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PREDICTING READING IN VOWELIZED AND UNVOWELIZED ARABIC SCRIPT: AN INVESTIGATION OF READING IN FIRST AND SECOND GRADES

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This study examined the orthographic transparency of Arabic by investigating the contribution of phonological awareness (PA), vocabulary, and Rapid Automatized Naming (RAN) to reading vowelized and unvowelized words. The results from first and second grade children showed that PA contribution was similar in the vowelized and unvowelized orthographies. The RAN contribution was weak and similar in both versions. The vocabulary contribution increased with grade and was slightly higher in the unvowelized than vowelized orthography. Since orthography transparency in Arabic is determined solely by vowelization, these results are discussed in relation to its position on the transparency-depth continuum.

The extent to which various linguistic and cognitive variables contribute to reading processes (Vellutino, Fletcher, & Snowling, 2004) is thought to vary from one language to another, depending on the transparency/depth of orthographic system of the language studied (Share, 2008). Orthographic transparency refers to the degree of consistency in the correspondence between letters and sounds (Frost, 1998; Bick, Goelman, & Frost, 2011;

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Seymour, Aro, & Erskine, 2003; Ziegler et al., 2010). In languages with transparent orthographies, such as Italian, Spanish, and Finnish, letters or clusters of letter are always pronounced in the same way (Frost, 1998; Ziegler et al., 2010), hence the relation between the written and the spoken language is considered as highly consistent. In deep orthographies, such as English, French, and Danish, this consistency is significantly reduced because the relation between written and spoken language is more or less ambiguous. Because reading acquisition in the early stages relies mainly on the mapping between letters and sounds (Ziegler & Goswami, 2005) reading in transparent orthographies is acquired with greater ease than in deep orthographies (Aro & Wimmer, 2003; Landerl & Wimmer, 2008; Seymour et al., 2003). By the end of the first grade, children in the Italian transparent orthography reach 94% accurate word reading, while in the less transparent Portuguese orthography they perform around 80%, and in the deep English orthography their performance does not exceed 34% (Seymour et al., 2003).

Differences in performance in reading during the early stages of literacy in different orthographic systems is accompanied by a differential involvement of cognitive and linguistic components in the reading process (Bick et al., 2011; Caravolas, Volín, & Hulme, 2005; Share, 2008). In particular, phonological awareness (PA: the ability to segment and manipulate sounds in spoken words) and Rapid Automatized Naming (RAN: the speed of access to and retrieval of stored phonological information) appear to behave differently in languages with transparent and deep orthographies (Share, 2008; Ziegler et al., 2010). The contribution of PA to reading was found to be less important in transparent orthographies (Landerl & Wimmer, 2008; Shatil & Share, 2003; Ziegler et al., 2010) and limited to early grades (Shatil & Share, 2003) because the high consistency in the grapheme-phoneme relations allows for an early mastery of the alphabetic code for accurate reading. However, the speed of retrieving the phonological information in transparent orthographies may still challenge the reader, explaining thus a more critical role for RAN in transparent than in deep orthographies (Wimmer, Mayringer, & Landerl, 2000). For instance, a cross-linguistic study assessing reading in English and Greek (transparent) orthographies (Georgiou, Parrila, & Papadopoulos, 2008) have reported

that while PA predicts better word decoding in English than in Greek, the contribution of RAN was significant only in Greek. A different contribution of PA to reading has also been reported in other European languages that differ in their orthographic transparency (Ziegler et al., 2010).

In addition to phonological processing, the contribution of vocabulary to reading was also assessed in different languages and orthographies and some researchers claimed that the role of vocabulary might be more critical in English and other deep orthographies than in transparent ones (Ricketts, Nation, & Bishop, 2007). Actually, the ambiguity in the relation between letters and sounds will often force (beginning) readers in deep orthographies to rely more on vocabulary than simply on grapheme-to-phoneme conversion rules (Tunmer & Chapman, 2012). In line with this view, a recent comparative study reported that vocabulary knowledge was more critical for reading in English than in German (Suggate, Reese, Lenhard, & Schneider, 2014). Taken together, the aforementioned literature suggests that the same linguistic and cognitive variables might differently contribute to reading depending on the transparency/depth of its orthographic system at hand, but probably also on other unique characteristics the language studied.

The Arabic orthography is an alphabetic system which includes 28 consonant letters, of which three also represent long vowels. The vowelization system in Arabic relies also on the use of short vowels that are presented as diacritical marks that appear above or under the letters (Abu-Rabia, 2001). When written words are presented with short vowels (i.e., vowelized), the orthography is considered as transparent since all the phonological information is provided and there is a sort of one-to-one relation between graphemes and phonemes. When words are presented without short vowels, but only with consonants and long vowels, the orthography is considered as deep (Abu-Rabia, 2001), part of the phonological information is missing and many words become homographs (i.e., having similar orthographic shapes but different pronunciations and meanings). The vowelized transparent Arabic version is used at the start of learning to read and write, and around the fourth grade, short vowels are progressively removed and children start to use the unvowelized deep orthography for reading to learn (Asadi, Ibrahim, & Khateb, 2016).

Although the opposition transparent vs. deep (vowelized and unvowelized) between the two forms of written Arabic is generally well accepted in the literature (Abu-Rabia, 2001; Saiegh-Haddad & Joshi, 2014), the depth question of Arabic is not totally unequivocal. Indeed, in a recent study which investigated reading only in vowelized Arabic among first to sixth grade children, it was observed that the vowelized version did not behave as other transparent orthographies (Asadi, Khateb, Ibrahim, & Taha, under revision). In this large-scale cross-sectional investigation, RAN failed to contribute significantly to reading vowelized/transparent words, and PA significantly predicted reading until the sixth grade (Asadi et al., under revision). Such findings are inconsistent with the transparency assumption of the vowelized words in Arabic, but are consistent with several previous studies on Arabic where a long-lasting contribution of PA to reading has been already reported (Abu-Rabia, Share, & Mansour, 2003; Al-Mannai & Everatt, 2005; Taibah & Haynes, 2010).

Due to the important role generally attributed to the orthographic transparency, to the differential involvement of cognitive and linguistic factors in reading, and to the potential theoretical and practical/pedagogical implications of such issues (Abu-Rabia, 2001; Share, 2008), this study aimed at investigating reading both in the vowelized/transparent and the unvowelized/deep Arabic orthographic versions. The advantage of such a design in Arabic is the fact that it allows the comparison between the two orthographic versions within the same language, the same participants, and using the same tools and methodology. The findings should allow providing new insights into the contribution of other putative linguistic components (other than the three of the major predictors of reading PA, vocabulary, and RAN) and socio-economic and cultural parameters that might have influenced findings from cross-linguistic studies (Schiff, 2012). Also, the results may contribute to clarify the position of vowelized and unvowelized Arabic on the orthographic transparency-depth continuum and ultimately to propose a model of reading in Arabic. Because this issue has never been explicitly addressed in Arabic, our main research question was as follows: To what extent are PA, RAN, and vocabulary involved in reading vowelized/transparent and unvowelized/deep orthographies by Arabic first and second grade children? On the basis of previous findings from other orthographies, we hypothesized that PA would predict reading in

both versions, but its contribution would be stronger in the unvowelized/deep than in the vowelized/transparent orthography. Moreover, we predicted that the RAN contribution, contrary to vocabulary, would be stronger in the vowelized/transparent than in the unvowelized/deep orthography one.

A Short Overview of the Main Characteristics of the Arabic Language

The Arabic language is particularly characterized by its diglossic situation and its special dense and complex orthography. The diglossia refers to the existence of two forms of the same language: The spoken Arabic dialects and the Literary Arabic (referred to also as Modern Standard Arabic, see Saiegh-Haddad & Joshi, 2014), which are distant at different linguistic levels (i.e., phonological, morphological, semantic, and syntactic, Saiegh-Haddad, 2003). Arabic children use only the spoken form for oral communication until the preschool period, and then the literary form is acquired through formal instruction. Hence, it is of relatively common acceptance that knowledge of certain/many linguistic components in the literary form (such as phonemes and words), which are necessary for learning to read, are not fully developed when the children enter school (Saiegh-Haddad & Joshi, 2014).

The Arabic orthographic system is written from right to left and, as already mentioned, comprises two versions, of which the vowelized one uses diacritics as short vowels is considered as visually dense and complex (Holes, 2004). In fact, besides the use of short vowels, the visual complexity of Arabic is further augmented by the great visual similarity between letters, of which some pairs or triplets share the same basic form but differ by the presence/absence of dots that are added below or above the letters and by their number (Asadi et al., 2016; Taha, 2013). In addition, the Arabic orthographic system comprises a few other particularities that make it more challenging. These include: (i) the presence of homophones (Taha & Khateb, 2013), sounds which are similar in pronunciation but different in their shapes (ط/ت, ذ/ظ, د/ض, ص/س); (ii) the fact that 23 letters can be written in four different forms[1], and

[1]Including the glottal stop "*hamza*" ("ء",/ʔ/) that can be written in more different shapes (e.g., < قارئ; قرأ; أقرأ; قارئة; مقرءون; قراءة>).

six other letters in two ways depending on their position in the word (Taha, Ibrahim, & Khateb, 2013; Khateb, Khateb-Abdelgani, Taha, & Ibrahim, 2014); (iii) the existence of sounds that are written but not pronounced and of letters that are pronounced but not written. All these features lead to a certain inconsistency in the relation between the written and the spoken language, hence the extent to which vowelized Arabic orthography might function as a transparent one is yet to be determined.

Methods

Participants

A total of 458 Arabic-speaking children (208 boys) took part in this study which included: 228 first graders ($M_{\text{age in month}} = 83.9$; $SD = 9.4$) and 230 second graders ($M_{\text{age in month}} = 95.6$; $SD = 10.2$). The participants were recruited from 33 Arabic speaking elementary schools from the north, the center, and the south of Israel. All participants were from regular classes and none was in special education classes or had visual, hearing, language or learning difficulties.

Measures

Children were assessed using measures of word reading, PA, vocabulary, and RAN. The measures used here were submitted to five teachers who work with children from this age range and all judged the items used here to be appropriate for the grades considered here.

WORD READING

There were two identical lists of real words that differed only by the presence/absence of the vowelization (see Appendix A). For the words selection, we chose a list of thirty unvowelized but non-homographic words. The rationale for choosing non-homographic words was to avoid the probability that the words would be read correctly, while being pronounced unintentionally in a form not meant by the reader (Abu-Rabia, 2001). The same list of thirty words was vowelized and presented to the same children. The words in the list represented several morphological patterns in Arabic and varied in terms of their length (between two to

four syllables) and the children's familiarity with them (low, medium and high familiarity words). For each list, the participant was required to read aloud the words as accurately as possible at a rate which suited him/her. The participant's score was based on the total number of correctly read items with a maximum score of thirty. The reliability of the test (Cronbach's α) was 0.90 in the vowelized/transparent version and 0.91 in the unvowelized/deep one.

PHONEMIC DELETION

A list of 40 items was developed to examine the ability to delete phonemes at the beginning (20) and at the end (20) of the words. The words were mono- and disyllabic and were from both the spoken and the literary versions (see examples in Appendix B). During the test, each word was read to the participant who had to repeat it after the examiner and then to say it again after deleting a specific phoneme. The reliability of the test (α) was 0.90 in the first grade and 0.86 in the second grade.

PHONEMIC SEGMENTATION

This test examined the ability to repeat and segment the words into their basic sounds. The words were mono- and disyllabic and were selected from spoken and literary Arabic (see examples in Appendix C). During the test, the participant had to repeat each word after the examiner and to segment it into separate sounds. The reliability of the test (α) was 0.94 in the first grade and 0.92 in the second grade.

EXPRESSIVE VOCABULARY

This test examined the semantic knowledge at the production level. A list of 32 literary Arabic words including verbs, expressions of time, quantity, and adjectives was used (see examples in Appendix D). During the test, each word presented auditorily to the participant, who after hearing it was asked to respond by giving its opposite. Each answer was compared to the possible correct answers. The reliability of the test (α) was 0.87 in the first grade and 0.88 in the second grade.

PERCEPTIVE VOCABULARY

This test evaluated the semantic knowledge at the perceptive level. A list of 30 literary Arabic words, including verbs, nouns and adjectives was used (see examples in Appendix E). The participant heard a target word followed by three other words and was required to choose from these words the one similar in meaning (synonym) to the target word. The reliability of the tests (α) was 0.79 in the first grade and 0.83 in the second grade.

RAN – LETTERS

The test consisted of five letters, randomly repeated ten times. The letters are: /س/, /ا/, /ض/, /ج/, /ث/. One of the letters' names consisted of two syllables and the four others were monosyllabic. The participant was required to identify the five stimuli before the start of the experiment, and then he/she was required to name the 50 letters (not give the sound it represented) as fast as possible. The time of naming was recorded for each participant.

RAN – OBJECTS

The tests consisted of five pictures of objects with which children are familiar from a very early age: a crown, a fire, a camel, a football pitch, and a key. These objects were randomly repeated ten times. Two of the words were monosyllabic and the others were disyllabic. The participant, after identifying the five pictures, was required to name all the 50 pictures as fast as possible. The time of naming was recorded for each participant.

Procedure

The participants were tested individually by the examiner in a quiet room in two short testing sessions in the third trimester (between April and June) of the school year. In addition, in order to prevent effects of fatigue and to avoid fluctuations in concentration in these first and second grade participants, a short break was also given to the child after each test. In one meeting, the children were tested on the vowelized version of the word reading test, and performed phonemic deletion, receptive vocabulary and the rapid naming of letters. In another testing session, about three weeks later, the children were tested on the unvowelized version

of word reading test, performed phonemic segmentation, expressive vocabulary and the rapid naming of tasks. However, in order to avoid order effects, half of the children started with the order of the first session while the other half started with the order of the second session. All the examiners were students in the field of education and had all received a specific and detailed training for administration of the different tasks.

Results

In view of the fact that the different domains investigated here were examined with two tests, it sought to produce one measure per domain by averaging the scores obtained in the two tests. This average was done after computing correlation analysis between the two tests of each field. A large significant correlation between phonemic deletion and phonemic segmentation tests ($r = .52$, $p < .01$) allowed the production of a PA measure. Similarly, a vocabulary knowledge measure was computed based on a large significant correlation between the receptive vocabulary and the expressive vocabulary tests ($r = 61$, $p < .01$). Finally a medium significant correlation was found between RAN objects and RAN letters tests ($r = .37$, $p < .01$) and allowed producing general measure for RAN.

The descriptive statistics of the participants' scores on the dependent variables (vowelized/transparent and unvowelized/deep versions of word reading) and all the independent variables (the different tests of PA, Vocabulary and RAN) for the first and the second grades are presented in Table 1. The means reflect the children's raw score of success in all variables except for RAN (which is expressed in number of items per minute). The participants' average performance on the different measures did not show floor or ceiling effects except for the vocabulary measure which suggested some difficulty for first graders. Interestingly, the results indicate a high similarity in the performance of reading vowelized and unvowelized words in both grades. However, the developmental changes (between grades) were highly significant for all variables ($p < .001$), a finding that strengthens the validity of the measures used to assess developmental changes.

The correlation analyses between the different measures after combining the scores of the two tests of each domain are presented in Table 2. This illustration shows that all

TABLE 1 Descriptive statistics of raw scores mean and SD

	Grade 1[a]		Grade 2[b]		
Variables	*M*	*SD*	*M*	*SD*	*F*
Vow WR	17.9	7.7	23.0	6.3	58.7***
Unvow WR	18.2	6.9	23.1	5.0	75.3***
Phonemic del	25.7	8.1	29.3	6.3	20.1***
Phonemic seg	22.8	9.4	24.9	8.3	6.3*
Expressive voc	17.2	6.1	21.1	5.9	47.4***
Perceptive voc	15.4	5.4	18.5	5.7	35.6***
RAN-L[c]	47.9	22.4	54.7	15.4	14.4***
RAN-O[d]	49.7	21.6	58.7	23.0	18.3***

Note: Vow WR: vowelized word reading; Unvow WR: unvowelized word reading; Phonemic del: phonemic deletion; Phonemic seg: phonemic segmentation; Expressive voc: expressive vocabulary; Perceptive voc: perceptive vocabulary; RAN-L: Rapid Automatized Naming for letters; RAN-O: Rapid Automatized Naming for objects

*$p < .05$.

***$p < .001$.

[a]$n = 228$;

[b]$n = 230$

[c-d]n = Item per minute

TABLE 2 Correlations analysis of all measures by grade

Measures	1	2	3	4	5
Grade 1[a]					
1.Vowelized	—				
2.Unvowelized	.71**	—			
3.PA	.51**	.52**	—		
4.VOC	.36**	.43**	.43**	—	
5.RAN	.24**	.26**	.16**	.18**	—
Grade 2[b]					
1.Vowelized	—				
2. Unvowelized	.55**	—			
3.PA	.38**	.37**	—		
4.VOC	.37**	.42**	.44**	—	
5.RAN	.26**	.25**	.26**	.20**	—

Note: Vowelized = vowelized/transparent word reading; Unvowelized = unvowelized/deep word reading; PA = phonemic awareness; VOC = vocabulary; RAN = rapid automatized naming.

*$p < .05$.

**$p < .01$.

[a]$n = 228$;

[b]$n = 230$

TABLE 3 Regression results for word reading in vowelized and unvowelized orthographies

		Vowelized/transparent			Unvowelized/deep		
Grade	Variables	B	SE	β	B	SE	β
1[a]	PA	.55	.09	.41***	.48	.07	.40***
	VOC	.24	.09	.16*	.32	.08	.23**
	RAN	.21	.09	.13*	.20	.08	.15**
	R^2	.29	.34				
2[b]	PA	.30	.09	.23**	.20	.07	.20**
	VOC	.29	.09	.23**	.31	.06	.31***
	RAN	.20	.08	.15*	.14	.06	.14*
	R^2	.21	.24				

Note. PA = phonological awareness; VOC = vocabulary; RAN = rapid automatized naming.

$p < .05$.

**$p < .01$.

***$p < .001$.*

[a]n = 228;

[b]n = 230

correlations were highly significant ($p < .001$) except that between RAN and PA ($p < .05$) in the first grade. A large and similar correlation was found between PA and reading in both versions in the first grade. In the second grade, a medium correlation, but still similar, was found between PA and reading in both versions. The correlation between RAN and reading in both versions was medium and consistent in both grades. Similarly, medium and consistent correlation was found between the vocabulary knowledge and reading in both versions. However, the correlation with reading unvowelized words was slightly higher than reading the vowelized ones. The correlation between RAN and both PA and vocabulary measures was particularly weak.

Linear regression analyses were conducted separately for reading in vowelized and unvowelized words, in the first and in second grade. As presented in Table 3, the explained variance (R^2) in reading the vowelized/transparent version was slightly lower than the unvowelized/deep one in both grades. Also, the trend of prediction decreased with grade in both versions. The contribution of PA, reflected in the standardized coefficients (β), to word reading was significant and was similar in both versions.

Yet this similarity was also reflected in the diminution of this contribution with age. Unlike PA, the contribution of vocabulary was higher in the unvowelized/deep version than in the vowelized/transparent one, and a rising trend with age was noted in both versions. As for RAN, a significant, weak and stable contribution to word reading was found in both versions in both grades.

Discussion

The current study aimed to investigate the impact of orthographic transparency on the involvement of PA, vocabulary and RAN in reading. The results we obtained with 458 first-second graders do not totally support this claim. More specifically, the prediction of PA to reading was strong and similar both in the vowelized/transparent and unvowelized/deep orthographies and decreased in the second grade in both versions. The contribution of RAN to reading was also similar in both versions but, unlike the PA contribution, the RAN contribution was weak and stable with age. As for the vocabulary, the contribution to reading was slightly higher in the unvowelized orthography than in the vowelized one and, unlike the other predictors, an ascending trend was shown when the children advanced to the second grade. The similarity between the two versions was also reflected in the correlation analysis and in the explained variance, which was particularly modest due to the fact that the regression analysis did not include several linguistic and cognitive predictors with which this study was not concerned.

The contribution of PA to reading both in vowelized/transparent and unvowelized/deep versions is in line with our prediction and in accordance with the view that PA is a universal predictor of reading (Caravolas, Volín, & Hulme, 2005). Actually, the PA contribution to reading in vowelized/transparent Arabic orthography has already been reported in previous studies (Abu-Rabia et al., 2003, Al-Mannai & Everatt, 2005; Asadi et al., under revision; Taibah & Haynes, 2010). Here, the PA contribution was equally strong in both versions, a finding which does not fit with our prediction of a stronger contribution of PA in the unvowelized/deep than in the vowelized/transparent orthography. This finding might be explained by the characteristics of the Arabic vowelized orthography that forces the reader to decode all the

available phonological information, including the short vowelization that the reader cannot ignore (Asadi et al., in revision).

As for RAN, our prediction that RAN would be more critical in the vowelized/transparent orthography than in the unvowelized/deep version was not borne out, an observation which contradicts previous reports (Georgiou et al., 2008; Wimmer et al., 2000). The observation here that the contribution of RAN was weak in both versions might be explained by the view that RAN is more critical for reading speed than for accuracy (Wolf & Bowers, 1999). Also, the weak contribution of RAN to reading accuracy, unlike the PA contribution, together with the fact that it weakly correlated with PA, do not support the view that RAN is a phonological processing component (Torgesen, Wagner, & Rashotte, 1994).

Our hypothesis regarding a higher contribution of vocabulary to reading in the unvowelized/deep orthography than in the vowelized/transparent version was confirmed in both grades. This finding is in line with previous studies (Ricketts et al., 2007; Suggate et al., 2014) and it suggest that when the phonological information necessary for accurate reading is presented, children rely less on vocabulary (Suggate et al., 2014). The increase in the contribution of vocabulary in the second grade in both orthographic versions might be related to the children's diglossic situation. Actually the literary oral language of Arabic-speaking children is poorly developed when entering school (Saiegh-Haddad & Henkin-Roitfarb, 2014). However, in the second grade, and after two years of formal instruction in the literary language, their vocabulary is significantly enriched and thus becomes more influential.

Given the fact that the present findings regarding the impact of orthographic transparency on reading run counter too much research, these results should be interpreted with caution. Actually, the orthographic transparency in Arabic is determined solely on the basis of the presence or absence of the vowelization (Abu-Rabia, 2001). However, if transparency refers to the fact that letters or clusters of letters are always pronounced the same, even in different words (Frost, 1998; Ziegler et al., 2010), making thus the relation between the written and the spoken language highly predictable or consistent, the Arabic language, as already mentioned, includes several characteristics that contribute to a

certain ambiguity in this relation, even in the vowelized version (see Introduction, and Asadi et al., 2016). In addition to these characteristics in the written language, the spoken language also adds to this ambiguity due to the diglossic situation. Indeed, some linguistic components in the literary Arabic language are not well developed in the children's oral language, which may simply interfere with the relation between these same literary linguistic components in the oral language and their correspondents in the written language.

Of the other indications that cast doubt upon the issue of the status of transparency in Arabic is the low performance in reading of Arabic native speakers (PIRLS, 2003). While it is well established that reading in transparent orthographies is easier to acquire and that some children can even reach the ceiling performance at the end of the first grade (Seymour et al., 2003), researchers have argued that learning to read in Arabic, even when vowelized, is a challenging process (Saiegh-Haddad & Joshi, 2014). Hence, the similarity here in the reading performance in both versions might suggest that vowelization, the criterion for transparency/depth in Arabic, does not positively affect reading accuracy as suggested in two recent studies (Saiegh-Haddad & Schiff, 2016; Taha, 2016). Actually, it was even found that reading single unvowelized words induced higher than reading vowelized ones.

Altogether, the findings of the current study, which are consistent with those of a previous study (Asadi et al., in revision) that assessed reading vowelized words only and included other groups of participants and various cognitive and linguistic measures, it appears that vowelized Arabic does not behave as expected a transparent orthography. Accordingly, it appears necessary to seriously reconsider vowelization as the sole criterion for determining the status of Arabic on the orthographic transparency/depth continuum, given that the results presented here suggest that Arabic might be placed around the middle of the spectrum.

The implications arising from this research might involve different aspects of written and spoken language. Firstly, this study and other recent ones would indicate that reading curricula should take into consideration that vowelized Arabic does not behave as a totally transparent orthography. The findings presented here suggest that children might learn to read and store visual word patterns without necessarily the full and visually

dense vowelization. Also, given the diglossic situation in which evolve all Arabic native speaking children, this study emphasizes the need to intensify and to enrich children in the preschool stages, before they learn to read in order to reduce as much as possible the challenge and the ambiguity in the relation between the written and the spoken language. Finally, one should underline that the current study suffers from the fact that reading was tested here only by word reading tasks, and that only accuracy in reading was considered. Future research should include sentences and texts rather than isolated words, and should also take into consideration the fluency component in order to better understand the interplay between the two orthographic versions and the two components of reading: accuracy and speed.

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Appendix A

Items of Vowelized and Unvowelized Word Reading Task

	Vowelized	Unvowelized
1	مُمَرِّضَةٌ	ممرّضة
2	تَحْسِينِ	تحسين
3	لِكَي	لكي
4	حَيْثُما	حيثما
5	عِنْدَئِذٍ	عندئذ
6	إِسْتَلْقَى	استلقى
7	مُجَوَّفَةٌ	مجوّفة
8	مُنْضَدَةٍ	منضدة
9	تَطْعِيمَ	تطعيم
10	إِنْتِشارًا	انتشار
11	عُمَّالَ	عمّال
12	مَزْروعَ	مزروع
13	اهداءَ	اهداء
14	سَيِّءٌ	سيّء
15	صبورًا	صبورا
16	جَزاءِ	جزاء
17	جَوْهَرْ	جوهر
18	تَكْييفَ	تكييف
19	مَسْأَلَةٌ	مسألة
20	مَدْرَسَةِ	مدرسة
21	مَخْبَزَ	مخبز
22	بَيْضاءَ	بيضاء
23	قالَتا	قالتا
24	شَرِبْنَ	شربن
25	رَسَّامُ	رسّام
26	لُعْبَتي	لعبتي
27	جَلَسوا	جلسوا
28	مِنْطادِ	منطاد
29	اخْتِيارُ	اختيار
30	مَسْؤولِ	مسؤول

Appendix B

Examples of Items on the Phonemic Deletion Task

	Items	Initial/final	Sound to delete
1.	"بوق"	initial	"ب"
2.	"كيس"	initial	"ك"
3.	"ثَعْلَبْ"	initial	"ث"
4.	"صَنْدَلْ"	initial	"ص"
5.	"جاف"	final	"ف"
6.	"بوط"	final	"ط"
7.	"زِنخْ"	final	"خ"
8.	"كْتير"	final	" ر "

Appendix C

Examples of Items on the Phonemic Segmentation Task

	Items
1.	ريح
2.	جاط
3.	ظِل
4.	فِش
5.	ثَّلّج
6.	كُريك
7.	مِحْراث
8.	مِشْوار

Appendix D

Examples of Items on the Expressive Vocabulary (Opposites) Task

	Items
1.	تَحت
2.	سريع
3.	مفتوح
4.	قريب
5.	غَني
6.	قوي
7.	هُدوء
8.	مر

Appendix E

Examples of Items on the Perceptive Vocabulary (Synonym) Task

	Word test			Distractors and target words
1.	سُرور	ذهاب	فرح	فوز
2.	سارق	ناظر	لص	هارب
3.	نافذة	عبور	شباك	شُبّاك
4.	شاهَدَ	حاكم	إنتظرَ	رأى
5.	سار	انتهى	أصبح	مشى
6.	شَقيق	رقيق	اخ	مشاغب
7.	تَغلبَ	انهزم	تقاتل	انتصر
8.	خطَمَ	كَسّر	قص	طحن