological knowledge in spelling from early on and highlighted the importance of the morphoorthographic knowledge in facilitating spelling. For instance, Taha (2013), emphasized the importance of the morpho-orthographic knowledge on spelling and postulated that "morphoorthographic knowledge among Arabic spellers can be used as a cost-effective strategy because, while spelling a word, the awareness to the specific pattern that this word was inflected on and the awareness to the root letter sequences of the specific word could produce a monitoring system in spelling". Such explanations highlight the importance of the systematic learning of morphological patterns in facilitating the orthographic representation of words.

What the current study has shown is that phonetic errors are best understood within the framework of the root and the word pattern which can have pedagogical and clinical implications for teaching spelling, while focusing on phonetic errors as independent errors may not help in developing any educational or clinical tools for some reasons. First of all, difficulties of representing Arabic sounds into orthographic forms could be due to the diglossic situation in Arabic (Saiegh-Haddad, 2004, 2005) where phonological variations exhibit between MSA taught in schools and local spoken dialects. Therefore, and considering the fact that children use dialectical forms from early

on, learners may use dialectal variants as a preference rather than production difficulty (Hamdan & Amayreh, 2007).

Thus, it is expected that learners encounter difficulties in emphatic sounds due to the absence of the emphatic phoneme in the local dialects. Taha (2013, p. 723) explained that such difficulties are "simply because there are always new emphatic words which the speller must be exposed to, while he/she does not yet have any stored orthographic patterns of those words". In addition, phonetic difficulties are expected among young learners due the fact that difficulties in mastering Arabic phonemes can continue even in the end of elementary grades and the full mastering of the MSA forms may take an even longer time even in the secondary grades (Alrabaa, 1986). Amayreh and Dyson (1998) investigated the acquisition of Arabic consonants among Jordanian children ranging in age between 2;0-6;4, and found that many consonants were not acquired by older children such as /?/, /  $\delta$ /, / $\Theta$ /, /z/, /S/, /d/d, /j/, /t/, / $\delta$ /, and /q/. In the same direction, Amayreh (2003) indicated that some MSA consonants might take a longer time to be acquired by approximately 8; 6–9; 0 years.

Therefore, phonological difficulties in such cases are explained by the impact of the environmental factors such as the diglossic nature of Arabic and the late or limited exposure to the MSA either before the formal schooling or even during formal schooling. As a result, Hamdan & Amayreh (2007, 63) suggested that "maximizing exposure to SA (Standard Arabic) forms during the preschool stage may play a positive role in unifying the consonant inventory of children at the onset of formal schooling" and, consequently, that will play a role in improving learners' ability in reading and spelling. Furthermore, Amayreh (2003) indicated that learners tend to replace some late acquired consonants with dialectal variants which have relatively less difficulties in articulating these consonants and, therefore, spelling errors involving glottal stops /?/ can be explained within this framework.

In order to overcome phonological variations between MSA and local dialects in spelling, learners should be exposed to morphological forms from early on to bridge the gap with local dialects and enhance the morpho-orthographic knowledge which can play a role in recovering phonological information and representing it in orthographic forms. In sum, the current study suggests that all

previous phonetic categories (e.g., Abu Rabia & Taha, 2004; Azzam, 1993) can be understood and explained within the framework of the root and the word pattern.

It is a well-documented finding that high-frequency words are easier and processed faster than low-frequency words upon hearing the target word in spelling-to-dictation tasks (Chua and Liow, 2014). Therefore, it is expected that the most frequent morphological forms are acquired earlier and easier than the less frequent ones. Consequently, it seems appropriate to compare our results of the complexity of morphological forms with the most frequent morphological forms in schools' reading books to shed light on the frequency effect on spelling. AL- Harahshe (1990) analyzed the most common morphological forms in reading texts in the reading books of the first and second grades in Jordan and found that the noun is the most circulated form with a ratio of 54.52% followed by verbs with a ratio of 20% . He also found that broken plurals are the most circulated form of plurals, and adjective is the most frequent form of derivation. With regards to verbs, he found that perfect verb is used more than other verbal forms in reading books and un-augmented verbs are used more than augmented verbs. He also found that triliteral verbs are more frequent than quadriliteral verbs, intact verbs are more frequent than weak verbs, and active voice verbs are more frequent than passive voice verbs.

In general, these findings support the effect of high-frequency words in spelling where the most frequent forms tend to be easier in spelling than less common forms. Therefore, frequency of morphological forms in schools' reading books seems to play a role in the complexity of morphological forms in spelling. Although adjective forms were the most common form of derivations in reading books, they were not the easiest form in spelling; nouns of place and time (NPT) were the easiest form of derivations in spelling. In addition, intact verbs were found to be more frequent than weak verbs; however, our results indicated that weak verbs were, in general, easier than the intact ones.

With regards to effects of group and grade levels and the interactions between them on learners' performance, a two-way multivariate analysis of variance (MANOVA) was conducted in this study to reveal the impact of group and grade level and the interaction between them on learners' performance in the spelling task. The results of this analysis indicated statistically significant

differences for both group (TD & LD) and grade levels with high effect size for group estimated at .868, which means that .86.8% of the spelling performance was accounted for by group, while grade obtained a lower effect size estimated at .262. The outcomes of this analysis revealed a significant interaction between the effects of the group and the grade on spelling task where 22.3% of the spelling performance was accounted for by both group and grade factors. This result indicates that the performance of LD and TD learners differ on spelling tests and differ across grades even though group (LD & TD) has more impact than grades on spelling performance.

Moreover, the results of the Tukey post-hoc test was used to determine the differences across group and grade levels on each morphological form in the morphologically-based spelling test. The results revealed a statistically significant difference for group and grade in all morphological forms while the interaction between group and grade obtained a statistically significant difference in AWV, PSV, DER, NOUN, and VN, while ASV, AUV, and PWV exhibited no significant differences.

As a result, the outcomes of this study displayed a significant difference between the performance of TD and LD learners although both LD and TD learners followed almost a similar pattern of complexity as shown in figure 5.4.



Figure 5.4: Patterns of morphological complexity among LD and TD learners

Note: ASV= Active voice/ intact verbs, AWV= Active voice/ Weak verbs, AUV= Augmented verbs, PSV= Passive voice/ intact verbs, PWV= Passive voice/ Weak verb, DER= Derivations, Noun= Nouns, VN= Verbal nouns

The overall result of this study showed that LD learners made more errors than TD learners although patterns of morphological complexity of LD learners, generally, did not differ from those of TD learners. In conclusion, both TD and LD learners followed a similar pattern of morphological complexity where both groups exhibit a difficulty with passive voice forms while derivations, verbal nouns and nouns were spelled more accurately than other morphological forms in spelling.

Therefore, the results for LD learners suggest a pattern of developmental delay rather than a qualitatively deviance in spelling performance. This is because learners with LD followed a similar pattern of complexity even though they made more errors than their counterparts. Such a proposal goes in line with previous cross-linguistic research studies such as Abu-Rabia and Taha (2004) for Arabic, Jiménez et al. (2008) for Spanish (cited in Diamanti et al., 2014), Diamanti et al. (2014) for Greek and Curtain et al. (2001) for English. In sum, following similar patterns of complexity among TD and LD learners may indicate that all learners mentally access and process morphological forms using similar cognitive pathways or routes. It also postulates that the dense orthographic neighbourhood (Coltheart et al., 1977) facilitated spelling words to the same extent of influence for both TD and LD learners. Arabic especially has relatively high orthographic density, i.e., many words can be created similar to the target word such as کاتب kaatib 'a writer', kitaab 'a book', مكتبة maktaba 'a library', كاتَب kaataba 'wrote to كاتَب somebody', كُتَيَب kutayyib 'a notebook', etc. Consequently, derivations and verbal nouns with high dense neighborhoods were the easiest forms in spelling since "words with dense neighborhoods receive activation from many similar formal words via the shared individual graphemic units, unlike words with sparse neighborhoods, which receive activation from only a small number of similar, formal words" (Roux and Bonin, 2009, p. 372). Such findings indicate that designing educational/ therapeutic instruction and strategies to overcome spelling difficulties among TD and LD learners should be similar; however, some modifications in terms of the task complexity might be considered.

With respect to the impact of the gender variable on learners' performance, independent-samples t-tests were used to compare the performance of males and females on phonological awareness
task, morphological awareness task, and morphologically-based spelling task. The outcomes of the t-tests displayed a significant difference in the performance of males and females on morphological categories of ASV, AUV, PWV, DER, NOUN, and VN, while morphological forms of AWV and PSV displayed no significant differences in the performance of males and females, i.e., both males and females performed similarly on AWV and PSV.

In general, girls outperformed boys on morphologically-based spelling tasks, resulting in the conclusion that girls spell morphological forms better than boys in all morphological forms which is consistent with the majority of literature that indicates girls' superior performance in spelling (e.g., Allred, 1990; Olinghouse, 2008). For example, Malecki & Jewell (2003) investigated writing samples of 946 American-English speaking students in first through eighth grade and found that girls outperformed boys in all dimensions of written expression including spelling accuracy among learners.

With respect to the performance on phonological and morphological awareness tasks, results revealed no significant differences between males and females which means that gender does not affect participants' performance on phonological and morphological awareness. Such results go in line with the gender similarities hypothesis (Hyde, 2005) which proposes that females and males perform similarly on psychological measures. In the same line, Kimura (1999) indicated that both males and females should perform similarly on cognitive abilities since gender differences are controlled biologically.

#### 5.2 Educational and clinical implications

The findings of the present study provide valuable information relevant to clinicians and educators working with young learners and help them to set appropriate expectations of morphological development in spelling and provide information relevant to assessment tools in spelling.

Based on the significant relationship between morphological knowledge and spelling performance in this study, both educators and clinicians should consider the impact of the complexity of morphological forms in spelling when designing assessment or applying educational or therapeutic strategies regarding spelling and writing. The prior knowledge of the complexity of morphological forms offers the opportunity to assess the strengths and weaknesses of morphological knowledge in spelling and, therefore, provides valuable insights regarding spelling performance due to the significant role of the morphological knowledge which is considered as one of best predictors of spelling and even other literacy abilities (see Carlisle, 2000, 1996, 1987; Bourassa et al., 2006; Green et al., 2003).

By identifying the hierarchy in which young learners master morphological forms in spelling, educators and clinicians can better interpret and understand the potential difficulties that each morphological form may pose to learners in spelling and, therefore, facilitating spelling performance as defined by the complexity of morphological forms by targeting the forms that need to be worked on in a systematic instruction and intervention to minimize the difficulty in masterng it.

As a result, it would be more beneficial to encourage teachers and clinicians to assess morphological difficulties in spelling from early on according to the morphological complexity. Thereafter, professionals should target words classified according to their morphological forms and word patterns, such as nouns, active voice verbs, passive voice verbs, etc., rather than targeting words randomly or according to topics regardless of the morphological structure. Taking into consideration the complexity heirarchy in teaching and intervention can lead to improve spelling and other literacy abilities where teaching instruction or intervention starts from the point where a learner experiences a breakdown in specific morphological forms.

In sum, educational and clinical implications that may result from the present study are the need for direct instruction of morphological forms from early on by raising awareness of the morphlogical forms and understanding the process of how to combine the root and the word pattern.

### 5.3 Limitations of the study and future research

Some limitations may have had an impact on the results of the current study: Firstly, LD were diagnosed by resource room teachers based on the Ministry of Education assessments without

assessing learners' intelligence, and that might lead to a confusion with other disabilities such as slow learners who experience more difficulties in reading and spelling. The second limitation concerned the learners' chronological ages where our results were based on grades; however, some grades, and specially LD, have students who were actually 1-2 years older than the grade in which they were enrolled. Finally, the study did not examine the word frequency and depended on a previous study which analyzed the most common morphological forms in reading texts in the reading books of the first and second grades in Jordan.

Future research should investigate the efficiency of using the hierarchy of morphological complexity in teaching spelling in comparison with other approaches. In addition, more research is needed to compare learners' performance on intact and weak verbs and whether teaching weak verbs based on the stem-based approach is more effective than the root-word pattern model in spelling.

### **5.4 Conclusion**

The purpose of the current study was to determine the complexity of morphological forms in spelling among Arabic-speaking young learners, in addition to the extent to which morphological and phonological awareness contributes to spelling abilities. The study also examined the effect of group, grade and gender and the interaction between them on the learners' performance.

A positive correlation was found between MA, PA, and spelling performance which confirms previous findings (e.g., Carlisle, 1988; Deacon et. al., 2009; Nunes & Bryant, 2006; Nunes et. al., 2003) and contributes to our understanding of the significant role of MA on Arabic spelling. In addition, the reciprocal relation between MA and PA and their role in spelling performance argued further for the non-linear growth of morphological knowedge in spelling where learners access and use morphological knowledge from early on and across all developmental stages.

A general finding of the comparison between LD and TD learners on spelling performance, and consistent with a spelling delay pattern, both groups of LD and TD followed a similar pattern of morphological complexity in spelling although LD learners made more errors. Both LD and TD learners experienced more difficulty with passive voice forms followed by active voice forms

while derivations, verbal nouns and nouns were the easiest morphological forms in spelling. The results also revealed statistically significant differences for both group and grade levels on morphological forms with a higher effect size for group than for grade. A significant interaction was also obtained for the effects of the group and the grade in the morphologically-based spelling task. In addition, the results of the Tukey post-hoc test revealed a statistically significant difference in all morphological forms in the spelling task while the interaction between group and grade obtained a statistically significant difference in AWV, PSV, DER, NOUN, and VN, while ASV, AUV, and PWV exhibited no significant differences.

The most striking observation to emerge from the data was learners' performance on weak verbs. Learners spelled weak verbs, which involve some changes and modifications to the weak radicals in the orthographic representation, more accurately than intact ones which are fully represented in the orthographic representation. Theoretically, these findings postulate that both forms are processed differently in spelling. Therefore, the current study suggests a dual model to explain the potential processing of Arabic words in spelling. The model proposes that the spelling process goes in a hierarchical way where words can be accessed and processed according to either their root or to their stem. This hierarchy proposes that, in order to spell a word, the learner should firstly access the root/ stem which is, thereafter, attached to the proper grapheme of the word pattern. Then, the learner accesses prefixes followed by suffixes and, finally, diacritics are attached to the word pattern. Intact verbs are proposed to be accessed according to either their root or the hand, could be accessed and processed according to either the root or the stem. Weak verb forms, which undergo some changes or modifications to their weak radicals, are accessed and processed according to their root, while weak forms, which their weak radicals are represented in the spoken word, are accessed and processed similarly to intact verbs, i.e., according to their root.

This study suggests incorporating the teaching of morphological patterns in a systematic way based on their complexity in addition to morphological awareness from early on in the educational curriculm of young learners to improve their spelling abilities.

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### Appendices

### Appendix A-1: Permission from the ethical committee at Rhodes University



**Appendix A-2**: Permission to administer the research tasks on the schools' children from the Ministry of Education, Jordan

- 63 110AF 11./F-1) الدريج. ٢ جمادي الأول ٢٤٣٧ T . 17/. T/. Vat ... السيد مدير التربية والتعليم للواء قصية إريد/ محافظة إريد الموضوع: البحث التريوي السلام عليكم ورحمة الله ويركاته، ويعدا فأرجو العلم بأن الطالب إياد على محمد عيسي يقوم بإجراء دراسة عنوانها المسعوبات المسرقية لدى الطلبة الداطفن بالعربية"، استثمالاً لمتطلبات المعمول على درجة الدكتوراء تخميمن اللغويات/ جامعة روتز / جنوب أفريقيا، ويحتاج ذلك إلى تطبيق أدوات دراسة على عيده من طلبة المرحلة الأساسية في المدارس الثابعة لمديريتكم. راجباً نسبيل مهمة الطالب المنكور. وتقديم المساعدة الممكنة له، على أن يتم مطابقة الأدوات المطبقة مع الأدوات المرققة. واقيلوا الاحترام ر وزير التر 100000000 د. - 10% مار --- ۲۰۰۰ کرد ایج ایجری مز موجو م

Appendix B: Parental consent form for child participation in the study

# PARENTAL CONSENT FORM FOR CHILD PARTICIPATION IN RESEARCH

Dear Parent/ Guardian,

Your child...... is invited to participate in a study investigating the relationship between morphological knowledge and Arabic orthography by investigating the development of spelling among learning-disabled (LD) and typically developing (TD) Arabic-speaking children in the early years of schooling. The outcome of this research could help teachers and therapists in assessing and treating student weaknesses relative to spelling skills.

If you decided to allow your child to participate, he/ she will be asked to do a series of assessments that will assess their spelling development. He/ she will be asked to complete morphological and phonological awareness tests which will take 15- 20 minutes. Thereafter, he/ she will be asked to complete an isolated word task (reading and spelling) that will take around 60- 90 minutes and that will be conducted over 2 sessions. Your child's participation in this study is voluntary and free of charge. Testing will be held at your child's school. There are no known risks or discomforts associated with this study and none are expected. The experimental tests hope to gain information regarding patterns of morphological errors for each child. Any information obtained in this study by which your child could be identified will remain confidential. If you have any questions about this research, you may contact:

Iyad Issa, a doctoral student at Rhodes University/ South Africa, <u>g13i5625@campus.ru.ac.za/</u> <u>iyad\_awda@yahoo.com</u>.

### **Statement of Consent:**

I have read the above information. I consent to participate in this study.

Student's Name	
Signature of Participant (Student)	Date:
Signature of Parent/ Legal Guardian	Date:

*Thank you for your participation!* 227

## نموذج موافقة ولي الأمر لمشاركة ابنه/ ابنته في بحث علمي Arabic)

Version)

عزيزي ولي الأمر,

تم دعوة ابنكم/ ابنتكم ...... للمشاركة في دراسة علمية تبحث في العلاقة بين المعوفة الصرفية والكتابة في اللغة العربية من خلال دراسة أخطاء الكتابة الإملائية بين الطلبة العاديين والطلبة ذوي صعوبات التعلم في المراحل الدراسية المبكرة. يمكن لنتائج هذه الدراسة أن تساعد المعلمين والاختصاصيين في تشخيص وعلاج نقاط الضعف في المهارات الاملائية لدى الطلبة. في حال موافقتكم على مشاركة ابنكم/ ابنتكم فسيطلب منه/ منها تنفيذ بعض التمارين من أجل تقييم قدراته الاملائية التطورية. سيطلب منه/ منها اولا تنفيذ تمارين لتقييم الوعي الصرفي والصوتي ويستغرق ما بين 15-20 دقيقة. فيما بعد سيتم الطلب منه/ منها تنفيذ تمرين الكلمات المعزولة قراءةً وكتابة ويستغرق ما بين 50-90 دقيقة حيث يتم تنفيذه في أكثر من جلستين. مشاركة ابنكم/ ابنتكم في هذه الدراسة هي من باب التطوع ومجانية وسيتم اجراء التقييمات داخل مدرسة الطالب/ الطالبة المشارك/ة. لا يوجد أبه عوامل يمكن أن تشكل خطورة أو ازعاج كنتيجة للمشاركة في هذه الدراسة. يؤمل من هذه التقييمات الحصول على معلومات حول نماذج الأخطاء الصرفية لكل طالب/ طالبة. سيتم التعامل مع جميع المعلومات التي تخص الطالب/ الطالبة المشارك/ة. لا يوجد أبه عوامل يمكن موفي قدرة الدراسة مي مناولاتيم وجانية وسيتم اجراء التقييمات داخل مدرسة الطالب/ الطالبة المشارك/بة. لا يوجد أبه عوامل يمكن مدر التعليم خطورة أو ازعاج كنتيجة للمشاركة في هذه الدراسة. يؤمل من هذه التقييمات الحصول على معلومات حول نماذج الأخطاء وعرفية لكل طالب/ طالبة. سيتم التعامل مع جميع المعلومات التي تخص الطالب/ الطالبة بسرية تامة. في حال وجود أية استفسارات

g13i5625@campus.ru.ac.za/ iyad\_awda@yahoo.com

الموافقة:

لقد اطلعت عل المعلومات اعلاه. أوافق على مشاركة الطالب/ الطالبة:

اسم الطالب:....

شكرا لمشاركتكم

Appendix C: Test of phonological awareness skills

	_ الجنس: ( ) ذكر ( ) أنثى الصف:	اسم االطالب/ـــة:
Student:	Sex: M	() F() Grade:
جموعة: ( ) عادي ( ) صعوبات	ـ المدرسة: الم	تاريخ الميلاد :
DOB:	School Name:	Group: TD ( ) LD ( )
س),( 0) للإجابة الخاطئة	, (1) للإجابة المفهومة مع بعض الاخطاء (تقدير الفاحص	العلامة: ( 2 ) للاجابة الصحيحة

## **Test of Phonological Awareness Skills**

Score: (2)for correct response, (1) Correct with some errors, (0) Incorrect

الرقم No	المهارة Still	الإجابة Response	العلامة Score
INO.	SKIII	Kesponse	Score
	Practice مثال:		
	الصوت الأول في كلمة طائرة (ط)		
	الصوت الأخير في كلب (ب)		
	قل ماعز بدون ما (عز)		
	قل طبق بدون ق (طب)		
-1	ما الصوت الأول في كلمة "سيارة"؟		
	Say the initial sound of the word sayyaara 'car'. /s/		
-2	قل كلمة "أستاذ" بدون "أس"		
	Say ?ustaað 'a teacher' without initial /?us/. taað		
-3	ما الصوت الأخير في كلمة "جرش"		
	What is the final sound of ʒaraʃ (Jerash- a city in Jordan). /ʃ/		

قل كلمة " ملعقة " بدون قاف	-4
Say milçaqa 'a spoon' without /q/. milçaa	
قل كلمة "معلمات" بدون (ات)	-5
Say muçalimaat 'female teachers' without /aat/. muçalim	
Practice مثال:	
ما الكلمة المختلفة صوتيا (نار فار خبز)	
which word is different in rhyme when I say naar 'fire', faar 'a mouse', xubz 'bread. xubz	
ما الكلمة المختلفة صوتيا ( طيارة, باص, سيارة)	-6
Which word is different in rhyme when I say tayyaara 'plane', baaş 'bus', sayyaara 'car'. baaş	
ما الكلمة المختلفة صوتيا (صخر, صامد, صقر)	-7
Which word is different in rhyme when I say şaxr 'rock', şaamid 'immovable, şaqr 'falcon'. şaamid	
ما الكلمة المختلفة صوتيا ( نور, خاب, خاف)	-8
Which word is different in rhyme when I say noor 'light', xaab 'disappointed', xaaf 'fear. noor	
ما الكلمة المختلفة صوتيا ( ضيف, طيف, طائر)	-9
Which word is different in rhyme when I say daif 'guest), țaif 'spectrum', țaaer 'bird'. țaaer	

-10	ما الكلمة المختلفة صوتيا ( مازن, ضار, حار)	
	Which word is different in rhyme when I say Maazin 'a proper name', daar 'hurtful', haar 'hot'. Maazin	
	مثال:Practice	
	قل كلمة: بيت لحم: الأن قلها ثانية دون أن تلفظ (بيت)	
	Example: Say the word: Bayt Laħim (a Palestinian city): Now say it without (bayt). Laħim	
-11	قل كلمة: جمال: الأن قلها ثانية دون أن تلفظ (ج)	
	Say ʒamaal 'a proper name': Now say it without /ʒ/. maal	
-12	قل كلمة: أناشيد: الأن قلها ثانية دون أن تلفظ (شيد)	
	Say ?anaasheed 'songs': Now say it without (sheed). ?anaa	
-13	قل كلمة: سفر جل: الأن قلها ثانية دون أن تلفظ (سفر)	
	Say safar-ʒal 'a kind of flowers': Now say it without (safar). ʒal	
-14	قل كلمة: نعام: الأن قلها ثانية دون أن تلفظ (ع)	
	Say the word naçaam 'ostrich': Now say it without $/\varsigma/$ . naaam	
-15	قل كلمة: صدف: الأن قلها ثانية دون أن تلفظ (د)	
	Say the word şadaf 'seashell': Now say it without /d/. şaaf	

	مثال Practice:	
	قسم كلمة /قطار / إلى مقاطعها الصوتية /قـ/, /طار /	
	Example: Segment the word qitaar 'a train') into sound syllables. /qi- t̪aar/	
	قسم كلمة /مسمار / إلى مقاطعها الصوتية	-16
	Segment the word mismaar 'nail' into sound syllables. Mis-maar	
	قسم كلمة /انعطاف/ إلى مقاطعها الصوتية	-17
	Segment the word ?inçitaaf 'turning' into sound syllables. ?in-çi-taaf	
	Practice مثال:	
	كوّن كلمة من الأصوات التالية: بَ, طا, طا (بطاطا)	
	Example: Blend the sounds: ba, ța, ța to form a word. bațața 'potatoes'	
	كوّن كلمة من الأصوات التالية: من, ت, صر (منتصر)	-18
	Blend the sounds: mun- ta- șir to form a word. muntașir 'a winner'	
	كوّن كلمة من الأصوات التالية: تف فا حة	-19
	Blend the sounds: tuf- faa- ħa to form a word. tuffaaħa 'an apple'	
	كوّن كلمة من الأصوات التالية: مس, ت, طيل	-20
	Blend the sounds: mus-ta- țiil to form a word. mustațiil 'rectangle'	

	مثال:Practice	
	أعط كلمة مماثلة في الصوت لكلمة (رنّان).	
	Example: Give a word that rhymes with rannan 'sonorous'	
	أعط كلمة مماثلة في الصوت لكلمة (غائم).	-21
	: Give a word that rhymes with yaa?im 'cloudy'	
	أعط كلمة مماثلة في الصوت لكلمة (جمل).	-22
	: Give a word that rhymes with ʒamal 'camel'	
	مثال:Practice	
	قل كتاب دون حرف التاء: كاب	
	Example: say kitaab 'a book' without pronouncing taa. kaab	
	قل تجارة بدون (أ)	-23
	Say tizaara 'trade' without aa- tizra	
	قل صحافة بدون (ح)	-24
	 Say ṣaħaafa 'journalism' without ħ- ṣaafa	
	قل منسو جات بدون (ت)	-25
	Say mansoo3aat 'textiles' without t- mansoo3aa	
Total		

Appendix D: Test of morphological awareness

## **Test of Morphological Awareness Skills**

:فغ	ــــــــــــــــــــــــــــــــــــــ	اسم االطالب/ــــ:
Student:	Sex: M() F()	Grade:
۔ المجموعة: ( ) عادي    ( ) صعوبات	- المدر سة:	تاريخ الميلاد :
DOB:	_School Name:	Group: TD ( ) LD ( )

العلامة: ( 2) للإجابة الصحيحة, (1) للإجابة المفهومة مع بعض الاخطاء (تقدير الفاحص), (0) للإجابة الخاطئة

Score: (2) correct response, (1) Understood but with some errors, (0) Incorrect

العلامه Score	الإجابة Response	المهارة Skill	الرقم No.
		Practice : مثال	
		-(مزرعة) يعمل خالي(مزارعا)	
		(mazraça 'farm')- My uncle works as a muzaariç 'a farmer'	
		(ساعد) تقدم أختي (المساعدة)	1
		(saaçada 'helped')- My sister offered a musaaçada 'a help'	
		دفئ- يختار الجاكيت لأنه(دافئ) (dif? 'warmth')- He chooses the jacket because it is daafi? 'warm'	2
		یدرس- کان یعمل(مدر سا)	3
		(yadrus 'study')- He worked as a mudarisan 'teacher'	
		(يأذن)- من أجل المغادرة, نحتاج للحصول على(إذن)	4

(ya?ðan 'permit')- You need a workto leave early ?iðn 'permit'.	
(ربح)- بيع العصائر في الصيف يعد عملا(مربحا) (rib ħ 'profit')- Selling drinks in summer is a work murbiħan 'profitable'	5
(أربعة) أنا في الصف (الرابع) (?arbaça 'four')- I am in the –grade ?alraabiç 'fourth'	6
(عدالة)- من مميز ات الحاكم المسلم(العدل)	7
(çadaalah 'justice') One of the principles of Muslim rulers is ?alçadl 'justice'	
سبح- أحمد بارع (سباح)	8
(sabaħa 'swam')- Ahmad is a skillful sabbaaħ 'a swimmer'	
أنتج- يجب على المشتري الانتباه الى تاريخ انتهاء (المنتج)	9
(?antaʒa 'produced')- The customer should give attention to the expiry date of the	
?almuntaz 'product'	
مدرسة سامي في جامعة البرموك (درس)	10
(madrasa 'a school')- Sami at Yarmouk university.	
darasa 'studied'	
مشهور ـ يبذل الفنانون الكثير من الجهد من أجل الوصول الى عالم(الشهرة)	11
---	----
(maʃhuur 'reputed')- Artists do a lot of efforts to reach ?alʃuhra 'reputation'	
اتفق- تناقش الطرفان لساعات طويلة من أجل الوصول الى (إتفاق)	12
(?ittafaqa/ agree)- Both parties have discussed for long hours in order to reach an	
?itifaaq 'agreement'	
نمى- يحتاج الطفل الى الرضاعة لمدة عامين حتى (ينمو)	13
(nama/grew)- Infant needs two years of breastfeeding to yanmuu 'grow'	
قرر - اختيار التخصص المناسب في الجامعة هو شخص (قداد)	14
(Qarrara 'decided')- Choosing the right specialization at the university is a personal	
Qaraar 'decision'	
حسّن- يحتاج المزار عون الى البذار(المحسّنة)	15
(ħassana 'improve')- Farmers need	
?almuħassana 'improved'	
قبل- من شروط الزواج الصحيح الموافقة و (القبول)	16
(qabila 'accept')- Terms of proper marriage	
alqubuul 'acceptance'	

شجّع- يقال بأن الكثرة تغلب (الشجاعة) (ʃaʒʒaʕa 'encouraged')- It is said that abundance overcomes ?alʃaʒaaʕa 'courage').	17
Practice : مثال Practice : مثال ما الكلمة الناتجة من الجذر (درس) و المبنى (فعالة)؟ فان الكلمة الناتجة هي <u>دراسة</u> What is the word that is derived from the root [drs] 'to study' and follows the pattern /fiçaala/? The resulted word is /diraasa/ 'a study' أكل _ فعول (أكول)	
رکض ۔فعّیل (رکّیض)	
ما الكلمة الناتجة من الجذر (ظهر) والمبنى (يفعل) فان الكلمة الناتجة هي (يظهر)	18
What is the word that is derived from the root [ðhr] 'appear' and follows the pattern yafçalu//? yaðharu	
ما الكلمة الناتجة من الجذر (زلزل) والمبنى (فعلال)؟ الكلمة الناتجة هي (زلزال)	19
What is the word that is derived from the root [zlzl] 'convulse' and follows the pattern /fiçlaal/? Zilzaal 'earthquake'	
ما الكلمة الناتجة من الجذر (قبل) والمبنى (فعول)؟ الكمة الناتجة هي (قبول)	20
What is the word that is derived from the root [qbl] 'accept' and follows the pattern /fuçuul/? qubuul	

	ما صيغة الجمع لكلمة (محاسب)؟ محاسبون	21
	What is the plural form of muħaasib 'accountant'? Muħaasibuun	
	ما صيغة الجمع لكلمة ( طفلة)؟ طفلات	22
	What is the plural of tifla 'a female child'?	
	țiflaatl	
	ما صيغة الجمع لكلمة (أفعي)؟ أفاعي	23
	What is the plural of ?afça 'a snake'? ?afaaçi	
	ما صيغة الجمع لكلمة (ورقة)؟ أوراق	24
	What is the plural of waraqa 'a paper'? ?awraaq	
	ما صيغة الجمع لكلمة (فرن)؟ أفران	25
	What is the plural of furun 'oven'? ?afraan	
Total		

Word الكلمة	Word الكلمة	Word الكلمة	Word الكلمة
نَضَعُ	ٲؙڮؚڵؾؙ	قَرَأْتُ	ػؘؾؘڹؚؾؙ
AVVWIR	PVIHV	AVFHV	AVRTIV
4	3	2	1
إقامة	إخراج	غَلَيان	إدارة
GNTR	GNTR	TRG	GNTR
8	7	6	5
أقُولُ	وَحْنَعْنَا	ڡؙٞۯؿ	وَحْمَعْتُ
AVHV	AVVWIR	AVHV	AVVWIR
12	11	10	9
غُرَف	فِتِية	أطعِمة	أثواب
BPM	BPP	BPP	BPP
16	15	14	13
مُفتتح	معرِض	مَولِدْ	مُخْرَج
РР	NPT	NPT	РР
20	19	18	17

Appendix E: Word lists used in the morphologically-based spelling test

مانشٍ	تسبيحة	وَقَفَة	جِلسة	
АР	GI	GI	GS	
4		2	1	
الرّضوِيّ	مَكّي	ڔؠؘۅؚۑۜ	صحر اويّ	
RA 8	RA	RA 6	RA	
	/		5	
أُكْوَى	ڂؙڡٛٮؙ	أخرجَ	ٳؚڠ۫ۯؘٷؙۅٵ	
PVADWV	PVHV	TA1	AVFHV	
12	11	10	9	
أُكِلْتِ	أخرِجْ	تُكْوَيْنَ	ڂؙڡ۠۫ٮٞ	
PVIHV	TA1	PVADWV	PVHV	
16	15	14	13	
أرغِفة	بَراثن	صِبية	أوقات	
BPP	BPM	BPP	BPP	
20	19	18	17	

بُلْدان	قَتلی	أ <b>قوياء</b>	غُزاة
ВРМ	BPM	BPM	BPM
4	3	2	1
أَكْتُبُ	يُؤْكَلُ	أَقْرَ أُ	أُكِلْتَ
AVRTIV	PVIHV	AVFHV	PVIHV
8	7	6	5
تَكْبِير	قُدُو مْ	سُعَال	حُمْرَة
GNTR	TRG	TRG	TRG
12	11	10	9
يُخرِ جُ	أَضنَعُ	<b>قُلْنَا</b>	<b>وَ ضَ عْتُنَ</b>
TA1	AVVWIR	AVHV	AVVWIR
16	15	14	13
انکِسار	احمِر ار	امْتِثَال	تَدَحْرُ ج
GNTR	GNTR	GNTR	GNTR
20	19	18	17

جامعيين	مهندسون	سْمُر	أهِله	
SMPN	SMPN	BPM	BPM	
4	3	2	1	
تَضَعْنَ	أُكِلَ	إِقْرَأْ	أُكِلَتْ	
AVVWIR	PVIHV	AVFHV	PVIHV	
8	7	6	5	
<b>بُبُو</b> سَمَّة	ستُعَالَ	عَرَج	فِلاحة	
GNTR	GNTR	GNTR	GNTR	
12	11	10	9	
تَقْرَوُونَ	تُخَافِينَ	قَرَرَأْتُمْ	ضَىَعْنَ	
AVFHV	PVHV	AVFHV	AVVWIR	
16	15	14	13	
حيتان	كُتّاب	<b>كراسي</b>	عُمُد	
BPM	BPM	BPM	BPM	
20	19	18	17	

تُخَافُ	<b>قدّم</b>	<b>يُقَدِّمُ</b>	نَقُولُ
PVHV	TA1	TA1	AVHV
4	3	2	1
مَرَرْنَا	وَضَعْتِ	أَمْرُ	خَفْتَ
AVTDV	AVVWIR	AVTDV	PVHV
8	7	6	5
ڭُلْتِ	وَ ضَعْتَ	نَمُرُّ	نَكْتُبُ
AVHV	AVVWIR	AVTDV	AVRTIV
12	11	10	9
نَقْرَ أُ	تُكْوَى	قَرَ أَنَا	خِيفَتْ
AVFHV	PVADWV	AVFHV	PVHV
16	15	14	13
زوابع	حِـعاب	كَتَبَة	صُوّم
BPM	BPM	BPM	BPM
20	19	18	17

ختعًا	تَقْرَأُ	ۇقِيِيتُ	جادَل
AVVWIR	AVFHV	PVSDWV	TA1
4	3	2	1
جَبَان	حَسَن	عَطْشان	وَقور
ADJ	ADJ	ADJ	ADJ
8	7	6	5
یُجَادِلُ	خِيفَ	<b>ق</b> َدِّمْ	دُعِيتُ
TA1	PVHV	TA1	PVDWV
12	11	10	9
داع	کاتب	<b>وقفة</b>	قائل
AP	AP	GI	AP
16	15	14	13
كَتَبْنَىٰ	تَضمَعِينَ	كَتَبْتُمَا	يُخَافُ
AVRTIV	AVVWIR	AVRTIV	PVHV
20	19	18	17

نُمور	مؤمنین	دِببَة	معلمون
BPM	SMPN	BPM	AMPN
4	3	2	1
قَرَ أَتَ	<b>ضَعِي</b>	قَرَ أُتِ	<b>إڤْرَ</b> أْنَ
AVFHV	AVVWIR	AVFHV	AVFHV
8	7	6	5
یَنکسِرُ	رُمِيتُ	جَادِلْ	انکستر
TA2	PVDWV	TA1	TA2
12	11	10	9
تَقْرَئِينَ	مَرَرْتِ	تُؤْكَلُ	مَرَرْتْ
AVFHV	AVTDV	PVIHV	AVTDV
16	15	14	13
لاعب	بائع	مِشية	مُلاكِم
AP	AP	GI	AP
20	19	18	17

قُولاً	وَضَعْثُمَا	إِقْرَئِي	أُخَافُ
AVHV	AVVWIR	AVFHV	PVHV
4	3	2	1
معارف	ر سامین	کُر ماء	طباخون
BPM	SMPN	ВРМ	SMPN
8	7	6	5
تَمُرّينَ	<b>قَ</b> رَأَتْ	قَرَ أَتَا	تَقْرَ أَنَ
AVTDV	AVFHV	AVFHV	AVFHV
12	11	10	9
قَرَ أَثُنَّ	تَضَعَانِ	<b>مُر</b> ّ <i>ي</i>	<b>دُعِيتِ</b>
AVFHV	AVVWIR	AVTDV	PVDWV
16	15	14	13
إِقْرَ آ	تقر آنِ	كَتَبْتِ	تَقُولِينَ
AVFHV	AVFHV	AVRTIV	AVHV
20	19	18	17

تَقُو لأنِ	رُمِیتَ	قَرَ أَثْمَا	دُعِيتَ
AVHV	PVDYV	AVFHV	PVDWV
4	3	2	1
تَكْتُبِينَ	قُولِي	قُلْثُمَا	تَضنَعُ
AVRTIV	AVHV	AVHV	AVVWIR
8	7	6	5
رُمِيتِ	دُعِيَ	ۇقيىتَ	رُمِيَتْ
PVDYV	PVDWV	PVVWIR	PVDYV
12	11	10	9
رُمِيَ	تَكْتُبَانِ	دُعِيَتْ	تَمُرَّانِ
PVDYV	AVRTIV	PVDWV	AVTDV
16	15	14	13
انکسِڑ	تُدْعَيْنَ	رَوَيْتُ	ۇقىيت
TA2	PVDWV	AVADWV	PVVWIR
20	19	18	17

یُدْعَی	أُمْرُرْنَ	<b>تُدْعَى</b>	قَرَ أَنَ
PVDWV	AVTDV	PVDWV	AVFHV
4	3	2	1
ملکات	شُجَيْرَة	حمامات	محطات
SFPN	DIMIN	SFPN	SFPN
8	7	6	5
يَقْرَ أَنَ	<b>زُرْقَة</b>	أَدْعَى	افتتَحَ
AVFHV	TRG	PVDWV	TA2
12	11	10	9
یَفتتِحُ	تَمُرُّ	أُكْتُبِي	فَتْح
TA2	AVTDV	AVRTIV	TRG
16	15	14	13
تَمْرُرْنَ	افتتِحْ	تقات <i>ل</i>	اِرْوِيَا
AVTDV	TA2	TA2	AVADWV
20	19	18	17

يَأْخُذُونَ	قَـَالَتَـَا	تُتَرْجِمَانِ	قُرِ نْتُ
AVIHV	AVHV	AVRQIV	PVFHV
4	3	2	1
یُسْتَّلُ	تُسْأَلِينَ	نَسِيَ	يَضَعْنَ
PVMHV	PVMHV	AVDYV	AVVWIR
8	7	6	5
وَقَيَبًا	قَالَ	تُسْنَّأَلُ	ۇ عِدْتُ
AVSDWV	AVHV	PVMHV	PVVWIR
12	11	10	9
دَعَوْتُمُ	سُئِئِلَ	سُئِلَتْ	كَتَبَتْ
AVDWV	PVMHV	PVMHV	AVRTIV
16	15	14	13
كَتَبْثُنَّ	يَنْسَيْنَ	<b>قُر</b> ئ	أُوكَلُ
AVRTIV	AVDYV	PVFHV	PVIHV
20	19	18	17

يَأْخُذْنَ AVIHV 4	قُلْنَ AVHV 3	خُذُو ا AVIHV 2	سُئِلْتِ PVMHV 1	
أَدْعُ AVDWV 8	يَقِبَانِ AVSDWV 7	أَقْرَرَأُ AVFHV 6	أَخَذَتْ AVIHV 5	
أَخَذْنَ AVIHV 12	يَقُلْنَ AVHV 11	أَخَذَتَا AVIHV 10	أَخَذَ AVIHV 9	
سُئِلْتَ PVMHV 16	يُقْرَأُ PVFHV 15	تَرْو <i>ِي</i> AVADWV 14	سُئِلْتُ PVMHV 13	
وَضَعَا AVVWIR 20	قُرِ نَتْ PVFHV 19	نَسِينَ AVDYV 18	کَتَبَ AVRTIV 17	

<b>ڌُر</b> ٺُٽَ	كَتَبُوا	وَضَعَ	يَقِي
PVFHV	AVRTIV	AVVWIR	AVSDWV
4	3	2	1
تُتَرْجِمِينَ	یَضَـَعُ	تُقْرَ ئِينَ	قُرِ نُتِ
AVRQIV	AVVWIR	PVFHV	PVFHV
8	7	6	5
تَرْجِمَا	أَقْرَرَأُ	أَسْتَالُ	تَرْجَمْتِ
AVRQIV	PVFHV	AVMHV	AVRQIV
12	11	10	9
ساطور	أَقْوَلْ	ساقية	غستالة
IN	EN	IN	IN
16	15	14	13
رَوَيْتُمْ	تَدْعُو	أحمر	دَعَوْتَ
AVADWV	AVDWV	ADJ	AVDWV
20	19	18	17

سَأَلْنَا	ۇ عِدْتِ	تَكْثُبُ	يَقِينَ
AVMHV	PVVWIR	AVRTV	AVSDWV
4	3	2	1
أُكْثُبْ	ۇ عِدْتَ	كَتَبْنَ	ار و
AVRTIV	PVVWIR	AVRTIV	AVADWV
8	7	6	5
تحدّي	تَأْخُذُ	وَقَ <i>ي</i>	يَكْتُبَانِ
GNTR	AVIHV	AVSDWV	AVRTIV
12	11	10	9
خُذْنَ	خُذُ	مِقدام	تَأْخُذُونَ
AVIHV	AVIHV	FOE	AVIHV
16	15	14	13
أَخَذْتُمْ	لِطْمَأْذِنْ	أَخَذْتَ	يَقْرَوُونَ
AVIHV	QA2	AVIHV	AVFHV
20	19	18	17

وَقَيْنَ	أُو عَدُ	يَضَعُونَ	سَنَأَلْتُ
AVSDWV	PVVWIR	AVVWIR	AVMHV
4	3	2	1
ۇ عِدَتْ	سَأَلْتِ	يَقُولُونَ	نَسْئَأَلُ
PVVWIR	AVMHV	AVHV	AVMHV
8	7	6	5
نَسِيَتَا	<b>علاّم</b>	مُستغفِر	أُدَحْرَجُ
AVDYV	FOE	GWM	PVRQIV
12	11	10	9
تَأْخُذْنَ	كَتَبْتَ	اِنْسَوْا	أَكْتُبْنَ
AVIHV	AVRTIV	AVDYV	AVRTIV
16	15	14	13
وَضَعُوا	يَطْمَئِنُّ	سَـَّأَلَ	يَسْأَلْنَ
AVVWIR	QA2	AVMHV	AVMHV
20	19	18	17

اُدْعُونَ	یَسْأَل	يَضنَعَانِ	تُدَحْرَجُ
AVDWV	AVMHV	AVVWIR	PVRQIV
4	3	2	1
يُدَحْرَ جُ	يَكْتُبُ	وَقَتَّا	نَسِيَتْ
PVRQIV	AVRTIV	AVSDWV	AVDYV
8	7	6	5
أَخَذْتُنَّ	تُدَحْرَجِينَ	کَتَبَا	<del>أو</del> ا
AVIHV	PVRQIV	AVRTIV	AVSDWV
12	11	10	9
تَنْسَوْنَ	تَدْعُونَ	أُتَرْجِمُ	وَقَتْ
AVDYV	AVDWV	AVRQIV	AVSDWV
16	15	14	13
تُو عَدِينَ	دُحْرِ جَ	رَوَتَا	تَرْ جَمْتَ
PVVWIR	PVRQIV	AVADWV	AVRQIV
20	19	18	17

خُذَا	وَ قَيْتَ	أَخَذْتُمَا	دُحْرِ جَتْ
AVIHV	AVSDWV	AVIHV	PVRQIV
4	3	2	1
قِينَ	لِطْمَأَنَّ	دَعَوْ تُنَّ	ستألتًا
AVSDWV	QA2	AVDWV	AVMHV
8	7	6	5
سَأَلَتْ	تَأْخُذَانِ	سَـَّالْتُمْ	سَـَأَلْنَ
٧MHV	AVIHV	AVMHV	AVMHV
12	11	10	9
نَسِيتُم	تَرْوُونَ	قِ	اِنْسَ
AVDYV	AVADWV	AVSDWV	AVDYV
16	15	14	13
وَقيتُم	اُدْعُوَا	تَرْجَمْنَا	رَوَيْنَ
AVSDWV	AVDWV	AVRQIVV	AVADWV
20	19	18	17

تَرْ جَمْتُ	تَقِي	تَسْأَلُونَ	تَنْسَكَى
AVRQIV	AVSDWV	AVMHV	AVDYV
4	3	2	1
إِسْأَلُو ا	يَدْعُوَانِ	خُذِي	تَقُونَ
AVMHV	AVDWV	AVIHV	AVSDWV
8	7	6	5
دَعَوَا	سَأَلاَ	تَدْعُوَانِ	تَرْجِمْنَ
AVDWV	AVMHV	AVDWV	AVRQIV
12	11	10	9
تُتَرَ جِمْنَ	تَأْخُذِينَ	تَرْجَمْتُنَّ	يَرْوِينَ
AVRQIV	AVIHV	AVRQIV	AVADWV
16	15	14	13
دَعَوْا	زلز لْتُنَّ	نَسِيتَ	تُزلزِلْنَ
AVDWV	AVQDV	AVDYV	AQDV
20	19	18	17

زلزلُوا	زلزلْتَ	تُزلزلُونَ	تَرْ جَمَتْ
AVQDV	AVQDV	AVQDV	AVRQIV
4	3	2	1
مَرْمِي	مأكول	مکتوب	شُجاع
PP	PP	PP	ADJ
8	7	6	5
<b>فَر خ</b>	صِدِّیق	<b>بلج</b>	شكُور
ADJ	FOE	FOE	FOE
12	11	10	9
زلزِنْ	تَرْجَمَتَا	تُزلز لَانِ	زلز لَا
AVQDV	AVRQIV	AVQDV	AVQDV
16	15	14	13
أُزلزِلُ	ز لز لْنَا	يَدْعُو	زلزلْتُ
AVQDV	AVQDV	AVDWV	AVQDV
20	19	18	17

تُزلزِلُ	زلزلْتُم	اِرْوُوا	تُزلزلِينَ
AVQDV	AVQDV	AVADWV	AVQDV
4	3	2	1
تَرْجَمْنَ	اِنْسَيْنَ	نُتَرْجِمُ	أَخَذْتِ
AVIHV	AVDYV	AVRQIV	AVIHV
8	7	6	5
ئزلزِلُ	زلزلْتُمَا	زلزِلْنَ	زلزلْتِ
AVQDV	AVQDV	AVQDV	AVQDV
12	11	10	9
زلزلِي	زلزلَتْ	جَلْسَنَة	دُحْرِ جْتَ
AVQDV	AVQDV	GI	PVRQIV
16	15	14	13
وَقَيِتُما	تَسْأَلِينَ	يُزلز لْنَ	زلزل
AVSDWV	AMHV	AVQDV	<sup>AVQDV</sup>
20	19	18	17

No.	Morphological form in Arabic	Translation in English	IPA	Code used in the study
1.	الأفعال الصّحيحة المبنية للمعلوم	Active voice intact verbs	?al-?afSa:l ?aş-şahi:ha	ASV
1.1	الفعل الصحيح السالم الثلاثي	Regular triliteral intact verb	?al-fiSl ?aṣ-ṣaħi:ħ ?as- sa:lim ?aө-өula:өi	AVRTV
1.2	الفعل الصحيح السالم الرباعي	Regular quadriliteral intact verb	?al-fiSl ?aṣ-ṣaħi:ħ ?as- sa:lim ?al-ruba:Si	AVRQV
1.3	الفعل المضعف الثلاثي	Trilitteral-doubled verb root	?al-fiSl ?al-muḍaSSaf ?aə- əula:əi	AVTD
1.4	الفعل المضعّف الرباعي	Quadriliteral-doubled verb	?alfisl ?al-muḍassaf ?al- ruba:si	AVQDV
1.5	الفعل المهموز أول الكلمة	Initially-hamzated verb	?alfiSl ?al-mahmu:z ?awwal ?al-kalima	AVIHV
1.6	الفعل المهموز وسط الكلمة	Medially-hamzated verb	?al-fiSl ?al-mahmu:z wasat ?al-kalima	AVMHV
1.7	الفعل المهموز آخر الكلمة	Finally-hamzated verb	?al-fiSl ?al-mahmu:z ?a:xir ?al-kalima	AVFHV
2.	الأفعال الضعيفة	Active voice weak verbs	?al-?afSa:l ?aḍ-ḍaSi:fa	AWV
2.1	الفعل المثال	Verbs with a weak initial radical	?al-fiSl ?al-mioa:l	AVVWIR
2.2	الفعل الأجوف	Hollow verb	?al-fisl ?al-?actwaf	AVHV
2.2	الفعل الناقص الواوي	Defective with waw verb	?al-fifl ?al-na:qis ?al-wa:wi	AVDWV
2.3	الفعل الناقص اليائي	Defective with yaa? Verb	?al-fisl ?al-na:qis ?al-ja:?i	AVDYV
2.4	الفعل اللفيف المفروق	Seperated doubly-weak verb	?al-fiSl ?al-lafi:f ?al- mafru:q	AVSDWV
2.5	الفعل اللفيف المقرون	Adjacent doubly-weak verb	?al-fiSl ?al-lafi:f ?al- maqru:n	AVADWV

Appendix F: Main and minor morphological forms of the morphologically-based spelling task

3.	الأفعال المزيدة	Augmented verbs	?al-?af\$a:l ?al-mazi:da	AUV
3.1	الفعل الثلاثي المزيد بحرف واحد	Triliteral augmented by one letter	?al-fiSl ?aoula:oi ?al- mazi:da bi ħarf waħid	TA1
3.2	الفعل الثلاثي المزيد بحرفين	Triliteral augmented by two letters	?al-fiSl ?aoula:oi ?al- mazi:da bi ħarfain	TA2
4-	الأفعال الصّحيحة المبنية للمجهول	Passive voice intact verbs	?al-?afSa:l ?aş-şahi:ħa ?al-mabnijja lil-majhu:l	PSV
4.1	الفعل الصحيح السالم الثلاثي	Regular triliteral intact verb	?al-fiSl ?aṣ-ṣaħi:ħ ?as- sa:lim ?ao-oula:oi	PVRTIV
4.2	الفعل الصحيح السالم الرباعي	Regular quadriliteral intact verb	?al-fiSl ?aṣ-ṣaħi:ħ ?as- sa:lim ?al-ruba:Si	PVRQIV
4.3	الفعل المهموز أول الكلمة	Initially-hamzated verb	?al-fiSl ?al-mahmu:z ?awwal ?al-kalima	PVIHV
4.4	الفعل المهموز وسط الكلمة	Medially-hamzated verb	?al-fiSl ?al-mahmu:z wasaţ ?al-kalima	PVMHV
4.5	الفعل المهموز آخر الكلمة	Finally-hamzated verb	?al-fiSl ?al-mahmu:z ?a:xir ?al-kalima	PVFHV
5.	الأفعال الضعيفة المبنية للمجهول	Passive voice weak verbs	?al-?afSa:l ?al-ḍaSi:fa	PWV
5.1	الفعل الناقص اليائي	Defective with yaa? Verb	?al-fifl ?al-na:qis ?al-ja: ?i	PVDWYV
5.2	الفعل اللفيف المفروق	Separated doubly-weak verb	?al-fiSl ?al-lafi:f ?al- mafru:q	PVSDWV
5.3	الفعل اللفيف المقرون	Adjacent doubly-weak verb	?al-fiSl ?al-lafi:f ?al- maqru:n	PVADWV
5.4	الفعل المثال	Verbs with a weak initial radical	?al-fisl ?al-mioa:l	PVVWIR
5.5	الفعل الناقص الواوي	Defective with waw verb	?al-fi\$l ?al-na:qis ?al-wa:wi	PVDWV
5.6	الفعل الأجوف	Hollow verb	?al-fisl ?al-?ad;waf	PVHV
6.	المشتقات	Derivations	?al-mu∫taqa:t	DER

				1
6.1	اسم الفاعل	Active participle	?ism- ?al-fa:Sil	AP
6.2	صيغة المبالغة	Form of exaggeration	şi:yat ?al-muba:laya	FOE
6.3	الصفة المشبهة	Adjective	?aş-şifa ?al-mu∫abaha	ADJ
6.4	اسم المفعول	The passive participle	?ism- ?al-mafSu:l	РР
6.5	اسما الزمان والمكان	Nouns of place and time	?isma: ?az-zama:n wal maka:n	NPT
6.6	اسم الآلة	Instrumental noun	?ism ?al- ?a:la	IN
6.7	اسم التفضيل	Elative noun	?ism ?at-tafḍi:l	EN
7.	الأسماء	Nouns	?al-?asma: ?	NOUN
7.1	جمع المذكر السالم	The Sound Masculine Plural Noun	dzamiS ?al–muððakkar ?as- sa:lim	SMPN
7.2	جمع المؤنث السالم	The Sound Feminine Plural Noun	dzamiS ?al-mu?annaə ?as- sa:lim	SFPN
7.3	جمع القلة	Broken Plural of paucity	dzami\$ ?al-qillah	BPP
7.4	جمع الكثرة	Broken Plural of multitude	dzami§ ?al-kaərah	(BPM)
7.5	اسم النسبة	Relative adjective	?ism ?an-nisbbah	RA
7.6	التّصغير	Diminutive	?t-taşyi:r	DIM
8.	المصادر	Verbal Nouns	?al-mașșa:dir	VN
8.1	المصدر الثلاثي	Triliteral root verbal nouns	?al-maşdar ?aə-əula:oi	TRG
8.2	المصدر غير الثلاثي	Verbal nouns of non- triliteral root	?al-maşdar yajr ?ao-oula:oi	GNTR
8.3	المصدر الميمي	Verbal nouns with initial miim (GM)	?al-maşdar ?al-mi:mi	(GWM)
8.4	مصدر المرة	Verbal nouns of instance	maşdar ??alal	(GI)
8.5	مصدر الهيئة	Verbal nouns of state	maşdar ?al-haj ?	GS
1				

Appendix G: Means and standard deviations of spelling tests among TD and LD groups

	Group	Grade	Mean	Std. Deviation	Ν	
ASV	Typically Developing Learners	Grade 2	14.2566	2.56966	10	
		Grade 3	19.0513	2.31837	10	
		Grade 4	18.9065	2.27900	10	
		Grade 5	22.4134	2.12282	10	
		Grade 6	21.6178	2.29975	10	
		Grade 7	23.7452	.87863	9	
		Grade 8	24.5711	1.17523	10	
		Total	20.6069	3.84695	69	
	Learning Disabled Learners	Grade 4	7.1850	3.09341	6	
		Grade 5	7.5493	1.69066	10	
		Grade 6	8.9287	2.63225	8	
		Grade 7	11.8323	5.46969	7	
		Grade 8	14.7567	5.12339	7	
		Total	9.8988	4.52428	38	
	Total	Grade 2	14.2566	2.56966	10	
		Grade 3	19.0513	2.31837	10	
		Grade 4	14.5109	6.37609	16	
		Grade 5	14.9813	7.85057	20	
		Grade 6	15.9782	6.90999	18	
		Grade 7	18.5333	7.04500	16	
		Grade 8	20.5299	5.95053	17	
		Total	16.8040	6.56854	107	
AWV	Typically Developing Learners	Grade 2	15.5380	2.68335	10	
		Grade 3	20.0816	1.19376	10	
		Grade 4	20.7806	1.57746	10	
		Grade 5	22.9080	1.94815	10	
		Grade 6	22.5643	1.68110	10	
		Grade 7	24.6174	.47619	9	
		Grade 8	23.9819	.86651	10	
		Total	21.4507	3.27421	69	
	Learning Disabled Learners	Grade 4	8.7386	4.16447	6	

**Descriptive Statistics** 

			-		
		Grade 5	8.5227	2.29712	10
		Grade 6	10.4438	3.08514	8
		Grade 7	14.2718	3.82321	7
		Grade 8	17.4903	4.21063	7
		Total	11.6722	4.77058	38
	Total	Grade 2	15.5380	2.68335	10
		Grade 3	20.0816	1.19376	10
		Grade 4	16.2649	6.59744	16
		Grade 5	15.7154	7.66514	20
		Grade 6	17.1774	6.61988	18
		Grade 7	20.0912	5.83642	16
		Grade 8	21.3089	4.23274	17
		Total	17.9780	6.07670	107
AUV	Typically Developing Learners	Grade 2	13.5400	2.79243	10
		Grade 3	20.3700	2.67729	10
		Grade 4	20.3100	2.60851	10
		Grade 5	22.1600	1.96636	10
		Grade 6	22.8150	1.97443	10
		Grade 7	22.9389	1.78724	9
		Grade 8	23.3150	1.18111	10
		Total	20.7471	3.83210	69
	Learning Disabled Learners	Grade 4	11.1083	5.86936	6
		Grade 5	11.4150	6.20273	10
		Grade 6	11.3188	6.03111	8
		Grade 7	16.0000	6.04718	7
		Grade 8	17.9786	5.17195	7
		Total	13.4000	6.26588	38
	Total	Grade 2	13.5400	2.79243	10
		Grade 3	20.3700	2.67729	10
		Grade 4	16.8594	6.06081	16
		Grade 5	16.7875	7.10204	20
		Grade 6	17.7056	7.18290	18
		Grade 7	19.9031	5.38236	16
		Grade 8	21.1176	4.25962	17
		Total	18.1379	5.96689	107
PWV	Typically Developing Learners	Grade 2	10.2146	1.90041	10

		Grade 3	14.5738	3.77530	10
		Grade 4	15.3338	4.03052	10
		Grade 5	18.9246	3.49204	10
		Grade 6	17.7833	3.58570	10
		Grade 7	21.1269	2.83866	9
		Grade 8	22.7896	2.13178	10
		Total	17.1933	5.02045	69
	Learning Disabled Learners	Grade 4	8.3063	5.03055	6
		Grade 5	6.2904	2.82954	10
		Grade 6	6.2839	3.76719	8
		Grade 7	10.0232	5.07429	7
		Grade 8	11.8065	4.56492	7
		Total	8.3111	4.52384	38
	Total	Grade 2	10.2146	1.90041	10
		Grade 3	14.5738	3.77530	10
		Grade 4	12.6984	5.52530	16
		Grade 5	12.6075	7.18154	20
		Grade 6	12.6725	6.87186	18
		Grade 7	16.2690	6.85279	16
		Grade 8	18.2672	6.43540	17
		Total	14.0389	6.44601	107
PSV	Typically Developing Learners	Grade 2	11.6376	3.94278	10
		Grade 3	15.7873	3.59742	10
		Grade 4	12.9118	3.51372	10
		Grade 5	17.1071	2.93124	10
		Grade 6	16.6783	2.33929	10
		Grade 7	18.7193	3.52633	9
		Grade 8	21.9677	.74753	10
		Total	16.3677	4.39740	69
	Learning Disabled Learners	Grade 4	4.9994	1.98457	6
		Grade 5	3.3229	1.34421	10
		Grade 6	4.6671	1.71569	8
		Grade 7	7.1348	2.59632	7
		Grade 8	9.2213	3.30663	7
		Total	5.6594	2.99431	38
	Total	Grade 2	11.6376	3.94278	10

			-		
		Grade 3	15.7873	3.59742	10
		Grade 4	9.9446	4.93680	16
		Grade 5	10.2150	7.41125	20
		Grade 6	11.3400	6.46731	18
		Grade 7	13.6511	6.67503	16
		Grade 8	16.7192	6.79902	17
		Total	12.5647	6.48407	107
DER	Typically Developing Learners	Grade 2	17.8200	1.69771	10
		Grade 3	22.2533	2.69024	10
		Grade 4	24.6208	1.19417	10
		Grade 5	25.0347	1.27241	10
		Grade 6	25.2037	1.87391	10
		Grade 7	25.7959	.94583	9
		Grade 8	25.9776	.74185	10
		Total	23.7864	3.13581	69
	Learning Disabled Learners	Grade 4	10.5949	4.40905	6
		Grade 5	13.2784	4.65704	10
		Grade 6	15.4584	4.38858	8
		Grade 7	17.3895	5.98121	7
		Grade 8	22.1878	3.39457	7
		Total	15.7121	5.79163	38
	Total	Grade 2	17.8200	1.69771	10
		Grade 3	22.2533	2.69024	10
		Grade 4	19.3611	7.51779	16
		Grade 5	19.1565	6.88560	20
		Grade 6	20.8724	5.88373	18
		Grade 7	22.1181	5.77385	16
		Grade 8	24.4170	2.88565	17
		Total	20.9189	5.75221	107
NOUN	Typically Developing Learners	Grade 2	15.4075	1.80127	10
		Grade 3	21.5925	2.62605	10
		Grade 4	21.5325	2.40650	10
		Grade 5	22.9175	1.73738	10
		Grade 6	23.2725	3.60070	10
		Grade 7	24.5000	1.50062	9
		Grade 8	25.7800	.62880	10

		1			
		Total	22.1091	3.77724	69
	Learning Disabled Learners	Grade 4	8.7000	3.39974	6
		Grade 5	10.0800	4.70823	10
		Grade 6	10.9000	6.37452	8
		Grade 7	17.4464	5.68689	7
		Grade 8	18.9000	3.52946	7
		Total	13.0164	6.20389	38
	Total	Grade 2	15.4075	1.80127	10
		Grade 3	21.5925	2.62605	10
		Grade 4	16.7203	6.96389	16
		Grade 5	16.4988	7.43633	20
		Grade 6	17.7736	7.97598	18
		Grade 7	21.4141	5.21511	16
		Grade 8	22.9471	4.13225	17
		Total	18.8799	6.45755	107
/N	Typically Developing Learners	Grade 2	16.0606	3.36298	10
		Grade 3	22.0348	3.07246	10
		Grade 4	22.8475	2.12889	10
		Grade 5	24.4588	1.29010	10
		Grade 6	23.5434	1.93024	10
		Grade 7	24.3190	1.58458	9
		Grade 8	25.6523	.95808	10
		Total	22.6789	3.63524	69
	Learning Disabled Learners	Grade 4	9.8915	4.65354	6
		Grade 5	11.7078	2.64861	10
		Grade 6	14.1877	2.59961	8
		Grade 7	14.4191	5.28436	7
		Grade 8	18.6132	4.63964	7
		Total	13.7146	4.69798	38
	Total	Grade 2	16.0606	3.36298	10
		Grade 3	22.0348	3.07246	10
		Grade 4	17,9890	7.20432	16
		Grade 5	18.0833	6 84815	20
		Grade 6	10 2852	5 25724	12
		Graue 0	19.0000	5.25724	10

Grade 7	19.9878	6.18351	16
Grade 8	22.7538	4.61956	17
Total	19.4953	5.89564	107

Appendix H: Average scores of the morphologically-based spelling test for each individual grade

Descriptive Statistics						
	Grade	Mean	Std. Deviation	N		
ASV	Grade 2	14.2566	2.56966	10		
	Grade 3	19.0513	2.31837	10		
	Grade 4	14.5109	6.37609	16		
	Grade 5	14.9813	7.85057	20		
	Grade 6	15.9782	6.90999	18		
	Grade 7	18.5333	7.04500	16		
	Grade 8	20.5299	5.95053	17		
	Total	16.8040	6.56854	107		
AWV	Grade 2	15.5380	2.68335	10		
	Grade 3	20.0816	1.19376	10		
	Grade 4	16.2649	6.59744	16		
	Grade 5	15.7154	7.66514	20		
	Grade 6	17.1774	6.61988	18		
	Grade 7	20.0912	5.83642	16		
	Grade 8	21.3089	4.23274	17		
	Total	17.9780	6.07670	107		
AUV	Grade 2	13.5400	2.79243	10		
	Grade 3	20.3700	2.67729	10		
	Grade 4	16.8594	6.06081	16		
	Grade 5	16.7875	7.10204	20		
	Grade 6	17.7056	7.18290	18		
	Grade 7	19.9031	5.38236	16		
1	Grade 8	21.1176	4.25962	17		
	Total	18.1379	5.96689	107		
PWV	Grade 2	10.2146	1.90041	10		
	Grade 3	14.5738	3.77530	10		
	Grade 4	12.6984	5.52530	16		
	Grade 5	12.6075	7.18154	20		
	Grade 6	12.6725	6.87186	18		
	Grade 7	16.2690	6.85279	16		
	Grade 8	18.2672	6.43540	17		

	Total	14.0389	6.44601	107
PSV	Grade 2	11.6376	3.94278	10
	Grade 3	15.7873	3.59742	10
	Grade 4	9.9446	4.93680	16
	Grade 5	10.2150	7.41125	20
	Grade 6	11.3400	6.46731	18
	Grade 7	13.6511	6.67503	16
	Grade 8	16.7192	6.79902	17
	Total	12.5647	6.48407	107
DER	Grade 2	17.8200	1.69771	10
	Grade 3	22.2533	2.69024	10
	Grade 4	19.3611	7.51779	16
	Grade 5	19.1565	6.88560	20
	Grade 6	20.8724	5.88373	18
	Grade 7	22.1181	5.77385	16
	Grade 8	24.4170	2.88565	17
	Total	20.9189	5.75221	107
NOUN	Grade 2	15.4075	1.80127	10
	Grade 3	21.5925	2.62605	10
	Grade 4	16.7203	6.96389	16
	Grade 5	16.4988	7.43633	20
	Grade 6	17.7736	7.97598	18
	Grade 7	21.4141	5.21511	16
	Grade 8	22.9471	4.13225	17
	Total	18.8799	6.45755	107
VN	Grade 2	16.0606	3.36298	10
	Grade 3	22.0348	3.07246	10
	Grade 4	17.9890	7.20432	16
	Grade 5	18.0833	6.84815	20
	Grade 6	19.3853	5.25724	18
	Grade 7	19.9878	6.18351	16
	Grade 8	22.7538	4.61956	17
	Total	19.4953	5.89564	107

Descriptive Statistics						
	Grade	Mean	Std. Deviation	Ν		
ASV	Grade 2	14.2566	2.56966	10		
	Grade 3	19.0513	2.31837	10		
	Grade 4	14.5109	6.37609	16		
	Grade 5	14.9813	7.85057	20		
	Grade 6	15.9782	6.90999	18		
	Grade 7	18.5333	7.04500	16		
	Grade 8	20.5299	5.95053	17		
	Total	16.8040	6.56854	107		
AWV	Grade 2	15.5380	2.68335	10		
	Grade 3	20.0816	1.19376	10		
	Grade 4	16.2649	6.59744	16		
	Grade 5	15.7154	7.66514	20		
	Grade 6	17.1774	6.61988	18		
	Grade 7	20.0912	5.83642	16		
	Grade 8	21.3089	4.23274	17		
	Total	17.9780	6.07670	107		
AUV	Grade 2	13.5400	2.79243	10		
	Grade 3	20.3700	2.67729	10		
	Grade 4	16.8594	6.06081	16		
	Grade 5	16.7875	7.10204	20		
	Grade 6	17.7056	7.18290	18		
	Grade 7	19.9031	5.38236	16		
	Grade 8	21.1176	4.25962	17		
	Total	18.1379	5.96689	107		
PWV	Grade 2	10.2146	1.90041	10		
	Grade 3	14.5738	3.77530	10		
	Grade 4	12.6984	5.52530	16		
	Grade 5	12.6075	7.18154	20		
	Grade 6	12.6725	6.87186	18		
	Grade 7	16.2690	6.85279	16		
	Grade 8	18.2672	6.43540	17		

Appendix I: The score averages of morphological categories across TD grades

				-						
	Total	14.0389	6.44601	107						
PSV	Grade 2	11.6376	3.94278	10						
	Grade 3	15.7873	3.59742	10						
	Grade 4	9.9446	4.93680	16						
	Grade 5	10.2150	7.41125	20						
	Grade 6	11.3400	6.46731	18						
	Grade 7	13.6511	6.67503	16						
	Grade 8	16.7192	6.79902	17						
	Total	12.5647	6.48407	107						
DER	Grade 2	17.8200	1.69771	10						
	Grade 3	22.2533	2.69024	10						
	Grade 4	19.3611	7.51779	16						
	Grade 5	19.1565	6.88560	20						
	Grade 6	20.8724	5.88373	18						
	Grade 7	22.1181	5.77385	16						
	Grade 8	24.4170	2.88565	17						
	Total	20.9189	5.75221	107						
NOUN	Grade 2	15.4075	1.80127	10						
	Grade 3	21.5925	2.62605	10						
	Grade 4	16.7203	6.96389	16						
	Grade 5	16.4988	7.43633	20						
	Grade 6	17.7736	7.97598	18						
	Grade 7	21.4141	5.21511	16						
	Grade 8	22.9471	4.13225	17						
	Total	18.8799	6.45755	107						
VN	Grade 2	16.0606	3.36298	10						
	Grade 3	22.0348	3.07246	10						
	Grade 4	17.9890	7.20432	16						
	Grade 5	18.0833	6.84815	20						
	Grade 6	19.3853	5.25724	18						
	Grade 7	19.9878	6.18351	16						
	Grade 8	22.7538	4.61956	17						
	Total	19.4953	5.89 <u></u> 564	107						
	Independent Samples Test									
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		Levene's	s Test							
		for Equa	lity of							
		Varian	ces			t-test for Equality of Means				
									95% Cc	onfidence
						Sig.			Interva	al of the
						(2-	Mean	Std. Error	Diffe	rence
		F	Sig.	t	df	tailed)	Difference	Difference	Lower	Upper
ASV	Equal									
	variances	.101	.752	12.934	105	.000	10.70803	.82793	9.06640	12.34966
	assumed									
	Equal									
	variances			40.000	00 507	000	40 70000	00704	0.07500	10 11011
	not			12.339	66.587	.000	10.70803	.86784	8.97562	12.44044
	assumed									
AWV	Equal									
	variances	4.471	.037	12.514	105	.000	9.77855	.78141	8.22916	11.32793
	assumed									
	Equal									
	variances			11 250	56 614	000	0 77855	86840	8 03017	11 51702
	not			11.200	50.014	.000	3.11000	.000+3	0.00017	11.017.02
	assumed									
AUV	Equal									
	variances	18.020	.000	7.527	105	.000	7.34710	.97605	5.41177	9.28244
	assumed									
	Equal									
	variances			6.582	52,599	.000	7.34710	1,11625	5,10779	9.58642
	not			0.002	02.000					0.000.2
	assumed									
PWV	Equal									
	variances	1.930	.168	9.063	105	.000	8.88222	.98001	6.93905	10.82540
	assumed									

Appendix J: A significant difference in spelling performance between TD and LD learners

	Equal variances not assumed			9.343	83.350	.000	8.88222	.95071	6.99142	10.77302
PSV	Equal variances assumed	11.239	.001	13.386	105	.000	10.70834	.79999	9.12211	12.29457
	Equal variances not assumed			14.904	100.187	.000	10.70834	.71847	9.28296	12.13372
DER	Equal variances assumed	18.756	.000	9.372	105	.000	8.07429	.86153	6.36603	9.78254
	Equal variances not assumed			7.974	49.214	.000	8.07429	1.01253	6.03975	10.10882
NOUN	Equal variances assumed	11.348	.001	9.426	105	.000	9.09261	.96464	7.17990	11.00532
	Equal variances not assumed			8.233	52.460	.000	9.09261	1.10437	6.87700	11.30822
VN	Equal variances assumed	5.142	.025	10.979	105	.000	8.96429	.81648	7.34537	10.58322
	Equal variances not assumed			10.200	61.770	.000	8.96429	.87883	7.20741	10.72117

Appendix K: Gender's effect on morphologically-based spelling test

		Levene's for Equa	Test lity of			t_1	test for Equal	ity of Means		
		Vanan				Sig. (2-	Mean	Std. Error	95% Col Interva Differ	nfidence I of the rence
		F	Sig.	t	df	tailed)	Difference	Difference	Lower	Upper
ASV	Equal variances assumed	5.762	.018	2.094	105	.039	-2.61941	1.25069	-5.09929	13953
	Equal variances not assumed			- 2.106	103.071	.038	-2.61941	1.24389	-5.08636	15246
AWV	Equal variances assumed	4.139	.044	- 1.804	105	.074	-2.09843	1.16307	-4.40458	.20772
	Equal variances not assumed			- 1.814	103.195	.073	-2.09843	1.15690	-4.39281	.19595
AUV	Equal variances assumed	22.387	.000	- 3.722	105	.000	-4.05671	1.08995	-6.21788	-1.89555
	Equal variances not assumed			- 3.775	87.230	.000	-4.05671	1.07460	-6.19252	-1.92091
PWV	Equal variances assumed	16.918	.000	- 2.209	105	.029	-2.70571	1.22459	-5.13384	27758

Independent Samples Test

	Equal variances not assumed			- 2.235	93.746	.028	-2.70571	1.21084	-5.10995	30146
PSV	Equal variances assumed	5.142	.025	997	105	.321	-1.25025	1.25421	-3.73711	1.23662
	Equal variances not assumed			- 1.001	103.872	.319	-1.25025	1.24854	-3.72618	1.22568
DER	Equal variances assumed	12.780	.001	- 2.653	105	.009	-2.87137	1.08221	-5.01719	72555
	Equal variances not assumed			- 2.680	96.245	.009	-2.87137	1.07139	-4.99800	74474
NOUN	Equal variances assumed	10.818	.001	- 2.396	105	.018	-2.92828	1.22201	-5.35129	50527
	Equal variances not assumed			- 2.421	95.711	.017	-2.92828	1.20946	-5.32913	52742
VN	Equal variances assumed	8.792	.004	- 2.326	105	.022	-2.59862	1.11735	-4.81412	38311
	Equal variances not assumed			- 2.339	102.603	.021	-2.59862	1.11079	-4.80170	39554

**Appendix L:** The morphological complexity patterns of main and minor morphological forms across overall TD and LD (from easiest to most difficult)

	<b>Overall Morphological</b>	Morphological Complexity across	Morphological among LD
	Complexity	TD	
1-	Derivations (DER)	Derivations (DER)	Derivations (DER)
	a) Nouns of place and time	a) Nouns of place and time (NPT)	a) Nouns of place and time (NPT)
	(NPT)	b) Elative nouns (EN)	b) Elative nouns (EN)
	b) Elative noun (EN)	c) The passive participle (PP)	c) Adjective ( ADJ)
	c) The passive participle	d) Active participle (AP)	d) The passive participle (PP)
	(PP)	e) Adjective ( ADJ)	e) Active participle (AP)
	d) Adjective ( ADJ)	f) Instrumental noun (IN)	f) Forms of exaggerations (FOE)
	e) Active participle (AP)	g) Form of exaggerations (FOE)	g) Instrumental noun (IN)
	f) Form of exaggeration		
	(FOE)		
	g) Instrumental noun (IN).		
2-	Verbal Nouns (VN)	Verbal Nouns (VN)	Verbal Nouns (VN)
	a) Triliteral root verbal	a) Verbal nouns of non-triliteral root	a) Triliteral root verbal nouns (TRG)
	nouns (TRG)	(GNTR)	b) Verbal nouns of state (GS)
	b) Verbal nouns of state	b) Triliteral root verbal nouns	c) Verbal nouns of instance (GI)
	(GS)	(TRG)	d) Verbal nouns of non-triliteral root
	c) Verbal nouns of non-	c) Verbal nouns of state (GS)	(GNTR)
	triliteral root (GNTR)	d) Verbal nouns with initial miim	e) Verbal nouns with initial miim
	d) Verbal nouns with	(GWM)	(GWM)
	initial miim (GWM)	e) Verbal nouns of instance (GI)	
	e) Verbal nouns of		
	instance (GI)		
3-	Nouns (NOUN)	Nouns (NOUN)	Augmented verbs (AUV)
	a) The sound feminine	a) Broken plural of paucity (BPP)	a) Triliteral verb augmented by two
	plural noun (SFPN)	and the sound feminine plural noun	letters (TA1)
	b) Broken plural of	(SFPN) with a same average	ab triliteral verb augmented by one
	multitude (BPM)	b) The sound masculine plural noun	letter (TA12)
	c) The sound masculine	(SMPN)	
	plural noun (SMPN)	c) Broken plural of multitude (BPM)	
		d) Diminutive (DIM)	

	d) Broken plural of paucity	e) Relative adjective (RA)	
	(BPP)		
	e) Diminutive (DIM)		
	f) Relative adjective (RA)		
4-	Augmented verbs (AUV)	Active voice/ weak verb (AWV)	Nouns
	a) triliteral verb augmented	a) Active voice/ defective with waw	a) Broken plural of multitude (BPM)
	by one letter (TA1)	verb (AVDWV)	b) the sound feminine plural noun
	b) Triliteral verb	b) Active voice/ separated doubly-	(SFPN)
	augmented by two letters	weak verb (AVSDWV)	c) The sound masculine plural noun
	(TA2)	c) Active voice/ hollow verb	(SMPN)
		(AVHV)	d) Broken plural of paucity (BPP) e)
		d) Active voice/ a weak initial	Relative adjective (RA)
		radical (AVVWIR)	f) Diminutive (DIM).
		e) Active voice /defective with yaa?	
		Verb (AVDYV)	
		f) Active voice/ adjacent doubly-	
		weak verb (AVADWV).	
5-	Active voice/ weak verbs	Augmented verbs (AUV)	Active voice/ weak verb (AWV)
	(AWV)	a) Triliteral verb augmented by two	a) Active voice/ hollow verb (AVHV)
	a) Active voice/ separated	letters (TA1)	b) Active voice/ separated doubly-
	doubly-weak verb	ab triliteral verb augmented by one	weak verb (AVSDWV)
	(AVSDWV)	letter (TA2)	c) Active voice/ a weak initial radical
	b) Active voice/ hollow		(AVVWIR)
	verb (AVHV)		d) Active voice /defective with yaa?
	c) Active voice/ a weak		Verb (AVDYV)
	initial radical (AVVWIR)		e) Active voice/ adjacent doubly-weak
	d) Active voice/ defective		verb (AVADWV).
	with waw verb (AVDWV)		f) Active voice/ defective with waw
	e) Active voice /defective		verb (AVDWV).
	with yaa? Verb (AVDYV)		
	f) Active voice/ adjacent		
	doubly-weak verb		
	(AVADWV).		
6-	Active voice/ intact verbs	Active voice/ intact verbs (ASV)	Active voice/ intact verbs (ASV)
	(ASV)		

	a) Active voice regular	a) Active voice/ regular triliteral	a) Active voice/ regular triliteral intact
	triliteral intact verb	intact verb (AVRTV)	verb (AVRTV)
	(AVRTIV)	b) Active voice/ initially-hamzated	b) Active voice/ trilitteral-Doubled
	b) Active voice triliteral-	verb (AVIHV)	verb root (AVTDV)
	doubled verb root	c) Active voice/ regular quadriliteral	c) Active voice/ regular quadriliteral
	(AVTDV)	intact verb (AVRQV)	intact verb (AVRQV) d) Active voice/
	c) Active voice regular	d) Active voice/ trilitteral-Doubled	finally-hamzated verb (AVFHV)
	quadriliteral intact verb	verb root (AVTDV)	e) Active voice/ initially-hamzated
	(AVRQIV)	e) Active voice/ quadriliteral-	verb (AVIHV)
	d) Active voice initially-	doubled verb (AVQDV)	f) Active voice/ medially-hamzated
	hamzated verb (AVIHV)	f) Active voice/ medially-hamzated	verb (AVMHV)
	e) Active voice medially-	verb (AVMHV)	g) Active voice/ quadriliteral-doubled
	hamzated verb (AVMHV)	g) Active voice/ finally-hamzated	verb (AVQDV)
	f) Active voice finally-	verb (AVFHV),	
	hamzated verb (AVFHV)		
	g) Active voice		
	quadriliteral-doubled verb		
	quantitional actions a toro		
	(AVQDV)		
7-	(AVQDV) Passive voice/ weak verb	Passive voice/ weak verb (PWV)	Passive voice/ weak verb (PWV)
7-	(AVQDV) Passive voice/ weak verb (PWV)	Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb	Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow	Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weak
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV)	Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-	Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ adjacent doubly-weak verb (PVADWV)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with waw
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective with	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective with yaa? Verb	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective withwaw verb (PVDWV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)e) Passive voice/ defective with yaa?
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective with yaa? Verb (PVDWYV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective withwaw verb (PVDWV)e) Passive voice/ defective with	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)e) Passive voice/ defective with yaa?Verb (PVDWYV)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective with yaa? Verb (PVDWYV) d) Passive voice/ adjacent	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective withwaw verb (PVDWV)e) Passive voice/ verbs with a weakinitial radical (PVVWIR)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)e) Passive voice/ defective with yaa?Verb (PVDWYV)f) Passive voice/ verbs with a weak
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective with yaa? Verb (PVDWYV) d) Passive voice/ adjacent doubly-weak verb	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective withwaw verb (PVDWV)e) Passive voice/ verbs with a weakinitial radical (PVVWIR)f) Passive voice/ adjacent doubly-	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)e) Passive voice/ defective with yaa?Verb (PVDWYV)f) Passive voice/ verbs with a weakinitial radical (PVVWIR)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective with yaa? Verb (PVDWYV) d) Passive voice/ adjacent doubly-weak verb (PVADWV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective withwaw verb (PVDWV)e) Passive voice/ verbs with a weakinitial radical (PVVWIR)f) Passive voice/ adjacent doubly-weak verb (PVADWV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)e) Passive voice/ defective with yaa?Verb (PVDWYV)f) Passive voice/ verbs with a weakinitial radical (PVVWIR)
7-	(AVQDV) Passive voice/ weak verb (PWV) a) Passive voice/ hollow verb (PVHV) b) Passive voice/ separated doubly-weak verb (PVSDWV) c) Passive voice/ defective with yaa? Verb (PVDWYV) d) Passive voice/ adjacent doubly-weak verb (PVADWV) e) Passive voice/ defective	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb(PVHV)b) Passive voice/ separated doubly-weak verb (PVSDWV)c) Passive voice/ defective with yaa?Verb (PVDWYV)d) Passive voice/ defective withwaw verb (PVDWV)e) Passive voice/ verbs with a weakinitial radical (PVVWIR)f) Passive voice/ adjacent doubly-weak verb (PVADWV)	Passive voice/ weak verb (PWV)a) Passive voice/ hollow verb (PVHV)b) Passive voice/ adjacent doubly-weakverb (PVADWV)c) Passive voice/ defective with wawverb (PVDWV)d) Passive voice/ separated doubly-weak verb (PVSDWV)e) Passive voice/ defective with yaa?Verb (PVDWYV)f) Passive voice/ verbs with a weakinitial radical (PVVWIR)

	f) Passive voice/ verbs		
	with a weak initial radical		
	(PVVWIR)		
8-	Passive voice/ intact	Passive voice/ intact verbs (PSV)	Passive voice/ intact verbs (PSV)
	verbs (PSV)	a) Passive Voice/ Regular Triliteral	a) Passive Voice/ Initially-Hamzated
	a) Pasive voice/ regular	Intact Verb (PVRTIV)	Verb (PVIHV)
	triliteral intact verb	b) Passive Voice/ Regular	b) Passive Voice/ Regular Quadriliteral
	(PVRTIV).	Quadriliteral Intact Verb (PVRQIV	Intact Verb (PVRQIV)
	b) Passive voice/ initially-	c) Passive Voice/ Initially-Hamzated	c) Passive Voice/ Finally-Hamzated
	hamzated verb (PVIHV)	Verb (PVIHV)	Verb root (PVFHV)
	c) Passive voice/ regular	d) Passive Voice/ Finally-Hamzated	d) Passive Voice/ Regular Triliteral
	quadriliteral intact verb	Verb root (PVFHV)	Intact Verb (PVRTIV)
	(PVRQIV)	e) Passive Voice/ Medially-	e) Passive Voice/ Medially-Hamzated
	b) Passive voice/ finally-	Hamzated Verb (PVMHV)	Verb (PVMHV)
	hamzated verb root		
	(PVFHV)		
	d) Passive voice/ medially-		
	hamzated verb (PVMHV)		