

The Role of Vowels and Context in the Reading of Highly Skilled Native Arabic Readers

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The role of context and vowels among highly skilled native Arabic readers was investigated in this study. Sixty-eight high school participants were selected after reading a list of isolated words. Only the highly skilled students participated in this study. Each participant individually had to read aloud vowelized and unvowelized paragraphs, and vowelized and unvowelized lists of words. The results showed that vowels and context were significant facilitators of word recognition in Arabic orthography.

INTRODUCTION

This study investigated the influence of vowels on reading accuracy of highly skilled native readers in Arabic orthography, a phenomenon which has rarely been studied. The question of vowels cannot be raised with Latin orthography because they are part of the alphabet and appear as letters in text. English texts are presented in the same reading condition (correctly vowelized) for skilled and poor readers, which differentiates them from Arabic texts. Arabic readers read with vowels to facilitate word recognition, but when reading without vowels, they rely on context to compensate for the lack. Because Arabic writing is highly homographic (i.e., one word carries several different meanings), vowels are necessary for poor and skilled readers to disambiguate Arabic homographic words when they are presented.

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Arabic Orthography Versus English Orthography

Arabic writing is an almost consistent letter–sound alphabetical system if presented vowelized, with 28 letters which are all consonants, and some also serving as long vowels. Short vowels, represented only by added diacritics, are not part of the alphabet. Short vowel patterns are rule-governed according to word meaning, inflection, and function in a sentence. Each word is pronounced differently in different places in the sentence and in most cases the change in short vowels leads to different lexical meanings. Skilled readers usually bring considerable knowledge of literary Arabic to texts and usually read them without vowels, but poor and beginning readers learn and read Arabic with vowels (for a comprehensive review of Arabic script and grammar, see Haywood & Nahmad, 1965).

In literary Arabic there is an almost predictable sound–symbol correspondence between letters and their sounds if the text is presented with vowels. There are six vowels in Arabic writing: (a) *a*, *fatha*, *فَ*, is indicated by a small stroke above the consonant, as *ba*; (b) *i*, *kasra*, *كَ*, is a similar stroke under the letter, as *bi*; (c) *u*, *damma*, *وُ*, is written like a miniature /waw/ above the letter, as *bu*. In order to indicate the absence of a vowel a *sukon* is written above the letter, as *eb*. Usually these are considered short vowels, and they are lengthened by the addition of the long vowels which are considered part of the alphabet: /ā/ *al*, /aw/ *waw*, /ay/ *ya*. In most modern written and printed Arabic texts no vowel signs are given, and the reader has to deduce them from context and/or prior knowledge. Reading Arabic script without vowels can be a difficult task for poor or beginning readers owing to word (homograph phenomenon) and letter similarities; certain letters are distinguished from each other only by a single stroke or dot (/ā/ *ain*, /ghā/ *ghan* and /jīm/ *jim*, /hā/ *ha*, /khā/ *kha*), or they may be phonologically indistinct in the colloquial variant of spoken Arabic. For first-grade pupils being introduced to it, literary Arabic is almost a new language in writing, reading, and speaking.

The form of a particular letter may differ depending on its position in a word. Some letters have three different forms: one when it begins the word, another when it is in the middle of the word, and a third when it ends the word. Further, different rules are used for the writing of each form. For example, in the words *awwal* and *awwal* the letter /waw/ cannot be connected to the left in the first and must be connected from the right in the second. Recognizing the diverse writing rules for these letters in their different positions, and recognizing the different vowels below and above them, is therefore critical for word identification and word decoding, which may demand considerably more than the usual cognitive attention by readers in the process of print perception.

The homograph phenomenon is widespread in Arabic; one word carries several different meanings. Without vowels, reading in Arabic orthography is a difficult mission even for skilled readers because many words are visually and orthographically homographic; they look the same, but they carry different meanings and are pronounced differently. Included in this phenomenon are nouns, verbs, and conjunctions. The vowels provide the beginning and poor reader with phonological information by showing the right pronunciation of words according to their functions in the sentence and also according to their inflections in agreement with the preceding conjunctions. Thus they change Arabic from a deep orthography to a shallow orthography.

Regarding English, Venezky (1970) suggested that the letters in a word can be divided into two main types: spelling patterns and markers. Spelling patterns are essentially the letters that are pronounced. A marker is a letter that is not usually pronounced, but whose occurrence either signals some feature of the pronunciation of other letters or preserves some morphological or orthographic patterns. For example, *e* at the end of the word usually signals a change in the pronunciation of the preceding vowels. In Arabic this marker phenomenon exists, but it is not as common as in English. For example, the words *اكتف*, /covered/ and *الله*, /God/ can be very confusing even with vowels for advanced readers. Furthermore, the vowels can be above and/or below the letters for letter-sound pronunciations: /lo/ لـ, /la/ لـ, /loon/ لـ, /li/ لـ. Thus, reading a text with complete vowels is considered a cognitively demanding operation for a beginning reader, requiring simultaneous perception and processing of many rules in order to decode and derive meaning. This very hard operation is gradually eased when the poor or beginning reader reaches the automaticity level in decoding and acquires more knowledge about Arabic script (e.g., syntax, vocabulary), which enables the reader to use context and vowels perhaps as “holistic automaticity” in reading instead of “autonomous automatic word recognition.” A minor mistake, through confusion of similar letter shapes, homographic words, or vowels above and below the letters, leads to wrong decoding. Examples are the following different verbs: *قال* /said/, *تعد* /tended/, *ثروة* /wealth/; or the words: *لين* /lin/, *لم* /in mel/, *شرب* /drink/, *شرب* /gave to drink/. Moreover, there are certain irregularities that require the reader to bring to the text considerable knowledge of literary Arabic—syntax, vocabulary, and contextual interpretations, especially if the text is written without vowels.

Literature Review

Reading psychology research has noted that poor readers rely more on the reading context than skilled readers (Bruck, 1990; Perfetti, 1985; Schwantes, 1985; Simpon & Foster, 1986; Stanovich, 1980, 1986; Stanovich

& Feeman, 1981; West & Stanovich, 1978). These studies were conducted in Latin orthography, while other orthographies, for example, Arabic, have not been studied. This raises the probability that different orthographies may provide different context effects for poor and skilled readers.

This study also investigated the influence of vowels in Arabic orthography on reading accuracy among poor and skilled readers. The problem does not exist in languages written in Latin orthography because vowels are part of the alphabet and texts cannot be presented without them. In Arabic vowels are not part of the alphabet, and skilled readers are presented with unvoweled texts.

Arabic words are based on trilateral (three-letter) roots, and various derivatives are formed by the addition of affixes and vowels. Many of them look identical (homographs) if they are written without vowels (Abu-Rabia & Siegel, 1995; Haywood & Nahmad, 1965; Ryan & Meara, 1991). Therefore, beginning and poor readers read texts with vowels, since without them most isolated words may be read in different ways and have different meanings. Skilled and adult readers, reading without vowels, may rely greatly on context to identify homographic words. Context is particularly important here for skilled readers too, because in Arabic the verb usually comes at the beginning of the sentence. This is the location most common for the homographic phenomenon (Abu-Rabia & Siegel, 1995; Haywood & Nahmad, 1965).

Abu-Rabia and Siegel (1995) tested the effect of voweled and unvoweled sentence context on skilled and poor readers' reading of voweled and unvoweled words. Skilled readers did not significantly differ from poor readers in reading homographs when they were presented unvoweled. Hence the special nature of Arabic orthography should be considered carefully in any discussion of a comprehensive reading theory. Essentially, Arabic alphabet reading differs from Latin alphabet reading in the well-established fact that, in the latter, skilled readers rely on their autonomous decoding of each word and do not need the context to facilitate word recognition. Only poor readers lacking these automatic decoding skills compensate for this deficit with other resources (Stanovich, 1980).

As noted, the conclusion that poor readers rely more than good readers on context in word recognition was reached in experiments conducted in a language with a Latin alphabet with complex grapheme-phoneme conversion (GPC) rules.

Studies investigating context effects in reading have employed priming paradigms where context is a word, a sentence, or a paragraph preceding a target word, to which the subject must make a naming response or a lexical decision. Many of these studies were discrete-trial reaction-time studies of context effects, which showed consistently that poor readers use context

more than better or skilled readers (Perfetti, 1985; Stanovich, 1980, 1986; West & Stanovich, 1978).

The absence of such studies in orthographies other than Latin (e.g., Arabic, Chinese), which, if conducted, might show different context effects, creates a problem in developing a general theory of reading; no account is taken of the processing roles played by linguistic and orthographic features not found in Latin alphabet languages.

Chen (1987) argued that, in reading Chinese, characters rather than words are important perceptual units, which may function as coding units similar to those of alphabetic words. He noted that Chinese character identification is highly context-dependent for the following reasons: (a) Many individual characters have several meanings, and (b) single characters can also be used with other characters to form multicharacter words with distinctively different meanings. In this, Chinese is probably similar to Arabic, which, as noted, is highly context-dependent for skilled readers if presented unvowelized.

Frost, Katz, and Bentin (1987) addressed the issue in Hebrew, like Arabic a Semitic language. They tested lexical decision time in the deep unpointed (unvoweled) Hebrew orthography. They found that the lexical status of the word had similar effects on naming and on lexical access, suggesting that pronunciation was achieved by an addressed routine in which the whole word phonology was retrieved from lexical memory and that vowels did not facilitate word naming. The researchers disregarded the homograph phenomenon in Hebrew; only words with one meaning were used. Further, the use of word naming as the method of the study is not satisfactory with a Semitic language because then the investigator automatically overlooks the homograph phenomenon. Thus, Frost et al.'s (1987) results cannot be generalized beyond Hebrew and may not be applicable to Arabic (Abu-Rabia & Siegel, 1995). Navon and Shimron (1981, 1984) concluded that, although the skilled Hebrew reader does not need vowel marks for fast lexical decisions, he/she cannot ignore them even when instructed to do so. They also concluded that the vowels in Hebrew do not facilitate reading for skilled readers. Additionally Frost and Bentin (1992) suggested that vowels in Hebrew are not essential for locating a specific lexical entry. For these words the consonant structure is sufficient to specify a unique word. This is because in such cases only one phonological pattern can be assigned to the letter string to create a meaningful word. These researchers concluded that, despite the ambiguity of the unpointed Hebrew structure, skilled readers do not need the vowel marks for reading. Further, Koriat (1984) tested lexical decisions of Hebrew readers in unpointed print. In his study Koriat used only words that had only one meaningful pronunciation in their pointed form, and found almost identical lexical decision latencies for pointed and

unpointed words. Koriat's (1984, 1985) data, despite his initial conclusions, indicate that the presence of vowel marks affects visual word recognition.

Additionally, Bentin and Frost (1987) tested naming of pointed and unpointed Hebrew words. Subjects were presented with phonemically and semantically ambiguous consonantal strings. Each string could have been read either as a high-frequency word or as a low-frequency word, depending on the vowel configuration assigned to it. Lexical decision time for the unpointed ambiguous consonantal string was compared with lexical decision time for the unequivocal pointed printed forms of the high- or the low-frequency phonological alternatives. The results showed that lexical decisions for the unpointed ambiguous strings were faster than lexical decisions for either of their pointed alternatives: Explicit presentation of vowel marks did not necessarily accelerate lexical decision times. The researchers suggested that lexical decisions for Hebrew unpointed words may occur prior to the process of phonological disambiguation, at least when the letter string represents two different words (cf. Balota & Chumbley, 1984).

Arabic is quite different from Hebrew and English. The homograph phenomenon is common and almost every third word in a passage can be a homograph (noun, verb, conjunction) representing several meanings; placing inappropriate vowels over the letters of the word may change its structural function in the sentence and give it a different meaning. This phenomenon is not common in Hebrew, probably because this language was hardly used for centuries, which hindered its development.

The purpose of this study is to test the applicability to Arabic orthography of Stanovich's argument on context effects in Latin orthography and to consider the role of vowels as an additional variable in reading orthography. Does context facilitate reading by highly skilled Arabic readers? Do vowels facilitate reading by highly skilled Arabic readers?

The participants of this study were tested for reading accuracy. Namely, participants had to correctly read each word isolated or in context with all vowels presented or unrepresented. For the isolated unvoweled words, pronouncing all vowels was necessary except for the final vowel which was posted on the last letter. The word could be pronounced in any acceptable way (but of course without changing it into another word or into a pseudoword).

METHOD

Participants

Sixty native Arabic-speaking high school students, 17 to 18 years of age, were selected for this study. They were all highly skilled Arabic readers

from four Arab high schools of the Haifa area in Israel. They were selected on the basis of their reading accuracy of a list of 100 isolated vowelized words. The list was constructed for this study and four Arabic teachers of these participants judged the list for Arabic vowelization and low/high frequency. The words in the list were chosen from the high school Arabic literature book used in Israel. The first 50 words were high-frequency words and the other 50 were low-frequency words. Students who gained $90 \geq$ were selected for this study. Others were dropped. The selected participants were also stated by their Arabic teachers to be highly skilled Arabic readers.

Materials

Four paragraphs were randomly sampled from an article in the high school Arabic literature book. Paragraphs were shortened to 50 words in each. Each paragraph was presented to the students in a different reading condition: One was presented fully vowelized, the second was presented unvowelized, the third was scrambled and presented a list of unvowelized isolated words, and the fourth was also scrambled and presented as a list of fully vowelized isolated words. All paragraphs were judged by the participants' Arabic teachers for length of paragraphs, length of words, academic difficulty, and correct vowelization.

Procedure

Participants read aloud each of the paragraphs and word lists. For counterbalancing, the order of reading material was changed for every second participant: One read the vowelized paragraph and word list and the next began with the unvowelized paragraph and word list. Two testers wrote down the participants' errors. For human error control all readers were recorded audially. Time was not limited.

Each vowelized word had to be correctly read with full consideration of all vowels. The isolated unvowelized words had to be read with full vowelization although the vowels were not posted except for the vowel on the last letter in each word. In isolated unvoweled words, the last letter can be pronounced in any acceptable way in Arabic.

RESULTS

Table I and Fig. 1 present descriptive statistics of reading errors of Arab students on reading vowelized and unvowelized paragraphs and isolated words. The multivariate analysis of variance (MANOVA) of these values revealed significant effect for vowels, $F(1, 59) = 442.3, p < .001$,

Table I. Means and Standard Deviations of Errors in All Reading Conditions

Reading condition	\bar{X}	SD
Vowelized text	1.95	1.2
Unvowelized text	3.05	1.48
Vowelized word naming	5.60	2.12
Unvowelized word naming	9.95	2.61

Skilled Readers' Performance in the Four Reading Conditions

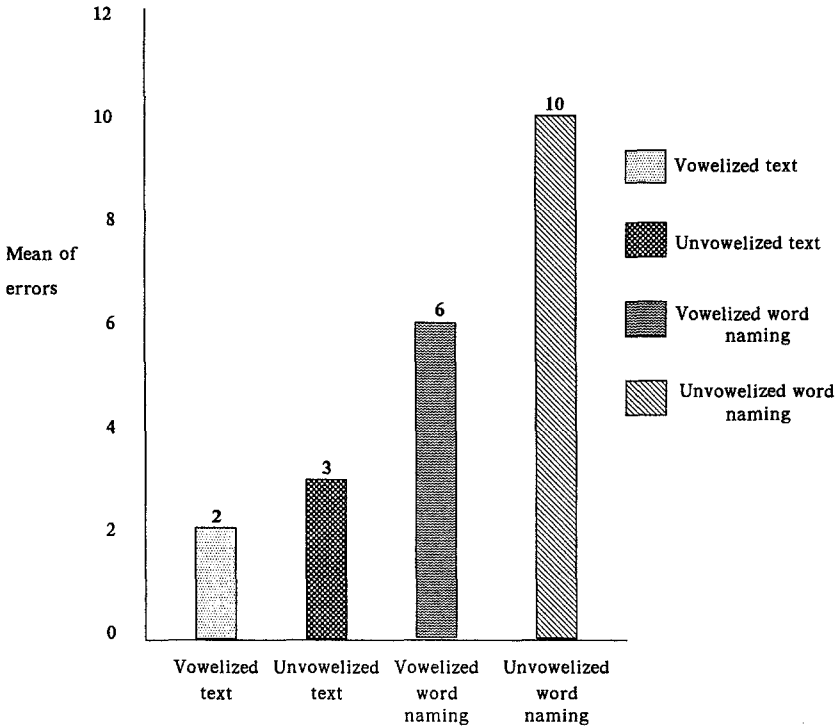


Fig. 1. Skilled readers' performance in the four reading conditions.

and a significant effect for context, $F(1, 59) = 296.3, p < .001$. There was also a significant interaction of Vowels \times Context, $F(1, 59) = 146.5, p < .001$ (see Table I). Namely, when context and vowels were combined in one reading condition, reading became optimal.

Reading Errors Analysis

The reading errors of the students can be divided into five categories: (a) errors in reading homographic words (words that look alike but carry different meanings); these were mostly read as the most common word in Arabic; (b) errors in reading stressed syllables with *shadda*; (c) errors in reading the last vowelized letter; (d) a tendency to substitute the other vowels with the sound *a*; and (e) errors in reading the *hamza* (Table II). The above errors were made even though words and texts were vowelized. More errors, of course, were made in reading conditions where words and texts were presented unvowelized.

Table II. Reading Errors and Categories of Errors

Error category					Reading error	Target word
a	b	c	d	e		
✓					rijil	rajulon
✓				✓	musawi	masawia
✓	✓				alhubba	alhabbu
✓		✓			kabila	kabiluhu
✓					aksa	oksiya
	✓	✓			maktufa	maktufan
	✓	✓			wahidu	wahidun
	✓	✓			adyana	adyanan
✓	✓	✓			dachilayhi	dachiliyatun
✓	✓				aklaba	okallibu
✓	✓				maabaran	muabbiran
✓	✓				takun	takawwana
✓	✓				tuarid	taarrada
✓	✓				mashkal	mushakkalon
		✓			wajadat	wajadtu
✓					mabalin	mubalina
✓	✓				ashaddah	ashidata
✓					hubbu	hibu
	✓			✓	asru	osarru
					fakatal	fakutila
				✓	amamen	omamen
✓					habu	hibu
✓					yahabuni	yahabuni
✓					maradifan	muradifan

DISCUSSION

The major findings of this study are that vowels and text had a significant effect on the reading of very skilled readers in Arabic. Readers made less errors when they were presented vowelized texts. Namely, when words were in context and were fully vowelized, readers made less errors. However, when vowels were unvoiced and isolated, the reading errors were the highest of all reading conditions. This indicates the essential role played by vowels in reading Arabic. Further, when readers read vowelized words in context (vowelized text condition), their reading errors were significantly reduced. This also indicates the significance of context in reading Arabic. These findings concerning context are in contrast with findings obtained from Latin orthography (Perfetti, 1985; Simpon & Foster, 1986; Stanovich, 1980, 1986; Stanovich & Feeman, 1981; West & Stanovich, 1978). The Latin orthography findings indicated that context did not foster word recognition for skilled readers, but it did so for poor readers.

Additionally, vowels were indicated as playing an essential role in reading Arabic among very skilled readers. These results are in contrast with results obtained from Hebrew orthography, a Semitic language like Arabic (Frost & Bentin, 1992; Navon & Shimron, 1981, 1984) and consistent with results obtained from Hebrew orthography by Koriat (1984, 1985) and Shimron and Sivan (1994). In Shimron and Sivan's study, the vowels significantly facilitated reading comprehension as compared with reading comprehension with an unvoiced text among highly skilled native Hebrew readers.

The present results confirm the significant role played by vowels and context in reading Arabic. Thus, reading Arabic is not an autonomous word recognition process but a context-dependent word recognition process where the final correct pronunciation is activated after processing all the vowels and diacritics and matching word meaning (pronunciation) to context. This is true even though the text is vowelized because the ends of words have to be vowelized according to their grammatical functions in the sentence, and misprocessing of the right diacritics above or beneath letters may change meaningful words into pseudowords or other meaningful words. This characteristic of the Arabic writing system is not a characteristic of the modern Hebrew language practiced today.

The analysis of the errors revealed five categories of errors, which can be summed up in two major categories: (a) problems in processing vowels, and (b) problems in matching words to contexts. It seems that, even though vowels are presented, processing all vowels is not a very easy and automatic process even for highly skilled readers. This is because of the additional role played by context. The reading task is harder for readers with an unvoiced text, which requires the reader to think of word meanings and the

macro sentence meaning in addition to the functions of these words in the sentence and the diacritics placed above or under the final letters of the words. This eye-fixation process on either vowelized or unvowelized words causes tiredness. This is because the whole process is not a pure eye-fixation word recognition process as decoding Arabic words is not an autonomous word recognition process. It is more of a word-sentence fixation process because of the central role played by the context and by the vowels, especially when the ends of words are vowelized according to the words' grammatical functions in the sentence, which directly affects pronunciation and lexical access (cf. Just & Carpenter, 1980, 1987; Perfetti, 1985; Pollatsek, Rayner & Balota, 1986).

Thus, reading in Arabic orthography for highly skilled readers does not fit any of the reading models derived from Latin orthography. Since none of these models considers vowels and context in reading Arabic (cf. Chall, 1983; Frith, 1985; Gough & Hillinger, 1980), these Latin orthography models are word-recognition-centered, which contrasts with the findings of this study.

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