The Role of Morphology and Short Vowelization in Reading Morphological Complex Words in Arabic: Evidence for the Domination of the Morpheme/Root-Based theory in Reading Arabic

Salim Abu-Rabia
Faculty of Education, University of Haifa Mt. Carmel, Haifa, Israel
Email: salimar@edu.haifa.ac.il

Received July 1st, 2012; revised August 8th, 2012; accepted August 18th, 2012

This study investigated the reading accuracy of 59 adult highly skilled native Arabic readers in reading morphological complex Arabic words in 6 reading conditions: Isolated words with short vowelization, isolated words without short vowelization, sentences with roots with short vowelization, sentences with roots without short vowelization, sentences without priming roots with short vowelization and sentences without priming roots without short vowelization. The results indicated that roots and short vowelization were good facilitators for these adults highly skilled readers in their reading accuracy of morphological complex Arabic words. The results are discussed in the light of the role of roots as autonomous semantic entities and that the complex morphology of Arabic needs short vowelization for accuracy in reading.

Keywords: Arabic Morphology; Morpheme/Root-Based Theory; Morphological Complexity; Reading Accuracy; Roots and Phonology; Short Vowelization

Introduction
Phonological awareness is related to the acquisition of reading (Bradley & Bryant, 1983; Stanovich, Cunningham, & Cramer, 1984; Tunmer & Nesdale, 1985). Some scholars have claimed a causal link between phonological awareness and reading and that phonological awareness is a crucial precondition for beginning reading (Liberman & Liberman, 1990; Snowling 1980; Snowling, Goulandris, Bowby, & Howell, 1986; Mann & Liberman, 1984; Lundberg, Olofsson, & Wall, 1980).

Phonology has attracted the research attention for many years and relatively less attention has been given to morphology. Many studies have been emerging in the last few years focusing on the contribution of morphology to reading as an additional factor to phonology (Beauvillain & Segni, 1992; Feldman, 1991; Caramazza, Laudanna, & Romani, 1988; Feldman, 1994). Carlisle (1995) has suggested a definition to the term morphological awareness: “Morphological awareness focuses on children’s conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate the structure” (p. 194). There is clear evidence of a relationship between morphological awareness and reading in the early stages of reading (Carlisle, 1995; Champion, 1997; Fowler & Liberman, 1995).

Although a serious database of research finding has been documenting the role of phonology and morphology in reading acquisition, not much has been known about the role of these variables in reading in different orthographies like Arabic. This study investigates the role of phonology (short vowelization) and complex Arabic morphology on the reading accuracy of highly skilled adult Arabic readers in reading morphological complex Arabic words and sentences. It is well known that skilled Arabic adult readers use textbooks with morphologically complex words, an indicator of their good level of literary Arabic. I will first present the nature of the Arabic orthography with its morphology and then a relevant review of the literature focusing on the rationale of the present study and its theoretical and practical contribution.

Arabic Orthography
Arabic is a language written in an alphabetic system of 28 letters, all consonants except three, the long vowels. Most Arabic letters have more than one written form, depending on the letter’s place in a word: beginning, middle, or end. However, the essential shape of the letter is maintained in all cases (Abd El-Minem, 1987). In addition, the letters are divided into categories according to their form and their difference between them is the number of dots on, in or under the letter. Dots appear with 15 letters: 10 have one dot, three have two dots, and two have three dots. In addition to the dots, there are diacritical marks that contribute phonology to the Arabic alphabet (Abu-Rabia, 2001). Arabic words are a combination of consonants and vowels. Skilled and adult readers are expected to read texts without short vowelization, but this demands heavy reliance on context and other resources. Beginners and poor readers read texts with short vowelization. Vowelized Arabic is considered shallow orthography, and unvowelized Arabic is considered deep orthography. Reading accuracy in Arabic requires vowelizing word endings according to their grammatical function in the sentence, which is an advanced phonological and syntactical ability (Abu-Rabia, 2001). Silent reading comprehension is less strict, because the reader can rely on orthog-
Arabic morphology. Arabic morphology is built of two types of structures: derivational and inflectional.

Derivational morphology. All words in Arabic are based on phonological patterns built on roots that are consonantal patterns. Roots are triliteral or quadriliteral, that is, with three or four consonants. This is not a phonological unit but an abstract entity. The phonological pattern is constructed of: 1) short vowelization built onto roots. The phonological process does not break the orthographic order of the consonantal root; 2) patterns that include vowel letters, which are inserted between the root consonants. Here the phonological pattern of the infixes breaks the orthographic order of the consonantal root; 3) additional patterns with vowel letters that may come as prefixes or suffixes. The root conveys the initial lexical access and the combination of roots and phonological patterns conveys specific semantics (Frost, Forster, & Deutsch, 1997).

The derivational morphology has two types of word patterns: verbal word patterns and nominal word patterns. There are 15 very frequent verbal word patterns in Arabic. Each verbal word pattern determines the inflectional pattern of the word (Abd El-Minem, 1987; Al-Dahdah, 1989; Wright, 1967). The verb pattern conveys basic semantics via verb roots, and it can change the meaning of a new word created from that root; different verb patterns built on the same root may convey different semantics (Abd El-Minem, 1987). There are nine nominal word patterns. There is semantic consistency in all these different nominal word patterns (Bentin & Frost, 1995), some of which are more common than others. The derivations of nouns are constructed in two ways, one by addition of nominal patterns of the base roots and one by changing the past tense to the present tense by applying a phonological pattern to the latter (Abd El-Minem, 1987; Al-Dahdah, 1989; Wright, 1967).

Inflectional morphology. In contrast to the derivational process, in which the basic constituents are roots and word patterns, the inflectional morphological system in Arabic is constructed by attaching prefixes and suffixes to real words. The system of inflectional morphology of verbs is systematic and considers person, number, gender, and time. In the past tense inflectional morphology shows person, number, and gender through the addition of suffixes to the basic verb pattern (third person masculine singular). In future and present tenses of verbs the inflectional morphology is also according to person, number, and gender, indicated by prefixes and sometimes suffixes. The imperative mood is formed for person, number, and gender by the addition of prefixes and suffixes (Abd El-Minem, 1987; Al-Dahdah, 1989; Wright, 1967). The inflectional morphological system of nouns considers gender, masculine/feminine; number, singular/plural, masculine and feminine; and pairs, masculine/feminine.

Most verbs and the majority of nouns are constructed out of roots of three consonants, occasionally two or four. Roots are built in phonological patterns to create specific words; these patterns may be a series of consonants or a series of vowels and consonants. As for roots and morphemic word patterns, most words in Arabic are constructed of two morphemes: the combination of a root and a word pattern creates the particular word. Different morphemes convey different types of information: the root conveys more information than the phonological pattern because it provides the core meaning of the word (Abu-Rabia, 2001, 2002), whereas the word patterns usually convey information on word class.

In sum, the combination of morphological units in Arabic is not linear, but relies on intertwining between two independent morphemes (the root and the word pattern). The order of root letters depends upon the word pattern and its way of intertwining with the root. The word pattern can be built of prefixes, suffixes and infixes, whose intertwining with the root can break the order of the root letters.

Review of the Literature

Morphology and reading. Research on the early stages of reading suggests that young children have basic and intuitive knowledge about the structure of words, morphology (Carlisle, 1995; Carlisle & Nomanbhay, 1993; Champion, 1997; Clark & Hecht, 1982; Tornéus, 1987). Clear evidence has been conveyed by some studies about the morphological awareness prediction of reading ability (Tornéus, 1987). Tornéus tested children’s understanding of kindergarten children of novel compounds, for example, explain the meaning of grass bee and bee grass. She reported that morphological awareness of kindergarten pupil predicted their reading ability in the second grade. Similarly, Carlisle (1995) reported that morphological awareness of kindergarten children measured by morphological production tests predicted the reading comprehension in grade 2.

Some researchers argue that the exposure to print, seeing the same morpheme in different words, accelerates high morphological awareness to words when decoding them (Fowler & Liberman, 1995).

Furthermore, Fowler and Liberman (1995) tested the relationship between phonology and morphology. They tested this relationship among grade 2 and 4 pupils. The students’ vocabulary and reading and spelling abilities were measured in addition to their morphological production. The results indicated that only to ability to solve phonologically complex items separated poor from good readers. Fowler and Liberman (1995) suggested that differences in morphological awareness depend on differences in the phonological domain. In a study by Wunes, Bryant and Bindman (1997) investigated the development of morphological strategies of spelling in grade 2 and 4 pupils. They found that the students passed through successive stages of morphological spelling skills from grade 2 to grade 4. The authors concluded that explicit morphological (grammatical) awareness of spoken language was accelerated by more experience with the specific orthography; reading and writing.

Furthermore, in a recent study by Arnabak and Elbro (2000) where they conducted a training study of morphological awareness involving 33 dyslexic students in grade 4 and 5. The training was oral and focused on semantic aspects of morphemes. During the training period, the experimental group gained significantly more than a similar group of untrained controls (n = 27) on one of three measures of morphological awareness. Both groups made equal progress on measures of phonological awareness, phoneme discrimination and picture naming. The experimental group progressed significantly more than the controls in reading comprehension and in spelling of morphologically complex words. The authors concluded that it is possible to develop dyslexic students’ morphological awareness and that awareness of morphemes, the smallest meaningful units of language, may support the development of meaning-oriented decoding strategies in reading and spelling.

Furthermore, Elbro and Arnabak (1996) investigated reading compounds (compared to other words) by Danish dyslexic
adolescents and reading-age matched normal readers. They found that the dyslexic reader relied more sensitive to morphological structures compared to the normal readers. Namely, in Danish skilled readers may not depend on morphological segmentation and alternatively developed automatic visual recognition of words as whole entities.

Some researchers argue that the morphology of the language plays an essential role in reading and spelling, especially in the semitic languages: Arabic and Hebrew (Abu-Rabia, 2001; Abu-Rabia, Share & Mansour, 2003; Beland & Mimouni, 2001; Prunet, Béland, & Idrissi, 2000; Ravid, 2001). Ravid (2001) argues that the morphology of Hebrew plays a major role in determining what letters are acquired first among children. She asserts that beginners rely on morphological cues of their familiar spoken language and look for those cues in the written language while learning spelling. Furthermore, Somech (2001) found that primary school children pronounced words according to morphological structures expected from the contexts of the story. Likewise, Beland and Mimouni (2001) assume that Arabic is a highly morphological language that heavily affects the reading strategy of the readers.

In a study by Prunet, Béland and Idrissi (2000) they argue that Arabic and all Semitic languages are addressed through the root morpheme, since the root is an autonomous semantic entity. They advocate that the lexicon of Semitic language readers is a root/morpheme-based lexicon. Such an approach supported from very early years by structuralists such as Cantineau (1950) and Harris (1951) where they recognized roots as autonomous morphemes expressing the basic meaning of the word, additional morphological information being expressed by a distinct vocalized pattern. This view was later discussed in an autosegmental analysis such as those of McCarthy (1981) and Hoberman (1988), which typically further separates vocalized patterns into morphemes consisting of vowels only or templates only. Such analysis implicitly or explicitly adopt a morpheme-based theory of morphology since their lexicon includes roots; expressing the basic meaning of the word. However, other Hebrew and Arabic grammarians also expressed different views (Saussure, 1978; Mahadin, 1982; Heath, 1987; Bat-El, 1994; Ratcliffe, 1997; Ussishkin, 1999). They viewed Semitic roots as paradigmatic relations existing between fully formed words, rather than as autonomous morphemes. Prunet, Béland and Idrissi (2000) in a thorough analysis of morpheme-based theory in Semitic lexicons, they used data from bilingual aphasic patients. They argue that the consonant metathesis error (changing the order of root letters) provide evidence for the existence of roots as lexical units in the mental lexicon of speakers of Arabic. These errors differed quantitatively and qualitatively in Arabic and French. Their aphasic patients revealed parallel linguistic details in the two languages, and their metatheses must arise during the phonological planning stage in both languages. The same deficit yields different effects because the phonological representations of these languages are different (Béland & Paradis, 1997; Paradis & Prunet, 2000; Tranel, 1995). Of course, more recent psycholinguistic studies support the roots in Semitic languages (based on Hebrew) are semantic autonomous entities (Frost, Deutsch, Kenneth, & Forster, 1997; Feldman, Frost, & Pini, 1995).

From the above brief literature review, it is clear that morphology is an important factor in reading acquisition. The present study investigates the role of roots in reading morphologically complex words among native adult highly proficient Arabic readers.

**Phonology and reading.** The most important skill in phonological processing is the association of sounds with letters; that is, the understanding of grapheme-phoneme conversion rules and the exception of these rules. This ability is the basis of decoding print, and although there are other routes to obtain meaning from print, the phonological route is clearly an important one and critical in the early development of reading skills (Stanovich, 1988a, 1988b). Current theories of the development of reading skills in English stress phonological processing as the most significant underlying cognitive process. Arguments for this position are outlined in Stanovich (1988a, 1988b). Studies such as those of Bruck (1988), Ehri and Wilce (1983), Snowling (1980), Siegel and Ryan (1988) and Waters, Bruck and Seidenberg (1985) have shown that disabled readers have more difficulty reading unfamiliar words and pseudowords than normal readers matched on a chronological age or reading level. Further, this difficulty seems to be the fundamental problem of children with reading disability and often continues even to adulthood. Sometimes adults with a reading disability become like normal readers but still have difficulty reading pseudowords or read them very slowly (e.g., Barwick of Siegel, 1990; Bruck, 1990; Shafrir & Siegel, 1991). Many studies have also shown that children’s knowledge of the phonological structure of a language is a good predictor of early reading ability (Bradley & Bryant, 1983; Tunmer & Nesda1e, 1985; Mann, 1984; Olso, Wise, Conners, Rack, & Fulker, 1989; Shankweiler & Liberman, 1989), an impairment in the representation of processing of phonological information are implicated in at least some forms of developmental dyslexia (Manis, Seidenberg, Doi, McBride-Chang, & Peterson, 1996; Stanovich, Siegel, & Gottardo, 1997). Furthermore, skilled readers also rely on this information in identifying words (Van Orden, Pennington, & Stone, 1990; Lukatela & Turvey, 1994; Siedenberg, 1985; Jared & Seidenberg, 1991; Perfetti & Bell, 1991; Perfetti, Bell, & Delaney, 1988).

The relationship between phonological awareness and reading ability has been tested in English and other languages, which resulted in compelling evidence that an understanding of the phonological constituents of words is an important determinant of reading success in many other alphabetic orthographies besides English (Durgunoglu, Nagy, & Hancia-Bhatt, 1993; Cardoso-Martins, 1995; Crossu, Shankweiler, Liberman, Katz & Tola, 1988; Treiman, 1991; MacBride-Chang, 1995; Yopp, 1988).

**The Rationale of the Study**

The present study is aiming to investigate the role of the complex Arabic morphology in reading accuracy of adult native highly proficient readers. The Arabic complex morphology was rarely studied. The reading accuracy of the participants was tested via isolated morphological complex word recognition, sentences with morphological complex words preceded with priming roots and sentences without priming roots. Since morphology is always based on phonological patterns, the phonology (short vowelization mastery) is also tested in a way that each reading condition is presented, one with short vowelization and another equal condition without short vowelization.

The rationale of the present study is derived from the findings of a number of studies in Arabic reading among regular,
poor and dyslexic readers. Some of these reading studies indicated that the characteristics of Arabic slow processing (Ivitar & Ibrahim, 2003), such a finding questions the relevance of reading fluency/speed as a testing measure. Others indicated that reading accuracy does not correlate with reading comprehension due to different resources involved (Abu-Rabia, 2001); and further studies indicated that phonology is a highly dominant factor in reading accuracy and reading comprehension across all ages and reading levels (Abu-Rabia, 1997, 1998, 2000, 2001, 2002; Abu-Rabia, Share, & Mansour, 2003). Such a finding also questions the fluency of Arabic skilled readers. If phonology is highly influential on reading and reading comprehension, then the reading process is still slow to enable efficient phonological processing. These findings so far support this claim and fits the nature of the Arabic writing system. Reading scripts with and without short vowelization when testing reading accuracy demands pronouncing the short vowelization posted on letters with special focus on the final letter of the word because it indicates a grammatical unit. Further studies indicated that the phonological stage in reading and spelling in Arabic orthography is a continuous stage that accompanies readers and spellers all their lives (Abu-Rabia & Taha, 2004, 2006a, 2006b). The findings of Abu-Rabia and Taha (2006a) indicated that the percentage of phonological spelling errors were the highest among all grades from 1 to 9.

As to the morphology, roots in Arabic are basic morphemes and considered autonomous semantic entities (Prunet, Béland, & Idrissi, 2000) that enable lexical access to readers. If this is correct then priming roots in regular Arabic sentences should ease reading accuracy of target morphological high density words. As seen in the literature research focused usually on school children assuming that the role of morphology is crucial in the early stages of reading acquisition. This study investigates the role of morphology among highly skilled adult readers.

Research Questions

1) What is the role of the root or base word in reading morphologically complex words in context with vowels and without vowels?

2) What is the role of short vowelization in reading isolated morphologically complex words?

Hypotheses

1) Roots facilitate reading accuracy of morphologically complex words in context with vowels and without vowels.

2) The reading accuracy of the adult proficient readers will be significantly higher in the vowelized reading condition than the unvowelized reading condition in all reading conditions.

Method

Participants. Fifty-nine adult proficient native Arabic speakers were selected to participate in the study. They are university graduates in Arabic literature and working as Arabic language teachers in Arab schools. None of these adults has any sort of learning disorder according to their self-questionnaire report. Their chronological age range was 25 - 32 years. Each participant had at least 3 years of teaching experience. All the teachers volunteered to participate in this study.

Materials and Research Design

Six reading conditions were designed for the 59 adult participants. All the participants had to be tested on all these reading conditions for reading accuracy:

Condition 1. A list of 60 Arabic words, all are morphological high density words. The words were chosen from adult literary books. All the words were presented with full vowelization. The participants had to read all words aloud.

Condition 2. Another parallel list of 60 Arabic words, all are morphological high density words. The words are equivalent to the list in condition 1 as far as possible. However, this list is presented unvowelized. The participants had to read all the words aloud.

Condition 3. A list of 60 sentences with a base word and a target word. The target word is a highly morphological density word which is preceded by the a root. All the 60 sentences were presented with full vowelization. The distance between the root and the target word was two words. The participants were tested for the reading accuracy of the target word.

Condition 4. Another list of 60 sentences with a root and a target word. The target word is a highly morphological density word. All 60 sentences were presented unvowelized and the distance between the target word and the priming root was two words. The participants were tested for the reading accuracy of the target word.

Condition 5. A list of 60 sentences without a root but with a target word with high morphological density. These sentences have the same length and linguistic difficulty as the sentences in conditions 3 and 4. All the sentences were presented with full vowelization. The participants were tested for the reading accuracy of the target word.

Condition 6. Another list of 60 sentences without a root word but with a target word with high morphological density. These sentences were parallel in linguistic difficulty and length to the sentences in condition 5. The participants were tested for reading accuracy.

Building the materials. All the testing materials were subjected to 10 Arabic experts, all high school or college Arabic teachers. They edited the tasks and had to rate them according to morphological gradual difficulty.

Scoring. Participants read all the reading conditions out loud. They were scored on the sentences reading conditions only on the target word should be read with thorough pronunciation of the whole short vowels.

Procedure

All the 59 participants had to read aloud in all 6 reading conditions because they were tested for reading accuracy. The reading of the participants was recorded. The testing took place in a quiet room in the teachers’ schools. The lists of words and sentences were typed on transparencies and presented to the participants on an overhead. There was always a break of about 10 minutes between each reading condition. The order of tests was changed for each participant for counterbalancing purposes. The total average time for testing and breaks for each participant was about 2.5 hours. The total average time for testing only was 70 minutes.

Results

The data of this study was treated by a one-way ANOVA re-
peated measure (within-subject factors), one group of one level readers. All the 59 participants were tested in the 6 reading conditions. Then the t-test analysis for paired samples was applied to locate specific significant differences between the different reading conditions. Table 1 presents the means and standard deviations of the percentages of the correct answer in each reading condition.

As seen in Table 1 the best performance of these highly skilled adult Arabic readers is on reading vowelized sentences with roots that preceded the target word while the poorest condition of the same readers is our reading unvowelized sentences and without roots. The one way ANOVA repeated measures indicated a main effect for reading condition, multivariate test of within-subjects factors, Wilks’ Lambda F(5,54) = 368.988, p < 0.001. For further analysis the t-test analysis for paired samples was used in this case to test the specific differences of reading conditions. When reading vowelized words was compared with unvowelized words the difference was significant for the benefit of the vowelized condition t(2,58) = 19.765, p < 0.001; vowelized sentences with roots vs. unvowelized sentences with roots the differences were significant for the vowelized sentences t(1,58) = 9.48, p < 0.001; vowelized sentences without roots vs. unvowelized sentences without roots vs. unvowelized sentences without roots the differences were significant for the benefit of the vowelized sentences t(1,58) = 4.80, p < 0.001; vowelized sentences with roots vs. unvowelized sentences without roots vs. unvowelized sentences without roots the differences were significant for the benefit of the vowelized sentences t(1,58) = 367.93, p < 0.001; and when unvowelized sentences with roots were compared with unvowelized sentences without bas words the difference was significant for the benefit of the base-words condition t(1,58) = −29.65, p < 0.001. Figure 1 illustrates usually the mean percentages of performance of the same reading group on the 6 reading conditions.

In sum, there were significant differences between the 6 reading conditions. The best reading condition was when sentences were vowelized with roots (88.33%) and followed by the reading condition when sentences were presented without vowelization and with roots (77.23%), the poorest results were when isolated words were presented unvowelized (20.28%).

**Discussion**

The most important findings of this study are that, 1) roots facilitate reading accuracy of highly proficient adult readers in reading morphologically complex words, with and without short vowelization; 2) short vowelization facilitate reading accuracy of morphological complex words of highly proficient native adult readers; 3) short vowelization facilitate reading accuracy of reading morphologically complex words in sentential context compared to the same reading condition without short vowelization.

The first finding indicates that roots facilitate reading accuracy of target words that are morphological complex. These adult proficient Arabic readers, their accuracy in this reading condition was one of the highest positive results although these sentences were presented without short vowelization (see Figure 1). Namely, roots facilitate reading accuracy, since these roots trigger orthographic lexical information that was retrieved directly to assist in identification of morphologically complex Arabic words. This is because roots are semantic autonomous entities. The results here are similar to previous results of Abu-Rabia and Awwad (2004), where they found in a computerized priming paradigm that the differences between the phonological pattern results and the roots’ results are not significant. Namely, both phonology and morphology (roots) contribute, maybe equally, to reading Arabic. The results of Abu-Rabia and Awwad probably because the material used was with familiar words. The results of this specific reading condition in the present study testing reading accuracy indicate optimal superiority of orthographic word knowledge when reading morphological complex words in context. Generally, these results accord with previous results conducted in different orthographies which indicated the importance of the role of the morphology in reading Arabic (Abu-Rabia, 2001; Abu-Rabia, 2004).

**Table 1.**

<table>
<thead>
<tr>
<th>Reading condition</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unvowelized words</td>
<td>20.28</td>
<td>10.61</td>
</tr>
<tr>
<td>Vowelized words</td>
<td>47.89</td>
<td>8.31</td>
</tr>
<tr>
<td>Sentences with roots, target and vowelization</td>
<td>88.33</td>
<td>7.77</td>
</tr>
<tr>
<td>Sentences with roots and target words without vowelization</td>
<td>77.44</td>
<td>8.35</td>
</tr>
<tr>
<td>Sentences without roots— with target word with vowelization</td>
<td>23.08</td>
<td>7.85</td>
</tr>
<tr>
<td>Sentences without roots without vowelization</td>
<td>18.93</td>
<td>8.25</td>
</tr>
</tbody>
</table>
studies revealed that the Arabic information from more studies conducted on aphasic patients. These theory in Semitic languages. This theory receives more confirmation process (Taft, 1991; Taft & Forster, 1975; Prunet, Béland, & Idrissi, 2000), where the functional nature of derivational and inflectional processing is considered similar. Both are affiliated with the same level of analysis regardless of their lexicon representation, namely under the word morphology or under the semantics of the word. The supporters of this approach do encode the morphological structure and argue that the morphological information is helpful in the word identification process (Taft, 1991; Taft & Forster, 1975; Prunet, Béland, & Idrissi, 2000).

In Arabic, and because of the complexity of the Arabic morphology, the semantics of the root morpheme as a semantic entity is helpful and accessible for initial lexical access, initial understanding and later connected the rest of the affixes (morphemes) to construct the exact phonological representation (pattern) (Prunet, Béland, & Idrissi, 2000; Frost et al., 1997; Feldman et al., 1995). Thus, since roots (morphemes) are crucial in identification of morphological complex Arabic words and phonology is retrieved later which slows its processing (Ivitar & Ibrahim, 2003), this questions the relevancy of fluency, speed and automaticity in reading Arabic when testing reading accuracy (reading aloud) (Abu-Rabia, 2001; Saiegh-Haddad, in press).

Since roots of words revealed good assistance for highly skilled adult readers, this confirms the morpheme/root-based theory in Semitic languages. This theory receives more confirmation from more studies conducted on aphasic patients. These studies revealed that the Arabic metatheses (keeping the root letter but in some different order) are more frequent than other non-Semitic languages among the same aphasic patients. In the study of Prunet, Béland and Idrissi (2000), a patient produced five consonant metatheses in French as opposed to 119 in Arabic. It seems that this result is explained by arguing that the morphemic and floating nature of Arabic root consonants compared to the non-morphemic and pre-anchored nature of French consonants. Other studies based on error analysis confirmed this conclusion in different Semitic languages (Béland & Paradis, 1997; Béland et al., 1999; Berman, 1981).

Idrissi et al. (2000) argue that these results are because the “… consonants of French are more stable than those of Arabic because they are pre-anchored. This entails that Arabic consonants are not pre-anchored, which means that they form roots” (p. 633). In both languages, the consonants are ordered, but the order of Arabic roots need only contain precedence relations on one order. This while in Indo-European languages consonants must contain precedence relations on both melodic and skeletal tiers in addition to information about how the units on both tiers are connected to one another (Idrissi et al., 2000). Further, whatever formalism is used to express precedence, the order of segments should be more stable in Indo-European than in Semitic because the links between the prosodic and segmental tiers are memorized rather than derived by rules, principles, or constraints (Idrissi et al., 2000).

As to the second finding that short vowelization of morphological complex words facilitates reading accuracy among highly proficient adult native Arabic readers, this result is not new. It accords strongly with previous results obtained by Abu-Rabia among high school and university students (Abu-Rabia, 1997a, 1997b, 1998, 2001). The university native Arabic students were tested on reading isolated words with and without vowels and on reading comprehension of texts with and without vowels. The results indicated that even among adults, the short vowelization had a significant effect on their reading accuracy and their reading comprehension. Such a result was confirmed in Hebrew reading comprehension among highly adult proficient Hebrew readers (Shimron & Sivan, 1994). The significant effect of vowels on reading morphologically complex words among highly proficient adult readers means that the phonological stage in reading Arabic is a continuous stage that accompanies even highly skilled adult Arabic readers all their lives. Such a finding is divergent from results obtained from other orthographies; that phonology is an initial stage in reading and writing, and that for readers to become fluent, they should rely on their automatic lexical-visual-recognition of words, based on their rich orthographic mental lexicon (Lemox & Siegel, 1993; Snowling, 1987; Snowling, Defty, & Goulardi, 1996; Bruck, 1989; Stanovich, 1994; Ellis, 1993; Steffler, 2001; Frith, 1985; Temple, 1986, Perfetti, 1992; Seymour, 1990; Share, 1995; Stanovich & Siegel, 1994). As to the third finding that short vowelization facilitated reading accuracy of morphological complex words when they were in sentential context, this finding accord with previous results, that even when the sentential context is presented, for reading accuracy the vowels are very crucial, especially for pronouncing short vowelization posted on ends of words to indicate grammatical fraction. Such a task is required for reading accuracy (reading aloud) not necessary in silent reading comprehension, which leads to a lack of positive significant correlation between reading accuracy and reading comprehension in Arabic orthography (Abu-Rabia, 2001; Saiegh-Haddad, in press).

Furthermore, in this study, it is argued that if the reading accuracy of these Arabic highly proficient readers always needs phonology (short vowelization), namely, the phonological stage in Arabic reading development is continuous. This leads to the conclusion that there is no skilled reader in Arabic, this if we adopt the definition of the skilled reader, as it is in the reading literature today. Some studies in the orthography of Arabic indicate that the phonological stage in reading and spelling is a continuous stage that accompanies readers and writers all their lives (Abu-Rabia & Taha, 2004, 2006a, 2006b). These findings suggest that the highest percentage rate of reading and spelling errors made by readers was mainly phonological. Such a find-
ing enhances the phonological findings (short vowelization) of the present study. Such a finding challenges reading development of the reading theory today which leads scholars to consider more cross-orthographic studies for more expanded, comprehensive and revised reading theory.

In sum, reading morphological complex words in Arabic even by native adult highly skilled Arabic readers occurs via a morphological decomposing process which slows word recognition process (Iviatar & Ibrahim, 2003). One of the key words for reading accuracy of morphological complex words in Arabic orthography is the root for initial lexical access. Furthermore, short vowelization is needed to facilitate reading accuracy in isolation and in sentential context. Namely, morphological knowledge and short vowelization are the key variables in the process of reading accuracy even among adult highly skilled readers.

I would like to end this discussion with the words of a great Arabic grammarian who depicted the morphological complexity of the Arabic language. Those are the words of Al-Khalil ibn Ahmad who was born in 718 CE, Oman and died in 791, Persia (cited in Al-Makhzoumi & As-Saamarrai, 1988):

Know that the biradical root may be permut[ed] in two ways, like qad—daq, sad—ds. The triradical root may be permut[ed] in six ways: this is called "six-way variation", like d bara—bra bar a bad ara—rad aba—rabad a. The quadriradical root may be permut[ed] in twenty-four ways, because each of its four radicals may be combined with the six permutations of the triradical roots, making a total of twenty-four ways.

REFERENCES


morphological abilities for different phases of reading development. Paper presented at the Third World Congress of Dyslexia, Crete.