THE ROLE OF SHORT VOWELS AND CONTEXT IN THE READING OF ARABIC, COMPREHENSION AND WORD RECOGNITION OF HIGHLY SKILLED READERS

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The purpose of this study was to investigate the role of short vowels in reading Arabic for skilled Arab adult readers. Previous studies claimed that the presence of short vowels (and diacritics) has a facilitative role in the reading of Arabic. That is, adding short vowels to the consonants facilitates the reading comprehension and reading accuracy of both children and skilled adult Arab readers. Further, those studies claimed that the absence of short vowels (and diacritics) and context makes reading Arabic impossible. But these studies did not manipulate the short vowels and diacritics to the degree that would isolate the short vowels effect. Nor did they take into account the level of reading involved: text, sentence, and word. That is, on a text level, assessing the role of short vowels should take into account the text level in terms of word frequency; on a sentence level, the structure of the sentence- garden-path versus non-garden-path-; and finally, on a word level the type of word, homographic versus nonhomographic. Thus, the study described in the following pages was designed with three tasks to assess the role of short vowels in relation to each level: the text frequency, the garden-path structure, and the homography aspect of the word. In general, the results showed that the presence or absence of short vowels and diacritics in combination do not affect the reading process, comprehension, and accuracy of skilled adult Arab readers. However, only in a word-naming task, the absence of short vowels and context prevented the skilled adult Arab reader from choosing the right form of the heterophonic homographic word. Further, according to the findings, at the absence of short vowels and diacritics in combination, the role of context in Arabic is still limited to the heterophonic homographic words. In sum, the results demonstrated that the only variable that affects the reading process of Adult Arab skilled readers is the word frequency. Justification for such effects and recommendations for pedagogical purposes and future research are suggested.

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PREFACE

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1. CHAPTER ONE

1.1. INTRODUCTION

Four incidents stimulated interest in pursuing the topic of this study: a teaching experience, a personal investigation of Arabic textbooks, a child's struggle with reading, and a recent claim about the applicability of Goodman's reading process model to the Arabic reading process. In the first incident, the opportunity to teach Arabic reading, grammar, and literature to high school students (1994-1997) helped the researcher to observe closely and classify qualitatively the types of mispronunciation students made when they read Arabic textbooks. The observation revealed that students, including the highly skilled, were misreading the unvowelized, low-frequency words embedded in the traditional Arabic poetic and prose texts. Indeed, the observation demonstrated the same result with nontraditional texts that included a high rate of low-frequency words. The students' immediate recovery was noticeable when they attempted to combine the consonants carefully and to assign suitable short vowels to them in order to recognize the word. This result is not surprising, knowing that short vowels were not presented and that the students were encouraged implicitly to look up the word and infer the short vowels.

In the second incident, the author surveyed the textbooks used in Saudi classrooms from elementary to high school (2001-2002, and up to now). This survey revealed a deliberate and common pattern among these textbooks to take the reader gradually from transparent to deep orthography. Furthermore, it revealed that first and second grade children are exposed consistently to fully vowelized script textbooks in all subjects (full vowelization makes the correspondence between a grapheme and a phoneme consistent). Departure from transparent orthography begins partially in third grade where only Math and Science textbooks are printed in unvowelized script. This conveys a message to teachers in presenting reading materials that should move the child from transparent to deep orthography by starting with phonics and ending with the sight word approach as the ultimate goal of reading.

However, generally speaking, this correspondence decreases gradually as students move from a lower to a higher grade level until they reach high school where short vowels are provided only partially and for very rare and special positions within texts. The students are supposed to supplement these missing short vowels and diacritics from the texts, a skill that assumes a previous deep exposure to print and a high level of morphological and syntactic knowledge. Beyond textbooks, adults and even children are challenged by fully unvowelized printed materials: newspapers, magazines, personal letters, etc. Indeed, it is a "prestigious practice" to read and write without short vowels (Mahmoud, 1980). Thus, a deep correspondence between grapheme and phoneme is recognized within the writings and printed materials of college and even elementary school students (see Appendices A, B, and C for samples of students' writings, school textbooks, and public printed materials).

Implicitly, both adult and child readers are in fact encouraged to read and write with deep orthography, a practice that could result in confusion and attention-consuming effort in comprehending a text. Mahmoud (1980) described explicitly the confusion that could result from the absence of short vowels in print, and stated that:

> most readers even the experts among them, sometimes find it hard to accurately understand an Arabic text without a great deal of alertness and concentration. Much of the reader's effort is expended in hunting for contextual clues and redundancies that could help him supply the missing vowels. This grammatical knowledge the writer can afford not to master, but the reader cannot do without. Because of the tradition of printing

> Arabic without vowels, the writer is not accountable for any built-in ambiguities or vagaries his writing may lend itself to. The onus of deciphering what was written or printed falls upon the reader. (p.727-728)

Thus, to give students texts of low frequency vocabulary and without short vowels is to give them 'inconsiderate' texts that could interfere with their attempt to recognize the words and to comprehend the text. This claim is based on two assumptions. First, the Arabic language reflects the diglossia phenomenon in which the spoken is different from the written. School children, to some extent, are taught Literary Arabic almost as a second language (Abu-Rabia, 2001; Ayari, 1996). Second, the old traditional Arabic texts are present in the school curricula for children and adults, and in public printed materials.

From another standpoint, the historical account of the necessity that forced the linguists to invent these diacritics implies that the consonantal Arabic script was not complete enough to convey the 'full thought' Arabs hoped their script would convey, to use De Francis's (1989) concept. These diacritics were invented to be a main part of the script, and to remove them from the print leads that caused confusion similar to that experienced earlier and which produced "inconsiderate" texts. Mahmoud concurs (1980), "Because of the tradition of printing Arabic without vowels, the writer is not accountable for any built-in ambiguities or vagaries his writing may lend itself to" (p. 728). Therefore, with the revival of vowelization; the same necessity that Arabs faced in the earlier period of development of their writing, needs to be considered in order to re-disambiguate the homographic script (or the heterophonic homographic script, to be exact). Indeed, according to a report by the Egyptian Language Academy, over 300 proposals were introduced between 1938 and 1968 to the Egyptian Arabic Conference for reforming the writing system, particularly its scripts (Mahmoud, 1980). These proposals implied the concern Arabs had in regard to their writing system and the obstacles their children encountered in learning to read. Most of these reforms emphasized the missing short vowels as the main obstacle in reading the script.

The third incident is the case of a private school student's struggle to read. This school adopted a different approach (resembling the so-called "whole language") from the mainstream approach (phonics). The child was encouraged to memorize passages and the forms of words during his first and second year. In his fourth year of schooling, unlike his siblings, he fell behind his peers and his inability to read unfamiliar texts became apparent.

Finally, a recent investigation claims the existence of evidence that the reading process in Arabic does not involve word identification, but a "sociopsycholinguistic process that operates within a specific sociocultural context and involves an interaction between language and thought" (Al-Fahid, 2000, p. 12). This claim amplifies the role of linguistic knowledge and experience and diminishes, if not disavows, the role of print in reading Arabic. In fact, such a conclusion can be reached by generalization based on one specific situation involving specific experimental materials. Furthermore, this study, in addition to that of Abu-Rabia (1997a), which demonstrated that highly skilled readers rely on context for unvowelized word recognition and that Arab readers move from orthography to meaning, could lead to the conclusion that reading Arabic does not involve the sequential processing of letters, thus favoring the context effect and disregarding the automaticity of word recognition. Such a conclusion ignores the spelling pattern and knowledge of morphology that Arab readers bring to a text, and further, it ignores the existence of sublexical accessibility in word recognition, particularly in languages that have intensive affixation, e.g., Arabic and Hebrew (Cole, Segui & Taft, 1997; Taft, 1981). Arabic readers make use of their knowledge of *trilateral* roots in comprehending literary Arabic (Badry, 1982). Although such a conclusion may be true for some circumstances in which the words the adult reader encounters are so familiar that they become as sight words, foreign words and long words will demonstrate that adult readers attempt to assemble the phonetic aspect of the word in order to access the lexicon; in short, they attempt to use the "assemble-route" in recognizing such words (Coltheart et al., 1993; Besner, 1990).

In fact, Abu-Rabia's (1997a) findings may explain word naming only in relation to context under certain special circumstances in reading Arabic words, e.g., homographs (or heterophonic homographs, to be exact), but it cannot explain recognizing the meaning of the word in relation to context. Hence, conclusions extracted from the two aforementioned studies, Abu-Rabia (1995) and Al-Fahid (2000), could be misinterpreted in the practice of teaching reading. They could bring intuitive-based debate and confusion to the Arabic educational system, with the knowledge that the Al-Fahid (2000) study was modeling qualitatively the so-called Goodman reading process model (1967; 1997). Despite the findings in cognitive science on the reading process in general and eye movements in particular which demonstrated that even fluent readers do not skip words but fixate nearly on every content word, and that this occurs in scripts written from left to right as in English or from right to left as in Hebrew (Rayner & Sereno, 1994; Rayner, Well, Pollatsek & Bertera, 1982; Just & Carpenter, 1980), Goodman's (1967, 1997) reading process model still views reading as a "psycholinguistic game" that is a universal characteristic of any reading process and applicable to any language orthography. Indeed, the Pollatsek et al. (1981) study demonstrated that the perception span for Hebrew readers was smaller than that of English due to the intensity of the Hebrew morphology (and this can be applied to Arabic because of the similarity between these two Semitic languages in morphological characteristics and in reading direction). Thus, we could say that adult Arabs utilize their knowledge of morphology in accessing words due to the similarity between these two writing systems: Hebrew and Arabic.

Furthermore, very well supported research revealed that attention is required for the second and third levels in reading (assuming that we can divide the reading process into three levels: 1) word recognition, 2) propositional structure building, and 3) personal mental representation). At the word recognition level, attention is essential for beginning and poor readers. However, for skilled readers word recognition is so automatic that they can turn their attention to higher levels. For example, they can assign their attention to constructing the "microstructure" and the "macrostructure" of the text while they are reading (Kintsch, 1998; Fletcher, 1994; van Dijk & Kintsch, 1983). Further, they can assign it to creating their personal mental representations (Zwaan & Radvansky, 1998; Fletcher, 1994).

Furthermore, psycholinguistic and cognitive psychology research on the reading process of alphabetic writing systems has resulted in several findings, including the following: written words need to be converted into spoken representation when perceiving letters, recognizing words, integrating them into propositions (Underwood & Batt, 1996) even when parsing sentences is necessary (Liberman & Shankweiler, 1991); short-term memory relies on phonological structure to hold linguistic information (Liberman & Shankweiler, 1991); poor readers face a bottleneck at lower level processing and a deficiency in holding verbal materials (Perfetti & Lesgold, 1979); "Word-recognition skill plays a smaller, but still detectable, role in adults' reading ability: Better readers are faster at pronouncing words than are less skilled readers (Perfetti, 1985)" (cited in Beck & Carpenter, 1986, p. 1101); "If children do not learn the code to a high degree of skill, their ability to read with comprehension will be at risk" (Perfetti, 1977); "word identification processes for skilled readers are relatively automatized through learning and practice" which results in redundant lexical representations and spelling knowledge of the orthography, "allowing resources to be devoted to certain comprehension processes rather than to word identification" (Perfetti, 1994, p. 878); subsequently, in word recognition, contrary to skilled readers, less skilled readers will be more dependent on context (Stanovich, 1980; Perfetti & Lesgold, 1977); and finally, findings from eye movement studies revealed that "most readers spend more time on longer words and less on frequent words because it takes more time to encode and retrieve the meaning of longer and less frequent words" (Beck & Carpenter, 1986, p. 1099) and that skilled readers need to fixate virtually on each word in the content, and that the phonological information is integrated during fixation (Pollatsek et al., 1992; Just & Carpenter, 1980). Thus, the question becomes whether short vowels and context play a major role in reading Arabic for skilled readers.

Because Arab and Israeli adults and children read unvowelized print, and short vowels/pointings (and diacritics) are optionally segregable in the orthographies of Arabic and Hebrew, this unique characteristic of these two scripts places their orthographies in a better position for testing the extent to which the departure of a writing system from representing speech (as can be realized in the absence of short vowels/pointings from script) might influence word recognition (Shimron, 1993; Chitiri, 1991). Therefore, researchers investigated the psychological mechanisms of reading Arabic and Hebrew in order to find out if reading these scripts corresponds to or differs from reading other alphabetic writing systems. Such an investigation will enlighten efforts to construct a universal reading process theory.

Indeed, as this researcher found recently, the same phenomena of the segregabilty of short vowels from print and the dual presentation of orthography (shallow versus deep) on the basis of the learner's education level (children versus adults) are found, too, in Persian which uses the Arabic script (or a modified Arabic script) for its writing system (Baluch & Besner, 1991).

From these inquiries, especially those studies conducted on adult readers, two noncomplimentary conclusions in relation to the role of short vowels and pointings emerged. The first claims a positive role of short vowels and pointings in reading accuracy and comprehension (Abu-Rabia, 2001, 1999, 1998, 1997a, 1997b, 1997c, 1996, 1995; Shimron & Sivan, 1994; Koriat, 1985); and the second claims a neutral role of pointings in word recognition and reading accuracy (Frost & Bentin, 1987; Koriat, 1984; Baluch & Besner, 1991; Baluch, 1993 & 1996). Note, as will be presented later, the neutral role was obvious in the lexical decision tasks and, further, the stimuli presented were always non-homographic.

The question then becomes whether the symbols for the short vowels in Arabic have an indispensable psychological role that makes a difference in the reading process: word recognition (or reading accuracy) and comprehension. If they are indispensable for comprehension and word recognition, these symbols can be considered part of the reading process and subsequently a primary part of the Arabic script and not subordinate or auxiliary; thus, omitting them from reading materials may add confusion to the text as Mahmoud (1980) stated in the aforementioned quotation.

From an educational point of view, textbooks and other printed materials introduced to children and adults need to be determined by empirical research to enlighten the effort to present proper texts for both groups. Considering short vowels part of the primary orthography will shed some light on the way Arabic script should be printed.

Therefore, the purpose of this study is to investigate 1) the role of Arabic short vowels and 2), the role of context on reading recognition and comprehension for very skilled readers, as represented by adult graduate students.

1.2. STATEMENT OF THE PROBLEM

The purpose of this study is twofold. First, it aims to investigate the role of short vowels per se and in combination with context in word recognition for highly skilled readers as represented by graduate students. Second, it aims to investigate the psychological role of Arabic short vowels in reading accuracy and comprehension for highly skilled readers, as represented by graduate students.

1.3. RESEARCH QUESTIONS

There are two main questions this research attempts to address regarding the reading of Arabic. The first question relates to short vowels and the second relates to context.

I. Do short vowels play a role in both stages of the reading process, comprehension and word recognition, for highly skilled readers of Arabic?

1. Is there a significant difference in the comprehension of highly skilled readers when reading a vowelized versus an unvowelized text?

2. Is there a significant difference in the reading accuracy of highly skilled readers when reading a vowelized versus an unvowelized text?

II. Does context have a role in word recognition of highly skilled readers of Arabic?

1. Does the contextualization of words produce a significant difference in word recognition of college students when reading vowelized versus unvowelized words?

1.4. DEFINITION OF TERMS

Writing system- a system of graphic symbols used to convey thoughts (De Francis, 1989).

Orthography- "A method of representing spoken language by letters and diacritics; spelling" (Snow et al., 1998); "the system that actually implements the writing system" (Perfetti, 1999, p.168). In this study, orthography means, roughly, the rules of the writing system.

Shallow Orthographies- "orthographies that reflect relatively faithfully the surface phonology of the language (i.e., its linear string of phonemes) are referred to as *shallow* or *transparent*" (Perfetti, 1997, p. 24)

Deep Orthographies- orthographies that "reflect more the morphology of the language (at the expense of the phonology) are considered deep orthographies" (Frost, Katz & Bentin, 1987, cited in Perfetti, 1997, p. 24-25).

Script- "a set of graphic forms used in a writing system, as Latin alphabet, Cyrillic alphabet, Japanese kana, Chinese logographs, etc." (Harris & Hodges, 1995, p. 228). In this study, script will be used to signify the form of the writing system.

Arabic Short vowels- allophones of three vowel phonemes that take the form of diacritics to mark the *a*, *u*, *i* sounds. These short vowels that take the forms: ـَ , ـُ, and ـِ can be doubled to indicate nunation, that is, to take the forms: ـً, ـٌ, and ـٍ (Bateson, 1967).

Diacritics- very tiny visual signs that are placed over or below the letters. In this study, the term diacritics is used to mean any visual signs other than the short vowels signs. In the context of Arabic, diacritics include only *skun*, and *shaddah* signs.

Shaddah- (*tashdid*) or strengthening,‘ ّ ’, is a mark written above the letter to indicate a doubled consonant (geminated) (Campbell, 1997, p. 2-3)

Skun- a diacritic that is represented with the symbol, " ْ " and placed over the consonant to indicate that the consonant is devoid of any short vowel.

Pointing- “diacritical marks are especially used in the teaching of Hebrew and in printed texts of the Hebrew Bible”; “a fuller system of vowel indication was developed that made use of dots placed above or below a letter [or within a letter]” (De Francis, 1989, 171).

Unpointing- a process of unmarking the script which “omits every indication of vowels and relies heavily on context for their correct identification” (Coulmas, 1989, p. 149).

Homographic word- in the context of Arabic, homograph and heterophonic homograph are used interchangeably to mean a lable for a plain word (in which only consonants are presented) that has more than one legal form or reading.

Garden-path sentence- a sentence "in which listeners are initially led astray because a sentence is capable of more than one meaning" (Finch, 2000, p. 224).

Reading recognition- “the process of determining the pronunciation and some degree of meaning of a word in written or printed form” (Harris & Hodges, 1995, p. 283). In this study, word recognition and word accuracy will be used alternatively to mean the process of determining the pronunciation of a written word. Reading accuracy will be adopted for reading connected texts as in Experiment 1; however, word recognition will be adopted in Experiment 3 (word naming), where the test will be conducted only on isolated words.

Comprehension- comprehension here will mean, “accurately understanding what is written or said” (Harris & Hodges, 1995, p. 39); understanding that employs minimal inferences and not deep inferences (Perfetti, 1999). Comprehension and understanding will be used in this paper interchangeably.

Reading condition- the reading representation in which the short vowels and diacritics were manipulated.

Textbase representation- "a mental representation of the propositions of the text . . . The atoms of meaning are extracted from sentences, built up through the reading of the successive sentences of the text and supplemented only by inferences necessary to make the text coherent . . . essentially linguistic, consisting of propositions derived from sentences . . ." it is "what the text says" (Perfetti, 1999, 186).

Context- "the sounds, words, or phrases adjacent to a spoken or written language unit; linguistic environment" (Harris & Hodges, 1995, p. 44). Context in this study will mean only the linguistic context: words, or phrases adjacent to a written word.

Text- "a segment of spoken or written language available for description or analysis . . . written or printed on a page or in a book, in contrast to illustrations; words" (Harris & Hodges, 1995, p. 255).

1.5. SIGNIFICANCE OF THE STUDY

The significance of this study is fourfold. First, it will test the consistency with the previous research that demonstrated the important role of short vowels in reading Arabic, both to reading accuracy and reading comprehension. Such an investigation will demonstrate whether "after years of practice with an economical writing system redundancy is still helpful" (Navon & Shimron, 1981, 97). Subsequently, empirically, the study will enlighten textbook designers, language policy and curriculum makers in their effort to introduce considerate reading materials for both children and adults.

Second, this study will either support Goodman's universal view of minimizing the role of print in reading or dismiss his suggestion of the minimal impact of orthography on the reading process. In fact, it will enlighten some of the efforts that have been made to apply Goodman's model of reading to Arabic, assuming that there is supportive evidence that can be drawn on by applying the model to Arabic (Al-Fahid, 2000). Thus, this study hopes to contribute, to some extent, to the psycholinguistic debate over the importance of orthography and word frequency in lexicon access.

Thirdly it hopes to demonstrate the role of context in reading Arabic for skilled readers. In addition to the types of reading errors recognized in previous literature, e.g., those identified with high school and intermediate school students (Abu-Rabia, 1996, 1997a), and Azzam's (1990) study which revealed that the persistent type of error among Arab children learning Arabic was attributed to the short vowels, this research study hopes to shed some light on the common types of errors, if any, among Arab adult readers when reading Arabic texts.

Finally, according to Haberlandt (1994), "The choice of stimulus materials and the detection and control of confounds is both a theoretical and a methodological problem" (p.5). The present study is in one way or another an attempt to overcome the potential problem of confounding that previous studies might have involved, especially when knowing that the materials used in the previous experiments were not novel (further, not representative), but were extracted, in most experiments, from the participants' textbooks (see Abu-Rabia, 1999, 1998, 1997a, 1997b, 1996, 1995). Therefore, the present study will select the experimental materials following defined criteria in order to avoid external validity threats, e.g., history and bias.

Above all, as Chitiri (1991) put it, this study "is justified by the fact that reading is an internal mental operation that cannot be studied directly. As a result, findings on the reading process cannot be conclusive until they have been confirmed by a considerable number of studies in various orthographies" (p. 56).

2. CHAPTER TWO

2.1. REVIEW OF LITERATURE

In spite of the fact that the research on the effect of context and orthography on the reading process is extensive, investigation of the role of short vowels in the reading process is limited. This scarcity in examining this aspect of orthography on the reading process can be attributed to three assumptions. First, the short vowels are not segregable in Latin alphabetic writing systems but constitute an irreducible part of the script. Second, there are only a few writing systems that include the segregable short vowels in their script (e.g., Arabic, Hebrew, and Persian). Third, this kind of inquiry is very new because this type of research arose from a new perspective linguists recently incorporated in studying and classifying writing systems (Sampson, 1985; De Francis, 1989; Sampson, 1994).

This new perspective attempts to classify writing systems in terms of their representations of speech. Thus, an account holding that script can be used in classifying even alphabetical writing systems drew researchers' attention to examine the reading process in correlation to script and, more specifically, to orthography. Thus, "With respect to the impact of orthography, the question has been raised as to the extent to which the departure of a writing system from the representation of speech might influence word recognition (Hung & Tzeng, 1981)" (Chitiri, 1991, p.1).

Following this research paradigm, several researchers investigated unique systems of writing that incorporate segregable sub-letters, short vowels, voluntarily: Arabic, Persian, ("the modified version" of Arabic script), and Hebrew. The orthographies of these three languages do not present short vowels as major letters in the script, but as segregable, supplementary diacritics that can be adopted only for particular circumstances, for example, for children who are still learning to read and for presenting the sacred scriptures (Mahmoud, 1979; Baluch, 1992; Shimron, 1993).

The general aim of this research is to investigate 1) the role of short vowels per se, and in combination with context in the reading process and 2) the extent to which their absence from the script (a text, a sentence, or a word) may affect the reading process. The focus is on comprehension and reading accuracy, including in the literature the empirical studies that addressed the effect of pointings (short vowels) and context on reading Hebrew, and the empirical studies that addressed the effect of short vowels and context on reading Persian. Note that unlike Persian, which is an Indo-European language, both Arabic and Hebrew are Semitic languages that share, to a large extent, the same morphological system: inflectional and derivational, and syntactic features, and thus, what is valid for Arabic is valid for Hebrew as well. Examples include the patterns of negation, verb movements, the nature of participles, etc. (Shlonsky, 1997). On the other hand, what is valid for Persian is valid for Arabic due to the fact that they use the same script and the same forms of short vowels (ـُ , ـَ , and ـِ).

Thus, the review of literature will bring these inquiries that examined the Semitic scripts (Arabic, modified Arabic, and Hebrew) in relation to the reading process of Arabic, Hebrew, and Persian, for they are (to the researcher's best knowledge) the only three languages that can be cited, whose orthographies present the short vowels voluntarily. The organization of this section introduces the available related empirical studies that investigated the role of short vowels and context in the reading process of Arabic, Hebrew, and Persian. However, an introduction about the Arabic language (the target language in this study), the evolution of its orthography, the features of its script and its writing system will provide more background about the nature of these short vowels and a context for the position this paper takes in regard to the nature of these diacritical signs in relation to the Arabic script.

2.1.1. Arabic Background

Arabic (Literary or Classic Arabic) is considered the main representative of the South-Central Semitic language group. It is the language of the Koran, the sacred book of Islam, and is the religious language of all Muslims; it is spoken in North Africa, the Arabian Peninsula, and other parts of the Middle East. Arabic is uniform throughout the Arab world. As Kristeva (1989) put it, "[a]ll specialists of Arab culture agree on acknowledging the importance attributed to la langue in the Arab civilization . . . [and that] the scared book of Islam, the Koran, is a written monument of la langue (standard Arabic), which one must know how to decipher and pronounce correctly in order to gain access to its teachings" (p. 129).

Arabic has a number of dialects, all of which have been strongly influenced by the literary language. Speakers of different dialect groups use Modern Literary Arabic, which is a modified form of Classical Arabic, the language of the Koran, as a formal spoken and written language, instead of the local vernacular dialects. They use Modern Literary Arabic for "communication with speakers of other Arabic dialects (interdialectal communication), for formal speeches, formal documents, serious literature, and so forth, whereas the local dialect is used primarily for ordinary oral communication and for such nonserious literature as comic books and joke books" (Lyovin, 1997, p. 201). However, because of "the spread of literacy and the increase in higher education in the Arab world, the influence of Classical Arabic on the colloquial dialects has become greater" (The New Encyclopedia Britannica, 1994, volume 1, p. 510).

Regarding its sound system, Arabic includes a number of distinctive guttural sounds (pharyngeal and uvular fricatives), a series of velarized consonants (pronounced with accompanying constriction of the pharynx and raising of the back of the tongue), which differentiates it from English and the other languages of Europe, e.g., ح, ث , ض . Arabic includes three short vowels (*a*, ___َ; *i*, ___ِ &; *u*, ___ُ), and three long vowels (*a:*, ا , *i:* ي & *u:* و). Arabic words "always start with a single consonant followed by a vowel, and long vowels are rarely followed by more than a single consonant; clusters containing more than two consonants do not occur in the language" (The New Encyclopedia Britannica, 1994, volume 1, p. 509).

Regarding its morphology,

> Arabic shows the fullest development of typical Semitic word structure. An Arabic word is composed of two parts: (1) the root, which generally consists of three consonants and *provides the basic lexical meaning of the word*, and (2) the pattern, which consists of vowels and gives grammatical meaning to the word. Thus, the root *ktb* combined with the pattern -*i*-*a*- gives *kitab* ("book"), whereas the same root combined with the pattern -*a*-*i*- gives *katib* ("one who writes," or "clerk"). The language also makes use of prefixes and suffixes, which act as subject markers, pronouns, prepositions, and the definite article. Verbs in Arabic are regular in conjugation. There are two tenses: the perfect, formed by the addition of suffixes, which is often used to express past time; and the imperfect, formed by the addition of prefixes and sometimes containing suffixes indicating number and gender, which is often used for expressing present or future time. In addition to the two tenses there are imperative forms, an active participle, a passive participle, and a verbal noun. Verbs are inflected for three persons, three numbers (singular, dual, plural), and two genders. In Classical Arabic there is no dual form and no gender differentiation in the first person, and the modern dialects have lost all dual forms. The classical language also has forms for the passive voice. There are three cases (nominative, genitive, and accusative) in the declensional system of Classical Arabic nouns; nouns are no longer declined in the modern dialects. Pronouns occur both as suffixes and as independent words. (The New Encyclopedia Britannica, 1994, volume 1, pp. 509-510)

2.1.2. Features Of Arabic Script: Vowels/Diacritics

Arabic is read and written from right to left in a cursive consonantal script based on 25 consonant symbols plus six vowels: three long and three short. A short vowel, called: *fatha*, ___َ , *kasra*, ___ِ and *damma*, ___ُ, in Arabic is presented as a mark above or below an adjoining consonant, e.g., تَ , تِ , تُ . If vowelized, its orthography is considered transparent, in which the correspondence between graphemes to phonemes is consistent; otherwise it is considered a deep orthography. The script is also distinguished by the large number of ligatures and by the different shapes its characters take; depending on their positions in a text string and the surrounding characters, these letters take up to four different allographs: independent, word-initial, medial, and final, e.g., the letter, ح: ح , حب , بحر , and بح , respectively. There is no cursive versus "print dichotomy" in Arabic writing since all writing is essentially cursive. However, there are several different styles or forms of scripts, such as Kufi, Deewani, Req'aa, Thuluth, and Naskh which "underlies most contemporary type-fonts" (Campbell, 1997, p. 2). Some of the letters such as "و" /wa:w/ or " د " /da:l/ cannot be connected to letters that follow; for such letters only the independent and final forms exist, e.g., د ر and سد . Unlike English, written Arabic has no equivalent to capital letters, and characters can be joined to form ligatures.

Additional signs are used in Arabic script such as *tanwin* or nunation' which express the indefinite for Arabic nouns, e.g., the addition of ending –un, marked as ٌ_ superscript in the nominative case changes to ً- /-an/ and ٍ- /-in/ in the "oblique cases." For example, the word, 'town', is written: مدينةٌ: madinatun [nominative case]; مدينةً madinatan [accusative case]; or مدينةٍ madinatin [genitive case] (Campbell, 1997). *Sukun*, or resting, is another sign that takes the superscript marker over a consonant and indicates that the consonant is voweless: e.g., شرْق : 'east,' where the consonant, ر , is marked by *sukun*, ' ْ .' Two types of *hamza* exist in Arabic, *hamzat-al-qat'* or the cutting *hamza*, e.g., أ ; and *hamzat-al-wasl* or the joining *hamza*, e.g., ا . The first one is "pure glottal stop with full consonantal value and in well-edited books and periodicals is generally written" (Cowan, 1958, p. 6). *Hamzat-al-qat'* is rule governed, especially when it is the first radical in a verb. The initial *hamza*, always, is carried by an *alif*, with *fatha*, *kasra* or *damma* as required, e.g., أ or إ. Medial *hamza* may be carried by *alif*, *waw* or *ya*, e.g., أ , ؤ or ئ; and the final *hamza* which is placed on the line of script, e.g., ء. *Hamzat –al-wasl*, on the other hand, takes the form, "ا", and "always occurs at the beginning of a word and its vowel is written above or below *'alif*, e.g., اَ or اُ , or اِ . If any word precedes it, *hamzat-al-wasl* and its vowel must be elided. It is not actually written although we sometimes find it written as ٱ . Modern opinion, however, does not approve of this use of ٱ , which is reserved for *hamzat-al-qat,'* " أ " (Cowan, 1958, p. 6). *Shaddah* (*tashdid*) or strengthening,' ّ ', is a mark written above the letter to indicate a doubled consonant (geminated), e.g., كسّر : 'he smashed to pieces.' When two *alifs* (and one of them is the "bearer" of *hamzat-al*-qat') come together," *madda* or lengthening, a superscript sign in the form, ~, written along an *alif*, will replace the two *alifs*, e.g.,آ . (Campbell, 1997, p. 2-3).

The structure of the Arabic syllable, as Bateson (1967) described, is expressed in terms of consonants and vowels:

> all Arabic syllables must begin with a single consonant; the simplest type is Cv, a consonant plus a short vowel, e.g., /huwa/ هو 'he,' /sariba/ شرب 'he drank,' with two and three short syllables respectively . . . A long syllable either contains a long vowel, Cv, or has the form CvC where another syllable with its own initial consonant follow. For example, /qabli/ قبلي 'before me' has a first syllable of the type of CvC (qab-) and a second syllable Cv (-li) . . . Syllables of the type CvC are termed "overlong" and rarely occur . . . On the whole, syllable formation is very regular in Arabic. (pp. 6-7)

2.1.3. Arabic Orthography: Evolution And Characteristics

The Arabic script, modern and ancient, is derived from the cursive form of the Aramaic script (Nabatean) which dates back to the fourth century A. D. Because Aramaic “has fewer consonants than Arabic, some letters came to stand for more than one consonant;” that is, a letter came to stand for more than one distinctive phoneme (Bauer, 1996, p. 559). For example, there was no symbol for representing the Arabic voiceless interdental fricative, ث : [O], (Lyovin, 1997, p. 206).

This inadequacy in the Arabic writing system “came to stand for more than one consonant” (Bauer, 1996, p. 559) which created some ambiguities in distinguishing these consonants. For example, the letters: ح /ha:/, خ /kha:/, and ج /ji:m/ can be written with only one form. However, since the representation of the phonemic principle in the Arabic writing system was incomplete, additional diacritical symbols were created as a response to the necessity that emerged during the first century of Islam (roughly 632-688 A.D.) because of the confusion the readers, especially, the non-Arab converts to Islam face when they read the Koran. That is, the reader would find it difficult to read the letter ح as /Ha:/ and not ج /ji:m/ or خ /kha:/; also, this can apply to the letter ب /Ba:/ and the letter ز /za:/. These letters, “b : ب” , “t: ت”, “n: ن”, and “j: ج, خ, ح ” were not adequately differentiated or not differentiated at all in some positions. This difficulty drew the attention of one of the rulers of the Umayyad empire in the seventh century, assumed to be Al-Hajjaj, to ask one of the Arab scholars, Nasr Ibn Asim to come up with an idea for eliminating ‘alujmah’ (alujmah in Arabic means obscurity and ambiguity) when reading the Holy Text by distinguishing the similar letters in order to guarantee an unequivocal reading of the Koran. Subsequently, dots over or under some of the letters were introduced.

From the seventh century, Islam spread over new domains and many non-Arabs embraced the new religion one of whose principles was to recite the Koran in its original version. Koranic verses had to be clear and legible because distorting the sacred text was unacceptable. As a result, the converts needed to read the Koran; and the best way to read it properly was to read it by heart, and not to rely on its written form, because its written form was not sufficiently transparent to extract its phonological form. This problem facing the non-Arab converts when reading the Text drew the linguist and scholar, Abul-Aswad ad-Du'ali (688 A.D.) to create the diacritics ("diacritical dots" that represent the spoken short vowels) in order to eliminate the equivocal reading of the Text (Mahmoud, 1979). Abul-Aswad ad-Du'ali brought one of the Arab scribes, gave him a colored ink (red) that was different from the Koranic text color (black), and asked him to follow the movements of his mouth (Abul-Aswad's lips and tongue movements) when Abul-Aswad read the Koran. The scribe was to put a dot above the consonant if he kept his lips open while articulating the sound (that is if the consonant is followed by ا /a/); a dot within the consonant if he rounded his lips (that is if the consonant is followed by و /u/); and another different dot below the consonant if he lengthened his lips laterally (that is if the consonant is followed by ي /i/). Later, because of the similarity in form between the dots invented for eliminating "alujma" and the dots that were invented for conveying the short vowels, the linguist, Al-Khalil Ibn Ahmed by the middle of the eighth century (786 A.D.) adopted the use of new vowel signs to replace the dots (so-called, *Shakl*) that were used to represent the short vowels, with simplified versions of the letters alif: ا , waw: و and ya: ي. Then, later, these forms: ---َ--, --ِ---, and ---ُ-- were doubled to indicate nunation, that is to take the form: ---ً--, --ٍ---, and ---ٌ-- (Bateson, 1967; Mahmoud, 1979).

Minor developments continued to occur to the script; marks such as *hamza* (glottal stop), an invention attributed to the Arab grammarian Al-Khalil, *shaddah*, *madda*, and other signs were invented and added later. As is clear from this development, the Arabic script went through three stages: **Nagt** (diacritical dots for short vowels), **Alujmah** (diacritical dots/points to differentiate similar consonants), and finally **Shakl**, that is, vowel diacritics "whose shapes remind us of the incorporated long vowels" and "diacritical marks" such as *shaddah*, *skun*, and hamza (Mahmoud, 1979, p. 7-10). With this last stage, "the Arabic writing system was transformed from a <u>scriptio defectiva</u> to a <u>scriptio plena</u>" (Blachere, 1959, cited in Mahmoud, 1979, p. 10). Therefore, the claim that "the orthography of Classical Arabic and that of Modern Standard Arabic are essentially the same" is instantiated (Bauer, 1996, p. 559).

With the expansion of Islam (632-712), the Arabic script extended and spread throughout much of the world and was "adapted to express the peculiar sounds of languages of the most varied type-Arabic, Turkic, Persian, Pushtu, Beluchi, Hindustani, and Malay" (Taylor, 1883, p. 313):

> It now stands second only to the Latin alphabet in the extent of its use (De Francis, 1989, p. 173); "Arabic script was used and [is] still being used to write many languages other than Arabic: Urdu (Indo-European) in Pakistan, Pashto and Dari (Indo-European) in Afghanistan, Uighur (Turkic) in China, Tibetan dialects (Sino-Tibetan) spoken by Tibetan Muslims in Kashmir, Persian or Farsi (Indo-European) in Iran, and so forth. (Lyovin, 1997, p. 206)

Regarding the principle of the Arabic writing system and how it can be classified, is it an alphabetic-principle based writing system as Arabic linguists classify it, a syllabic script as Gelb (1963) claims, or pure consonantal scripts as De Francis (1989) asserts? It is still controversial. However, in classifying the Arabic writing system as alphabetic, the Arab linguists might not ignore that short vowels are part of the writing system. On the other hand, De Francis (1989) classified Arabic as a pure consonantal script on the basis that Arabic does not represent the short vowels. However, his argument can be refuted because Arabic represents the long vowels and in terms of serious documented scripts and the Koranic text, it represents short vowels as well (Mahmoud, 1979). Gelb (1963), on the other hand, described the old Semitic writings, including Arabic and old Hebrew, as syllabic. His justification is that since Semitic writings signs are transliterated from cuneiform since "the Semitic and cuneiform writings are identical in structure," and since "the cuneiform writing is definitely syllabic, the resulting conclusion is that the identical Semitic spellings should also be considered syllabic and not alphabetic" (Gelb, 1963, p. 149). He maintained that the basic signs in these Semitic systems were made up of a consonant plus a vowel, e.g., "ka" is "k" + "a." For the same reason, "he maintained that every Hebrew letter represents one of five syllables; for example, the letter 'b' represents either /ba/, /be/, /bi/, /bo/, or /bu/ [note that *a*, *e*, *i*, *o*, *u* are short vowels], but not the consonant /b/ itself" (Shimron, 1993, p. 52). With his justification, Gelb (1963) might maintain that diacritics are spelling patterns and not markers so the /ba/, /be/, etc. are syllabic and not consonantal. However, when examining the Arabic script, as well as the Hebrew one, it will appear that consonants can be represented with vowels, as well as without vowels at some positions in the word; therefore, his argument can be rejected. However, although Gelb (1963) described the old Semitic languages as syllabic, he hesitated in classifying the modern Semitic writings, such as Arabic and Hebrew, asking "how shall we classify the modern Semitic writings, such as Arabic and Hebrew, which although well able to express vowel differentiation, neglect it frequently by writing only consonants? It would hardly seem proper to call them syllabic in writings, which did not know how to express vowel differentiation" (Gelb, 1963, p. 188).

In conclusion, the pressing circumstances that brought to light the incompleteness of the Arabic writing system created the need to reform it by making a change in its script, and thus inventing the diacritics that present the short vowels in the spoken Arabic, the strengthening, etc. As explained earlier, in one period of the development of the Arabic writing system, the script lacked clarity and understandability and thus the need to disambiguate homographic words when reading them in isolation and to facilitate the parsing of connected words when reading them in a sentence became persistent. To put it briefly, the Arabic script needed additional tools to help with parsing on the sentence level and with disambiguating homographs on the word level. Therefore, these short vowels were created to play the role of facilitating the perceptual recognition in phonological processing and thus facilitating reading. Subsequently, vowels changed Arabic from a deep orthography to a transparent orthography. Therefore, it can be claimed that short vowels, which were presented in the form of diacritics, became an indispensable part of the Arabic script and thus a distinct characteristic of its writing system.

From the previous brief history of the development of the Arabic system, it can be maintained that diacritics which express short vowels are part of the Arabic writing system and should be taken into account when giving any close investigation into its orthography. Further, removing these short vowels shall revive the same confusion their absence made when Arabic orthography was presented without them.

2.1.4. The Role Of Short Vowels And Context In Reading: Empirical Studies From Arabic

Researching the literature on Arabic orthography, particularly its short vowels, in relation to the reading process reveals that there is a narrow range of research done in this area. Only one single author who investigated Arabic orthography, particularly its short vowels in relation to the reading process, can be cited. Abu-Rabia investigated comprehensively the impact of Arabic orthography on the reading process in eight consecutive studies that can be organized chronologically. He conducted different experiments to investigate the effect of Arabic vowels per se and in combination with other factors such as context (with and without context), reading skill (skilled versus non-skilled), and text type (narrative versus informative versus Koranic versus poetic) on the reading process understood as consisting of two parts: word recognition (reading accuracy) and comprehension (Abu-Rabia, 1995, 1996, 1997a, 1997b, 1997c, 1998, 1999, 2001).

In the first study (1995), Abu-Rabia's purpose was "to test the applicability of Stanovich's argument about context effects in Latin alphabetic orthography to Arabic orthography; do poor readers rely more on context than skilled readers when they read in Arabic orthography?" (p. 6). In contrast to the priming paradigms, Abu-Rabia adopted another methodology for investigating the effect of context on reading Arabic. This method can be classified as a masking/unmasking method. His justification is that the priming paradigms cannot be applied to reading Arabic because "poor" (Abu-Rabia's term) and skilled readers cannot read unvowelized isolated words correctly due to their similar visual identity that gives each isolated word the possibility of carrying different meanings if read without vowels. According to Abu-Rabia, any correct response, then, can by interpreted as a guess; therefore, he

(1995) used a masking method in which with self monitoring the participants first read the first word, and then the rest of the sentence is unmasked.

Forty 15-year-old native Arabic speakers who live in Canada participated in this study. Based on their teachers' judgments, the 40 tenth graders were grouped into poor and skilled readers. The task for each participant in both groups was to read aloud 10 vowelized sentences and 10 other unvowelized sentences. The procedure which was administered manually was to show the rest of the sentence in both conditions: vowelized and unvowelized after the participant read the first word which was considered to be homographic in its unvowelized form. The participants were allowed to correct their initial response when the rest of the sentence was unmasked.

With this procedure, the researcher was able to assess four conditions. The first and second conditions were to read vowelized and unvowelized isolated words (the initial words in each sentence); the third and forth conditions were reading the same initial words while the sentences are unmasked.

The study demonstrated three major findings. The first is that both poor and skilled readers relied on context when the words were presented unvowelized. Poor and skilled readers failed to read words correctly if they were presented unvowelized and without context. Finally, skilled readers relied on context more than poor readers. Such a finding, according to Abu-Rabia, "contradicts with the well-established hypothesis that poor readers rely more on context than do skilled readers (Becker, 1985; Briggs, Austin, & Underwood, 1984; Bruck, 1990; Perfetti, 1985; Stanovich, 1980, 1986; West & Stanovich, 1878)" (p. 13).

Abu-Rabia (1996) investigated the effect of vowels and context on the reading accuracy of highly skilled native Arabic readers. The purpose of the study was identical to the purpose of the previous study, that 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” (p. 634). Abu-Rabia attempted to find out whether context per se and vowels per se facilitate reading for highly skilled Arabic readers.

The participants were 60 17—and 18-year-old high school students, all highly skilled Arabic native speakers. The students’ task was to read four types of materials: a fully vowelized paragraph, an unvowelized paragraph, a vowelized word list, and finally, a list of unvowelized words. These materials were constructed from one article that was divided into four paragraphs, in which the last two paragraphs were scrambled to present the word list materials. The reading errors were recorded and measured by two testers.

The major findings of this study revealed that with vowels per se or context per se the participants’ reading errors significantly decreased. Further, the vowels and the context in combination reduced the error rate to an “optimal level.” Furthermore, the reading errors were the highest among all reading conditions when the participants read the unvowelized isolated word list.

In an attempt to support his claim from the previous study (1996) that “reading in Arabic orthography for highly skilled readers does not fit any of the reading models derived from Latin orthography [due to the fact that] none of these models considers vowels and context in reading Arabic” (639), Abu-Rabia (1997a) conducted an experiment that was exactly identical to the (1995) experiment except that the sample was 60 14-year-old Arab 8th graders who lived in their native Palestine. Further, the author included another criterion for blocking the sample into two reading levels: poor and skilled, based on sounding a 70-word list. The words were extracted from the participants’ curriculum and presented vowelized. The criterion for classifying the participants as poor or skilled readers was the following: if the participant scored 40 or less out of the 70-word list he or she was considered normal/skilled; however, if the obtained score were 30 or less out of 70, the participant would be classified as a poor reader. Further, the sentences used in the experiment were high frequency sentences as judged by eighth grade students and teachers.

In addition to the findings of the (1995) study, this study found that the participants obtained the optimal level when vowelization was combined with sentence context. Second, unlike poor readers, normal readers benefited very much from sentence context.

The author's justification for obtaining such a result that contradicted the findings from experiments conducted on Latin orthographies was twofold. The first was Arabic's unique orthography and the second was its unique linguistic structure, particularly its morphology in which "the words are based on trilateral (three-letter) roots and varied with vowels, prefixes, suffixes and infixes" (Abu-Rabia, 139). Thus, according to Abu-Rabia, "the process of reading in Arabic orthography should be viewed more as a function of parallel combination of interactive-dynamic processing of word recognition and sentence context effects, with special focus on sentence context effects as the key variable in reading in Arabic orthography by poor and skilled readers" (Abu-Rabia, 1997a, p. 145).

In order to validate his findings from the previous experiments, that is that poor and skilled Arabic readers rely heavily on context, especially in the absence of vowels, Abu-Rabia's (1997b) study included textual materials that differed in length: paragraphs, sentences, and words. Further, these textual materials were extracted from the participants' curriculum. Each of the 78 Arab 10th grade participants read orally 15 paragraphs, 60 sentences, and 210 isolated words under three conditions: vowelized, unvowelized, and partially vowelized (only the last letter of each word was vowelized using syntactic vowelization; case-ending markings).

The results corroborated the conclusion that was obtained from the previous experiments; that is, that skilled Arabic readers rely heavily on context when they are presented with unvowelized texts. Unlike reading the unvowelized and isolated words which showed the floor effect, in which both skilled and poor readers performed poorly in reading paragraphs and sentences, the poor and the skilled readers improved their reading accuracy by relying on the context that the paragraphs and sentences provided. The vowels had no significant effect when words were presented in a context, that is, within a sentence or a paragraph. Further, no significant difference was found in the performance of skilled and poor readers on reading the vowelized and partially vowelized sentences. However, there was a significant difference for the vowels when reading vowelized and partially vowelized paragraphs. According to the author, obtaining such results "shows the importance of vowels for reading texts in Arabic orthography. In reading theory, therefore, an additional important variable, namely, vowels, should be considered in respect of poor and skilled readers in Arabic orthography (cf. Perfetti, 1985; Stanovich, 1980, 1986; Stanovich & Feeman, 1981; West & Stanovich, 1978)" (Abu-Rabia, 1997b, p. 477).

In a replicate study, but using different types of writing, four narratives and four newspaper articles, Abu-Rabia (1997c) revisited the same issue by reinvestigating "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 Arabic orthography" (p. 634; see also Abu-Rabia, 1996, 1997a, 1997b).

In two experiments, 109 Arab 10th grade participants were classified into poor and skilled readers. In the first experiment, each participant at each level read four types of materials: a vowelized short story, an unvowelized short story, a vowelized word naming list (extracted from the third narrative text), and an unvowelized word naming list (extracted from the fourth narrative text). In the second experiment, the same procedure was conducted but with newspaper articles.

The results in both experiments showed that “context and/or vowels facilitated reading, especially when reading was in context or vowelized” (p. 72). Further, skilled readers benefited more from context than poor readers.

In a replicated study, but with different reading materials, Abu-Rabia (1998) introduced other types of writing styles that could be covaried with the independent variable, vowelization. These types of writing, in addition to the narrative and informative, were poetic and Koranic. Further, he incorporated another level of vowelization into his study design, that is, the wrong vowelization. With the same purpose as that of the previous studies, Abu-Rabia (1998) investigated the effects of “vowels” (Abu-Rabia’s term) in Arabic orthography on the reading accuracy of 11th grade native Arabic speakers who were skilled and poor readers under three conditions: correctly vowelized, unvowelized, and wrongly vowelized in a way that changed the words into different words or into pseudowords, and with four types of texts: narrative, informative, poetic, and Koranic, that were sampled from the participants’ literature curriculum.

Sixty -four native Arabic speakers, aged 17 and grouped into two blocks, skilled and poor readers, individually read aloud the four types of texts: narrative, informative (Abu-Rabia’s term), poetic, and Koranic, under the three reading conditions; “None of the texts was read more than once in any of the reading conditions” (p. 111).

The most important finding of this study was the significant influence of vowels (or short vowels which is the term used interchangeably with vowels in Abu-Rabia's narrative) on the reading performance of both poor and skilled readers. This significant influence was apparent regardless of the type of text they were reading. Furthermore, the vowels were found to be "a good reading facilitator more for skilled readers than for poor readers" (p.112). According to Abu-Rabia, obtaining such results could be attributed to the uniqueness of the Arabic orthography and its linguistic structure (Abu-Rabia, 1997a, 1997b, 1997c).

Unlike the previous studies that tested only reading accuracy, Abu-Rabia's (1999) two-experiment study incorporated comprehension as a dependent variable and attempted to compare the effect of short vowels on the reading comprehension of two different populations: second and sixth graders. The purpose of the study was to investigate the influence of short vowels of Arabic orthography on reading comprehension.

In the first experiment, 74 sixth-grade native Arabic speakers, aged 12 to 12 ½, were divided into two groups. The first group read the vowelized short story and answered 10 multiple-choice, vowelized questions. The second group read the unvowelized version of the text and answered 10 multiple-choice unvowelized questions. In the second experiment, 71 second-grade students, aged 7 to 8, read two different stories from their basic reader. The first one was vowelized and the second was unvowelized. However, the 7 multiple-choice questions that followed their reading were vowelized in both conditions.

The main finding of the study was that vowels facilitated the reading comprehension of both the sixth grade readers who were considered advanced and the second grade readers, considered beginning. According to the author, obtaining such a result was explained by the fact that short vowels provide phonological information and, since the linguistic information is coded phonologically in the working memory, this helps the reader to “maintain that information longer during reading, which facilitates reading comprehension” (p. 100).

In his (2001) study, Abu-Rabia investigated the role of vowels and context (Arabic short vowels and pointings) in reading Arabic and Hebrew texts: reading accuracy and reading comprehension. Sixty-five adult native Arabic speakers, aged 22 to 30, who were considered proficient in Arabic and Hebrew participated in this study (also, skilled adult readers of Arabic and Hebrew). In “a between-subject design” (p. 47; indeed, it was a completely within-subject design), each participant read the following materials silently: 65 unvowelized words, 65 fully vowelized words, an unvowelized paragraph of 65 words, a fully vowelized paragraph of 65 words, and finally, a short story (about 475 words) under two conditions (vowelized and unvowelized), followed by six multiple-choice comprehension questions. In terms of the Hebrew materials, the same participants read 65 unpointed words, 65 pointed words, an unpointed paragraph of 65 words, a fully pointed paragraph of 65 words, and, silently, a short story under two conditions: pointed and unpointed, followed by six multiple-choice comprehension questions. A comparison of reading accuracy when naming an Arabic and a Hebrew word list and when reading Arabic and Hebrew paragraphs was made, as well as a comparison between reading comprehension of Hebrew and Arabic short stories.

Three important results were revealed. The first was that short vowels/pointings improved word recognition in Arabic and Hebrew, whether the words were isolated or in a paragraph context. Second, short vowels were found to positively affect comprehension. However, the results of the reading comprehension were not correlated with the results of the reading accuracy. Third, there was no significant difference when the results of the reading accuracy of both vowelized isolated words and vowelized paragraphs were compared; however, unlike Hebrew, a significant difference was found between the results of reading accuracy for both unvowelized isolated words and unvowelized paragraphs due to the shallow orthography in the former finding and the context effect in the latter. The analyses on Hebrew did not reveal any significant difference in reading accuracy between the unpointed word list and the unpointed paragraphs.

To summarize, the short vowels play two roles in the reading process of Arabic: a necessary and indispensable role in aiding reading accuracy for isolated words, and an additive role in reading connected texts for both reading accuracy and comprehension. The second conclusion is that context is a major advantage for both skilled and poor readers in reading Arabic.

For now, although it will be elaborated on later, there are four points worth mentioning concerning those findings for Arabic. First, vowels and short vowels were very often used interchangeably and that was reflected in the manipulation process. Note that, those signs that are super- or subscripted to the letters in a word do not represent short vowels only, but also, diacritics: *skun*, *shaddah*, and case-ending markings that take, in addition to other shapes, e.g., *skun*, the shapes of short vowels. The second point is related to the lack of differentiation between word recognition and word naming (pronunciation). The third point is that not every word in Arabic is a homograph once it is presented plain (only consonants are presented). Finally, interpreting the effects of vowels/short vowels on reading comprehension (studies: 1999 & 2001) should take into account the sizeable difference between the means, and the measurement scale employed in the study.

2.1.5. The Role Of Short Vowels And Context In Reading: Empirical Studies From Hebrew

Although it seems that, in general, most of the studies conducted on Hebrew orthography did not attempt to examine directly and exclusively the role of short vowels (referred to as pointings) and context in reading Hebrew, their findings do explain implicitly the role of short vowels and context in reading Hebrew orthography. However, two different conclusions were found in regard to short vowels in the literature on Hebrew orthography. The first conclusion suggested that short vowels did not facilitate word recognition and the second conclusion suggested a neutral role for short vowels in reading Hebrew.

The first conclusion came from Koriat's (1984) three-experiment study on the lexical decisions of pointed and unpointed non-homographic words which investigated if "phonological encoding is necessary for lexical access in Hebrew" (p. 229). In the first experiment, 40 Hebrew-speaking college students were divided into two groups of 20 and assigned to two reading conditions: pointed and unpointed. The task for the participants was to classify the letter strings into words and nonwords with the response latency measured to the nearest millisecond. By priming the targeted real words (in both cases pointed and unpointed and with 4 levels of string length, 2-5 letters) by semantically related words, or semantically unrelated words, the author attempted to investigate the influence of context in relation to vowelization (pointing) on word recognition. The study's results revealed no main effect for pointings: pointing was not a facilitator in Hebrew word recognition despite its partial effect on error rates as a result of the phonemic mediation (mean error rates were 2.9 % for pointed words versus 5.3 % for unpointed words) and on response times to nonwords (14 msec advantage for the pointed nonwords). Further, the analyses revealed neither a significant effect for word length nor a significant interaction between word length and pointing. However, the author indicated that the 5-letter words seemed to require longer response than the short words, and the advantage was for the pointed words. Further, the analyses did not show that the effect of pointing increased as a function of increasing string length. In terms of context, the result revealed a significant effect for context, but no interaction between context and pointing (37 msec for pointed words versus 43 msec for unpointed words).

Those results led Koriat (1984) to suggest that the lexical access in Hebrew is not phonologically mediated, but direct, visual-to-meaning. However, for researchers who believe that short vowels are indispensable to the reading process (e.g., Abu-Rabia), Koriat (1984) ignored the homographic phenomenon in Hebrew by presenting his subjects with words that had only one legal pronunciation in its unpointed form. Furthermore, Koriat (1984) stated explicitly that in this study "the words employed were selected from the most frequently used 3,000 words in primary school materials" (Koriat, 1985, p. 38).

For experiments 2 and 3, 24 college students participated in each. The two experiments were identical to experiment 1 except in experiment 2 only words were used; however, the stimuli were non-homographic words, and the dependent variable in both experiments was naming latency.

Their analyses revealed that the effects of the three manipulated variables, pointing, context, and word length were significant. However, the interaction between those variables was not. Pointed words and non-words were named faster than their counterpart unpointed words/non-words. Further, the mean response latencies increased as a function of word length, and this increase was much more steady within the non-words.

The main conclusion of both experiments was that "although pointing has little effect on lexical decision, it seems to aid pronunciation" (p. 235). Hence, for word recognition in Hebrew, an update for the suggested one-mechanism (direct route) model necessitated the inclusion of a phonological mediating mechanism (indirect). Thus, in a lexical access, being unaffected by the presence of pointings, the direct route was faster; however, in word naming, being affected by the presence of pointings, the indirect route was faster (Koriat, 1984; Shimron, 1993).

Because his previous study included only the most frequent words, Koriat's (1985) study manipulated word frequency in addition to the other factors. Thus, word frequency (low and high), word length (from two to five consonantal letters), pointing form (pointed or unpointed), and context (related or unrelated) were the independent variables in the study. Forty-eight Hebrew-speaking college students participated in this study. The task was similar to the previous study (Experiment 1, 1984). Three main findings were revealed. First, although the percent errors were greater for the low-frequency words (13.0 % versus 0.8 %), pointing enhanced the processing of low frequency words more than that of high frequency words. On average, it reduced the incidence of errors by 4.6 percent for low frequency words and 0.7 percent for high-frequency words. Context, on the other hand, reduced incidence of errors by 8.7 percent for low-frequency words versus 0.9 percent for high-frequency words. For error incidence reduction, the effects of pointing and a "related context" were found to be "almost perfectly additive for the low-frequency words" (p. 40). On the other hand, the response latencies were found to be longer for low-frequency words (125 msec difference), and "a related context" speeded the response time (51 msec difference), and that was obviously stronger for low-frequency words. Further, the effects of pointing and a related context were found to be additive, and that was stronger with low-frequency words. Since the vowelization facilitation was the same for the low frequency words regardless of their length, a strategy in which the participants derived the phonological code on the basis of the word as a whole, not a serial processing of the letters from grapheme to phoneme, was assumed. Second, the presence of context in the form of related semantic priming did not compensate for the absence of pointing (vowels). The effect of context was found to be additive to the effect of pointing (vowels). Finally, the response time latency for both pointed and unpointed nonwords was identical. This is a surprising result because "Pointing should therefore have a beneficial effect, since it reduces greatly the number of phonological representations to be tested" (Koriat, 1985, p. 43).

On the other hand, the study that corroborated the second conclusion that suggested a neutral role of short vowels in reading Hebrew was Shimron and Sivan's (1994) two-experiment study. In this study, the purpose was to examine the effect of "the orthography of readers' first and second languages" on their reading time and comprehension (p. 5). In the first experiment, a bilingual group of 24 postgraduate students and faculty whose first language was Hebrew and a bilingual group of 12 postgraduate students and faculty whose first language was English were the participants. The task for the group whose L1 was Hebrew was to read "two passages in the Hebrew versions": vowelized and unvowelized. The task for the group whose L1 was English was to read "two passages in the English versions." There were two multiple-choice questions after each passage to assess comprehension.

The main finding of this experiment was that

> English texts were read significantly faster than were Hebrew texts when vowelized and unvowelized texts were combined, even though the English texts contained about 40% more words (48.8 sec for English; 68.8 sec for unvowelized Hebrew; and 69.0 for vowelized Hebrew). There was no significant difference between reading the voweled and the unvoweled Hebrew texts. (Shimron & Sivan, 1994, p. 17)

In terms of comprehension, although there was no significant main effect, the unvowelized Hebrew texts were found to be comprehended less effectively than both the vowelized Hebrew and English texts (1.75 correct answers for English; 1.42 for unvowelized Hebrew; and 1.75 for vowelized Hebrew). According to the authors, the unvowelized Hebrew texts "appear to have been comprehended less effectively than both English and voweled Hebrew texts" (p. 17).

In reaction to their concern that the results of their previous experiment could be attributed to the participants' reading skills, Shimron and Sivan replicated the first experiment but used a within-subjects design. There were 24 participants of whom two-thirds had earned a PhD and one-third were at the master's level. Each participant read the same four texts that were used in the previous experiment: two passages in English, and two in Hebrew (vowelized and unvowelized).

The findings of this study were the same as the previous experiment. English was read faster than the vowelized and unvowelized Hebrew texts (49.8 sec for English; 57.2 sec for unvowelized Hebrew; and 53.5 sec for vowelized Hebrew). According to the authors, obtaining such results could be attributed to either the excessive affixation of the Hebrew language and its effect on comprehension or to the different orthographies, e.g., the script shape and the reading direction. The reading time for vowelized and unvowelized Hebrew was on average the same. However, the vowelized Hebrew texts were found to be comprehended better than their counterpart unvowelized texts. This last finding was attributed to the presence of pointings (vowels) which facilitated memory retention in a way that improved text comprehension.

Furthermore, by conducting a two-tailed *t*-test, the authors found that, unlike the comprehension of English versus Hebrew vowelized texts, the comprehension of English texts was significantly better than the comprehension of Hebrew unvowelized texts.

Navon and Shimron (1981) demonstrated such an effect for the short vowels in word recognition despite the fact that the short vowels did not contribute any more information to the letters. To address the question of whether reading Hebrew involves an automatic translation of phoneme to grapheme, Navon and Shimron (1981) asked 36 native Hebrew college students to name individual words under three conditions. For each group, the first half of the group of words was correctly vowelized; however, the second half belonged to one of the following categories: unvowelized words that have only one legal reading, incorrectly vowelized words that lead to graphemic distortion but preserve the phonemic structure, and finally, incorrectly vowelized words that lead to graphemic and phonemic distortion. The results revealed that, in contrast to the graphemic distortion which was found not to be significantly different in the unvowelized reading condition, "distortions which change the phonology of the word do inhibit appropriate naming" (p. 103). However, their finding from the previous experiment can account for an explanation other than the phonological conflict that results from the phonemic distortion manipulation, so as to attribute such a result to the dissimilarities between the visual graphemic signs that result when the phonological structure is preserved and the visual graphemic signs that result when the phonological structure is not preserved.

In the next experiment, Navon and Shimron tested the aforementioned explanation by conducting "the pairwise visual discriminations between the vowels signs" card-sorting discriminating task. A different sample of participants was asked to sort out 32 cards that matched the distortion conditions in Experiment 1. In one task, the participants were asked to discriminate between symbols that are associated with different phonemes in one task and between symbols associated with the same phonemes in another task. The result demonstrated no difference in performance between the two tasks, that is, "signs signifying the same phoneme seem not to be less perceptually distrainable, that is, not more visually similar to each other, than are signs signifying different phonemes" (p. 104). Further, in Experiment 1, according to the authors, the "absence of vowel signs did not produce any significant loss in speed" compared with the graphemic distortion condition as a result of asking the participants to ignore the short vowels while naming the words.

For this reason, Navon and Shimron (1981) conducted Experiment 3 in the same way they conducted Experiment 1, but with slight modifications: the participants were not told to ignore the short vowels and only the unvowelized and the graphemically distorted vowelization was tested. The results did not accord with the results from Experiment 1, that is, "whereas graphemic distortions were clearly not detrimental under the instructions given to subjects in this experiment, the absence of any vowel signs was inhibitory" (p. 105). The authors' conclusion was that short vowels facilitate word recognition for isolated words despite the fact that adding the short vowels to the letters was redundant and did not contribute any more information to the letters; such a demonstration suggests that "advantages of redundancy may not vanish with extensive practice" (p. 106); thus, reading Hebrew involves essentially and automatically a grapheme to phoneme translation.

In a three-experiment study, Frost, Katz, and Bentin (1987) compared the impact of three types of orthographies that differed in depth on word recognition: Hebrew (deep), English (average), and Serbo-Croatian (shallow). In the first experiment, they tested the hypothesis that "the deeper the orthography is, the more the reader will depend on lexical information for naming" (p. 106). Three samples of 48 undergraduate native speakers of each language were divided into two groups of 24 participants and assigned to one of two tasks: lexical decision or naming. The participants in each group read 48 words of low and high frequency and 48 nonwords of their language. According to the authors, the results "substantiated the hypothesis that the deeper the orthography is, the more lexical mediation occurs" (p. 107). That is,

> the lexical status of the stimulus (i.e., being a high-frequency word, a low-frequency word, or a nonword) affected the speed of naming in Hebrew more than in English and in English more than in Serbo-Croatian. Furthermore, only in Hebrew were the effects on naming very similar to the effects on lexical decision. (p. 113)

In order to exclude other interpretations to their previous finding where the lexical status of the stimulus was manipulated, Frost and colleagues in experiment 2 manipulated the context by priming the targeted words with semantically related words or semantically unrelated words. According to the authors, "the results suggested that semantic priming (a factor that presumably operates on the lexicon) facilitates naming in Hebrew and has a smaller effect in English, whereas in Serbo-Croatian it has no effect at all" (p. 113).

Experiment 2 revealed that, unlike Serbo-Croatian, the naming task of Hebrew was slower when participants read words that followed nonwords than when they followed words, a finding that could be attributed to the naming strategy switching that characterizes the deep orthography reading process. For this reason, experiment 3 was designed to examine this hypothesis by including a large proportion of nonwords (80 % of the stimuli words in the experiment). The result demonstrated that the phonological route in reading Hebrew was dominant to the extent it "speeded naming at the expense of treating many words as nonwords" (p. 113). However, including a large proportion of nonwords had small effect on the English naming task and no effect on the Serbo-Croatian naming task. In the case of a deep orthography, as in Hebrew, the general conclusion of these three experiments can be suggested as that, "Hebrew readers normally use an orthographic code to access the lexicon for naming but may abandon it when it becomes intractable (as when he or she must name many nonwords, which have no lexical representation)" (p. 113).

Bentin's and Frost's (1987) two-experiment study assessed the effects of semantic and phonological ambiguity on word recognition in Hebrew: lexical decision (experiment 1) and word naming (experiment 2). For both tasks, the stimuli were manipulated on the basis of ambiguity: homographic versus non-homographic, word frequency: high- versus low-frequency, and vowelization (pointing): vowelized versus unvowelized. Further, a group of nonwords: real nonwords (in the so-called, "optional" condition) and nonwords as a function of the wrong vowelization (in the so-called, "obligatory" condition) were added for control purposes. The participants in experiments 1 and 2 were 96 and 64 undergraduate students, respectively. In experiment 1, the results on the homographic stimuli, generally speaking, showed that the reaction times (RT) for the unvowelized consonant strings were on average shorter than the RT for their vowelized "alternatives." Further, the reaction times to the high-frequency consonant strings were on average shorter than their low-frequency counterparts. For the non-homographs, the only significant effect was found for word frequency, but no effect for "vowels" signs or an interaction between vowelization and word frequency was found; low-frequency non-homographs took longer to respond to than their high-frequency counterparts.

In the word naming task, for the non-homographs, the analyses did not show any significant effect for the presence of "vowels" signs; the only significant difference for the effect of vowelization was found for the vowelized low-frequency homographs which took, on average, more time to name than their unvowelized counterparts. Those results led the authors to conclude that,

> [a]subsequent consideration of the vowel marks had no significant effect on the processing time if they were congruent with the subject's initial response tendency (as was the case with the high-frequency alternatives or with the unambiguous words), but vowel marks required a time consuming revision of the output pattern if they were incongruent with the initial response. (Bentin & Frost, 1987, p. 20)

Frost's (1994) four consecutive experiments investigated the applicability of the so-called, "orthographic depth hypothesis (ODH)" to Hebrew; that is, whether "differences in orthographic depth lead to differences in processing printed words." In experiment 1, the stimuli were a group of non-homographic words of both high- and low-frequency, and "pronounceable" nonwords. In two tasks (word naming and lexical decision), those stimuli were presented either pointed or unpointed. In a between-subject design, four 40-participant blocks were constructed and assigned to either reading condition: pointed/unpointed, and to either task: word naming/lexical decision.

The analyses revealed a main significant effect for the stimulus type (high-frequency, low-frequency, and word frequency). Further, a significant effect for word frequency was found for the lexical task of both representations: pointed/unpointed, and for the word naming task of only unpointed representation; however, the difference in naming latencies of the pointed representation was not significant. In general, high-frequency words were named on average faster than low-frequency words. This last indifference finding was attributed to the "prelexical" conversion rules employed in a naming task as result of the presence of pointings. On the other hand, the unfamiliarity factor was used for justifying the slow naming latencies for the pointed nonwords compared with the high-frequency words.

In the second experiment and with the same design, the effects of semantic factors (related/unrelated context) on word naming of pointed/unpointed non-homographic stimuli were assessed.

In a between-subject design, 96 participants, 24 each, were assigned to each of four reading conditions. In general, the analyses revealed that, unlike the pointed words, context facilitated significantly the naming of unpointed words (531 and 509 msec for the unrelated and related unpointed print, respectively). Further, examining the naming latency means showed that the naming of the pointed words was on average faster than the naming of the unpointed words (512 msec and 531 msec, respectively). Accordingly, Frost's conclusion about this result was that, "semantic facilitation is stronger in the deeper than in the shallower Hebrew orthography" (p. 122).

In the third experiment, the only difference from experiment 1 was that the vowel signs were presented either simultaneously with the consonants or in a lagged-interval of 100, 200, or 300 msec. By presenting the consonants first and then imposing the vowel signs at intervals, the question was whether the participants would delay their response (naming as one task, and lexical decision as the other task). Note that the participants were informed of the manipulation of the vowels-interval presentation, and further, they could communicate their response anytime without waiting for the vowels to appear. Further, note that the target words were non-homographic. Thus, in addition to other indications from word frequency and manipulation of nonwords, holding the response until the vowels were presented should point out the participants' preference for a "prelexical assembly of phonology." Although the analyses revealed that the lagging effect of vowels was much greater in the naming task than in the lexical decision task, its effect on the low-frequency and nonwords in the lexical decision was "somewhat greater," particularly the nonwords. Combining all findings of this experiment suggests that both strategies, address and assemble, are used for both lexical decision and word naming, and preferring one to the other is based on the type of stimulus: word versus nonword and high- versus low-frequency.

Experiment 4, on the other hand, was identical to experiment 3 except that the target words were homographs (heterophonic homographs). The analyses revealed the same aforementioned findings as from experiment 3. That is, while the lagging effect was "very low" in the lexical decision task, it was high in the word naming task. The consonant cluster was sufficient for lexical decision. However, for word naming, participants had to hold their response until the vowels were presented in order to choose the accurate form of the heterophonic homograph.

The general conclusion that can be extracted from these results is that the presence of vowel signs "encourages the reader to generate a prelexical phonologic representation for naming" (p. 127). That is, these results would support the proposal that the default strategy in reading shallow orthographies is the prelexical phonology assembly.

2.1.6. The Role Of Short Vowels And Context In Reading: Empirical Studies From Persian

Although the effect of context on Persian orthography was directly examined, it seems that, in general, those studies did not attempt to examine directly and exclusively the role of short vowels (referred to as "vowels") on reading Persian orthography. However, the findings of those studies did explain explicitly the role of context, and implicitly the role of short vowels in reading Persian orthography.

Researching the literature on Persian orthography (it is a slightly "modified" Arabic orthography, but for the purpose of this literature review and for clarity it will be referred to as Persian orthography), particularly its short vowels, in relation to the reading process reveals (to the researcher's best knowledge) that there is only a narrow range of research done on this area. There appears to be only one single author who has investigated Persian orthography, particularly its short vowels in relation to the reading process. Baluch (1991-1996) investigated the impact of Persian orthography on the reading process in several consecutive studies that can be organized chronologically. He conducted several experiments to assess the effects of ambiguity/unambiguity of a word per se and in combination with other factors such as context and word frequency (high- versus low-frequency) on the word recognition of Persian orthography (Baluch & Besner 1991; Baluch, 1993, 1996).

In their attempt to investigate the effects of deep and shallow Persian orthography on the word naming by Iranian adults, Baluch and Besner (1991) conducted four consecutive experiments manipulating semantic factors (context: related versus unrelated; and word frequency: high- versus low-), phonological factors (short vowels: presence versus absence), and nonwords (inclusion versus exclusion). In the first experiment, in a between-subject design, 34 Persian-speaking college students and professors were asked to read aloud a group of words (and nonwords) that were primed with semantically related or unrelated words. Those target stimuli were either "transparent" (as a function of the presence of vowels) or "opaque" (as a function of the absence of vowels); however, the nonwords were only transparent as a function of the presence of vowels. The analyses of the reading time latencies (RTs) revealed that an interaction between both factors, context and stimulus type ("transparent" versus "opaque") was found. Unlike transparent words, naming "opaque" words was facilitated by context (605 msec with context and 626 without context). Further, the authors reports that, in contrast to the "opaque" words, the "transparent" words were not "sensitive" to context and word frequency, a result that, according to the authors, "suggest[s] that consistent spelling-sound correspondences in a script can have a dramatic effect upon oral reading under certain circumstances" (Baluch & Besner, 1991, p. 647). Another result the analyses revealed was the mean effect of the stimulus type: examining the means showed that the "transparent" words took on average less time to name than the "opaque" words (556 msec versus 605 msec, respectively, for the related context; and 558 msec and 626, respectively, for the unrelated context). On the other hand, the transparent words were named significantly faster than the nonwords.

For generalizabilty purposes, the authors repeated experiment 1 with a different sample of subjects and excluding the nonwords type which, according to them, may "bias subjects to read the transparent words by the same routine as that employed for reading the nonwords" (Baluch & Besner, 1991, p. 647). The results revealed main effects for stimulus type and context, but no interaction. Context facilitated the speed of word reading for both "opaque" and "transparent" words. Further, the authors reported that their correlation procedure showed that, "word frequency exerts an effect on the naming of both opaque and transparent words" (p. 648). Because context and word frequency affected both stimulus types, the authors' explanation for such results was that, "subjects do not typically use the nonlexical routine to read words. Instead, they rely upon the addressed routine to read both types of words when there are no nonwords in the stimulus set" (p. 648).

In their attempt to determine whether the previous explanation still held, the authors examined the word naming of only transparent words in two experiments labeled, Experiment 3A and Experiment 3B. These experiments were identical except that in Experiment 3B, a group of transparent nonwords were mixed with the transparent words. Both transparent words reflected word frequency: high- and low-frequency.

In Experiment 3A, the participants' task was to name the transparent words of both high- and low-frequency; while, in Experiment 3B, the task of a different group of the participants was to name the same transparent words as Experiment 3A, but mixed with transparent nonwords. The analyses of Experiment 3A (only words) revealed a significant effect for word frequency; high-frequency words were on average named faster than low-frequency words (562 msec and 597 msec, respectively). However, in Experiment 3B (words and nonwords), the analyses revealed no significant effect for word frequency; only 11 msec difference was found (546 msec and 557 msec, respectively). Further, the difference between transparent words and transparent nonwords was found to be significant and in favor of words which took on average less time to name than the nonwords. The general conclusion from these experiments seems to have been that both routes, assemble (nonlexical) and address (lexical) operate in word recognition of Persian orthography, and that the dominant route would be the address route, direct visual to meaning, unless the adult readers of Persian are forced to use the assemble route as a result of nonwords inclusion.

Baluch (1993) investigated the effect of orthographic transparency on lexical decision of Persian-speaking adults (10 participants). The task was to read a group of words and nonwords and decide whether the stimulus was a word or nonword. The words were manipulated in terms of transparency (transparent versus opaque) and word frequency (high- versus low-frequency). In addition to the significant main effects of both stimulus type and word frequency, the analyses revealed a significant interaction between stimulus type and word frequency. Examining the simple main effects shows that, in contrast to the high-frequency words, the effect of stimulus type for low-frequency words was significant.

The reaction times on average were larger for the “opaque” low-frequency words than for the transparent low-frequency (815 msec and 719 msec, respectively). However, for the high-frequency words, no significant difference was found between the “opaque” and the “transparent” words (683 msec versus 662 msec; only 21 msec difference). Further, regardless of the stimulus type, the low-frequency words always took on average more time to name than their counterpart high-frequency words. According to the author, those results suggest that, “the transparency of the word’s spelling [in Persian] is not crucial in a lexical decision task” and that, “recognition of words [Persian] is achieved primarily through visual orthographic information, regardless of their orthographic transparency” (Baluch, 1993, p. 26).

In his attempt to assess the effect of print exposure on word recognition in Persian orthography, Baluch (1996) conducted a word naming task on two different populations that reflected reading exposure experience: "experienced" readers (20 temporary Iranian residents of a foreign country) and "previously experienced" readers (20 Iranian permanent residents of a foreign country). In a between-subject design, the two groups were asked to read aloud a group of high- and low-frequency transparent words. In addition to the main effect for word frequency (high- being faster than low-frequency words), a significant interaction between word frequency and group type was found. Only for "experienced" readers was the difference between high- and low-frequency words significant (572 msec and 608 msec, respectively, for the "experienced"; and 624 msec and 637 msec for the "previously experienced"). Further, the difference in speed naming of the high-frequency words was significant and in favor of the “experienced” readers who took on average less time to name them. However, for the low-frequency words, no significant difference was found between the two groups.

The general conclusion from those studies was that the essential factor in the reading process of Persian orthography is not the phonological factor, e.g., the presence or absence of "vowels," but on the contrary, the semantic factors as represented by word frequency and context.

2.1.7. Summary

Taking into account the different populations among those studies (only graduate/undergraduate students for Hebrew and Persian; and elementary and high school students, with one exception for Arabic studies), the different tasks employed (word naming versus lexical decision versus both lexical decision and word naming), the type of stimuli used (homographic versus non-homographic versus both homographic and non-homographic), and finally the purpose of the study, summing up the previous studies, particularly Arabic and Hebrew (since both word recognition and comprehension were assessed in those languages), four major conclusions may be drawn. First, short vowels play two roles in Semitic orthographies, particularly in Arabic orthography: a necessary and indispensable role in aiding reading accuracy for isolated words, and an additive role in reading connected texts for both reading accuracy and comprehension. The second conclusion is that context is a major advantage for both skilled and poor readers in reading Arabic (consistent with Persian studies, too, e.g., Baluch & Besner, 1991), especially in the absence of vowels. Such conclusions, despite Frost, Katz and Bentin (1987), Frost and Bentin (1987), Koriat's

(1984) initial conclusion, and Navon and Shimron's (1981) findings (which did not show any role for vowels on lexical decision), are in accord with findings obtained from Hebrew studies, for example, studies by Navon and Shimron (1981), Koriat (1984, 1985), and Abu-Rabia (2001) which involved both Arabic and Hebrew orthographies.

According to Abu-Rabia, such a contradiction in the findings on Hebrew can be attributed to the fact that

> the researchers [referring to Frost, Katz & Bentin, 1987] 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. (Abu-Rabia, 1996, p. 633)

In terms of comprehension, in both Arabic and Hebrew vowels were found to significantly improve reading comprehension even for highly skilled readers, due to "the additional phonological information conveyed by vowels" (Abu-Rabia, 2001, p. 52). However, there was no positive correlation between reading comprehension results and reading accuracy results. This mismatch, according to Abu-Rabia, is due to a unique feature of Arabic morphology. That is, in reading unvowelized texts,

> the reader's cognitive effort is focused on morphological aspects of words: the *trilateral/quadrilateral-root* model of words for lexical access. Sentence context and prior knowledge strengthen initial understanding, which compensates (Stanovich 1980) for the absence of vowels. The cognitive effort is focused more on deep reading comprehension through visual-orthographic roots, and not on retrieval of phonological representations for each word in the text. Relying on context and schema compensation (Rumelhart 1984) is one possible way that readers make mistakes, so reading with unvowelized texts is less comprehensible. (Abu-Rabia, 2001, p. 53)

The third conclusion is that low frequency has a noticeable effect on word recognition: speed and accuracy. This last conclusion was found to be consistent for all the reviewed orthographies: Arabic, Hebrew, and Persian (modified Arabic orthography).

Finally, a lexical route in the word recognition of Hebrew and particularly Persian is suggested to be dominant regardless of whether the script is shallow or deep (Baluch, 1996). However, a default strategy of a prelexical phonology assembly in reading the shallow orthography of those languages is challengingly proposed (Frost, 1994).

2.1.8. Conclusion

The aforementioned conclusions, obtained particularly from Arabic empirical studies, contradict solid findings obtained from studies conducted on Latin orthographies. The latter studies indicate that automaticity in word recognition is required as a first stage in reading; insufficient word recognition leads the poor reader to rely on context; the highly skilled reader does not rely on context in word recognition (Stanovich, 1986; Perfetti & Roth, 1981; Stanovich, 1980; Perfetti, Goldman & Hogaboam, 1979).

According to these studies, skilled readers' word recognition is so automatic that they can assign their attention to the higher-level tasks of the reading process. For example, they can focus on constructing the "microstructure" and the "macrostructure" of the text while they are reading (Kientch, 1998; Fletcher, 1994; van Dijk & Kintsch, 1983). Further, they can give their attention to creating their personal mental representations (Zwaan & Radvansky, 1998; Fletcher, 1994).

Owing to the diglossia in the Arab world, spoken Arabic is different from literary Arabic. According to Sampson (1985),

> there are considerable differences in vocabulary, grammar, and phonology between written and spoken varieties of Arabic. It is possible to transcribe Arabic speech directly into Arabic script, but such writing strikes Arabs as bizarre – the forms of spoken Arabic are perceived as simply inappropriate for writing down. Written Arabic can be spoken, but this will be done only in unusually formal speech-situations such as public lectures. (p. 27)

As a result, the vocabulary will be of low frequency and not from the everyday language children and adults hear or practice at home; neither is it the language spoken in their community. Further, as Ayari (1996) and Abu-Rabia (2001) put it, the children in schools will be taught the Literary Arabic almost, they claim, as a second language, owing to the fact that some of the short vowels are syntactic vowels which children don't start to learn until grade four and which they don't master, if they ever do, until the eleventh grade or beyond. The short vowels that have syntactic function are case-ending markings. Positioning these case-ending markings requires an analytic faculty that is not innate, but learnable. Arab readers need to recall a linguistic knowledge consciously in order to figure out the case-ending markings of each word in the sentence.

The existence of sublexical accessibility in word recognition (Cole, Segui & Taft, 1997; Taft, 1981) and the results of Badry's study (1982) on the morphological characteristic of the *trilateral*-root model of words in Arabic, and its effect on primary schoolchildren's creative written production of novel verbs to express new concepts, indicated that such a *trilateral*-root model of words plays an important role in comprehending texts written in Literary Arabic. However, in the absence of short vowels, processing an affixed word can make word recognition slower and more cumbersome. As Shimron and Sivan (1994) express it, "to comprehend an affixed word, the reader needs to parse the word into its morphemes. Only then is the reader ready to incorporate the meanings derived from the word with the structures of meaning already constructed from the text" (p. 21). In this study, Shimron and Sivan found that although English texts contained about 40 percent more words than do their Hebrew translations, the native Hebrew readers read English texts faster. Therefore, attributing reading comprehension to vowelization by claiming that short vowels facilitate retention in working memory needs more supportive evidence.

Though Hebrew and Arabic orthographies are similar, the studies on these orthographies in relation to short vowels have demonstrated noncomplimentary findings in terms of the effect of short vowels and context on reading accuracy and comprehension (Koriat, 1984). For example, Abu-Rabia (2001 & 1999) found that Arabic vowelized texts were comprehended better than the unvowelized texts; however, Shimron and Sivan (1994) stated that, "the comprehension of the Hebrew vowelized texts was <u>nearly</u> significantly better than was the comprehension of the Hebrew unvowelized texts" (p. 5). Frost and Bentin (1992a), on the other hand, found that Hebrew readers maintain without decay for 750 ms from stimulus onset all possible meanings for a heterophonic homograph and with context they select the appropriate one. This finding suggests that "vowels in Hebrew are not essential for locating a specific lexical entry" (Abu-Rabia, 2001, p. 44). In addition to these findings, Abu-Rabia (2001) stated that, "the Arabic reading comprehension results did not positively and significantly correlate with the reading accuracy results. Further, the multiple regression procedures did not reveal significant prediction by these reading accuracy scores for the reading comprehension results" (p. 52). This inconsistency should not be surprising due to the fact that in comprehension, Arabic readers use their knowledge of the morphological root for accessing the meaning of the words.

Indeed, reviewing the statistical analysis of this 1999 study shows that the means of the two reading conditions in both experiments were very close; that is, the difference between them was very slight, especially when we realize that the maximum score was 10: *M* 7.20 with *SD* 1.70 for the vowelized condition and *M* 6.10 with *SD* 2.22 for the unvowelized condition. In the second experiment, the means were *M* 6.34 with *SD* 1.58 for the vowelized condition and *M* 5.46 with 2.00 *SD* for the unvowelized condition with a maximum score of 7. Note that the measurement scale involved one point for each correct response, with an ultimate score of 10/7 points.

Abu-Rabia (2001& 1999) used the multiple-choice test for measuring comprehension, a test which has received criticism, e.g., that it is text-independent (Bernhardt, 1991) and that guessing is possible in this type of test. Furthermore, attributing comprehension to the representation of the short vowels is questionable since Abu-Rabia's studies included the 'strengthening' (represented by the *shaddah* sign, ـّ) as part of the short vowels signs where in fact, the strengthening marking, *shaddah*, is different marking that when represented with a grapheme indicates that this grapheme is doubled (geminated). Thus, the representation of the short vowels was not scientifically and experimentally manipulated to the degree that the extraneous variables were controlled.

Bowing to these realities and incorporating, in addition to the multiple-choice test, a better indicator of readers' performance, that is, retelling (recall) different results may be found. As Lipson and Wixson (1997) put it:

> [A]rmed with a representation of the important elements of a particular text, it is possible to elicit recalls and assess lengthy selections with high levels of reliability … Retelling [procedures] can add immeasurably to our understanding of readers' comprehension because they allow us to get a view of the quantity, quality, and organization of information construct during reading. (pp. 283-284)

Further, the representation of short vowels needs to be manipulated. That is, to differentiate between full consonants representation and full morphological short vowels representation was necessary in order for the current study to exclude confounding effects of other diacritics (other than short vowels, e.g., *shaddah*, case-ending markings, and *skun*) and in order to determine the role of short vowels in comprehension, and further, in reading accuracy.

Therefore, the position this study takes is that although short vowels have an effect on word accuracy, and although this effect is gradually matched to the frequency level as presented by the two expository texts that reflect both high- and low-frequency vocabulary texts included in this study, the short vowels have no effect on the adult students' comprehension no matter what type of texts they read.

Further, in terms of reading accuracy, the current study predicts that a positive and significant correlation between the comprehension results and the reading results will be found when the Arabic readers read unvowelized texts that have a high-frequency vocabulary; however, when reading unvowelized texts that have a low-frequency vocabulary, a positive significant correlation may not be found. On the other hand, when reading vowelized texts despite the frequency of the vocabulary, the correlation between the comprehension results and the reading accuracy results will be positively significant.

In terms of context effect on skilled readers, Abu-Rabia's (1995) study revealed that contrary to the reading process of Latin alphabet languages, skilled readers in Arabic rely heavily on context to compensate for the missing short vowels in the script. His study was based on the fact that basic verbal sentences represent the majority of sentence types in Arabic.

Abu-Rabia's (1995) conclusion contradicts solid findings obtained from studies conducted on Latin orthographies. That is, automaticity in word recognition is required as a first stage in reading, and insufficient word recognition leads the poor reader to rely on context (Stanovich & West, 1987; Perfetti & Roth, 1981; Stanovich, 1980). These Latin-based orthographies share with Arabic the depth of the orthography when the short vowels are not presented and the transparency of the orthography when the short vowels are presented. In fact, not just the short vowels, but both the short vowels and the diacritics must be included in combination for a transparent orthography to be formed. That is, adding only short vowels can be redundant. To illustrate, the provision of short vowels to a word such as, "عالمة ": ‘ female scholar,’ does not contribute any more information beyond the information conveyed by the consonant string. That is, either way, vowelized or not vowelized, the word will have one legal reading. Further, for a word such as, "نجّارة ": ‘ a female carpenter,’ adding the short vowels to it, "نَجَّارَة ": ‘ a female carpenter,’ does not contribute any more information beyond the information conveyed by the consonant string; only one legal reading is accepted. In fact, when removing the diacritic, *shaddah*, ‘ ّ ’, strengthening, from the word, "نجّارة ": ‘ a female carpenter,’ an ambiguity may arise regarding whether the writer meant a gerund or a job (in terms of saying the word, but not in terms of recognition; both words have the same meaning which is based on the same root) That is, in the absence of the diacritic, *shaddah* from a word such as, " نجارة ," the root, ن ج ر , in both spoken and written Arabic, is, as Frost and Bentin put it for Hebrew, “the most important determinant of meaning” which would “usually specifies a constrained semantic field that constitutes the basic information regarding the meaning of the word” (Frost & Bentin’s comments on the root in Hebrew, 1992b, p. 39).

This ambiguity can be resolved by adding only one short vowel, and that is, *fatha*, ‘ َ ’. So, adding other short vowels to the word, نجارة , will add no more information beyond the information conveyed by the consonant string; they become redundant. However, for a word such as, "عمار ": ‘a common masculine name, adding the diacritic, *shaddah*, ‘ ّ ’, by itself or in combination with short vowels adds no more information to the consonant string; the presented consonants are sufficient for saying it correctly and recognizing it. In fact, resolving an ambiguity can be achieved by adding a short vowel only or a diacritic only such as, *shaddah* or *skun*. For example, adding one short vowel to the first consonant of a verb is enough to indicate that this verb is a passive voice and not an active voice. In fact, with the absence of short vowels and *shaddah*, other constraints come from the immediate adjoining word, or from the affixation clues in the word. Adding only the case-ending marking signs to the last consonant will constrain its multiple readings; that is to say, the constraint will specify that this word should be read as a noun and not as a verb or vice versa. In general, the facilitation of those constraints will always be recognized in terms of pronouncing the words and not in terms of accessing meaning. As was presented earlier, this facilitation can be attributed to the morphological characteristic of words in Arabic: the *trilateral/quadrilateral-root* model of Arabic word (Abu-Rabia, 2002).

Some Latin orthographies share with Arabic the characteristic of affixation, e.g., Spanish. Thus, this current study goes against Abu-Rabia's (1995 & 1997b) findings and claims that the basic verbal sentence type used to test the effect of context in reading Arabic is misleading. It is misleading because this type of sentence starts with the basic verb which is homographic. Arabic sentences are verbal and verbless (Fassi, 1993). The author used sentences that begin with basic verbs and propositions that had what Frazier (1987) called, "the multiple subcategorization frames"; the reader who reads a sentence that starts with items from this category will be, necessarily, garden-pathed. In such a "Garden Path" phenomenon, even the skilled reader, in Latin alphabetic languages, such as English, will need to rely heavily on context to comprehend the sentence and to recognize the words. In fact, in English the reader may need context for both to pronounce some words and to comprehend their meanings. In

Arabic, on the other hand, the claim is that context will help in saying the right form of the sentence initial which is a heterophonic homograph that has more than one legal form or reading. For convenience, for the case of Arabic, homograph will mean heterophonic homograph. However, context will not help in recognizing the initial homograph in the sentence, neither will it help in comprehending the sentence. That is, the Arab reader does not need to regress and reanalyze the sentence in order to understand the sentence because of the unique morphological aspect of Arabic. Affixation and root-based language will help the reader to activate the common meaning among the activation frames of the initial word, a process that will not face the criticism it received in English, due to the fact that activating multiple representations in Arabic is very often of the same core meaning. Thus, only one general core meaning that all forms of the word share will be activated, a process that may not require the load that targeted the multiple-activation hypothesis. However, those assumptions need more investigation.

The Modern Arabic Language permits flexible sentence order: the Modern Arabic sentence starts with either verb or noun and there is no preference for one over the other. Indeed, although Classical Arabic and Modern Standard Arabic use both word orders (V + S + O & S + V + O) based on stylistic variations; and although the VSO is the basic word order in Classical Arabic, Modern Standard Arabic (MSA) on the surface permits all variations: VSO, SVO, VOS, and OVS (Mohammad, 2000). The dominant word order in Classical Arabic is V + S + O, while, to some linguists, S + V + O is the dominant word order in Modern Standard Arabic (Watson, 2000; Emonds, 1980; Borer & Tuller 1985, cited in Mohammed, 2000).

Thus, a representative selection of sentences should be not only of the basic-verb type in particular, that is, V-initial sentences, or of the prepositional sentence type, that is, P-initial sentences (as is the type of sentences chosen by Abu-Rabia, (1995), or homographic words in both situations, but of all types that Arabic allows. Therefore, the current study predicts that with the representative sentence types or orders that Arabic allows, Arab readers, particularly the skilled readers, even with the absence of the short vowels or diacritics, do not need context to recognize the words within any type of sentence. It makes no difference whether the sentence starts with a homograph or non-homograph due to the affixation feature of Arabic morphology and the fact that not every word in Arabic is homographic. Therefore, claiming that the Arab reader needs to read the sentence in order for him or her to understand the sentence is not supported logically because the sentence in Arabic could start with a homographic word as well as with a non-homographic word. The sentence in Arabic could start with an affixated word as well as with a non-affixated word. On the other hand, in the case that the sentence starts with a homographic word, the Arab reader still can exploit his/her morphological knowledge of word occurrence frequency in a sentence, the spelling patterning of the words in Arabic, and the logical relation between the words in a sentence. However, in the absence of context, and within a special type of sentence, the less skilled and even the highly skilled readers will need context to activate the right form of the initial homograph in the first place. Thus, skilled readers always need the context for the unvowelized homographic initials that turn the structure of a sentence into a garden-pathed structure. In fact, this recognition should be viewed always in terms of pronunciation and not in terms of accessing the lexical meaning of these initial homographs. The position this paper is taking is that with incorporating every possible type of sentence that Arabic allows and by presenting the possible type of these initial words a sentence may take, the findings of Abu-Rabia (1995) can be put in a different context and given legitimacy for only a special type of words. The predictions of the current study are that context plays a helpful and a compensatory role in the recognition of homographic words (particularly pronunciation or naming). Thus, when a sentence is tested for comprehension or meaning, it will not matter if the sentence is vowelized or not. In fact, by using the moving window approach rather than the cumulative one, the participants' comprehension will not be affected whether they read the vowelized, vowelized with *shaddah* or the unvowelized forms of the sentences. Further, their comprehension will not be affected when reading a sentence of garden-path structure versus a sentence of non-garden-path structure. By having the space distance between the initial of the sentence in the garden-path sentence (e.g., the subject) and the disambiguating region (e.g., predicate) virtually close (3-5 words), their comprehension unlike reading time should not be affected. Arab readers will exploit their knowledge of Arabic morphology in the process of integrating the words of the sentence. This indifference can be attributed to the fact that Arabic morphology is 'Agglutinative' (and, fusional, too). That is, the affixes or bound morphemes are attached to the stem in which analyzing the form of the verb into its stem and suffix is transparent rather than difficult.

In addition, Arab readers exploit their knowledge of the *trilateral/quadrilateral-roo*t model in Arabic words as well as their knowledge of morphology in reading such deep orthography in which the words become sight words. However, when they encounter foreign or very low-frequency words, they will be forced to use the prelexical, assemble route in order to be able to pronounce the word, especially if its parts do not carry a clear stem; and in both cases, they do not need context. On the other hand, their reliance on context will be heavy when the task is to name the word, particularly when the initial word of the sentence is a basic verb (a verb that does not have affixation) or when the morphological type of the word is fusional; that is, "the affixes are characteristically fused with the stem" (Stewart & Vaillette, 2001).

In terms of reading time, the garden-path sentences may take the participants more time to read than the non-garden-path sentences, especially when the distance between the subject and the predicate is virtually long; however, their comprehension should not be affected. For reading words individually, unlike non-homographic words, the homographs may take more time to read. However, it is predicted that there will be no significant difference between the speed of reading homographic versus non-homographic words.

On the other hand, if the test is for reading accuracy, that is, saying the correct form of the word, the current study predicts exactly what Abu-Rabia (1995-2001) proposed: context will be essential for selecting the right form of the unvowelized word, that is, for choosing the right decision in the first place and not holding and waiting until the region of disambiguaty is reached. As has been explained, the current study emphasizes the difference between word recognition and word naming and considers them to be, particularly for Arabic script, different processes that need to be taken into account when examining the role of context in the process of reading Arabic. Further, by employing a word naming task, it can be predicted that low-frequency will play an essential role in the speed of word naming; low-frequency words should take more time to process than their high-frequency counterparts.

By employing the moving window task in which the task is to read the sentence orally word-by-word and for accuracy, it is predicted that the participants will be forced to activate all possible readings for the initial homographs (sentence initials) in a garden-path sentence, and later by giving the context, they will be able either to reanalyze their first reading or to keep on reading if their initial guess was correct. However, when they read the sentence silently and for meaning, and not for accuracy, they will not need to reanalyze their first assignment because very often the available forms of activation for the homographs will share the same root, and this root will suffice for accessing the mental lexicon.

Subsequently, extra time processing could be realized in the total time it will take the participants to read the garden-path sentences compared with the non-garden-path counterparts. However, for the non-garden-path sentences, although the context will not play any role in choosing the right reading for the initial HF word in both the vowelized and nonvowelized sentence (initials), its role will be additive for recognizing low-frequency words that are presented unvowelized. This claim can be tested by employing the word naming task for the overall time it takes to name low-frequency words versus high-frequency counterparts under both conditions: plain and vowelized-plus-*shaddah*. However, with presenting the short vowels, context plays no role in word recognition (accessing the mental lexicon), particularly for high-frequency words. It also plays no role in naming or recognizing words that are non-homographic and of high frequency. However, with low-frequency homographs, context may play an additive role. That is, in addition to context which is not enough for word recognition (naming), short vowels and *shaddah* will be essential under such circumstances.

In conclusion, short vowels by themselves, diacritics by themselves, both short vowels and *shaddah*, or context, will play no role in recognizing or naming non-homographs. However, context or the right short vowels and diacritics will play a major role in choosing the right form of a homographic word. In general, the current study will attempt to investigate directly the role of short vowels in comprehension and word recognition. Since diacritics, *shaddah* and *skun* were implicated in such a role, as was explained earlier, a combination of short vowels and *shaddah* also will be examined.

However, for understanding the role of context in reading Arabic, particularly individual words, differentiating between word recognition and word naming will be necessary. This differentiation was not given serious attention in the previous studies of Abu-Rabia (1995-2001) which consequently made an overstatement in claiming that once print is presented unvowelized (plain), every word will be homographic. As will be explained later in Experiment 3, the possibility of classifying Arabic words into homographic versus non-homographic was achieved. Thus, reinterpreting the findings of Abu-Rabia (1995-2001) by putting them in the right context will be sufficient for understanding the role of context in reading Arabic. Therefore, in addition to Abu-Rabia's findings (1994-2001) on the role of context in reading Arabic, a critique that is based on a logical analysis of Arabic word form, the reading accuracy task as will be employed in Experiment 1, and the findings from the word naming task that will be conducted, can in combination be sufficient information to use for understanding the role of context in reading Arabic.

This critique of previous studies has shown that the role of short vowels was implicated with other diacritics as well as with other factors, such as word frequency, homography, and garden-path structure. Accordingly, the implication of short vowels with those factors will lead to examination of their role at each stage of the reading process: word, sentence, and text. Therefore, three categories of questions and hypotheses were constructed that were concerned with each level of the reading process: text, sentence, and word.

2.2. RESEARCH QUESTIONS AND HYPOTHESES

2.2.1. Text Reading Level

<u>Silent Reading Task</u>

I. Do short vowels play a role in the reading process (comprehension and reading accuracy) of skilled adult Arab readers?

a. Is there a significant difference in the reading comprehension of skilled adult Arab readers when reading a vowelized text versus an unvowelized text?

Alternative[1] Hypothesis 1a: "There is no significant difference in the reading comprehension of skilled adult Arab readers when reading a vowelized[2] versus an unvowelized text."

b. Is there a significant difference in the reading comprehension of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text?

Alternative Hypothesis 1b: "There is no significant difference in the reading comprehension of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text."

c. Is there a significant difference in the reading time of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text?

Alternative hypothesis c1: "There is no significant difference in the reading time of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text and that should hold regardless of whether the text is plain or not."

Rationale

The insignificant difference would be justified by the assumption that only a small rate of low-frequency words that does not exceed 25 percent was included. Previous study that replaced a 25 percent of the high-frequency words with low-frequency counterparts did not affect the fifth graders' comprehension (Ryder & Hughes, 1985).

d. Is there a significant difference in the reading time of skilled adult Arab readers when reading silently a vowelized text versus an unvowelized text?

Alternative hypothesis d1: "There is no significant difference in the reading time of skilled adult Arab readers when reading silently a vowelized text versus an unvowelized text."

Rationale

The insignificant difference would be justified by the assumption that the presentation of short vowels and *shaddah* do not necessarily contribute more information to the representation of consonants. Arab readers would exploit their knowledge of their language morphology for lexical access, e.g., the *trilateral/quadrilateral-root* model of words.

Oral Reading Task

e. Is there a significant difference in the reading accuracy of skilled adult Arab readers when reading a vowelized versus an unvowelized text?

Alternative Hypothesis 1e1: "There is a significant difference in the reading accuracy of skilled adult Arab readers when reading a vowelized versus an unvowelized text in favor of the vowelized text and for the low-frequency text."

Alternative Hypothesis 1e2: "Vowelizing a low-frequency text would make a difference in the reading accuracy of skilled adult Arab readers when reading a vowelized versus an unvowelized low-frequency text."

Rationale

The significant difference would be justified by the assumption that in reading a discourse, Arab readers would exploit their knowledge of their language morphology for lexical access, e.g., the *trilateral/quadrilateral-root* model of words; further, they would exploit context for choosing the right form of the homographic words (naming/pronunciation), particularly the ones that do not lead to garden-path sentences; very often, the adjoining-word would provide the context for those types of homographs. Note that the target population is skilled adult Arab readers as represented by graduate/postgraduate students. However, once the text is of low frequency and presented plain, a double additive cost would be expected.

f. Is there a significant difference in the reading accuracy of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text?

Alternative Hypothesis 1f: "There is a significant difference in the reading accuracy of skilled adult Arab readers when reading orally a plain high-frequency text versus a plain low-frequency text in favor of the high-frequency text which should have few miscues."

g. Is there a significant difference in the reading time of skilled adult Arab readers when reading orally a vowelized versus an unvowelized text?

Alternative Hypothesis 1g: "There is a significant difference in the reading time of skilled adult Arab readers when reading orally a vowelized versus an unvowelized text in favor of the vowelized text that would take less time to process."

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1. Stating the hypothesis to be 'alternative hypothesis' means that the researcher has his own prediction. However, if the hypothesis is not given the adjective, 'alternative,' this means that the researcher has no prediction about the effect.
2. Vowelized means short vowels-plus-*shaddah*.

Rationale

The significant difference would be justified by the assumption that, in the oral task, presenting short vowels and *shaddah* would contribute necessary information to the representation of consonants, and subsequently should help Arabic readers in the first place in selecting the appropriate form of the homographs.

h. Is there a significant difference in the reading time of skilled adult Arab readers when reading orally a high-frequency versus a low-frequency text?

Alternative Hypothesis 1h: "There is a significant difference in the reading time of skilled adult Arab readers when reading orally a high-frequency versus a low-frequency plain text in favor of the high-frequency that would take less time to process."

Rationale

The significant difference would be justified by the assumption that the effect of low-frequency is additive. That is, by presenting the two texts (HF vs. LF) without short vowels and *shaddah*, Arab readers still can exploit their knowledge of morphology and context in minimizing the word neighboring size of the homographs. However, being of low-frequency, the homographs would consume a little bit more time for mental access compared with their counterpart high-frequency homographs.

2.2.2. Sentence Reading level: Questions and Hypotheses

<u>Homograph/Non-Homograph Variable</u>

II. Does a homographic-initial of a sentence affect the reading process (comprehension and reading time) of skilled adult Arab readers?

i. Is there a significant difference in the reading comprehension of skilled adult Arab readers when reading sentences with homographic initials versus sentences with non-homographic initials?

Alternative hypothesis 1i: "There is no significant difference in the reading comprehension of skilled adult Arab readers when reading sentences with homographic initials versus sentences with non-homographic initials regardless of the reading condition representation."

j. Is there a significant difference in the reading time of skilled adult Arab readers when reading sentences with homographic initials versus sentences with non-homographic initials?

Alternative hypothesis 1j: "There is a significant difference in the reading time of skilled adult Arab readers when reading plain sentences with homographic initials versus plain sentences with non-homographic initials in favor the sentences with the non-homographic initials which should take less time to read."

Garden-path Variable

II. Do short vowels play a role in the reading process (comprehension and reading time) of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences?

k. Is there a significant difference in the reading comprehension of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences?

Alternative Hypothesis 1k: "There is no significant difference in the reading comprehension of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences."

l. Is there a significant difference in the reading time of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences?

Alternative Hypothesis 1l: "There is a significant difference in the reading time of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences in favor of the non-garden-path sentences which should take less time to process."

Rationale

The extra reading time can be interpreted on the basis of the implicit "checking process" that operates with a delay cost, or on the basis of the processing load in the ambiguous region that was demonstrated by several studies that employed different techniques: eye-tracking studies (Ferreira & Henderson, 1990, Experiment 1), first fixation data (Frazier & Rayner, 1982), and self-paced reading tasks (Mitchell, Corley & Garnham, 1992, Experiment 1) (cited in Mitchell, 1994), as well as the self-paced reading task of Experiment 1 of the current study.

Reading condition Variable

II. Do short vowels play a role in the reading process (comprehension and reading time) of skilled adult Arab readers?

m. Is there a significant difference in the reading comprehension of skilled adult Arab readers when reading vowelized versus unvowelized sentences?

Alternative Hypothesis 1m: "There is no significant difference in the reading comprehension of skilled adult Arab readers when reading vowelized versus unvowelized sentences."

Rationale

The insignificant difference would be justified by the assumption that the presentation of short vowels and *shaddah* do not necessarily contribute more information to the representation of consonants. Arab readers would exploit their knowledge of their language morphology for lexical access, e.g., the *trilateral/quadrilateral-root* model of words.

n. Is there a significant difference in the reading time of skilled adult Arab readers when reading vowelized versus unvowelized sentences?

Alternative Hypothesis 1n: "There is a significant difference in the reading time of skilled adult Arab readers when reading vowelized versus unvowelized sentences in favor of the vowelized sentences (short vowels and *shaddah*) which would take less time to process."

Rationale

The significant difference would be justified by the assumption that providing the homographs with short vowels and *shaddah* would contribute necessary information to the representation of consonants which should help Arabic readers in selecting the appropriate form of the homographs in the first place, and subsequently speed the reading process.

Interaction between homograph and reading condition

II. Is there an interaction between the homograph/non-homograph variable and the reading condition representation on both dependent variables: reading time and comprehension for skilled adult Arab readers?

o. Is there an interaction between the homograph/non-homograph variable and reading condition representation on the comprehension of skilled adult Arab readers?

Alternative hypothesis 1o: "There is no significant interaction between homograph/non-homograph and reading condition representation on the comprehension of skilled adult Arab readers."

p. Is there an interaction between the homograph/non-homograph variable and reading condition representation on the reading time process of skilled adult Arab readers?

Null hypothesis 1p: "There is no significant interaction between the homograph/non-homograph variable and reading condition representation on the reading time process of skilled adult Arab readers."

Reading condition of minimal representation

II. Do the diacritic *skun*, and case-ending markings play any role in the reading process of garden-path sentences: reading time and comprehension for skilled adult Arab readers?

q. Is there a significant effect for the diacritic, *skun* in the reading comprehension of skilled adult Arab readers when reading garden-path sentences?

Alternative hypothesis 1q: "There is no significant effect for the diacritic, *skun* on the comprehension of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with *skun* versus a garden-path sentence whose initial word is not provided with *skun*."

r. Is there a significant effect for the diacritic, *skun* in the reading time process of skilled adult Arab readers when reading garden-path sentences?

Alternative Hypothesis 1r: "There is a significant effect for the diacritic, *skun* on the reading time process of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with *skun* versus a garden-path sentence whose word initial is not provided with *skun*, and this will be in favor of the garden-path sentence that is provided with *skun* which should take less time to read."

Rationale

The significant difference would be justified by the assumption that providing the homographs with the diacritic, *skun* would contribute necessary information to the representation of consonants which should help Arabic readers in selecting the appropriate form of the homographs in the first place, and subsequently speed the reading process.

s. Is there a significant effect for the case-ending marking in the reading comprehension of skilled adult Arab readers when reading garden-path sentences?

> Alternative hypothesis 1s: "There is no significant effect for the case-ending marking on the comprehension of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with a case-ending marking versus a garden-path sentence whose initial word is not provided with a case-ending marking."

t. Is there a significant effect for the case-ending marking in the reading time process of skilled adult Arab readers when reading garden-path sentences?

> Alternative Hypothesis 1t: "There is a significant effect for the case-ending marking on the reading time process of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with a case-ending marking versus a garden-path sentence whose initial word is not provided with a case-ending marking, and this will be in favor of the garden-path sentence that is provided with a case-ending marking which should take less time to read."

Rationale

The significant difference would be justified by the assumption that providing the homographs with a case-ending marking would contribute necessary information to the representation of consonants which should help Arabic readers in selecting the appropriate form of the homographs in the first place and subsequently speed the reading process.

2.2.3. Word Reading level: Questions and Hypotheses

III. What role do short vowels play in the reading process of individual words for skilled adult Arab readers?

u. Is there any significant difference in the reading time latency for skilled adult Arab readers when reading homographic versus non-homographic words?

> Alternative hypothesis 1u: "There is no significant difference in the speed of word recognition of skilled adult Arab readers when reading a homographic versus a non-homographic word."

v. Do short vowels produce a significant difference in the speed of word recognition for skilled adult Arab readers when reading vowelized versus unvowelized words?

> Alternative hypothesis 1v: "Vowelizing the word makes no significant difference in the speed of word recognition (RT) for skilled adult Arab readers when reading a vowelized versus unvowelized word."

Alternative hypothesis 2v: “Vowelizing the word slows the speed of word recognition (RT) for skilled adult Arab readers when reading a vowelized versus unvowelized word, and this holds regardless of whether the word is a homograph or non-homograph.”

w. Is there any significant difference in the reading time latency of skilled adult Arab readers when reading high-frequency words versus low-frequency words?

Alternative hypothesis 1w: “Low-frequency words take more time to process than their high-frequency counterparts.”

x. Is there any significant difference in the reading time latency of affixated words versus non-affixated words?

Alternative hypothesis 1x: “Affixated words should take more time to process than their non-affixated counterparts.”

3. CHAPTER THREE: METHODOLOGY

Overview

The general purpose of this study was to investigate the role of short vowels and context in the process of reading Arabic: specifically reading comprehension and reading accuracy. Because the diacritic, *shaddah* was implicated in such a role, it was necessary to manipulate both short vowels and *shaddah* in order to isolate the role of short vowels. For this reason, the role of short vowels both in themselves and in combination with *shaddah* was examined.

As was laid out earlier, the implication of short vowels with other diacritics as well as with other factors such as word frequency, homograph, and garden-path structure led to examination of the role of short vowels within each stage of the reading process: text, sentence, and word and hence to construction of three categories of questions and hypotheses over each stage of the reading process - text, sentence, and word.

Based on the concerns and questions this study attempted to explore, investigating the role of short vowels within each level of the reading process became necessary in order to detect the role of short vowels at each level of the reading process, and thus, to either support or update the previous models. Owing to the nature of this purpose, three experiments were designed and conducted separately for testing the hypotheses of the study. In Experiment 1, the effect of short vowels per se, and in combination with *shaddah* on reading comprehension and reading accuracy of skilled readers was examined. Further, the effect of short vowels and *shaddah* in correlation with word frequency in the text was also investigated. Accordingly, there were two tasks within Experiment I: reading comprehension and reading accuracy.

In Experiment 2, there were five areas of concern to be investigated by employing the moving window technique. In the first area, the focus was on the effect of homographic/non-homographic initial word of a sentence on the reading process of adult Arab readers: reading time and reading comprehension product (from now on, initial will mean initial word). The second concern was the role of short vowels-plus-*shaddah* in correlation with the homograph variable- homographic/non-homographic- on the reading process of Arab adult readers: reading time and reading comprehension product (for the purpose of the current study, reading comprehension and reading comprehension product are used interchangeably). The third concern was the effect of garden-path structure on the reading time and reading comprehension of adult Arab readers. The fourth concern was the role of economical representation of the diacritic, *skun*, and case-ending markings in resolving garden-path ambiguity as examined in terms of reading comprehension and reading time. Finally, the fifth concern was the effect of the mistaken representation of short vowels-plus-*shaddah* on adult Arabs' reading process: reading time and comprehension while reading sentences of homographic and non-homographic initials was assessed for control purposes.

In Experiment 3, by using the word naming method, the study attempted to investigate the effects of short vowels per se and in combination with *shaddah* on the speed (reading time latency; RT) of word recognition of adult Arab skilled readers while reading a pool of isolated words: homographs and non-homographs. The purpose of this test was to help examine whether the absence of short vowels/*shaddah* and context hindered word recognition as measured by the speed of reading naming. In addition, the effect of word frequency by itself and in correlation with short vowels-plus-*shaddah* representation on the speed of word recognition was examined, as was the effect of word frequency in correlation with the homographic/non-homographic variable. The isolated words matched the initial words of the moving window task sentences for all variables and virtually represented all the possible forms the initial word of an Arabic sentence might take.

However, due to the nature of Arabic morphology, the segregability of short vowels and diacritics from script, and the nature of Arabic affixation as was explained in detail in the previous chapters, the role of context was examined particularly in light of the reading accuracy task (the qualitative part in Experiment 1) and in light of the word naming task. That is, by designing an oral reading task where the participants read a connected text that included sentences with both homographic and non-homographic initials, the claim for the inevitable role of context in reading Arabic was assessed qualitatively. The claim that Arab readers, including highly skilled readers, need context in order to figure out the meaning of a sentence with a homographic initial was challenged by the current study's claim of the constrained role of context. By having sentences with both homographic initials that garden-path the reader and homographic initials that do not garden-path the reader in a connected text, the proposed claim for the constrained role of context (rather than an overall role) in the Arabic reading process was assessed. Hence, the participants were assessed qualitatively while they were approaching those types of sentences.

The qualitative content analysis of Arabic words was also used in assessing the constrained role of context in Arabic. Thus, the findings from the reading accuracy task in Experiment 1 and word naming task in Experiment 2, and further, the analytic investigation of the word form in Arabic (*Materials* section in Experiment 3) were employed in discussing the role of context in the reading process of Arabic.

In this chapter, each experiment is presented separately and consecutively, including its methodology, statistical analysis, and discussion. First, the sections on each experiment begin with its methodological elements along with justification and rationale for each element in those experiments: *Participants*, *Materials*, *Measures*, *Data Collection*, *Designs* and *Analysis*, and *Procedures*. The results of the statistical analysis of the collected data of that experiment is presented, followed by discussion of these data. The chapter concludes with a general discussion of the findings of all three experiments, taken together. Concerning the qualitative parts about the observations and the analysis of miscues from both, the reading accuracy task and the running record data of Experiments 1 and 3, respectively, two exclusive sections within those two experiments were constructed to present the descriptive analyses of those observations and their discussions.

An exclusive narrative section with a data-supported claim regarding the role of context in reading Arabic was dealt with exclusively in the general discussion section.

3.1. EXPERIMENT 1: TEXT LEVEL

(Silent/Oral Text Reading)

3.1.1. Method

3.1.1.1. Participants

One hundred and four native middle class Arabic speakers, aged 19 to 40, voluntarily participated in this study. These participants, who were pursuing their graduate and undergraduate studies, lived temporarily in Pittsburgh and Indiana, Pennsylvania, and in Morgantown, West Virginia. Upon completion of the study they were offered $ 7.50 as a compensation for their participation. None of them had ever participated in a similar study and all of them had normal or corrected-to-normal vision.

Choosing this population was based on three assumptions. First, the effects of vowelization differ according to a reader's skill. College students were selected to represent highly skilled readers on the assumption that due to their educational level (graduate and undergraduate) they had mastered the reading skill and were accomplished at reading whole texts. To confirm this skill level, the study adopted a post-criterion technique, enforced in the first session, in order to exclude any participant whose reading did not indicate reading fluency and thus be able to look for a substitute for that participant. Adopting this technique, that is, post-criteria rather than pre-criteria was necessary because of the shortage of eligible participants and the difficulty of access to native Arabic speakers. This post-criterion approach was conducted in the first session of the experiment while the participants were reading the short texts for reading accuracy. In this task, the participants were asked to read a short text orally in each session that reflected both reading condition and word frequency. Although the participants did not read the same text in terms of vowelization and *shaddah*, miscues were assessed while taking into account the reading condition the participant belonged to. Therefore, the participants who made errors that did not reflect reading skill deficiency (that is, miscues) were included in the study. However, the miscues that were related to poor reading skill (that is, errors) were taken into account as a judgmental criterion for excluding a participant from the study. Thus, the participants who made errors, and not misuses, that revealed reading insufficiency were excluded from the data analysis and subsequently from the study (see *Instrumentation* section). Each word read correctly gained one point and 232 points were the highest possible score. If a participant scored 90 percent or more he/she was included in the study; otherwise, the participant was excluded. No participant was excluded for his/her poor reading skill.

Adopting the post-criterion technique was necessary due to the shortage and difficult accessibility of native Arabic speakers. For example, the experiment needed at least 15-20 participants for each reading condition in order to give the test statistical validity. This totaled 75-100 participants. Another factor which forced the use of this technique was the nature of the experiment. It was to be conducted in two settings that were 10-14 days apart, a procedure which would probably increase the dropout rate. Accordingly, the participants were post-tested on their Arabic language and reading proficiency in the first session of the experiment in order to exclude any participant who did not meet the stated criteria.

The second assumption was that the effects of vowelization vary according to the type of Arabic orthography to which readers are exposed. College students and adults in general have had considerable exposure to deep orthography in which texts very often are devoid of short vowels.

Finally, choosing this population was based on the fact that adult readers would help in building a model of how Arab readers would process a print, e.g., a text. Such a model would help in recognizing the weaknesses and strengths of previous efforts to model and explain Arabic reading.

3.1.1.2. Materials

Two long and two short expository Arabic texts served as the experiment materials for Experiment 1. The two long texts, one for high frequency (HF) and one for low frequency (LF), were used for the comprehension assessment; the two short ones, also one each for HF and LF, respectively, were used for assessing the reading accuracy test (APPENDIX D). There were two reasons for selecting the informative type of text. First, it represented the actual language to which native Arabic participants had been exposed. Second, controlling extraneous variables that might affect the results of the study could be achieved with this type of writing. In fact, Arabs are exposed simultaneously to four types of writing: Koranic, narrative, poetic, and informative. These types of writing are the actual texts Arabs encounter in their everyday use.

However, because isolating extraneous variables that might confound the results of the study was essential in experimental research, the type of writing selected for this study was expository; the Koranic text is so familiar to Arabs in their daily lives (Kristeva, 1989) that it might confound the dependent variables of this study. For the poetic text, controlling the word frequency and analyzing the textual units of this text in order to measure comprehension might not be sensitive because the poetic text depends on rhythmic scales and it "contain[s] a high percentage of low frequency words" (Abu-Rabia, 1998, p. 115) in order to meet the paradigm of expectation in which poets emulate the old Arabic poetry style that includes a stale, hackneyed vocabulary. On the other hand, by using narrative texts, the recall procedure might confound the scheme of the narrative.

For these reasons, the type of writing selected was expository, a type that contains high frequency words in a great proportion of everyday writing.   However, different proportions of word frequency were used as a “simple index” of the material difficulty, particularly in word reading accuracy (Koriat, 1985). Further, the word frequency effect was found to be “implicated in the search model’s account of the ambiguity effect” (Underwood & Batt, 1996, p. 67), therefore, word frequency could also implicate the account of short vowel effect. For this reason, building this effect into the study design was necessary.

The types of passages selected for this experiment had to reflect sequentially two levels of difficulty. The first passage was designed to be of high frequency vocabulary (HF) and the second to reflect a low frequency vocabulary (LF). For achieving frequency difference between texts, a survey was constructed. In it, the words that were found to be common among those reports were considered to be HF, and their LF counterparts were searched for in books that attempted to track and judge words in terms of frequency. Abdu’s The Common Words in Arabic (1979) was used for this purpose. This book tried to introduce the most common 3000 words and therefore, the suggested low-frequency words for this experiment could not be among those 3,000, or at least would only be among the least frequently used words in this index (e.g., words that have a frequency of 29 or 28).

A group of LF and HF words were matched in pairs and introduced to a group of seven persons: two Arabic experts and five graduate students, to judge their frequency. Only the pairs whose frequency this group agreed on in terms of high versus low were included. The survey went through several modifications and revisions before it is verified and conducted. The rate of the low-frequency words did not exceed 25 percent of the words in the passages designed as low frequency.

Four criteria were used to select the expository texts for the study: readability, familiarity, novelty, and length. Despite the fact that college students are at a high academic level, a team of Arabic experts was consulted regarding the suitable difficulty level of the passages by rating them on a three-point scale: *easy*, *right level of difficulty*, *difficult*. They were also asked to detect any unprecedented or passé words in the passages, and to assess for any unfamiliar or exotic structure.

For familiarity and to insure that the themes of the materials were familiar to the participants, a team of Arabic experts, graduate students and high school Arabic teachers was consulted to judge the familiarity of the passages' themes, by rating them on a three-point scale: unfamiliar, less familiar, familiar.

For novelty, the passages were first constructed by the researcher and then they were read, assessed and changed under advisement. In fact, the long texts were constructed from scratch, although the short ones were in part extracted from a number of reports that were broadcast in online newspapers. That is, a variety of reports were read by the researcher and then one that closely resembled the type of reports that would be published in such website newspapers was made up; thus, the process of intertextuality in making up this passage could be detected from the surface of the passage (its wordings) and tracked down to the five reports that the researcher consulted most. This process of constructing the passages went through intensive review and modification. Further, the process helped the researcher to get a sense of the common words in such reports, and later, to design a survey for judging their frequency. In it, the words that were found to be common among these reports were considered to be of HF, and their LF counterparts were searched for in books that attempted to track and judge words in terms of frequency, as mentioned earlier.

However, since the experiment was attempting to measure the effect of short vowels per se, word frequency per se, and short vowels and word frequency in combination, the two passages had to be equal in each aspect (e.g., syntax difficulty, sentence length, word-neighboring in the unvowelized condition, etc.) except in word frequency. Therefore, the selected two passages were modified to address this concern. A matching analysis in terms of syntax, word frequency, neighboring size of the word, sentence length, etc., between the two passages was conducted in order to ensure the identicality of the two passages. For achieving the equality of the two passages, the first passage was constructed and then its counterpart was made up by a matching process. Thus, the second was matched to the first passage in all aspects, except word frequency. The locations of the event, the pronoun names, and the identity of the characters were replaced with other locations, pronoun names, and identities.

However, using words as a measure of length may not be the best index for text length, owing to the density of the Arabic morphology (affixation feature of its morphology) in which one word may contain three morphemes that can be segregated into three stand-alone separate words. That is, the morphological type of Arabic is agglutinative (and fusional). To illustrate this feature, the word, "استعملها" consists of استعمل + هو + هي (است + عمل + هو + هي) or است + عمل + ها. Further, controlling the number of morphemes between the texts is supported by the findings of several studies. For example, Shimron and Sivan's (1994) study revealed that the native speakers of Hebrew (a language very similar to Arabic, particularly in its morphology and its writing system principle) read English texts faster than their counterpart Hebrew translations, despite the fact that the English texts contained about 40 percent more words. The authors contributed this result to the excessive affixation of Hebrew. Taft's (1981) experiments demonstrated that "prefix stripping occurs in word recognition and this, in turn, implies that prefixed words are accessed through a representation of their stem" (p. 296). Finally, the results of Badry's (1982) study revealed that Moroccan children, aged 3 to 6, were aware of the underlying morphological root in their spoken language and this awareness was reflected in the production stage of their acquisition. Further, as will be presented later (table 29), the current study found that the affixated words descriptively took longer to name, on average, than their counterpart non-affixated words (the overall means of the RT for the affixated words, M = 753.3102 milliseconds, SD = 328.75; while for the non-affixated, M = 707.3590 milliseconds, SD = 186.81).

These studies combined imply the necessity of adopting a method of measuring the length of the passages on the basis of morphemes and not words. Thus, the length of the passages was measured and equalized in terms of morphemes instead of words. In spite of these reasons for adopting the morphemic unit in measuring the length of the passages, the words were also controlled among the texts. In terms of length, both long and short texts were matched on two axes: word and morpheme. Thus, the passages in the comprehension task contained 504 words and 834 morphemes, and those in the reading accuracy task contained 252 words and 415 morphemes. As can be concluded from the lengths of the passages, the short passages were half the length of the comprehension texts. Such a relationship would helpful in comparing the reading time between the silent and oral reading modes. Because comprehension may confound recall, keeping the passage fairly long helps diminish the ability of recalling a text even if it was not understood (Farr & Carey, 1986). In order to make the length of all passages identical, so as to avoid any external validity threat such as fatigue to the results of the study, and given that these participants were expected to read two passages in two sessions and take two comprehension tests, the length of the passages was adjusted so that the texts were fairly long for the comprehension test and fairly short for the reading accuracy test.

From each passage, five versions were created in relation to vowelization. One version was left plain, that is, it was fully unvowelized; the second version included only the diacritic, *shaddah*, "strengthening;" the passage in the third version included short vowels and *shaddah*; the passage was vowelized, but without *shaddah*, in the fourth version, that is, only short vowels were provided; and the wrong short vowels and *shaddah* were provided in the fifth version. In the last case, putting the short vowels and *shaddah* in the wrong positions would lead to a non-word if the included, mistaken short vowels and *shaddah* were assembled. That is, the short vowels and *shaddah* were deliberately put in a position that would lead to phonemic distortion and not to graphemic distortion; unlike the short vowels and *shaddah*, the consonants including their order were left intact. Adding these reading conditions was for control purposes, namely to isolate the role of the short vowels in Arabic reading for skilled adult readers (see APPENDIX D for the original texts and APPENDIX E for exemplars of how the orthographies for each condition were presented in a Romanized alphabet version; only the first sentence in the High-Frequency text were used as an exemplar).

3.1.1.3. Measures

Two dependent variables were measured in this study: comprehension and reading accuracy. Authenticity is a concern in the assessment research paradigm but still lacks a definite exact scoring, a matter of experiment concerning, and because comprehension can confound recall, two types of measures were used to assess reading comprehension: the unstandardized recall test, assessed in terms of units, and the standardized multiple-choice test, assessed in terms of questions and statements. Combining these two assessment procedures, recall and the multiple-choice test could help in overcoming the deficiencies that accompany each type and make comprehension measurement more sensitive. Lipson and Wixson (1997) elaborate:

> Armed with a representation of the important elements of a particular text, it is possible to elicit recalls and assess lengthy selections with high levels of reliability . . . Retelling [procedures] can add immeasurably to our understanding of readers' comprehension because they allow us to get a view of the quantity, quality, and organization of information constructed during reading. (pp. 283-284)

Hence, the passages were analyzed on the basis of concepts; thus, a *conceptual map* that identified relationships between major concepts in a text was created.

> These concepts are then arranged hierarchically to form the first two levels of the concept map-central purpose (s) and major ideas. Then the map is expanded to include a third level of information-supporting ideas. Relations between concepts are highlighted by adding relational links specifying how the concepts are connected. (Lipson and Wixson, 1997, p. 283)

Later, these concepts were converted into meaningful units and then into propositions that were charted on a recall protocol and judged by experts in Arabic teaching and assessment to evaluate their richness and their content validity (see Appendices F for the Multiple-Choice tests, and G for the Recall Propositional Analysis).

The modality of the recall was oral. Giving the recall orally made detection of the participants' understanding of the passage easier, based on the knowledge that the writing process might consume the effort and attention that were needed for demonstrating their understanding of the text (Ayari, 1998). Further, the recall assessment when given orally allowed the examiner to provide the participants with ongoing prompts to elicit recalling of the text they had just read. Before each reading for comprehension, the participants were given the following script orally: you are going to read a one page article or a report; you need to read the passage from the beginning to the end silently, and there will be no time restriction; after you finish, I will ask you some questions about what you read. Please, after you finish reading the article, flip the sheet upside down to indicate to me that you finished reading the passage (APPENDIX H).

To prevent the participant from being too selective in recalling what he/she thought was important, two types of prompts were used in each recall session: middle prompts, especially when the participant paused, and final prompts after he/she indicated that he/she had finished recalling. In such situations, the participants were prompted with questions such as, "Do you have anything to say?" or "Do you want to add something?" Generally speaking, all the prompt questions were open-ended questions (Lipson and Wixson, 1997, p. 285).

The scoring of the recall procedure was determined after analyzing the passages and having them judged by experts in Arabic teaching and assessment. Scoring was based on matching the participant's recall to the recall protocol in which one point was assigned to each meaningful unit that matched the one in the recall protocol, and the final score was based on the number of units that had been extracted from the passage.

In the multiple-choice tests, despite the criticism that has been leveled against them, for example that they are text-independent (Bernhardt, 1991) and that guessing is a potential in this type of test, the strict criteria advised for designing such tests were followed when constructing them in order to reduce their weaknesses. Further, a group of experts in Arabic teaching and assessment were asked to judge the content validity and the form of the questions. Furthermore, to limit guessing, the following script was read orally to each participant before answering the multiple-choice questions: you have 10 multiple-choice questions, and four optional responses given for each question; you need to answer each question based on the text you just read.

However, if you find that any of these questions are not related to the text you just read, or you find yourself trying to guess the answer randomly, or when the sentence does not make sense to you, you are asked to respond to such circumstances with the phrase, "I don't know." However, if you find that you are hesitating between two optional items, try to make an educated guess, that is, to see which one is close to what you have in your mind at that moment and select the item that fits best with your mental representation (APPENDIX H).

In general, the multiple-choice questions required factual responses based on the text. Only two questions required inferential responses that needed integration between two facts in order to arrive at an answer. There were four alternative answers, usually statements. Each multiple-choice test included 10 questions that were partially vowelized regardless of which reading condition they belonged to; only the regions that could slow down the reading process were identified and then provided with the right short vowels and diacritics. Further, each test was constructed in accordance with the textbase comprehension models. It was hoped that deriving the questions from a textbase level would insure that participants' comprehension was a product of reading the text per se; that is, a product of minimum inferences (Perfetti, 1999) and not of a schema or background knowledge alone. Each question was assigned one point and 10 was the maximum score for the multiple-choice test.

Because one of the purposes of this study was to identify the type of miscues readers would make when reading Arabic text, a running record during oral reading for the reading accuracy test was adopted as an instrument for both tracking the words that had been read correctly and incorrectly and then classifying the type of miscues the reader made; and then for criteria selection. The running record allowed for quantitative and qualitative analyses of the oral reading. For this purpose, the examiner held a copy of the same text for tracking the participant's reading. The words that made up the passage were in a column in a chart and the scoring was in a parallel column. Thus, each word read correctly was marked and assigned one point with a maximum score equaling the number of words comprising each passage, that is, 242.

3.1.1.4. Data collection procedure

Several steps were taken for conducting and collecting the data in this experiment. First, approval to conduct the study was obtained by submitting the research protocol, consent form, testing instrument and all necessary information to the Internal Review Board for Human Subjects at the University of Pittsburgh. The second step was to do some topographical statistics to identify the population of adult native Arabic speakers here in Pittsburgh and in neighboring cities: their locations, accessibility, availability, telephone numbers, and academic levels. Another step was to determine the criterion for inclusion. That is, after the potential population units were identified, and due to the scarcity of the targeted population units and the nature of the experiment that required two sessions at least 10 days apart, criteria were set up for inclusion. These criteria were: to include only native Arabs at the undergraduate or graduate academic level; to include only native Arabs who had earned at least their High School diploma in an Arabic country; and to include only the participants who would participate in both sessions, that is, only those who were going to be in the United States for the month following the first date of the experiment.

In the third step, the names of the people who agreed to participate in the experiment were taken and given ID numbers. Later, and by using the SPSS software program, participants were randomly assigned to five groups that met the five reading conditions. Because the experiment's design of the study was a between-subject, in which there were five reading conditions, the optimal targeted number to fill each reading condition was 15-20 in order to fulfill the statistical validity (power) for the analysis, that is, to minimize the type II error. Due to the difficult accessibility and the scarcity of Arab native speakers, the randomization procedure went through three stages. In the first stage, approximately 83 Arab native speakers were contacted. Of these, only the first 75 who agreed to participate in the study were then divided equally among the five reading conditions. Seven participants were dropped from the study either because there was a sudden distraction while conducting the study, or because they did not attend the second session of the experiment. However, substitutes for the missing participants were found as soon as additional Arab native speakers who qualified for the study based on the stated criteria were available and ready to take part in the study. When there were five or a multiple of five subjects available, they were randomly assigned to the five conditions. In the second stage, at least 40 Arab native speakers who went to schools in Pittsburgh and neighboring cities were contacted. Twenty-five participants' agreements were taken in order to reach the desired 20 for each reading condition. In general, the participants were randomly assigned to groups, and then each group to a reading condition.

Each participant was contacted in person or via email to set up a convenient time and location for him or her to take the tests. In general, the test was given in an empty, secured room and in convenient proximity to the participant. The experiment was given individually and by the primary researcher. The consent form was read orally to each participant and he/she was informed briefly about the task and the assessment that would follow each task; that is, that they would need to read some texts and take some tests on them in two sessions. Also, they were informed that they would be tape-recorded, that the data and the names would be kept in a secure place, and that the researcher would be the only person who would have access to them. They were told that the researcher would use only ID's instead of names in tabulating the data for running the statistical analysis, and that their recordings would be damaged after the study was completed.

After his/her first session, the participant was informed about the final, second session that needed to be given in ten to fourteen days from that day; they could either set up the time for the second session that moment, or they would be contacted via email or phone in order to set up the time for the second session. The same procedure was followed in all the reading tasks and with all the group conditions. The experiment started on April 17, 2003 and ended on August 20, 2003; thus, it took almost four months to complete.

3.1.1.5. Design and analysis

A Split-Plot Factorial Mixed 5 x 2 Design (Kirk, 1982): one between-subject factor and one within-subject factor was designed for this study to evaluate the effectiveness of vowelization on comprehension and reading accuracy while reading two types of texts. In this design, there were two factors: factor *A*, which represented the reading condition, the vowelization conditions; and factor *B*, which represented the text types. Under factor *A*, there were five levels in which each level represented a reading condition: plain (no short vowels or *shaddah*), only-*shaddah*, short vowels-plus-*shaddah*, short vowels-minus-*shaddah*, and wrong short vowels-plus-*shaddah*. The only-*shaddah* and only-vowels conditions were for control purposes. Adding only *shaddah* to the consonant strings in the text would convert it into a fully consonantal representation. That is, the consonants of the words would be fully presented. However, adding only short vowels to the consonant strings in the text would convert the text into a fully vowelized representation, that is, the short vowels would be fully represented. Combining both short vowels and *shaddah* with the consonants would convert the text into fully consonantal and vowelized. Therefore, by adding these two conditions (only *shaddah* and only short vowels), the role of short vowels could be detected clearly. However, the case-ending markings (which, in addition to the diacritic, *skun*, are represented with the same symbols as short vowels) were not manipulated and neither was the diacritic, *skun*. The justification for avoiding manipulating the case-ending markings was the fact that those case-ending markings are absent from the everyday language and from print (see the provided examples in APPENDIX C).

As noted earlier, children do not start to learn those case-ending markings until grade four and they do not master them, if they ever do, until the eleventh grade or beyond. Further, positioning these case-ending markings requires an analytic faculty that is not innate, but learnable. Arab readers need to recall consciously a linguistic knowledge in order to figure out the case-ending markings of each word in the sentence. On the other hand, the diacritic, *skun*, that is represented with the symbol, " ْ " and placed over the consonant, indicates that the consonant is devoid of any short vowel. That is, there is no phonological component attached to it; it only indicates that the consonant is blank (voweless). Thus, controlling the case-ending marking signs and the diacritic, *skun*, was essential for isolating the role of short vowels in the Arabic reading process.

Under factor B, there were two levels each of which represented a text type: high- and low-frequency expository texts. Subsequently, within factor A, there were 5 groups of 20 participants who were assigned randomly to each group in three stages (see *Participants* section for more detail on how the study ended up with 20 participants for each reading condition). Thus, 10 cells for the participants were created within this design (see Figure 1).

Text Types

		Reading Condition	Expository I High frequency	Expository II Low frequency
Groups	Group I	Plain		
	Group II	Only-*shaddah*		
	Group III	Short vowels-plus-*shaddah*		
	Group IV	Short vowels-minus-*shaddah*		
	Group V	Wrong short vowels-plus-*shaddah*		

Figure 1: Study design for Experiment 1

3.1.1.6. Procedure

The experiment was given in two separate sessions. There were two tasks in session one. In task one, the participant was asked to read silently the long passage for the comprehension test, either of HF or of LF, depending on whether the ID of the participant was an odd number or an even number. If the participant had an odd number, then he/she would read first the HF passage for comprehension and then the LF passage for reading accuracy. This order was reversed if the participant had an even number. The order of passage presentation was rotated to counterbalance materials and reading conditions within each group. Then, the participant was given the following instructions orally: you are going to read a one-page passage that is an article or a report; you need to read the passage from the beginning to the end silently, and there will be no time restriction. After you finish, I will ask you some questions about what you read. Please, after you finish reading the article, flip the sheet upside down in order to indicate to me that you finished reading the passage (APPENDIX H).

Each participant was told that time was not a concern and therefore they were free to read at their own pace. This openness regarding time was an effort to eliminate pressure so that haste did not affect the participant's attempt to understand the passage. However, the time spent reading each text type was measured by a stopwatch to assess the possibility of a relationship between text types (with low- versus high-frequency texts) and reading time. Further, reading time reflects reading process load. The time it took each participant was calculated to the millisecond by a stopwatch. The milliseconds were then converted to the nearest seconds. After the participants finished the reading, they were asked to recall what they had just read. The reading time was calculated for each participant and his/her recall was recorded by two devices: a mini-, sensitive with external microphone recorder and a digital Sony recorder.

During recall, the participant was prompted with middle and final prompts whenever he/she paused, in order to prevent the participant from being so selective in recalling only what he/she thought was important. In such situations, the participant was prompted with questions such as, "I want you to say everything about what you just read?," "Do you have anything to say?" or "Do you want to add something?"

Later, the multiple-choice test was given. Before taking this test, a script that included the following instructions was read to the participants: you have 10 multiple-choice questions and four optional responses for each question; you need to answer each question based on the text (passage) you just read; however, if you find that any of these questions are not related to the text (passage) you just read, or you find yourself guessing the answer, you are asked to respond to such circumstances with the phrase, "I don't know." However, if you find that you are hesitating between two optional items, try to make an educated guess, that is, choose which is close to what you have in your mind at that moment and select the item that fits best with what you have in mind (APPENDIX I).

In the second task, after having finished the multiple-choice test, the participant was given the short passage and asked to read it orally and accurately. He/She was told that accuracy would be based on reading the word accurately (in terms of its morphological structure and not in terms of case-ending markings). Thus, the participants were expected to leave the last letter unmarked (leaving it *sakinun*: "silent"). Leaving the last letter without the case-ending marking is a reading activity practiced in everyday language. In fact, adding the case-ending markings requires conscious knowledge of Arabic classical syntax which is achievable only by a few.

Reading time was calculated for each participant, being recorded by two devices: a mini-, sensitive with external microphone recorder, and a digital Sony recorder for a backup in case of disturbing circumstances. Each participant read aloud the short passage while the researcher was conducting the running-record procedure. The running-record procedure was achieved minimally because the researcher was the primary experiment conductor, whose focus was to measure the time accurately. Therefore, while the participant was reading the last line, the researcher's focus was switched to calculating the reading time. However, later, the oral reading was reviewed from the audio recordings and a running-record procedure was conducted again to fill in the gaps, identify the miscues, and count them.

After each session, the time it took participants to read the passage was recorded by a stopwatch to the nearest millisecond and later converted into seconds; the recorded recall on the tapes was transcribed, and the recorded oral reading was re-tracked and reviewed in order to identify, define, and count the miscues for each participant. Additional procedures were taken for the participants of Group III, IV, and V (Figure 1). In group V, the wrong short vowels-and-*shaddah* passages, each participant was informed individually prior to reading that in the passage the participant was going to read, there would be some words presented with wrong short vowels-plus-*shaddah*; the short vowels and *shaddah* were placed on the wrong positions in the words. For the reading accuracy task, the participant was asked to read the passages correctly disregarding the wrong positions of the short vowels and *shaddah* on the words. The Group IV participants were informed individually, in both reading tasks, that they were going to read a text that had the short vowels, *dhammah*, *fatha*, and *kasrah*, presented correctly. They were informed of that because this condition is not what Arab readers or writers experience as a whole; that is, leaving out *shaddah* while keeping the short vowels intact. However, for group III, the participants were informed that they were going to read a text that was supplemented with short vowels and *shaddah* correctly.

After his/her first session, the participant was informed of the final, second session that needed to be given in ten to fourteen days from that day; they could either set up the time for the second session that moment, or they would be contacted via email or phone in order to set up the time for the second session. The same procedure was followed in all the reading tasks and with all the group conditions.

3.1.2. Analysis and Results

Overview

A two-way repeated-measures Analysis of Variance was conducted to evaluate the effect of reading condition representation per se (including/excluding short vowels/*shaddah*) and in combination with word frequency on comprehension. The dependent variables were reading time, the number of propositions as measured by the recall test, and the number of correct responses as measured by the multiple-choice test. The between-subjects independent variable was the vowelization (used as a generic term, although it meant manipulating short vowels and *shaddah*) with its five conditions: no short vowels and diacritics (plain), only-*shaddah*-, short vowels-plus-*shaddah*, short vowels-minus-*shaddah*, and finally the wrong short vowels-plus-*shaddah*. The within-subjects independent variable was the word frequency with its two conditions: high-frequency and low-frequency.

For each participant, three dependent variables (reading time, number of propositions, and number of correct responses) on each text were collected and thus six columns of data were constructed: column one represented the data collected on the time spent reading the HF text; column two represented the data on the recall test for the HF text; column three represented the data on the multiple-choice test for the HF text; column four represented the data on time spent reading the LF text; column five represented the data on the recall test for the LF text; and finally, column six represented the data on the multiple-choice test on the LF text. The main effect for reading condition, the main effect for word frequency (text type in terms of word frequency representation), and the interaction effect between reading condition and word frequency on the dependent variables were tested by employing the two-way Repeated Measures Analysis of Variance in the SPSS statistical software package.

In the following section, the results from each manipulation are laid out. Two tables are provided for each analysis conducted. The first table shows the *F ratio* and the level of significance, and the second table shows the means and the marginal means.

3.1.2.1. Part One: Reading Comprehension Task

For the reading time data (Table 1), a significant main effect was found for text type (HF vs. LF), but not for reading condition. Further, there was no significant interaction between text type and reading condition. As a result, it did not matter which reading condition the individual was in; it always took the participant longer to read the low-frequency text than the high-frequency text. On average, it took the participant 206.32 seconds to read the LF text, but 194.13 seconds to read the HF text (Table 2).

Table 1: Results of Analysis of Variance on Reading Time

Source	SS	df	MS	F	*p*
Between Subjects					
Reading Condition	12,978.95	4	3,244.69	0.57	.685
Error	562,901.44	99	5,685.87		
Within Subjects					
Text Type	7,720.45	1	7,720.45	9.49	.003
Text Type X Reading Condition	2,476.68	4	619.17	0.761	.553
Error	80,553.43	99	813.67		

Table 2: Cell and Marginal Means on Reading Time by Reading Condition and Text

		High Freq.		Low Freq.		
Reading Condition ID	Reading Condition	M	SD	M	SD	Marginal
1	Plain					
2	*Shaddah* only	200.67	59.15	201.19	45.49	200.93
3	Short vowels-plus-*Shaddah*	200.05	84.35	220.20	72.25	210.13
4	Short vowels-minus-*Shaddah*	195.95	36.24	213.73	55.04	204.84
5	Wrong short vowels-plus-*Shaddah*	192.40	43.01	205.25	41.36	198.83
	Marginal	181.57	55.46	191.24	62.19	186.41
		194.13		206.32		

For the number of propositions of the recall test data, no significant main effects for text type or reading condition were found (Table 3). Further, the results did not show any significant interaction between text and reading condition (Table 3). Thus, it did not matter which text the participants read and which reading condition they were in; their performance was on average the same. As shown in Table 4, there was a 1.5 unit difference between the marginal means for the LF and HF texts (30.83 and 29.31, respectively). Note that the measurement scale involved one point for each meaningful proposition and therefore a 1.5 unit difference was equivalent to a difference of 1.5 propositions.

Table 3: Results of Analysis of Variance on the Recall Test

Source	SS	df	MS	F	*p*
Between Subjects					
Reading Condition	32.50	4	8.12	0.058	.994
Error	13950.56	99	140.92		
Within Subjects					
Text Type	120.29	1	120.29	1.919	.169
Text Type X Reading Condition	186.66	4	46.67	0.745	.564
Error	6204.26	99	62.67		

Table 4: Cell and Marginal Means on the Recall Test by Reading Condition and Text

Reading Condition	Text				
	High Freq.		Low Freq.		
	M	SD	M	SD	Marginal
1	31.76	10.34	29.90	9.41	30.83
2	31.95	10.14	27.60	10.90	29.78
3	29.05	9.29	30.55	8.66	29.80
4	31.00	11.75	29.05	10.59	30.03
5	30.38	9.12	29.43	10.56	29.91
Marginal	30.83		29.31		

For the number of correct responses as measured by the multiple-choice test, the analysis revealed exactly the same result that was obtained from analyzing the data of the recall test. That is, no significant main effects for reading condition or text type were found, neither was there a reading condition x text type interaction (Table 5). Thus, it did not matter which reading condition the participants were in or which text they read; their performance was on average the same (Table 6). In fact, as shown in Table 6, the difference between the marginal means for reading condition and the difference between the marginal means for text was a very slight fractional difference (only 0.1 difference between the HF text marginal mean and the LF text marginal mean). Note that the measurement scale involved one point for each correct response with an ultimate score of 10 points.

Table 5: Results of Analysis of Variance on the Multiple-Choice Test

Source	SS	df	MS	F	*p*
Between Subjects					
Reading Condition	0.76	4	0.19	0.077	.989
Error	242.66	99	2.45		
Within Subjects					
Text Type	0.51	1	0.51	0.237	.627
Text Type X Reading Condition	10.74	4	2.69	1.242	.298
Error	214.18	99	2.16		

Table 6: Cell and Marginal Means on the Multiple-Choice Test by Reading Condition and Text

Reading Condition	Text				
	High Freq.		Low Freq.		
	M	SD	M	SD	Marginal
1	7.76	1.546	7.33	1.74	7.55
2	7.55	1.356	7.75	1.21	7.65
3	7.59	1.563	7.68	1.29	7.64
4	7.30	1.525	7.75	1.45	7.53
5	7.90	1.513	7.10	1.87	7.50
Marginal	7.62		7.52		

3.1.2.2. Part two: Reading accuracy

THE QUANTITATIVE ANALYSIS

In this section, the analysis was concerned with the effect of the manipulated variable, reading condition per se (including and excluding short vowels/*shaddah*) and in combination with word frequency (high- vs. low-frequency) on two conditions in the reading process- reading time as indicated by the length of time it took the participants to read the texts, and on reading accuracy as indicated by the number of miscues the participant made while reading the texts. The between-subject independent variable was the vowelization (a generic term to mean both short vowels and *shaddah* manipulation) with five reading conditions: no short vowels and diacritics (plain), only-*shaddah*-, short vowels-plus-*shaddah*, short vowels-minus-*shaddah*, and finally the wrong short vowels-plus-*shaddah*. The within-subjects variable was word frequency under two conditions: high-frequency and low-frequency. For each participant, two dependent variables (reading time and number of miscues) were collected and counted respectively. As a result, four columns of data were constructed: column one represents the data collected on the time spent reading the HF text; column two represents the data on the number of miscues for the HF text; column three represents the data on the time spent reading the LF text; and column four represents the data on the number of miscues for the LF text. Therefore, the main effect for reading condition, the main effect for word frequency (text type in terms of word frequency representation), and the interaction effect between reading condition and word frequency on the dependent variables were tested by employing the two-way Repeated Measures of Variance in the SPSS statistical software package.

In the following section, the results from each manipulation are presented. Two tables are provided for each analysis conducted. The first table shows the *F ratio* and the level of significance, and the second table shows the means and the marginal means.

For the reading time data (Table 7), the analysis demonstrated a significant main effect for text type (HF vs. LF text type). Regardless of the reading condition, the participants on average took longer to read the LF text than the HF text (Table 8). However, neither a significant main effect for reading condition nor an interaction between reading condition and text type were revealed by the analysis.

Table 7: Results of Analysis of Variance on Reading Time

Source	SS	df	MS	F	*p*
Between Subjects					
Reading Condition	1797.08	4	449.27	0.482	.749
Error	92341.88	99	932.75		
Within Subjects					
Text Type	1417.05	1	1417.05	11.042	.001
Text Type x Reading Condition	1146.16	4	286.54	2.233	.071
Error	12704.76	99	128.33		

Table 8: Cell and Marginal Means on Reading Time by Reading Condition and Text

Reading Condition	Reading Condition	Text				
		High Freq.		Low Freq.		
		M	SD	M	SD	Marginal
1	Plain	127.43	16.42	134.10	16.44	130.76
2	*Shaddah* only	132.65	18.61	131.00	20.19	131.83
3	Short vowels-plus-*Shaddah*	134.00	20.80	142.27	25.92	138.14
4	Short vowels-minus-*Shaddah*	132.35	18.47	133.75	22.22	133.05
5	Wrong short vowels-plus-*Shaddah*	131.33	27.97	142.76	35.51	137.05
	Marginal	131.55		136.78		

Concerning the number of misuses among the five reading conditions, the analysis (Table 9) demonstrated a significant main effect for text type (HF vs. LF). That is, regardless of the reading condition that the participants were in, the number of their miscues was on average higher for the LF text than for the HF text (Table 10). Indeed, examining closely the marginal means shows that their differences were on average very small (M=2.09 versus M=3.32); a unit difference of only 1.23 units was observed between the marginal means. Note that the measurement scale involved one point for each miscue. Therefore, a 1.23 unit difference was equivalent to a difference of 1.23 miscues. However, the analysis did not reveal a significant main effect for reading condition or an interaction between reading condition and text type (Table 9).

Table 9: Results of Analysis of Variance on the Number of Errors

Source	SS	Df	MS	F	*p*
Between Subjects					
Reading Condition	43.10	4	10.78	1.16	.335
Error	922.66	99	9.32		
Within Subjects					
Text Type	78.14	1	78.14	39.38	.000
Text Type x Reading Condition	10.51	4	2.63	1.32	.266
Error	196.45	99	1.98		

Table 10: Cell and Marginal Means on the Number of Errors by Reading Condition and Text

Reading Condition	Text				
	High Freq.		Low Freq.		
	M	SD	M	SD	Marginal
1	1.71	2.00	3.19	2.79	2.45
2	1.85	1.81	3.85	3.07	2.85
3	3.05	2.38	4.00	2.76	3.52
4	1.95	1.76	2.70	1.98	2.33
5	1.90	1.95	2.86	2.78	2.38
Marginal	2.09		3.32		

THE QUALITATIVE ANALYSIS

To give a clearer picture of how Arab adults read a text, a qualitative analysis was also conducted on two parts of the study- that is, while the participants were reading orally the short texts in the second task of each session, and while they were reading orally the selected paragraph (that was always the last paragraph) from the long text of that session. In the first session and while the participants were reading the short texts (either the HF or the LF) orally, the observation focused primarily on the word level. That is, it was concerned with the number of miscues and their nature. Also observed was the processing of interspersed potential garden-path structures in the short texts. However, for the last paragraph of the long texts, principal attention was given to sentence level as well as evaluating the nature of miscues. In general, an overlapping interest was observed in both tasks at both the word and sentence levels. The last paragraph of the long texts was selected for the participant to read orally, for the following reason: within the last paragraph, there were two types of sentences that were driven by an initial-basic verb and an initial-basic noun. These types of sentences represent potentially the so-called garden-path phenomenon. Further, given that this last paragraph had already been read silently, the automaticity of the garden-path phenomenon in Arabic would be tested- that is, whether being exposed already to the same text and the same targeted sentences would prevent the participant from being garden-pathed. Running-record and tracking-observation techniques were administered by the primary researcher simultaneously on these two tasks. In section one, the nature of miscues within each reading condition was identified and illustrated. Later, the more frequent and overlapping miscues among the reading conditions were extracted for pattern identification. In section two, the way the participants were approaching and reading the potential garden-path sentences is described in detail and illustrated.

Section One

In this section, the more frequent miscues among the five reading conditions are presented. However, the lists of the observations for each reading condition per se can be found in APPENDIX J. Although the emphasis was on word level, a narrative, analytical description was given to the observations over the potentially garden-path sentences that were interspersed in the short texts used for the reading accuracy task. Later, the identified common misuses among all groups were classified and exemplified.

Common miscues among groups

I. When reading the initial word of a sentence the participants first tried out the active voice and kept reading; however, some went back and reanalyzed their first decision, e.g., in the sentence,"عمل كهذا في مدينة كهذه ولد" or in the sentence,
"وحول الممتلكات التي دمرت فقد أوضح المصدر بأن الانفجار ولد
أضرار بمساكن ومحلات تجارية مجاورة"

II. Some participants attempted to construct a verb-driven sentence. That is, even when the sentence began with a noun, a gerund, or a preposition, initial types of sentences that Arabic allows, they would convert it to a verb, e.g.,"استئناف" was read as, "استأنف, and "إذاعة" was read as "أذاعت," and, "جَزَعٌ" as "جَزَعَ", and "فتحُ" as "فَتَحَ." However, they would reanalyze their first decision correctly

III. Pause in the initial positions of the sentence that began with a gerund or a proposition: "... جزع الناس ", "... عمل كهذا" , "...حول الممتلكات": among all groups

IV. They all attempted to drop the demonstrative pronoun, "هذا", the preposition, "عن", or "في" from the following sentences, but they very often corrected their miscues
"تسبّب (هذا) عن الانفجار "
أدخلت الرعب (في)
"أسفر (عن) هذا الخبر"

V. The majority read, "ألفا" as a dual of, "ألف"

VI. The silent letter "ا" in "مائة" was always pronounced

VII. Pause over some words that were strengthened among all the texts in which *shaddah* was not included

VIII. Tried to spell long and foreign words, and words of low-frequency, e.g.
"تخبره ,التايلندية ,ساباولو,بوغوتا,كولومبيا,الريفيرا"

IX. Extensive reluctance over low-frequency words such as,"قوضت ,
" يقطن,بلبلة,أمكنة ,بضعة, محال, معوزين, تخبره, معمرين, الهلع

X. Pause and extensive hesitation over sentences that began with a passive voice verb, e.g.,"أن أفزعت"

XI. They attempted to assemble the letters while reading long words or words that had neighboring, similar or close sounds,
e.g., "تسَبَّب, مفخّخة ,بلبلة, المتسمة ,يتكتل"

XII. They read verbs without strengthening unless they were forced to do so, e.g., ,ملغمة
" ولد, الآني,معمرين"

XIII. They read the words, "الآنيَّة" as "الآتية", and, " تنتسب " as "تَتَسَبَّب"
and some corrected their first reading and some not

XIV. Some participants read,"اليمنيَّة" instead of "اليمينيَّة" and "بعض" instead of "بضعة"

XV. Sometimes when they read a part they were not familiar with (a rule: passive instead of their initial reading, active) they attempted to over-apply or overextend the rule to the subsequent parts, e.g.,
أربع منهن كانوا نساء وثلاثة منهن كانوا رجالا معمرين

XVI. When the participants encountered a sentence that started with a passive voice verb, they first assigned to it the active voice, and then corrected their first decision once they reached the disambiguating area, "أُعلن" as, "أعلن", even when it was marked by, " ُ", *Dhamma*

XVII. Trying to modify the foreign words so they complied with the Arabic patterning of pronunciation, such as pronouncing the words," ساباولو and بوغوتا " as,"سابولو؛ بوغواتا ," respectively

Section Two

The observation which is emphasized in this section is concerned with the sentence level, particularly the garden-path sentences. For clarification, an illustrative diagram was needed. Following are the complete paragraphs that were read from both long texts (HF and LF), including the garden-path sentences. The positions of the two garden-path sentences in those texts are pointed at and the way the participants approached and read the potential garden-path sentences are treated exclusively. The garden-path sentences within those texts are qualitatively described in detail and illustrated. Further, the percentages of the participants who were garden-pathed and the ones who were not garden-pathed are provided in this section.

Despite the reading condition, almost all participants were garden-pathed by these types of sentences. The way they approached these types of sentences can be described as follows: some participants reanalyzed the sentence at the disambiguating region of the sentence; a few of them paused at the disambiguating region and never went back but continued reading the sentence. However, a very few would assign the right reading form of the initial homograph in the first place and subsequently would not be garden-pathed. In the following section, the aforementioned phenomena are described in detail.

The paragraph (of HF long text)

أما لجنة التحقيق فوصفت بالفشل لأن هوية السارق القاتل لم تكتشف علما بأن أحد شهود العيان قدم وصفا تقريبيا للسيارة الواقفة بجانب المحل وقت ارتكبت السرقة, والتي انطلقت بطريقة مفاجئة بعد أن سمعت طلقات الرصاص بقليل. *فتح* **ملف هذه السرقة والجريمة بعد حوالي ثلاثة عشر عاما من وقوعها**/*عاد* للأذهان ذلك النقاش الطويل والصراع المرير الذي عاشه حي ستانفورد في ذلك الزمن. كذلك *خوف* **الناس على أنفسهم وممتلكاتهم** *عاد* من جديد. استئناف ملف هذه القضية كان بسبب ما أذاعته اللجنة المفوضة بمتابعة السرقة والجريمة عن توصلها إلى دليل مادي قد يوصل إلى مرتكب السرقة والجريمة. الإعلان كان في الحقيقة لجريمة أخرى وقعت في نفس الحي سنة 2002 ولم يكن لجريمة 1990.

فتح **ملف هذه الجريمة والسرقة بعد حوالي ثلاثة عشرعاما من وقوعها**/*عاد للأذهان ذلك النقاش الطويل والصراع المرير الذي عاشه حي ستانفورد في ذلك* الزمن

Sentence 2

كذلك خوف **الناس على أنفسهم وممتلكاتهم** *عاد من جديد*

Figure 2: Diagram of the Garden-Path Phenomenon of Sentences 1 & 2

Sentence 1 begins with the gerund, "فتح", which is the subject of the sentence. This form, "فتح" is the root of many words, such as, "فَتَحَ": active-voiced verb; "فُتِحَ": a passive-voiced verb; "فَتَّحَ": doubled verb; or, "فَتْحُ": a basic gerund. Sentence 2, on the other hand, begins with the gerund, "خوف", as the subject (or the noun phrase) of the sentence. This form, "جزع" is the root of many words, such as, "خَوَّفَ": active-voiced verb; "خُوِّفَ": a passive-voiced verb; or "خَوْفُ": a basic gerund.

On the other hand, the predicates, which constitute the disambiguating region in the garden path sentences, are the word, "أعاد" for sentence 1, and the word, "عاد" for sentence 2. The bolded areas in both sentences indicate what comes between the subjects and the predicates (Figure 2).

The observation conducted while the participants were reading those sentences showed that almost all participants were garden-pathed. They assigned the active-voiced verb as their initial decision. However, when they arrived at the region of disambiguation e.g., the predicates " أعاد " ; " عاد " respectively, they went back to the first word in the sentence and reanalyzed their initial decision correctly. In fact, they made an exclamation when they arrived at the region of disambiguation and some of them said “sorry” to show that they should not have assigned their incorrect reading in the first place, an indication that the process was automatic. However, a very noticeable phenomenon was that some of the participants, no more than 10 percent of the participants, did not correct their first decision, but continued reading. However, after they arrived at the disambiguating region they paused or showed some reluctance. The garden-pathed phenomenon was not the case always; that is, very few participants assigned their initial reading correctly the first place. However, those participants did pause in the area between the ending of the previous sentence and the beginning of the succeeding sentence. To illustrate using the HF paragraph above, they paused immediately after they read the word, "بقليل", that is, before they read the word, "فتح"; and immediately after they read the word, "كذلك", that is, before they read the word, "خوف" (See the Arabic HF paragraph above).

Another phenomenon was that some participants attempted some of the possible forms mentioned earlier before they moved to the second word. Indeed, they tried virtually all possible forms reluctantly, and finally they chose one reading which was always the incorrect one and which was always the active-voiced basic verb.

<u>The paragraph (of LF long text)</u>

أما لجنة التحقيق فنعيت بالفشل لأن هوية القاتل السارق لم تكتشف علما بأن أحد شهود العيان قدم وصفا للسيارة الواقفة بجانب المحل ساعة ارتكبت الجريمة, والتي انطلقت بطريقة مباغتة بعد أن سمعت طلقات الرصاص بقليل. *فتح **ملف هذه الجريمة والسرقة بعد حوالي** خمسة **عشر حولا من وقوعها** أحيا في العقول ذلك الجدل الطويل والصراع المحتدم الذي عاشه حي الريفيرا في ذلك الزمن. كذلك جزع **الناس على أنفسهم وممتلكاتهم** عاد من جديد. استئناف ملف القضية كان بسبب ما أذاعته اللجنة الموكلة بمتابعة الجريمة والسرقة عن عثورها على دليل مادي قد يوصل إلى مرتكب الجريمة والسرقة*. البلاغ كان في الحقيقة لجريمة أخرى وقعت في نفس الحي سنة 2003 ولم يكن لجريمة 1988.

Sentence 1

فتح **ملف هذه الجريمة والسرقة بعد حوالي** خمسة **عشر حولا من وقوعها** *أحيا في العقول ذلك الجدل الطويل والصراع المرير الذي عاشه حي الريفيرا في ذلك الزمن*

Sentence 2

كذلك جزع **الناس على أنفسهم وممتلكاتهم** *عاد من جديد*

Figure 3: Diagram of the Garden-Path Phenomenon of Sentences 1 & 2

Sentence 1 begins with the gerund, "فتح", which is the subject for the sentence. This form, "فتح" is the root of many words, such as, "فَتَحَ": active-voiced verb; "فُتِحَ": a passive-voiced verb; "فَتَّحَ": doubled verb; or, "فَتْحُ": a basic gerund. Sentence 2, on the other hand, begins with the gerund,

"جزع", which is the subject for the sentence. This form, "جزع" is the root of many words, such as, "جَزَعَ": active-voiced verb; "جُزِعَ": a passive-voiced verb; or "جَزَعٌ": a basic gerund.

On the other hand, the predicates, which constitute the disambiguating region in the garden-path sentences, are, "أحيا" for sentence 1, and "عاد" for sentence 2. The bolded areas in both sentences indicate what comes between the subjects and the predicates (Figure 3).

The observation conducted while the participants were reading those sentences showed that almost all participants were garden-pathed. They first assigned the active-voiced verb as their initial decision or as their first choice. However, when they arrived at the region of disambiguation, e.g., the predicates: "أحيا"; "عاد," they went back to the first word in the sentence and reanalyzed their initial decision correctly (Figure 3). In fact, they made an exclamation as they arrived at the region of disambiguation, and some of them said “sorry” to show that they should not have assigned their incorrect reading in the first place. However, a very noticeable phenomenon was that roughly 15 percent of the participants did not correct their first decision, but they kept on reading. However, after they arrived at the disambiguating region, they either paused or showed some hesitation. The garden-pathed phenomenon was not the case always; that is, very few participants assigned their initial reading correctly. But these participants did pause in the area between the ending of the previous sentence and the beginning of the succeeding sentence. To illustrate using LF paragraph above, they paused immediately after they read the word, "بقليل" , that is, before they read the word, "فتح"; and immediately after they read the word, "كذلك", that is, before they read the word, "جزع" for the second sentence (see the Arabic LF paragraph above).

Another phenomenon was that some participants tried out simultaneously some of the possible forms that were mentioned earlier, before they moved to the second word. Indeed, they tried some of the possible forms reluctantly, and finally they would choose one reading which always was the incorrect one and which always was the active-voiced basic verb.

In the second task when the participants were reading the short texts orally for reading accuracy, they were observed while they were reading the potential garden-pathed sentences. Following is the paragraph from the HF text that included the potential garden-pathed sentences:

The paragraph (of HF short text)

أيضا تسبب عن هذا الانفجار أن أفزعت الأقلية الصينية في هذه المدينة القديمة والمتميزة بوجود أقليات أجنبية عديدة. *عمل* **كهذا** في **مدينة اتسمت بالهدوء** *ولد* بلبلة وشغبا في مكان الحادث. *وحول* **الممتلكات** التي **دمرت**, *فقد* أوضح المصدر بأن الانفجار ألحق أضرارا بمساكن ومحالات تجارية مجاورة, وبأن زجاج الأبواب والنوافذ لهذه البيوت والمحالات قد تحطم.

Sentence 1

عمل **كهذا** في **مدينة اتسمت بالهدوء** *ولد* بلبلة ...

Sentence 2

وحول **الممتلكات** التي **دمرت**, *فقد أوضح* المصدر ...

Figure 4: Diagram of the Garden-Path Phenomenon of Sentences 1 & 2

Sentence 1 begins with the gerund, "عمل", which is the subject for the sentence. This form, "عمل" is the root of many words, such as, "عَمَلَ": active-voiced verb; "عُمِلَ": a passive-voiced verb; or,

"عَمَلٌ": a basic gerund. Sentence 2, on the other hand, begins with the preposition, "حول", which is like a subject for the sentence. This form, "حول" if not vowelized would be confused with the verb, "حَوَّلَ", which means, "to have changed the direction of something."

On the other hand, the predicates, which constitute the disambiguating region in the garden-path sentences, are the word, "ولد" for sentence 1, and the word, "فقد" for sentence 2. The bolded areas in both sentences indicate what comes between the subjects and the predicates (Figure 4).

The observation conducted while the participants were reading the garden-path sentences showed that almost all participants were garden-pathed. They assigned the active-voiced verb as their initial decision. However, when they arrive at the region of disambiguation, e.g., the predicates "ولد"; "فقد," respectively, they went back to the first word in the sentence and reanalyzed their initial decision correctly. In fact, they made an exclamation when they arrived at the region of disambiguation and some of them said "sorry" to show that they should not have assigned their incorrect reading in the first place. However, a very noticeable phenomenon was that some of the participants, no more than 15 percent, did not correct their initial decision, but they continued reading. However, after they arrived at the disambiguating region they paused or showed some hesitation. The garden-pathed phenomenon was not the case always; that is, very few participants assigned the initial reading correctly. However, those participants did pause in the area between the ending of the previous sentence and the beginning of the succeeding sentence. To illustrate, they paused immediately after they read the word, "عديدة", that is, before they read the word, "عمل" for the first sentence; and immediately after they read the word,

"الحادث", that is, before they read the word, "وحول" for the second sentence (See the Arabic paragraph above).

Another phenomenon was that some participants tried some of the possible forms mentioned earlier before they moved to the second word. Indeed, they tried virtually all possible forms reluctantly before they finally selected one, which was always the incorrect one, and which was always the active-voiced basic verb.

<u>The paragraph (of LF short text)</u>

أيضا تسبب عن هذا الانفجار أن أفزعت الأقلية التايلندية في هذه المدينة العتيقة والمتسمة بتكتل أقليات أجنبية عديدة. *فعل* **كهذا** في **مدينة اتسمت بالهدوء** *ولد* بلبلة وشغبا في مكان الحدث. *وحول* **الممتلكات التي قوضت,** *فقد أبان* المصدر بأن الانفجار ألحق أضرارا بمساكن ومحال تجارية مجاورة, وبأن زجاج النوافذ والأبواب لهذه البيوت والمحال قد تهشم.

Sentence 1

فعل **كهذا** في **مدينة اتسمت بالهدوء** *ولد* بلبلة ...

Sentence 2

وحول **الممتلكات التي قوضت,** *فقد أبان* المصدر ...

Figure 5: Diagram of the Garden-Path Phenomenon of Sentences 1 & 2

Sentence 1 begins with the gerund, "فعل", which is the subject for the sentence. This form, "فعل" is the root of many words, such as, "فَعَلَ": active-voiced verb; "فُعِلَ": a passive-voiced verb; or,

"فِعْلٌ": a basic gerund. Sentence 2, on the other hand, begins with the preposition, "حول", which is like a subject for the sentence. This form, "حول" if not vowelized would be confused with the verb, "حَوَّلَ", which means, 'to have changed the direction of something.'

The predicates, on the other hand, which constitute the disambiguating region in the garden-path phenomenon, are the word, "ولد" for sentence 1, and the word "فقد" for sentence 2. The bolded areas in both sentences indicate the words that separate the subjects from the predicates (Figure 5).

The observation conducted while the participants were reading those sentences showed that almost all participants were garden-pathed. They assigned the active-voiced basic verb as their first decision. However, when they arrived at the region of disambiguation, e.g., "ولد"; "فقد أبان," respectively, they went back to the first word in the sentence and reanalyzed their initial decision correctly. In fact, they made an exclamation when they arrived at the region of disambiguation and some of them said "sorry" to show that they should not have assigned their incorrect initial reading. However, a very noticeable phenomenon was that some participants, approximately 13 percent, did not correct their first decision, but continued reading. Once they arrived at the disambiguating region they paused or showed some hesitation. However, the garden-pathed phenomenon was not the case always; that is, very few participants assigned their initial reading correctly. These participants, however, did pause in the area between the ending of the previous sentence and the beginning of the succeeding sentence. To illustrate, they paused immediately after they read, "عديدة," that is, before they read, "فِعْلٌ" for the first sentence; and immediately after they read, "الحدث", that is, before they read, "وحول" for the second sentence (See the Arabic LF paragraph above).

Another phenomenon was that some participants tried out all possible forms mentioned earlier before they moved to the second word. Indeed, they tried all the forms reluctantly, and finally chose one reading which was always the incorrect reading and which was always the active-voiced basic verb.

To summarize, the garden-path was inevitable and automatic; almost all participants were garden-pathed. Further, the participants' initial reading assignment was always the active-voiced basic verb.

3.1.3. Discussion and Interpretation

Overview

In this section, the discussion and the interpretation follow the same organization and order as the previous chapter. Each part of the data analysis is given an exclusive treatment in discussion and interpretation. The quantitative results of part one regarding reading time and comprehension tests (recall and multiple-choice) are treated separately in one and two sections. The quantitative results of part two are treated separately in two sections: oral reading time and number of miscues.

For the qualitative analysis, the results are given a special treatment: section one was assigned exclusively to word level, particularly the identified miscues, and section two was assigned exclusively to sentence level processing, particularly the garden-pathed sentence. A summary of the discussion of each part is presented. However, the recommendations, both in theory and in practice, and the limitations are given separately after each experiment is analyzed and discussed.

3.1.3.1. Quantitative section

PART ONE (READING COMPREHENSION TASK)

Reading Time Results

According to the statistical analysis conducted on the data of experiment I (Tables 1 & 2), the word frequency was found to make a difference in the participants' reading time. As shown in Table 1, the only manipulated variable that correlated with the dependent variable (reading time) was found to be the text type (HF text vs. LF text). This result did not support hypothesis c1 (see the Hypotheses section). The current study predicted that in a silent reading, Arab readers would exploit their knowledge of morphology and context in accessing the low-frequency words. In actuality, their reading process was not hindered by the interspersed low-frequency words. Note that the percentage of word frequency in the low-frequency text was less than 30 percent. Despite this percentage, the word frequency made a difference in the Arabic reading process. The results of the reading time in the oral reading task were consistent with this finding which will be presented later. The low-frequency text on average took the participants longer to read than the high-frequency text, despite the reading condition representation. However, this last finding from the reading accuracy task was consistent with the predicted hypothesis (1h in Hypotheses section). The conflicting hypotheses that were constructed based on whether the reading mode was silent or oral were justified by the fact that homograph is implicated with word frequency (in that the low-frequency has an additive effect in addition to the homographic aspect of the word). The reader was expected to say the right form of the low-frequency word in the oral reading task.

The other independent variable, i.e., reading condition in terms of vowelization was not found to have an effect. The reading time was on average the same whether the text was presented plain, vowelized[1], or wrongly vowelized. Further, no interaction between the reading condition and the text type (HF vs. LF) was detected. This finding is in line with predicted hypothesis 1d (see the Hypotheses section). Further, this result is consistent with the two-experiment study of Shimron and Sivan (1994) which did not reveal any significant difference between the reading time of vowelized versus unvowelized Hebrew texts.

Reading Comprehension Results

Both tests, recall and multiple-choice, revealed the same results. That is, providing the consonants with short vowels and *shaddah* did not make any difference in the adult Arabs' reading comprehension. Regardless of the reading condition, their comprehension on average was the same (see Tables 3, 4, 5 & 6). Further, the word frequency was found not to interfere with the Arab readers' comprehension processes.

These results were in line with the predicted hypotheses (1a & 1b in the Hypotheses Section), where Arab adults exploited their morphological knowledge in accessing the mental lexicon of the text words. The current study claimed that in a silent mode of reading, the representation of only consonants was sufficient in processing a connected text; Arab adults exploited their knowledge of the Arabic morphology, particularly the *trilateral/quadrilateral-root* model of words in Arabic.

However, a claim that the finding should be attributed to the context factor should not be supported for the following reason: the results of the reading time analysis demonstrated that the reading condition (vowelized versus nonvowelized) did not correlate with the reading time dependent variable; only word frequency was found to be correlated with reading time. The participants did not regress for each type of sentences that starts with a homographic word. If they did, more time would be needed. However, the results showed that the reading time was on average the same regardless of the represented reading condition. This finding, as will be explained later, is consistent with the moving window experiment which demonstrated that reading time and reading comprehension were not affected by the one-direction reading of the moving window technique. That is, the participants were not able to move back and forth while processing sentences of homographic and non-homographic initial words. Despite this, their reading time and comprehension were on average the same (Table 12 & 13).

If context was involved in bringing about the above results, then its role should be minimized once the text was provided with short vowels and *shaddah*. This minimizing should be reflected in the reading time it took the participants to read a text that was provided with short vowels-plus-*shaddah* (reading condition 3) versus a text that was presented without short vowels and *shaddah* (reading condition 1). Indeed, examining the cell means in Table 2 shows that although it took relatively less time to read the high-frequency text in reading condition 3 than in reading condition1, it took more time to read the low-frequency text in reading condition 3 than in reading conditions 1, 4 and 5 (Table 2).

The current result does not support Abu-Rabia's results (1999; 2001) which indicated that the participants who read the 'vowelized' texts did better than those who read the 'unvowelized' texts (plain). Such conflicting findings should not be a surprise. The conflict in the findings can be traced to other factors, particularly to the different methodologies of the current and previous studies. The current study attributes Abu-Rabia's (1999-2001) conflicting results mainly to the failure of the studies' controlling procedure, namely, the materials he used in the experiment, the nature of the target population, its size and its reading skill level (his participants were identified as skilled by an unstandardized instrument that was constructed for the purpose of his studies, and the instrumentation procedure used. Note that the difference between the overall two means for the ‘vowelized’ and ‘unvowelized’ reading condition in the Abu-Rabia (1999) study was very small (*M* 7.20 with *SD* 1.70 for the vowelized condition and *M* 6.10 with *SD* 2.22 for the unvowelized condition in Experiment 1, 10 being the ultimate score; and *M* 6.34 with *SD* 1.58 for the vowelized condition and *M* 5.46 with 2.00 *SD* for the unvowelized condition in Experiment 2, 7 being the maximum score). The measurement scale involved one point for each correct answer. Therefore a 1.1 unit difference and a 0.88 unit difference were equivalent to a difference of 1.1 and 0.88 correct responses, respectively. The same thing applies to the later Abu-Rabia study (2001). The difference between the means was slight (for Arabic texts, *M* = 4.51 with SD 1.20 for the vowelized text, and 4.10 with SD 1.56 for the nonvowelized text; for Hebrew texts, *M* = 2.43 with SD 1.39 for the vowelized (pointed) Hebrew text, and 2.27 with SD 1.16 for the nonvowelized (unpointed) Hebrew text). The maximum correct answer was 6 and the measurement scale involved one point for each correct response. Therefore, a 0.41 unit difference and 0.16 unit difference were equivalent to a difference of 0.41 and 0.16 correct responses.

Concerning the instrumentation, Abu-Rabia (1999, 2001) used only the multiple-choice test for measuring the participants’ comprehension with a measurement scale of one unit for every correct answer. Ten and seven points were the ultimate scores for the 1999 study, and 6 points was the ultimate score for the 2001 study.

Among the criticisms that have been leveled against multiple-choice tests is that they are text-independent (Bernhardt, 1991) and that guessing is possible. Strict criteria are recommended when designing such a test in order to avoid its possible weaknesses, and these were established when constructing the multiple-choice test for this study. Further, the way, the current study employed and conducted the multiple-choice test helped to minimize one of these disadvantages, the potential for guessing. A short oral script was read to each participant before he/she answered the multiple-choice test. This script functioned as a pre-cautionary and guiding procedure for the participants so that they would base their response on the test itself, that is, on something they had just read in the text (see APPENDIX I for the script, and the *Measurement* section for the procedure). In this way, the multiple-choice test of this study was supposed to have been given an exclusive condition that should have helped in minimizing participant guessing, and subsequently should have strengthened the validity of score interpretation and therefore, supported the findings of the current study.

The existence of conflicting findings between Abu-Rabia's studies (1999, 2001) which found a significant difference with the inclusion of the short vowels, and the current study which did not find such a significant difference could be attributed to the large sample size that was used in Abu-Rabia's studies. The difference that was reported was only statistically significant. Further, Abu-Rabia's studies did not report any kind of controlling for other variables such as the factors that would differentiate texts from each other.

On the other hand, the current study claims that the materials used for its experiments were controlled to the extent that the only manipulated variable between the reading conditions was the inclusion and exclusion of short vowels and shaddah. Indeed, the current study adopted a procedure that should have helped isolate the effect of short vowels by themselves and in combination with *shaddah*. In addition, the two texts were presented with a time interval and a counterbalance procedure was adopted in order to eliminate the practice effect. For the two texts to be controlled, they needed to be identical in all aspects except in the short vowels and *shaddah* representation. This procedure may have enhanced the participants' comprehension when they read the second text, but in fact, the results of using the counterbalancing showed that both groups that differed only in one variable (that is, the manipulated variable which is here short vowels and *shaddah*) did not differ in the comprehension assessment, as measured by both the recall and multiple-choice tests. This result gives the current study a stronger stand in claiming that the inclusion of short vowels only, or short vowels-plus-*shaddah* did not benefit the comprehension of skilled readers as represented by Arab adults at undergraduate and graduate academic levels. The limited role for vowels and *shaddah* is compensated with the fact that Arabic is a highly affixated language with a dynamic morphology which participants bring to their reading task for accessing their mental lexicon. Indeed, Abu-Rabia's recent article (2002) assured that role of morphology in reading Arabic process.

It is worth noting that Abu-Rabia's earlier study (1999) was conducted with sixth grade participants while the current study was conducted with graduate/post-graduate participants. The current results on comprehension also are not consistent with the Shimron and Sivan (1994) two-experiment study. Those authors stated that, "Unvoweled Hebrew texts *appear* to have been comprehended less effectively than both English and voweled Hebrew texts" (p.17); note the uncertainty in the quote (emphasis is added). However, examining the means for both experiments shows that the difference was really slight (for experiment 1, M = 1.42 unvoweled Hebrew and 1.75 for the voweled Hebrew; for experiment 2, M = 1.42 unvoweled Hebrew and 1.62 for the voweled Hebrew). The maximum correct answer was 2, and the measurement scale involved one point for each correct response. Therefore, a 0.33 unit difference and 0.20 unit difference are equivalent to a difference of 0.33 and 0.20 correct responses.

Those findings of no explicit roles for short vowels (and also in combination with *shaddah*) in the reading process, i.e., reading time and reading comprehension products, should not be surprising as, for example, a contrast to English. As expressed by Shimron (1993), "An alternative writing without vowels, however, is unlikely to be equally feasible in different languages [orthographies]. Compared with Hebrew [and Arabic], English seems to be less amenable to consonant-only writing" (p. 55). Arabic morphology is characterized by the *trilateral/quadrilateral-root* model. Even nouns are derived from those *trilateral/quadrilateral* roots of the verbs. Further, even with the absence of short vowels and diacritics in general, the patterns (or forms) of words in Arabic, as in Hebrew, "provide a general and specific indication regarding the word's type: noun or verb (e.g., a location or an occupation)" (Shimron's (1993) comments on Hebrew). Those patterns indicate the tense of the verb. Indeed, generally speaking, the affixation elements that are attached to the core words are built of consonants, e.g., affixes that indicate gender, number, location, occupation, person, etc. Overall, the absence of short vowels and *shaddah* is compensated with other factors that help the Arab reader to recognize and access the mental lexicon.

Despite the provision of short vowels and *shaddah* to the text, its comprehension was not better than the counterpart vowelized text. This should not be seen as a counterpart to well-established findings conducted on Latin-alphabetic based languages which demonstrated the role of phonology in facilitating retention in working memory and subsequently comprehension (Lukatela & Turvey, 1994; Liberman & Shankweiler, 1991; Frost, 1991; Perfetti & McCutchen, 1982); rather, it should be explained on the basis of different orthographies. In fact, even with the absence of diacritics that represent short vowels and *shaddah* in Arabic script, the phonological aspect of the words is still presented. As Shimron put it in the context of Hebrew, those consonant letters in Arabic, "may contribute important phonological information to the word-recognition process by constraining the number of possible readings … unvoweled (printed) words are recognized partly on the basis of phonological information, which, although incomplete, is nevertheless useful for the word-recognition process" (Shimron, 1993, p. 64). Further, some constraints within Arabic spelling (discursive writing system) compensate for the absence of short vowels and diacritics from the script. To illustrate, within a syllable, presenting a short vowel or *shaddah* would not be necessary since the reader would figure it out as presented; that is, only one short vowel or *shaddah* is possible in that place in the syllable which makes materializing its representation unnecessary.

PART TWO (READING ACCURACY TASK)

Reading Time Results

For the reading accuracy task, the analysis was conducted on the reading time and the number of propositions in terms of reading condition and text type (HF vs. LF). The analysis, as shown in Table 7, revealed that the only manipulated variable that correlated with the dependent variable, reading time, was word frequency (text type: HF vs. LF). Due to the strict control the current study has followed in eliminating potential confounding variables, as explained earlier, it is legitimate to say that the only factor that was found to have affected reading time was the type of text in terms of word frequency: high- vs. low-frequency. Regardless of the reading condition, it took the participants on average longer to read the low-frequency text orally (Table 8). The study prediction was that there would be a significant difference in the reading time of skilled adult Arab readers when reading orally a vowelized versus unvowelized text and that the vowelized text that would take less time to process (1g in Hypotheses section). Further, the current study predicted that there would be a significant difference in the reading time of skilled adult Arab readers when reading orally a high-frequency versus a low-frequency plain text, and that the high-frequency text would take less time to process (1h in Hypotheses section).

However, this prediction was not supported by the current data. It was expected that due to long experience with print, the words, particularly the high-frequency words would become sight words. As a result, interspersing some low-frequency words in the text should force the readers to a two-way reading technique. That is, they would need to switch from the sight-word process to the primitive process of assembling the phonemes of the word sequentially. This switching would result in extra time to process. However, adding short vowels and *shaddah* to the consonants in the text should reduce this expected extra time of processing to a minimum that would not result in a statistically significant difference.

Although the results did not support the former hypothesis (1g in Hypotheses Section), they did support the latter one (1h in Hypotheses Section). Further, the results are consistent with the finding from the reading comprehension task; the text with low-frequency words took on average longer to read than its high-frequency counterpart (Table 28). Furthermore, the low-frequency words took longer to recognize (to name) than their high-frequency counterparts, a result which will be explained later in the word naming task findings.

Regardless of the mode of reading (silent or oral), the text with a proportion of low-frequency words (15% - 20%) took longer to read on average than the text with only high-frequency words. Indeed, regardless of whether the stimulus was a word or a text (as will be explained later after laying out the findings on the word-naming task), the effect of word frequency was consistent.

However, short vowels and *shaddah* had no significant effect on the reading time process (Table 7). The prediction that was justified and stated earlier (1g in Hypotheses section) was not supported by the data. Adding short vowels per se or in combination with *shaddah*, which minimized the homographic aspects of the words, on average did not speed the reading process. Providing the consonants with short vowels-plus-*shaddah* also had no effect on the participants' reading process. Indeed, the moving window task, as will be explained later, showed that adding short vowels and *shaddah* to the consonants slowed the reading process without any significant effect on comprehension. Hence, the trade would be a cost with no payoff: slowing the reading process with no explicit additional benefit.

The effect of word frequency was consistent with other findings, as will be explained later in Experiment 3. The low-frequency words took longer to name than their high-frequency counterparts (Table 28). Thus, an increase in reading time was expected for a text that has a rate of low-frequency words versus one that has a rate of high-frequency words. However, for comprehension, the low-frequency factor was not found to be implicated with text comprehension (Ryder & Hughes, 1986) once the topics of the texts were familiar to the readers. Only manipulation of the familiarity of text topics affected the comprehension product of a reader (Bransford & Johnson, 1972).

Reading Accuracy Results (Number of Miscues)

The analysis that was conducted on the number of miscues among the reading conditions and between text types showed that a main effect was found only for text type (Table 9). The results showed that the number of miscues correlated with word frequency, that is, the participants on average made more miscues in the low-frequency than in the high-frequency text. It was predicted that once the text was introduced plain, the word-frequency would have an affect, but by controlling for frequency, the provision of short vowels and *shaddah* would not make a difference to reading accuracy. The prediction was that only when the text had a rate of low-frequency words, would the provision of short vowels and *shaddah* be effective in minimizing the number of miscues.

However, the results showed that adding short vowels and *shaddah* to the consonants did not affect the participants' reading accuracy. That is, according to the data collected, the supplemented short vowels and *shaddah* did not contribute to the reduction of miscues. No main effect for reading condition was revealed by the analysis (Table 10). As noted, this finding is not in agreement with the predictions (1e1 & 1e2 in Hypotheses section) that adding short vowels and *shaddah* to the consonants would reduce the number of miscues, particularly for low-frequency texts, that is, the effect of the provision of short vowels and *shaddah* should be noticed over low-frequency words.

On the other hand, for a plain text, the low-frequency effect was predicted to be effective in maximizing the number of miscues. The result, as shown in Table 9, was consistent with the stated prediction (1f in Hypotheses section). Further, the running record procedure that was conducted in the reading accuracy task and while the participants were reading the last paragraph of the comprehension texts demonstrated that their miscues very often were over the low-frequency words and that was regardless of the reading condition (vowelized versus nonvowelized).

The findings on the reading time and the number of miscues from the reading accuracy task were not a surprise for the following reasons. First, the sample involved in this study (except 4 participants) comprised either graduate or postgraduate level students whose ages ranged from 20 to 40 years. Being at this level and in this range implied that the participants, generally speaking, were skilled readers because they were beyond the stage of learning to read which runs from kindergarten to grade four. Second, the reading accuracy session also was used as a criterion for excluding the data of any participant who showed any weaknesses in reading Arabic. Further, by time, reading words moves from a loading task to automaticity. That is, word recognition moves from letter-by-letter assembling, to syllable-by-syllable integrating, to finally, sight word processing. Since these gradual steps in reading evolve with practice, that is, by exposition to more print (Stanovich, 1981), the Arab adults presumably had gone through tremendous printed texts exposure that had helped them build knowledge of word spelling patterning, word structure, and their language morphology system. Further, this tremendous exposure presumably made word processing holistic, that is, as sight words.

However, attaining the sight-word level was not always the case for adult Arabs. Sight-word attainment would be affected by the nature of the word: its length and its frequency. Therefore, when the adults encountered low-frequency words, they reverted to the primitive stage of word recognition, that is, to letter-by-letter processing which takes more time. Indeed, the qualitative part of Experiment 1 substantiated those claims. Participants were more reluctant while they were reading the LF words; and further, their miscues always occurred with these LF words (APPENDIX J).

Examining the cell means in Table 10 shows that more miscues were found in reading condition 3 where correct short vowels and *shaddah* were supplemented, and that was consistent whether the text was of high-frequency or low-frequency. This finding may be explained on the basis of normality of the texts in terms of vowelized/unvowelized representation. Adult Arab readers experienced texts in their nonvowelized representation, and thus, they were forced to give more attention to the script; this resulted in more time processing and more miscues. In a descriptive analysis, examining the cell means in Table 8 and Table 10 shows that reading condition 3 (where short vowels-and-*shaddah* were supplemented) on average took more time to read (134 seconds for HF text with a range of 127.43 - 134.00 seconds; 142.27 seconds for LF text with a range of 131.00 - 142.76 seconds), and had more miscues than the other reading conditions (number of miscues 3.05 for the HF text with a range of 1.71 – 3.05 miscues; 4.00 miscues for the LF text with a range of 2.70 – 4.00 miscues).

The only suggested explanation for these results is that of familiarity in terms of exposure. Being exposed regularly to nonvowelized print forced the participants to switch their reading approach or strategies from a sight word using the address-route to an assemble-route which would be expected to result in more reading time and miscues. Indeed, several studies have demonstrated the effect of word frequency on both silent and oral reading. For convenience, Figure 6 presents the proposed hypotheses in correlation with the current findings.

Hypothesis ID	Hypothesis Statement	Finding
Alternative Hypothesis 1a	"There is no significant difference in the reading comprehension of skilled adult Arab readers when reading a vowelized[2] versus an unvowelized text"	Supported
Alternative Hypothesis 1b	"There is no significant difference in the reading comprehension of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text"	Supported
Alternative hypothesis 1c	"There is no significant difference in the reading time of skilled adult Arab readers when reading a high-frequency text versus a low-frequency text and that should hold regardless of whether the text is plain or not"	Not supported
Alternative hypothesis 1d	"There is no significant difference in the reading time of skilled adult Arab readers when reading silently a vowelized text versus an unvowelized text"	Supported
Alternative Hypothesis 1e1	"There is a significant difference in the reading accuracy of skilled adult Arab readers when reading a vowelized versus an unvowelized text in favor of the vowelized text and for the low-frequency text"	Not supported
Alternative Hypothesis 1e2	"Vowelizing a low-frequency text would make a difference in the reading accuracy of skilled adult Arab readers when reading a vowelized versus an unvowelized low-frequency text"	Not supported
Alternative Hypothesis 1f	"There is a significant difference in the reading accuracy of skilled adult Arab readers when reading orally a plain high-frequency text versus a plain low-frequency text in favor of the high-frequency text which should have few miscues"	Supported
Alternative Hypothesis 1g	"There is a significant difference in the reading time of skilled adult Arab readers when reading orally a vowelized versus an unvowelized text in favor of the vowelized text that would take less time to process."	Not supported
Alternative Hypothesis 1h	"There is a significant difference in the reading time of skilled adult Arab readers when reading orally a high-frequency versus a low-frequency plain text in favor of the high-frequency that would take less time to process."	Supported

Figure 6: Hypotheses Statements and Findings of Text Reading Experiment

3.1.3.2. Qualitative Section

PART ONE (READING COMPREHENSION TASK)

Word Level Observation

In this section, the approach followed in discussing and interpreting the results of the qualitative approach by classifying the observations into two levels, the word and the sentence level, was matched in discussing and interpreting the two parts separately. In general, the concern of the reading accuracy task was to track the participants' reading accuracy in terms of short vowels and *shaddah* per se and in combination with word frequency. In the texts that were employed for the reading accuracy task, there were foreign words, long words, and low-frequency words in addition to the overlapping high-frequency words that were present in both texts. Further, two potentially garden-path sentences were interspersed in both texts.

However, the primary concern in reading the last paragraph of the comprehension texts was to track the participants while they were reading two potential garden-path sentences. Thus, the observed linguistic levels identified were word level and structure level. In this section, a detailed discussion and suggested interpretation of each level was laid out. In section one, the identified misuses were classified and discussed in terms of their natures and their potential causes. In section two, the way the participants were processing a sentence, particularly the garden-path sentence was discussed with illustrations.

Section one

Word Level: Miscues

At the word level, the miscues adult Arab readers made while reading orally were examined closely in order to identify any patterns among the observations. Some miscue patterns became clear from this examination that were either exclusive to Arab adults or common among adults reading in other alphabetic writing systems. Five categories of miscues were identified among adults in general while reading orally: *substitution*, *insertion*, *omission*, *repetition*, *correction*, and *reversal* (Weaver, 2002). The same categories also were found in the miscues of adult Arabs while reading Arabic texts orally. One observation worth noting is that, generally speaking, the *substitution* miscues were of content words (morphemes), while the *omission* miscues were of functional words (for example, prepositions).

Further, exclusive categories other than these traditional ones were found. The first of these was labeled *adaptation*. This category was observed when participants were reading words of foreign origin written in Arabic script. They would either force the Arabic pattern of pronunciation onto the foreign-origin words, or assemble them in a foreign accent. Both observations were recognized regardless of the reading condition representation, e.g., the words "ستانفورد, أمريكا, سياتل, ساباولو."

This type of miscue can be attributed to the characteristics of the Arabic phonological system that does not accept two consecutive *skuns* (Al-Hamalawi, 2000) and further, does not accept beginning a word with a *skun*.

The second pattern of these miscues can be summarized in the aphorism, "mental precedes the material." That is, assuming the existence of mental process and visual process that work in parallel and in competition, it can be said that the mental process sometimes precedes the visual process. For example, the word, "اليمينية" was read as "اليمانيَّة" or "اليمنية", that is, by adding the long vowel that plays the role of consonant, " ا "; or "بعض" instead of "بضعة"; that is, they would force the high frequency counterpart (noting that both words "بعض" and "بضعة" were graphemically similar except in one consonant; they share four consonants), that is, by saying, "بعض" instead of the one in the text, "بضعة." Further, the participants read, "وهو مستوى" as

"وهو متوسط." However, the participants reanalyzed their first reading correctly. Another example is when some participants read the word, "السمعية" as "المسموعة" and later corrected their first reading.

On the other hand, the visual process preceding the mental process was very common among the participants, regardless of the reading condition they were in. The participants forced the phonological route and read the irregular word, "مائة" which should be read as, "مئة" as "مائة" by pronouncing the silent consonant," ا ". This type of word needs to be read as a sight word by forcing the address route. This previous phenomenon may be exclusive to the current study and thus given the label, the *immediate-experience* miscues. One possible explanation for some of these miscues was that the word frequency was implicated in the Arabic reading process. As illustrated earlier, when the participants ran into a phrase in which one of its words was replaced with a low-frequency counterpart, the participants still activated the high-frequency counterpart; note that usually the high- and low-frequency words had some overlapping consonants.

Those miscues, particularly *substitution*, *omission*, and *immediate-experience* need not be explained on the basis of a lack of visual attention or visual information, but on the constructive/interactive nature of the reading process (Paulson, 2002). The eye movement study conducted by Paulson (2002) demonstrated that the substituted and omitted words were fixated and examined thoroughly, and further, the differences between the duration of fixations on the substituted/omitted words and the duration of all fixations in the text were not significant. Indeed, the study found that the fixations on the substituted and omitted words were on average longer than on the other words in the text. As Pauson stated, the question becomes, “why are thoroughly examined portions of text changed during the course of constructing a parallel text?” (p. 62). One possible explanation is in viewing reading as a perceptual, interactive and constructive process that involves both graphemic information and the readers' attentive experiences and expectations. Indeed, the current study's qualitative analysis of the miscues demonstrated explicitly the interference of readers' experience and expectations in processing the graphemic information (see above and APPENDIX J). In Figure 7, the categories of the miscues identified are listed with examples.

Category of Miscue	Correct Reading	Miscue
Substitution	ملغَّمة	ملغومة
Omission	"تسبّب (هذا) عن الانفجار"	"تسبّب عن الانفجار"
Insertion		
Immediate-experience	اليمينية ,السمعية	اليمنيَّة ,المسموعة
Dialect miscue	الفَين	الفين
Adaptation	بُوغُوتا	بغْواتا
Extended-generalization	أربع منهن كانوا نساء وثلاثة <u>منهم</u> كانوا رجالا معمرين	أربع منهن كانوا نساء وثلاثة <u>منهن</u> كانوا رجالا معمرين

Figure 7: Miscue Categories

Another consistent pattern observed in their oral reading was that the Arab adults attempted to process foreign words, long words, some irregular words, and words with similar phonemes exclusively. They assembled the phonemes in a linear fashion, either letter-by-letter or syllable-by-syllable. According to the Dual-Route theory, the participants attempted to use the phonological route when they processed such types of words.

Section two

Structure Level: Garden-Path Sentences

In section two, the primary focus was to examine the observations collected on the sentence level from both sessions: from reading the short texts in the reading accuracy task and from reading the last paragraph in the comprehension texts. Several patterns were identified; some were uniquely exclusive to the Arabic writing system and some were not, but were common for adults reading in other alphabetic-based writing systems. First, the phenomena that were exclusive to the Arabic writing system are analyzed and discussed. Later, the phenomena that the Arabic writing system shares with other writing systems are also analyzed and discussed.

From the former, and while observing the participants as they were reading the short passages orally, a consistent pattern emerged. The students were garden-pathed whenever the initial word in the sentence was a basic form: a verb, a noun (gerund), or a proposition, that is, a basic word that was not yet affixated (free-root). Always the participants were garden-pathed with those types of sentences that were intentionally built in the four texts. Even exposing the participants to the same type of structures did not prevent them from being garden-pathed. That is, they would assign an initial decision as their preference, which always took the form of a basic active verb form, and later, they would reanalyze their initial decision. However, in some cases, the participant did not go back to reanalyze the wrong initial decision, but would pause over the disambiguating region in the sentence and keep on reading. Thus, it seems that the initial sentence default, to use the notions of the symbolic and associative theories of cognition

(Marcus et al., 1995), was the verb and not the noun or the preposition which Arabic allows. Further, this default was characterized by the fact that it was always regarding an active-voice verb, and this was noticed even in an embedded clause when the sentence led the reader logically to a passive voice more than to an active voice, e.g., " ... أفزعت" and " ... ألحق," from the sentences, respectively. The Arab adult readers first tried out the active voice and kept on reading until they reached the region of disambiguation, where only some of them went back and reanalyzed their first decision. Further, this phenomenon was noticed even when the previous sentence led the reader logically to adopt the passive-voice verb as the correct form.

This observation, in addition to the aforementioned concerns, led the researcher to adopt the moving window technique to investigate the Arab readers' comprehension of garden-path sentences.

To summarize, the participants would always be garden-pathed. This observation was not exclusive to one group condition, but to all groups. Almost 90 percent of the participants were garden-pathed, assigning the active verb form as their first choice. Another characteristic of this parser was that it would assign the active-voice verb as its first option once it started a sentence. That is, even when the initial word took the form of a noun, some participants attempted to construct a verb-lead sentence; even when the sentence began with a noun, gerund, or preposition, a type of sentence that Arabic allows, the participants converted it to a verb, e.g., "استئناف"was read as, "استأنف, and "إذاعة" was read as "أذاعت." However, their correction would be immediate.

On the other hand, for خوف, which functions as a gerund (and takes the place of the subject) in this sentence, "كذلك خوف الناس على ممتلكاتهم عاد من جديد", the majority of the participants read it as a transitive verb, and when they arrived at the region of disambiguation, they did not reanalyze their first incorrect decision but either paused momentarily or kept on reading. The question then became in that moment of passing this disambiguating region of the sentence, whether the sentence would make sense to the reader. That is, did this incorrect decision in the first place or this silence over the region of disambiguation indicate anything about sentence understanding? Did the sentence make sense to the participants at the moment they paused over the disambiguating regions of the garden-path sentences?

Another observation was the *overextension* strategy. When the participants assigned their initial reading to be an active-voice verb, and then corrected their first decision, they attempted to re-default their first decision by trying the passive-voice verb as their initial decision once they encountered the next sentence that started with a basic verb. This momentary re-default or configuration was limited to the text in hand. However, the consistent default was always the active-voice verb.

The second observation was related to the technique some participants employed that subsequently helped them avoid being garden-pathed; accordingly, they were able to assign their initial decision correctly in the first place. In this technique, the participants would pause in the initial positions of the sentences that began with a basic verb, gerund, or proposition, e.g., "جزع الناس ...", "عمل كهذا ...", "حول الممتلكات...." This pause helped them, as they reported to the researcher after they were asked to verbalize their thinking at that moment, to scan some words to the left of the initial words in the sentence. This pause was correlated with the distance that separated the subject or the initial of the sentence and its predicate or the region of disambiguation. That is, when the disambiguating region was far from the initial words in the sentence (as in a garden-path structure), they paused longer, and this was indeed observed; otherwise, if their scanning was brief they would be garden-pathed. However, sometimes the participants hesitated over the initial word of this type of sentence, and gave it more than one reading before they passed on the initial word of the sentence. In fact, some of them would change his/her reading before he/she passed the second or the third word in the sentence, but both analyses were still incorrect.

Another pattern, *experience effect*, was extracted from the same data. To illustrate, in a sentence such as,"تسبّب (هذا) عن الانفجار", or in "أسفر (عن) هذا الخبر", the participants, regardless of the reading condition, omitted the prepositions that followed the intransitive verbs, "تسبّب: أسفر", but they went back and read the sentences including the prepositions. This omission, which occurred very frequently among the groups, can be attributed to the fact that counterpart sentences in which the prepositions came after the subjects were also possible. Therefore, the frequency effect of occurrence on the adopted structure can explain this phenomenon. This observation also can explain the *immediate-experience* effect as was found in the analysis of miscues.

Another pattern was related to hesitation and reluctance; the participants experienced some hesitation and reluctance over words that were presented without the necessary diacritic, *shaddah*. Further, the hesitance was observed over passive-voiced verb forms that occurred in the middle of a sentence, e.g.,"أن أفزعت", that is, even when the previous part that preceded the passive-voiced verbs would not lead the reader to expect later the active-voiced form. Indeed, this observation occurred even when the short vowel," ُ" was given above the consonant, " أ ."

Positioning the short vowel, "ُ" , above the consonant, " أ ", turned the active form into a passive form, and subsequently should have helped the participants to make the right decision in the first place; participants should select the passive-voiced verb form.

When a verb started with the letter, " أ ", it was pronounced either as, "أَ " with the short vowel, "َ", *fatha*, or " أُ " , with the short vowel, " ُ", *dammah*. Assigning the short vowel, " َ", *fatha* to the consonant, " أ " meant that the verb was active, and with " ُ", *dammah*, it meant that the verb was passive. Thus, the short vowel, " ُ" plays the role of a morph when put over the initial consonant of the verb. This observation supported the claim that Arab participants who were not forced would choose the active-voice as their initial decision. Accordingly, the current study suggested that when constructing a tree structure for a verb-headed Arabic sentence, the parser, because of the default, would select the active-voice form of the verb as the first choice.

3.2. EXPERIMENT 2: SENTENCE LEVEL

(Moving Window Task)

Overview

The aim of Experiment 2 was fivefold. The first purpose was to assess the effect of a homographic/non-homographic initial of a sentence on the reading process of adult Arab readers: reading time and reading comprehension product. Accordingly, the role of short vowels and *shaddah* in correlation with the homographic variable on the reading process of adult Arab readers was evaluated on the basis of reading time and reading comprehension product. That is, what role was played by the representation of short vowels/short vowels-plus-*shaddah* versus plain representation in resolving the ambiguity that can be caused by the homographic initial of a sentence as examined via the reading time and reading comprehension product. The third aim was to assess the effect of garden-path versus non-garden-path structure on the reading process of adult Arab readers: reading time and reading comprehension product. Accordingly, the role of an economical representation of the diacritic, *skun*, and case-ending markings in resolving the ambiguity of garden-path structure was evaluated in terms of reading time and reading comprehension product. Finally, the effect of mistaken representation of short vowels and *shaddah* on the reading process of adult Arab readers while reading sentences of homographic and non-homographic initials was assessed in terms of reading time and reading comprehension. Assessing the effect of wrongly representation of short vowels and *shaddah* would be helpful in assessing the degree of this effect and the redundant claim of the contribution of short vowels and *shaddah* to the consonants representation.

Experiment 2 was given in three sessions. In session one, the participants read 90 sentences that represented three reading conditions with 30 sentences in each, respectively: Plain, short vowels-plus-*Shaddah*, and short vowels-minus-*shaddah*. In session two, the participants read eleven actual sentences. Five of these eleven sentences were provided with only *skun*, while the other six were provided with only case-ending markings. Three sentences in the reading condition that was presented with *skun* only were structurally garden-path sentences prior to the *skun* presentation. In addition, five of the six sentences in the case-ending markings reading condition were structurally garden-path sentences prior to the case-ending markings presentation. In session three, the participants read seven sentences that were presented with wrong short vowels and *shaddah* that led only to phonological distortion, while the graphemic representation (consonantal structure) was intact. After completing the three sessions, the participant had read 108 actual sentences and eight practice sentences (7 practice sentences for the first session, either session one or two, and one practice sentence for session three). In this experiment, two dependent variables were collected: reading time and correct responses.

3.2.1. Method

3.2.1.1. Rationale

The key-press technique, the moving window method, draws its strength from the fact that the reading time gathered in this way "matches the internal comprehension processes" a reader goes through (Haberlandt, 1994, p. 8-9). Further, the "interpretation of reading times is based on two additional hypotheses, the immediacy and the eye-mind assumptions" (p. 9). Therefore, the moving window method was used for measuring word integration skills in terms of sentence structure: garden-path versus non-garden-path. Because such technique is "sufficiently sensitive to detect frequency and length effects" (Haberlandt & Graesser, 1985; Just et al., 1982; Mitchell, 1984), assessing the effect of an initial homographic word of a sentence in correlation with short vowels and diacritics, *shaddah* and *skun* is reasonable.

3.2.1.2. Participants

Thirty-five native Arabic speakers, aged 26-40, from the same sample as Experiment 1 (except for 4 newcomers) participated in this study. Only the graduate and post-graduate participants who demonstrated efficient reading skills were included. All of them were graduate or post-graduate students pursuing their academic studies and living temporarily in Pittsburgh and Indiana, PA. Upon completion of the study, they were offered $ 7.50 as a compensation for their participation. Choosing the participants for Experiment 2 was based on the following criteria in addition to those used for selecting the participants in Experiment 1 (see *Participants* section in Experiment 1). Inclusion was based on the number of miscues and time length means that were identified in Experiment I, that is, the participants were included who had been around the mean in terms of number of miscues and time length in the comprehension and reading accuracy texts. In addition to the three assumptions in Experiment 1 (*Participants* section), choosing a population of adult Arabs at the graduate and post-graduate levels for this experiment implied the assumption that these students had acquired automaticity in word recognition to the extent that the effect of garden-path structure (in correlation to short vowels and *shaddah*) on their reading process can be clearly demonstrated.

All 35 participants, except one, completed the three sessions. One participant could not complete session 3 because of a technical problem. All participants had normal or correct-to-normal vision and none of them had ever participated in a similar study.

3.2.1.3. Materials

A hundred and eight Arabic sentences were constructed to be the sentence stimuli for the moving window task. Some of these sentences were extracted from the corpus of two sources: the databases of Arab state newspapers that have a large readership in the Arab countries and from the databases of electronic newspaper websites. An additional eight sentences were constructed for practice purpose. However, since a counterpart was needed for each type of sentence, some of the counterpart sentences were designed by matching. Other eight sentences were designed for practice purposes before the actual experiment.

There were four criteria for selecting these sentences: representativeness, length, word frequency, and naturalness or authenticity. First, they were to some extent representative of the type of sentence form that Arabic takes; that is, the initial words of the sentences were of the type that Arabic readers encounter in a connected text. Second, the sentences were equalized in terms of length; in terms of the number of words and roughly in terms of morphology, each sentence consisted of 11 words. Third, the sentences were matched in terms of word frequency; that is, the sentences consisted of only high-frequency words. Finally, the sentences were judged in terms of naturalness and authenticity; they reflected the types of sentences that can be heard or read in a newspaper.

The 108 sentences were distributed proportionally among the three sessions. In session one, 97 sentences were tested; only the first seven were used for practice purposes. The 90 sentences were made up of three groups of sentences that were matched in all formal aspects (word frequency and structure) except the manipulated reading condition (in terms of short vowels and *shaddah*). That is, on the basis of the possible initial of a sentence, three 30-sentence versions were constructed. Subsequently, version one was made plain, that is, without short vowels or *shaddah*; version two was supplemented with short vowels and *shaddah*; and version three was supplemented with short vowels but without *shaddah* (that is, only short vowels were presented).

The initial words in sentences were selected on the basis of five axes so that they would be representative. The first axis was word frequency: low and high. The second was word length: 3-consonant, 4-consonant, 5-consonant, or 6-consonant words. The 2-consonant and 7-consonant words were not included in the stimuli pool for two reasons. First, non-affixated words composed of 2 or 7 consonants constitute a very minimal proportion of the Arabic vocabulary; and second, Arabic morphology is based on *trilateral/quadrilateral*-roots. The third axis was the word morphological classification (word type): noun, conjugated noun, preposition, basic verb, conjugated verb, etc; that is, whether the word was affixated or not. The fourth was the potential position a word took in a sentence: initial, middle, and ending. The fifth axis was ambiguity, that is, the stimuli represented both homographic and non-homographic words.

The criterion of classifying the initials words of the sentences on these five axes was judged by a team of Arabic experts and Arabic high school teachers. Thus, 4 (length) x 5 (word type) x 2 (word frequency) x 2 (affixated vs. non-affixated) resulted in 80 tokens that had to be reflected in the experimental stimuli pool according to this procedure. Further, three versions of each token had to be constructed to reflect the reading condition: plain (no short vowels and *shaddah*), short vowels-plus-*shaddah*, and short vowels-minus-*shaddah*. Subsequently, 80 (tokens) x 3 (versions) resulted in 240 initial words that needed to be reflected in each sentence in the moving window experiment in order to achieve representativeness. Thus, a total of 240 sentences were the sentence stimuli in the moving window experiment.

However, because of restrictions in the nature of the Arabic morphs and the position slot of the initial word in the sentence, some of these tokens could be removed. To illustrate, the length of the propositions in Arabic is within the range of 2-4 consonants. Therefore, 5 (length) x proposition (type) were removed from such calculation as were the 6 (length) by proposition (type). Further, for a number of reasons, including the word frequency as a factor in order to test the effect of short vowels and *shaddah* on garden-path structure was not essential in investigating this effect. First, word frequency effect was predicted to be additive to the homographic aspect of the word. Therefore, controlling for such effect could be helpful in detecting the role of short vowels and *shaddah* in processing garden-path sentences. Finally, adding the word frequency would increase the number of tokens that needed to be controlled. Thus, 4 (length) x 5 (word type) x 2 (affixated vs. non-affixated) ended up with 40 tokens and subsequently with 120 possible initial words (40 tokens x 3 (versions).

However, examining these tokens closely revealed that some resemblances existed among them. Some of the nouns were similar to each other except in length; that is, the number of consonants. Therefore, the researcher found it to be very contrived to include both of them. Note that the current study claimed that, generally speaking, adding some of the short vowels and *shaddah* contributed no more information to the consonants. Indeed, the current study claimed that a minimal usage of short vowels or diacritics, *shaddah* or *skun*, or case-ending markings was sufficient to remove the ambiguity on both levels: word level (e.g., homographic words) and structure level (e.g., garden-path sentence). This claim needed to be substantiated with the moving window technique, particularly for the structure level. Therefore, other sentences were needed to test the claim of economical usage of other diacritics (used as a generic term: *skun*) and case-ending markings on the reading time and comprehension of garden-path sentences. The resulting large number of stimuli would be a burden on the participants, therefore, some tokens that were not uniquely different from other tokens were removed leaving 30 tokens that needed to be reflected in the stimuli pool. Subsequently, three versions of 30 sentences each were made in order to reflect the three aforementioned reading conditions: 30 sentences presented plain, 30 sentences presented with short vowels-plus-*shaddah*, and 30 sentences presented with short vowels-minus-*shaddah*. All words in the sentences were manipulated according to the reading condition.

Despite the necessity of removing some axes, the current study claimed that this removal did not hurt the stratifying procedure, and subsequently did not affect the results of the experiment. The reasoning was that the study attempted to test whether a homographic initial of a sentence would affect a reader's reading process, that is, reading time and reading comprehension, therefore, having a pool of sentence initials that could be blocked on the homographic axis was essential for achieving the purpose of the study.

In terms of garden-path and non-garden-path sentences, 20 percent of the plain 30 sentences were garden-path sentences. These garden-path sentences were matched in terms of the number of words that separated the subject from the predicate (or the initial from the region of ambiguity). Further, despite the fact that some of these 90 sentences were provided with short vowels and *shaddah*, blocking the sentences on the axis, homographic versus non-homographic initial, was still attainable. Therefore, within each reading condition, the 30 sentences were blocked on the homographic/non-homographic variable, that is, whether the initial of the sentence was a homographic or a non-homographic word.

For session two, the goal was to supplement the study with other reading conditions that would help in assessing the economical effect of the representation of other variables on the reading process of garden-path sentences. Eleven actual sentences were designed for this purpose. Five of these were provided with only *skun*, while the other six were provided with only case-ending markings. Only the homographic initial in the sentence was manipulated. That is, only the first word in the sentence was provided with either *skun* or case-ending marking. Three sentences in the *skun* reading condition were structurally garden-path sentences prior to provision of *skun*, and five sentences in the case-ending markings reading condition were structurally garden-path sentences prior to the provision of case-ending markings. The remaining sentences were fillers.

In session three, seven sentences were constructed with wrong short vowels and *shaddah*. Indeed, the participants read seven actual sentences and one practice sentence with the same reading condition. The seven sentences were meant to represent the wrong short vowels-plus-*shaddah* reading condition, that is, the short vowels and *shaddah* were put in a position that would lead to a phonological distortion and not to a graphemic distortion. In other words, unlike the short vowels and *shaddah*, the consonants including their order were left intact; that is to say, the consonantal structures were left intact. All words in the sentences were manipulated according to the reading condition. Adding the wrong short vowels-plus-*shaddah* reading condition was for control purposes.

The results of Experiment 1 demonstrated that the Arab readers were not affected under this reading condition, a result that was consistent for both modes of reading, oral and silent. Therefore, adding the wrong short vowels-plus-*shaddah* reading condition should have shed more light on understanding the role of short vowels and *shaddah* in reading Arabic sentences. Subsequently, it helped in assessing whether or not the representation of short vowels and *shaddah* contributed more information in understanding the sentence; that is, whether the representation of short vowels and *shaddah* in print was redundant. As a result, a claim that reading Arabic is based on consonantal representation was assessed.

For every sentence, a matched question in the form of a statement or a wh-question with three optional responses 'yes,' 'no' or 'I don't know' was constructed. These questions were designed to assess the participant's process of integrating the sentence in terms of reading time and comprehension product.

The comprehension product that needed to be measured was of a textual base and not a situational base. For each sentence only two possible responses were expected, that is, "Yes" or "No;" however, the third response, "I Don't Know" was provided either to eliminate guessing or to give the participant an optional response when the sentence did not make sense to him or her.

All sentences and questions were written with a familiar font, "Simplified Arabic font," size, "16." Later, for every sentence, a multiple-choice question with three optional responses was constructed and judged by Arabic experts and some post-graduate students drawn from the sample of Experiment 1.

The sentences then were stored in a text file format compatible with the computer software program which was designed exclusively for the purpose of this study (see section one in APPENDIX K for the sentences, garden-path sentences, and initial homographic/non-homographic sentences).

3.2.1.4. Measures

Two dependent variables were measured in this study: reading time and comprehension. Reading time was measured to the nearest milliseconds. Comprehension was measured dichotomously, 'yes, 'no,' and 'I don't know,' that is, the variable was coded dichotomously. Thus, each question that was answered correctly was assigned "1;" otherwise, the response was assigned "0." Further, a brief interview was conducted with the participant at the end of each session. This interview took the form of an open-ended question that asked if the participant had any comment about the sentences he/she just read, their nature and their integration process, or any concern the participant wanted to bring up.

3.2.1.5. Data collection procedure

Several steps were taken for conducting and collecting the data in this experiment. First, approval for conducting the study was obtained by submitting the research protocol, consent form, testing instrument and all necessary information to the Internal Review Board for Human Subjects at the University of Pittsburgh. The second step was to identify the participants on the basis of number of miscues and time reading in Experiment 1. Only the participants who scored around the mean in Experiment 1, that is, for reading time and the number of miscues, were selected for the moving window experiment. Thirty-five adult Arabic native speakers at the graduate level participated in this study.

The third step was to take the names of the people who agreed to participate in the experiment and give them ID numbers. In the first step of the experiment, the participant entered this ID number in response to a pop-up window that asked for this information before he/she could proceed to the second step, namely reading the instructions. Each participant was contacted in person or via email to set up a convenient time and location for him or her to take the test. In general, the test was given in an empty, secured room that was in convenient proximity to the participant. The experiment was given individually and by the primary researcher. The researcher read the consent form orally to each participant and informed him/her briefly about the task and the assessment that would follow each task. They were told that they would need to read some sentences at their own pace word by word, and at the end of every sentence a window would pop up that would introduce a question or a statement that had three response options: 'yes,' 'no,' and 'I don't know.' Before the actual experiment, the participants were given a short practice session to familiarize them with the task. After they finished the practice, a window opened that asked them whether they wanted to start the actual experiment, and they were also asked (by the researcher) if they had any questions.

In short, the test was given individually and each participant was seated at a convenient distance from the computer and then informed about the task. A training session and test trials with samples of different sentences were conducted before the actual experiment. Instructions were provided for each participant individually.

The participants were informed that the data and the names would be kept in a secure place and that the researcher was the only person who would have access to them. Further, they were told that the researcher would use ID's instead of names in tabulating the data for running the statistical analysis.

After his/her first session, the participant was informed of the second session which consisted of the same task and the same procedure. In this second session, the participants were told that they would be reading some sentences in the same manner. However, in session three, the participants were informed that they would be reading sentences in which the words were presented with the wrong short vowels and *shaddah*. They further were informed that assembling those wrong short vowels and *shaddah* would lead to constructing words that had no meaning in Arabic; that is, the graphemic form of the words was intact, while its phonological aspect was distorted. Assembling only the consonants while ignoring the short vowels and *shaddah* signs would lead the participant to read a real word in Arabic. All three sessions were given in one sitting.

The experiment started on February 20, 2004, and ended in April 20, 2004, taking almost two months to complete. A pilot study on a small scale was conducted before the actual experiment for which four participants volunteered. Based on this pilot study, some sentences were extensively revised, the instructions were modified, and concerns about potential problems in the setting conditions were identified and cleared.

It was necessary to break this task into three sessions because of the extent and intensity of the test. First of all, participants were asked to read more than 116 sentences including the practice sentences, word by word, which is a tedious job, and then take a brief multiple-choice test following each sentence. Secondly, one of the reading conditions was to give the participants the wrong short vowels-plus-*shaddah* sentences, a condition about which they had to be informed. Another reading condition in this experiment was giving the participants the correct short vowels-plus-*shaddah*. Mixing these conflicting types of sentences (with correct and incorrect conditions) in one pool forced the participants to be vigilant and watchful of the supplemented short vowels and *shaddah* in order for them to be sure whether short vowels and *shaddah* were positioned correctly or wrongly. Finally, as was justified earlier, the role of other variables, e.g., the diacritic, *skun* and case-ending markings, was examined to detect the role of economical representation of short vowels and diacritics on processing garden-path sentences. For all these reasons, it was appropriate to partition the whole moving-window task into three short sessions.

3.2.1.6. Design and analysis

There were five areas of concern that the moving window task attempted to investigate. In the first area, the concern was over the effect of a homographic/non-homographic initial of a sentence on the reading process of adult Arab readers: reading time and reading comprehension product. In the second area, the concern was over the role of short vowels and *shaddah* in correlation with a homographic/non-homographic variable in the sentence reading process of adult Arab readers: reading time and reading comprehension product. In the third area, the concern was over the effect of garden-path structure on reading time and reading comprehension product of adult Arab readers. In the fourth area, the concern was over the role of an economical representation of the diacritic, *skun*, and case-ending markings in resolving garden-path ambiguity as examined in terms of reading time and reading comprehension product. Finally, in the fifth area, the concern was over the effect of mistaken representation of short vowels and *shaddah* on the reading process of adult Arab readers' reading process: reading time and comprehension, while reading sentences with homographic and non-homographic heads. As a result of these, two designs were constructed to accommodate these discrete concerns. The first design covered concerns 1, 2, 3 and 5 and the second design covered the fourth concern.

DESIGN ONE

A two-factor within-subjects design was employed for this study to evaluate the effect of a homographic versus a non-homographic initial of a sentence by itself and in correlation with short vowels and *shaddah* (including the correct and incorrect representations of short vowels and *shaddah*) on the reading process of adult Arab readers: reading time and reading comprehension product. In this design, there were two factors: factor *A*, which represented the reading condition: plain versus non-plain; and factor *B*, which represented the sentence structure type: homographic-initial versus non-homographic-initial sentences. There were four levels under factor A, each of which represented a reading condition: no short vowels and *shaddah* (plain), correct short vowels-plus-*shaddah*, short vowels-minus-*shaddah*, and wrong short vowels-plus-*shaddah*. There were two levels under factor B, each one representing a sentence structure type: homographic-initial and non-homographic-initial.

Given the nature of the reading conditions and other factors as presented in the *Data Collection Procedure*, this first design was implemented in two sessions. In session one, the participants read 90 sentences and 7 practice sentences that represented the first, second and third reading conditions, as shown in Figure 8. In session two, they read seven sentences and one practice sentence that represented the last reading condition in Figure 8: the wrong short vowels-plus-*shaddah* reading condition. Hence, by the end of these two sessions, all 35 participants should have read 97 actual sentences and 8 practice sentences (Figure 8).

Two procedures were employed here separately for testing the effects of the aforementioned independent variables: the dependent samples *t*-test procedure and the two-way repeated measures analysis of variance.

<table>
<tr><th></th><th><u>Reading Condition</u>
(Sentence stimuli)</th><th><u>Homographic-Initial Sentences</u></th><th><u>Non-Homographic-Initial Sentences</u></th></tr>
<tr><td rowspan="4">Group</td><td>Plain
(no short vowels or shaddah)</td><td></td><td></td></tr>
<tr><td>Short vowels-plus-Shaddah</td><td></td><td></td></tr>
<tr><td>Short vowels-minus-Shaddah</td><td></td><td></td></tr>
<tr><td>Wrong short vowels-plus-shaddah</td><td></td><td></td></tr>
</table>

Figure 8: Study Design I for Experiment 2

DESIGN TWO

A one-factor within-subjects design was employed to assess the remaining concern (number 4) about the effect of economical representation of the diacritic, *skun* and case-ending markings on the reading process of adult Arab readers while reading some garden-path sentences: reading time and comprehension; that is, what role a plain representation versus short vowels-plus-*shaddah*, versus only *skun*, versus only case-marking endings would have in resolving the ambiguity of garden-path sentences as determined from the reading time and reading comprehension product. In this design, there were two factors: factor *A* represented the reading condition, and factor *B* represented the sentence structure type. Under factor *A*, there were four levels of reading representation: plain, short vowels-plus-*shaddah*, *skun* only and case-ending markings only. Under factor *B* there was only one level or sentence structure type: garden-path structure.

The reading conditions in this design were implemented in two separate sessions. The justification for this separation can be reviewed in the *Materials* section. However, generally speaking, implementing this design in two sessions was due to the possibility of fatigue. In this experiment, the participants were asked to read 116 sentences, word - by - word, and answer a comprehension question following each one. The study attempted to be as economical as possible by avoiding constructing more sentences for this design. Therefore, the results from the already garden-path sentences in *Design* one were used to represent the first and second reading conditions in Figure 9. However, 11 more sentences were needed in order to represent the additional reading conditions: 5 and 6 (Figure 9).

There were five garden-path sentences in reading condition 1 and three potential garden-path sentences in reading condition 2. On the other hand, there were three potential garden-path sentences in the *skun*-only reading condition (reading condition 5), and five potential garden-path sentences in the case-ending markings only reading condition (reading condition 6). The word, 'potential' was emphasized because these sentences might not have been considered garden-path sentences if the participants assembled the provided *skun*, case-ending markings, or short vowels-plus-*shaddah*. However, it is worth noting that the ambiguity of the homographic initial in the sentence was not resolved by adding the diacritic, *skun*, to sentence number 16 (see Group II in APPENDIX K), by adding the case ending marking, *fatha* (or *fatHa*) to sentence 24 (see Group II in APPENDIX K), or by adding the short vowel, *fatHa*, to sentence number 66 (see Group I in APPENDIX K). Despite the fact that the additions of *skun*, case-ending markings, and short vowel did not resolve this ambiguity, which might garden-path the reader, they still might have functioned to reduce the activation of other possible forms (alternative readings), and hence, narrow the word neighboring size to its minimum. This did not hurt the methodology of this part of the task, for the focus was on the extent of difference that an economical usage of short vowels-plus-*shaddah*, *skun*, and case-ending markings would make to the reading process of a garden-path sentence, compared with the same garden-path sentence in its plain representation. By the end of the two sessions, all 35 participants had read 16 potential garden-path sentences.

The analysis employed here for testing the effect was the one-way repeated measures analysis of variance.

	Reading condition	Reading Condition (Sentence Representation)	Garden-Path Sentences
Group	1	Plain (no short vowels and *shaddah*)	
	2	Short vowels-plus-*Shaddah*	
	5	*Skun*-only	
	6	Case-ending markings-only	

Figure 9: Study Design II for Experiment 2

3.2.1.7. Procedure

Special computer software was built exclusively for the purpose of this study. With some modifications in terms of the software, the stimuli, and the reading conditions, the procedure for this experiment was, generally speaking, similar to the one used by Fender (2002). Presenting the stimulus sentences, rotating the order of their presentation for counterbalancing, presenting the stimulus sentence randomly, measuring the reading time for each sentence, and collecting responses on the questions were controlled by the software program that was designed from scratch exclusively for the purpose of the current experiment.

The software program was installed in a personal computer attached to an external either 14- or 15-inch display. The participants were asked to sit close to the computer screen and adjust the chair and the monitor to a comfortable position. Then, every participant was informed orally and briefly about the general nature of the task and what tools he/she would need to use: keyboard and mouse. Next, a small box popped up asking the participants to write in their Id number, as provided by the researcher prior to conducting the experiment. The Instructions screen then opened (APPENDIX L) and the participants were asked to read the instructions carefully. In these instructions, they were informed about the nature of the task in detail; that is, that they would be asked to read some sentences, word by word carefully and naturally and at their own pace, and after each sentence to answer a multiple-choice question about what they had read by responding “Yes”, “No,” or “I Don’t Know.” The participants were informed to base their answers on what the sentence said to them. The other following steps were guided by the software program. The researcher then guided each participant through the practice part.

Technically, the software operated as follows: first, after starting the program, a small window popped up asking the participant to put in the ‘ID’ number she/he had received from the researcher prior to the task. After this, the participant was asked to click on the “OK” button, which led him/her to the “Instructions” window. The participant had to scroll the page to read the instructions by using either the arrows or the mouse that was provided. At the end of the instructions, the participant was asked to close the window once he/she felt the instructions were clearly understood (APPENDIX L). Once that window was closed, another opened up that asked the participant whether he/she was ready to start the practice part of the experiment. If the participant was ready, he/she needed to click the button, “OK.” Next, he/she was given the practice part (one or seven sentences according to the session) under the guidance of the researcher, that is, the researcher and the participant went through the training part of the experiment together. After the practice portion of the experiment was finished, a small window opened which asked the participant if she/he wanted now to begin the actual experiment. Once the participant began the actual experiment, he/she was left alone until the experiment was completed. After the last sentence of the task, a small window opened up saying, “Thank You” to the participant.

The participant was given a 5 minute break before starting the second session that included 11 actual sentences and 7 practice sentences. The practice portion could be skipped if the participant already had done the first session; due to the counterbalancing procedure, some participants started with session two and some started with session one. In any case, the same seven practice sentences were included in both sessions.

The procedure mentioned above was used for all three sessions. However, in session three, the participant was informed about the wrong short vowels-plus-*shaddah* reading condition prior to starting the task. He/she was informed twice orally as well as in the printed Instructions in the program.

All three sessions were conducted consecutively on one day, and the whole experiment was given and supervised by the primary researcher. Sessions one and two were counterbalanced for each second participant and the word-naming task (to be presented later) was counterbalanced with the moving window task for each second participant.

3.2.2. Analysis and Results

Overview

Because of the fivefold aim of the moving window task, several hypotheses were developed, and subsequently several analyses were conducted to test the proposed hypotheses (See group II in Hypotheses section). As explained earlier, there were five concerns to which the moving window task attempted to respond: the effect of a homographic versus non-homographic variable; the effect of a reading condition variable (reading representation) on the homographic/non-homographic variable; the effect of garden-path versus non-garden-path structures; the effect of the diacritic, *skun* and case-ending markings variables on garden-path structure variable; and finally, the effect of wrong short vowels-and-*shaddah* on the homographic/non-homographic variable. All effects were assessed in terms of reading time and reading comprehension product, that is, the time in milliseconds it took the participant on average to integrate the words in the sentence, and the percentages of their correct responses to the questions that followed the sentences. Hence, there were three manipulated independent variables: reading condition representation, homographic/non-homographic initial, and garden-path structure; and two dependent variables: reading time and reading comprehension product.

For the first manipulated reading condition variable, there were four main reading conditions, and two additional supplemented reading conditions. The four main reading conditions were: plain, correct short vowels-plus-*shaddah*, short vowels-minus-*shaddah*, and wrong short vowels-plus-*shaddah*. The two supplemented reading conditions were *skun*-only, and case-ending markings-only. The second independent variable was the homographic and non-homographic initial sentence; that is, whether the sentence started with a homographic or a non-homographic word. The third independent variable was whether the sentence was potentially a garden- or non-garden-path sentence. In addition, there were two dependent variables: reading time and comprehension. As a result of this manipulation, different analyses were made over several subsets of the data.

Accordingly, the analyses were conducted on three subsets of data. For the first concern, over the effect of a homographic versus a non-homographic initial in the sentence and garden-path versus non-garden-path structure, the subset of the plain reading condition was analyzed on the basis of reading time and reading comprehension product by using the dependent samples *t*-

test procedure. For the second concern over the effect of short vowels and *shaddah* signs (correctly or incorrectly positioned) in correlation with the homographic/non-homographic variable, the subsets of reading conditions 1, 2, 3, and 4 were analyzed in terms of reading time and comprehension by employing the two-way repeated measures analysis of variance. However, in the last analysis, by employing a one-way repeated measures analysis of variance, the garden-path sentences in reading conditions 1, 2, 5, and 6 were analyzed on the basis of reading time and reading comprehension product (Figures 2 & 3 in *Design* section).

In the following section, the analyses conducted on each subset of data for the manipulated variable are laid out. The analyses, including the means and standard deviations of both *t*-test and one-way ANOVA procedures, are presented in one table. However, two tables were constructed for the repeated measures analysis of variance: the first presents the results of the analysis of variance and the second presents the corresponding cell and marginal means.

3.2.2.1. Reading Time

The first analysis was conducted on the plain reading condition data; the sentences within the plain reading condition were blocked on the homographic/non-homographic variable. By using the dependent samples *t*-test procedure, the sentences that began with a homograph were compared on reading time and comprehension with the sentences that began with a non-homograph. The dependent variable, reading time, was represented in milliseconds; however, the dependent variable, comprehension product, was represented in the percentage of correct responses. It is worth repeating that this analysis helped evaluate whether a sentence with a homographic initial affected the Arab readers' word integration skill as reflected in reading time and reading comprehension product. Subsequently, the stated predictions (hypotheses 1i, 1j, 1k, 1l in Hypotheses section) would either be supported or not supported.

As shown in Table 11, by comparing the overall two means for the time it took the participants on average to read the sentences with homographic initials versus sentences with non-homographic initials, the analysis revealed no significant difference between them. As a result, in a plain reading condition, where only the consonants were provided, it did not matter which group of sentences the participants read: their reading time on average was the same (overall mean for the homographic-initial sentences, M = 6346.67; overall mean for the non-homographic-initial sentences, M = 6323.93). Indeed, only 22.74 milliseconds difference was found between the means.

Table 11: Results of the *t*-test on Reading Time of Homograph/Non-Homograph Initial Sentences

Homographic-Initial Sentences		Non-Homographic-Initial Sentences				
M	SD	M	SD	*t*	*df*	*p*
6346.67	1580.16	6323.93	1306.91	-0.204	34	.839

For the reading comprehension data (Table 12), the analysis did not show any significant difference between the means of the percentages of correct responses on the two types of sentences: homographic and non-homographic initial. As a result, in a plain reading condition, it did not matter which group of sentences the participants read; their comprehension on average was the same (overall mean for the homographic-initial sentences, M = .8455; overall mean for the non-homographic-initial sentences, *M* = .8179). Although the difference between the two means was a 3 percent in favor of the sentences with homographic initial, the result shows that both percentages of correct responses were on average very good.

Table 12: Results of the *t*-test on Reading Comprehension of Homograph/Non-Homograph Initial Sentences

Homographic-Initial Sentences		Non-Homographic-Initial Sentences				
M	SD	M	SD	*t*	*df*	*p*
0.8455	0.07888	0.8179	0.15262	-1.013	34	.318

For the garden-path/non-garden-path variable, by using the dependent samples *t*-test procedure, these types of sentences were compared on reading time and percentage of correct responses.

For the reading time data, the analysis (Table 13) revealed a significant difference for the garden-path structure. That is, on average, it took the participants longer to read the garden-path sentences than the non-garden-path sentences (*M* = 6747.14 for the garden-path sentences; *M* = 6259.30 for the non-garden-path sentences).

Table 13: Results of the *t*-test on the Reading Time of Garden-Path and Non-Garden-Path Sentences

Garden-Path Sentences		Non-Garden-Path Sentences				
M	SD	M	SD	*t*	*df*	*p*
6747.14	2071.86	6259.30	1413.28	2.549	34	.016

3.2.2.2. Reading Comprehension

The analysis of the reading comprehension data did not reveal any significant difference between the means of the percentages of correct responses to both types of sentences (Table 14). That is, the participants' correct responses on average did not differ significantly between the two types of sentences: garden-path and non-garden-path (the overall mean for the garden-path sentences, M = .8914; the overall mean for the non-garden-path sentences, M = .8286). Accordingly, the participants on average comprehended both types of structures. Due to the fact that the p-value = .05, and that the data was not normally distributed but extremely skewed because comprehension was very good on the whole; a non-parametric test (Wilcoxon Matched-Pair Signed- Ranks Test) was tried in addition to the dependent samples t-test analysis. The results did not reveal any significant difference between the means, *p-value* = .053. Therefore, only, the result of the t- test is provided in Table 14.

Table 14: Results of the *t*-test on the Reading Comprehension of Garden-Path and Non-Garden-Path Sentences

Garden-Path Sentences		Non-Garden-Path Sentences				
M	SD	M	SD	*t*	*df*	*p*
0.8914	0.17042	0.8286	0.08034	2.036	34	.05

For detecting the role of short vowels in correlation with the homographic/non-homographic variable, the third analysis involved reading conditions 2, 3 and 4. The plain reading condition (only consonants were represented) was compared with reading condition 2 (short vowels-plus-*shaddah*), reading condition 3 (short vowels-minus-*shaddah*), and reading condition 4 (wrong short vowels-plus-*shaddah*) (see Figure 8 of Study design I). Despite the fact that short vowels and *shaddah* were provided in such conditions, such provision was not sufficient to turn the homographs into non-homographs, as was claimed by previous studies (Abu-Rabia, 1995-2001). That is, providing the short vowels by themselves or in combination with *shaddah* was still partial and did not always prevent the homographic aspect of some words. However, providing the short vowels and *shaddah* should at the least have narrowed the word neighboring size of the homograph. Accordingly, it was possible to block the homograph or non-homograph sentence initials in the four reading conditions.

Hence, a two-way repeated measures analysis of variance was conducted on this subset of data by comparing the sentences with homographic initials to those with non-homographic initials within the four reading conditions and on both dependent variables. Subsequently, the stated predictions (hypotheses: 1m, 1n, 1o, 1p in Hypotheses section) would either be supported or not supported.

In the first analysis, the reading conditions 1, 2, 3 and 4 were compared on the time it took the participants on average to read the sentences with homographic initials versus those with non-homographic initials. However, due to the fact that there were some very extreme outliers (ID 25 in reading condition 4 on reading time; ID 4 in reading condition 1, and ID 22 in reading condition 3 on reading comprehension), two sets of analyses were conducted, with and without these outliers. The same results were obtained for both sets.

For reading time, the first analysis (Table 15), where the outlier was not excluded, revealed a significant main effect for reading condition, but neither a significant main effect for homograph/non-homograph variable nor a significant interaction between the two. By doing a post hoc analysis, the results revealed that reading conditions 1 and 3 were on average faster than reading conditions 2 and 4 (Table 16).

Exactly the same results for main effect for reading condition only and for significant pairs of comparison by the post hoc analysis were found after removing the extreme outlier (ID 25 in reading condition 4). Due to the exact findings in both analyses, only the original results where the outliers were included, were reported.

However, Mauchly's Test of Sphericity was found to be significant which was an indication that an assumption for the repeated measures analysis of variance was violated. With such a violation, the *F*-test would be too liberal, and thus the probability of Type 1 error would be greater. Therefore, the corrected *p* values, using Huynh-Feldt procedure, were reported.

Table 15: Results of Repeated Measures Analysis of Variance on Reading Time

Source	SS	df[1]	MS	F	*p*
Reading Condition	67959572.62	3	60138880.99	8.913	.004
Error	251615698.30	99	6747276.34		
Homograph/non-Homograph Initial	200388.30	1	200388.30	0.733	.398
Error	9023293.35	33	273433.13		
Reading Condition x Homograph /Non-Homograph Initial	146528.73	3	62355.55	0.160	.883
Error	30278364.87	99	390454.81		

[1] To minimize confusion, the unadjusted degrees of freedom values are reported.

Table 16: Cell and Marginal Means on Reading Time by Reading Condition and Homograph/non-Homograph Initial

		Sentence-Initial				
		Homographic		Non-Homographic		
		M	SD	M	SD	Marginal
Reading Condition ID's	Reading Condition					
1	Plain	6315.26	273.16	6301.33	226.31	6308.30
2	Short vowels-plus-*shaddah*	6741.12	285.30	6609.05	274.56	6675.09
3	Short vowels-minus-*shaddah*	6448.43	265.96	6423.83	266.41	6436.13
4	Wrong short vowels-plus-*shaddah*	7610.04	525.90	7563.50	453.29	7586.78
Marginal	Marginal	6778.71		6724.43		

For reading comprehension data and where the outliers were not excluded, the analysis (Table 17) did not reveal a significant main effect for reading condition or for the homographic/non-homographic variable. Further, the analysis did not show any significant interaction between the reading condition and the homographic/non-homographic variable.

By excluding the extreme outliers (ID 4 from the reading condition 1 and ID 22 from reading condition 3), the same results were found, that is, there was no significant main effect for reading condition or for the homographic/non-homographic variable. Further, the interaction between reading condition and homographic/non-homographic variable was not significant. In fact, the cell and marginal means indicated that the participants on average did very well despite the reading condition and the type of sentence: homographic versus non-homographic initial. Due to the identical results that were found with and without excluding the outliers, only the results where the outliers were not excluded were reported. Further, since the results of Mauchly's test of sphericity were significant, Huynh-Feldt *p* values were reported; see Table 17 for the analysis results and Table 18 for the cell and marginal means.

Table 17: Results of Repeated Measures Analysis of Variance on Reading Comprehension

Source	SS	df[1]	MS	F	*p*
Reading Condition	0.152	3	0.071	2.956	.055
Error	1.693	99	0.024		
Homograph/Non-Homograph Initial	0.039	1	0.039	2.181	.149
Error	0.585	33	0.018		
Reading Condition x Homograph/non-Homograph Initial	0.022	3	0.011	0.472	.625
Error	1.503	99	0.023		

[1] To minimize confusion, the unadjusted degrees of freedom values are reported.

Table 18: Cell and Marginal Means on Reading Comprehension by Reading Condition and Homograph/non-Homograph Initial

		Sentence-Initial				
		Homographic		Non-Homographic		
		M	SD	M	SD	Marginal
Reading Condition	Reading Condition					
1	Plain	0.846	0.014	0.816	0.027	0.831
2	Short vowels-plus-*shaddah*	0.895	0.014	0.853	0.012	0.874
3	Short vowels-minus-*shaddah*	0.866	0.017	0.871	0.016	0.868
4	Wrong short vowels-plus-*shaddah*	0.912	0.019	0.882	0.043	0.897
Marginal	Marginal	0.880		0.856		

In order to detect the role of short vowels-plus-*shaddah*, *skun*-only or case-ending markings-only in resolving the ambiguity that can be caused by the garden-path structure, reading conditions 1 and 2 were compared with the supplemented reading conditions 5 and 6 on both dependent variables. If the diacritic, *skun* or the case-ending markings were assembled with the consonants, their provision to the initial of a garden-path sentence should have eliminated the garden-path phenomenon, or at the least narrowed the activation of word neighboring size of the homographic initial of the garden-path sentence. The question then became whether a partially economical representation, plain versus *skun* versus case-ending markings versus short vowels-plus-*shaddah*, would minimize the reading process as reflected in the time it would take the participant to read the garden-path sentences. That is, would the participants take less time to process garden-path sentences that were provided with only *skun* or only case-ending markings versus garden-path sentences that were presented plain? Therefore, the garden-path sentences in reading conditions 1, 2, 5 and 6 were analyzed on reading time and the percentages of correct responses by using a one-way repeated measures analysis of variance. Subsequently, the stated predictions (hypotheses 1q, 1r, 1s, 1t in Hypotheses section) would either be supported or not supported.

The analyses conducted on this subset of data did not show any significant results for reading condition on both reading time (Table 19) and reading comprehension (Table 20). That is, for the reading time, regardless of the reading condition representation, it took the participants on average the same time to read the garden-path sentences (Table 21). Similarly, the percentage of correct responses was on average the same among the reading conditions. As shown in Table 22, the participants did very well regardless of the reading condition.

Table 19: Results of the One-Way Repeated Measures Analysis of Variance on Reading Time

Source	SS	df[1]	MS	F	*p*
Reading Condition	6240782.36	3	3123846.15	1.286	.283
Error	165037904.56	102	2429715.27		

[1] To eliminate confusion, the unadjusted degrees of freedom values are reported.

Table 20: Overall Means on Reading Time for Garden-Path Sentences

Reading Condition	Reading Condition	M	SD
1	Plain	6747.14	350.21
2	Short vowels-plus-*shaddah*	7277.76	399.16
5	Skun-only	6997.33	348.57
6	Case-ending markings-only	7230.64	387.91

Table 21: Results of the One-Way Repeated Measures Analysis of Variance on Reading Comprehension

Source	SS	df[1]	MS	F	*p*
Reading Condition	.168	3	.056	1.434	.237
Error	3.984	102	.039		

[1] To eliminate confusion, the unadjusted degrees of freedom values are reported.

Table 22: Overall Means on Readin Comprehension for Garden-Path Sentences

Reading Condition	Reading Condition	M	SD
1	Plain	.891	.029
2	Short vowels-plus-*shaddah*	.800	.034
5	*Skun*-only	.876	.034
6	Case-ending marking-only	.857	.034

3.2.3. Discussion and Interpretation

Overview

Different findings were obtained from the statistical analyses that were conducted on the data of the moving window experiment. Some of these findings were in line with the stated predictions and some were not. For the purpose of clarity, discussing the findings was categorized on the basis of the independent variable that was tested: homographic versus non-homographic initial, garden versus non-garden structure, and reading condition representation. In the following section, the analyses results on the effects of the three independent variables on the reading process of Arab adults were discussed and interpreted.

There were three subsections that represented the findings of each independent variable: 1) the effect of the homographic initial variable; 2) the effect of garden-path structure; and 3) the effect of reading condition representation in correlation with the homographic variable and garden-path structure, respectively. That is, they were concerned with the effect of short vowels by themselves and in combination with *shaddah* (both correct and wrong positions) on the reading process of sentences that start with homographic versus non-homographic words; and the effect of the provision of short vowels, *skun*, and case-ending markings on the reading process of garden-path structures. An overlapping discussion of the effect of the three manipulated variables was necessary for interconnection and comparison.

3.2.3.1. Homographic/non-Homographic Initials

The current study took the position that, in the absence of short vowels or diacritics (using diacritic as a generic term to include any supplemented signs other than the short vowels or the consonants, e.g., *skun* and *shaddah*), Arab adults do not need to re-analyze the sentence in order to understand it. That is, they do not need to read back and fourth in order to comprehend the sentence. However, their reading process as reflected in reading time might be affected. By conducting a moving window task in which the reader was unable to go back and reanalyze his/her initial choice (in the case where the initial word of the sentence was an ambiguous word; e.g., a heterophonic homographic word which had more than one reading), the aforementioned claims were tested.

While the results did show support for the stated prediction on reading comprehension (1i in Hypotheses section); they did not show such support for the stated prediction on reading time (1j in Hypotheses section; see Tables 11 and 12). Accordingly, based on the collected data, the current study rejected the alternative hypothesis (1j in Hypotheses section) but failed to reject the null hypothesis (1i in Hypotheses section).

Hence, using this moving window technique, the current study supported the prediction stated earlier that there was no significant difference in comprehension between the two types of sentences. Their comprehension product as represented by the percentage of correct responses, was on average the same (overall mean for homographic initial sentences, M = .8455; overall mean for non-homographic initial sentences, M = .8179). Indeed, examining the overall means closely showed that the participants did very well on both types of sentences (Table 12). The overall percentages of their correct responses on the sentences that had homographic initials were 85 percent and 82 percent for the sentences with the non-homographic initials. Therefore, it would be a legitimate statement to claim that when Arab adults are given plain sentences with initials of both homographic and non-homographic words and are forced to process the words serially without going back to reanalyze previous choice decisions, their reading comprehension is not affected.

Support of the prediction should not be a surprise due, as explained earlier, to the morphological characteristic of the *trilateral/quadrilateral-root* model of words in Arabic. Indeed, the *trilateral*-root model of words in Arabic demonstrated its effect on primary schoolchildren's creative written production of novel verbs to express new concepts, a result that indicated that the *trilateral*-root model plays an important role in comprehending texts written in literary Arabic (Badry, 1982). Further, experiment-based results demonstrated the existence of sublexical accessibility in word recognition (Cole, Segui & Taft, 1997; Taft, 1981). Note that very often "a large class of verbs and nouns are derived from the same roots, and those roots are conjugated in a form/pattern that "entails syntactic and semantic properties" (Shimron's comment on Hebrew, 1993, p. 56; Fassi Fehri, 1993). Those patterns/forms are productive and to a great extent "rule governed or predictable" (Shimron's comment on Hebrew, 1993, p. 56; Fassi Fehri, 1993). Further, Arabic is a highly affixated language, and "verb agreement affixes are highly productive (or predictable), that is, they are remarkably invariant across verb forms" (Shimron's comment on Hebrew, 1993, p. 56; Fassi Fehri, 1993).

Furthermore, a previous study demonstrated that the perception span of Hebrew readers (and this can be applied to Arabic because of the similarity between the two languages in the morphological characteristics and in the reading direction manner; Shlonsky, 1997) was smaller than that of English readers due to the intensity of Hebrew morphology (Pollatsek et al., 1981). Accordingly, more support would be added to the claim that Arab adults exploit their knowledge of morphology in accessing the lexicon.

While this finding (note the different stimuli: sentence versus text) is not in line with Abu-Rabia (2001 & 1999) who found that Arabic vowelized texts were comprehended better than unvowelized texts, it is in agreement with Shimron and Sivan (1994) who stated, "the comprehension of the Hebrew vowelized texts was nearly significantly better than was the comprehension of the Hebrew unvowelized texts" (p. 5).

Indeed, reviewing the statistical analysis of Abu-Rabia's (1999) study shows that the means of the two reading conditions in both experiments were very close; that is, the difference between them was very slight, especially when we realize that the maximum score was 10: *M* 7.20 with *SD* 1.70 for the vowelized condition and *M* 6.10 with *SD* 2.22 for the unvowelized condition. In the second experiment, the means were *M* 6.34 with *SD* 1.58 for the vowelized condition and *M* 5.46 with 2.00 *SD* for the unvowelized condition with a maximum score of 7. Note that the measurement scale involved one point for each correct response. Therefore, a 1.1 unit difference and 0.86 unit difference are equivalent to a difference of 1.1 and 0.86 correct responses. Besides, Abu-Rabia (2001 & 1999) used the multiple-choice for measuring comprehension, a test format which has received criticism, e.g., that it is text-independent (Bernhardt, 1991) and that guessing is possible. Furthermore, attributing comprehension to the representation of the short vowels is questionable since Abu-Rabia (1995-2001) did not manipulate short vowels as a separate part from the diacritic, *shaddah*. The distinction between short vowels and diacritics was not clear in his manipulation. The diacritic *shaddah* is a different marking when presented above a consonant, where it indicates that the consonant is a doubled consonant. Not to take this distinction into account when manipulating the short vowels signs should result in an unsound experimental design.

For these reasons, a variance was observed between the groups of participants should not be explained only by short vowel manipulation, but also with other variables the previous studies did not control for, e.g., diacritics, case-ending markings, etc. Thus, the representation of the short vowels in Abu-Rabia's (1995-2001) studies was not scientifically and experimentally manipulated to the degree that helped in isolating the effect of short vowels by themselves. That was a weak part of the design which the current study hoped to control for. Therefore, the current study would claim that Abu-Rabia's (1999) finding is somehow not in conflict with the current finding.

On the other hand, the stated prediction for reading time was that a sentence with a homographic initial would take more time to read than a sentence with a non-homographic initial. However, the analysis showed no difference in reading time between the overall means for homographic versus non-homographic initial sentences. The participants on average took the same amount of time to read both. This finding did not support the stated prediction (1j in Hypotheses section). The discrepancy in reading time between the two types of sentences can be explained on the basis of the word neighboring size that leads to temporary misanalysis. That is, the homographic initial of a sentence would force the reader to activate all possible forms that the initial word may take. While the possible forms might not be restricted in terms of pronunciation, they would be restricted on the basis of meanings due to the morphology of Arabic that is characterized by the so-called *trilateral/quadrilateral-root* model of words. That is, at the core of all activated potential forms there will be a *trilateral/quadrilateral-root* which indicates the core semantic element that is shared by all activated forms. Later, the context would help to narrow the activation size of the possible forms until the reader gets the clue of the appropriate form. Indeed, the context that would help in disambiguating the homographic aspect of the word is not necessarily the whole sentence. Only the word adjoining the homograph could help in selecting the appropriate form.

The running record data from the reading accuracy task in Experiment 1 substantiated this last explanation (see Qualitative Section in Experiment 1). Further, the previous explanation was substantiated by Frost and Bentin (1992a) who found that Hebrew readers maintained without decay for 750 ms from stimulus onset all possible meanings for a heterophonic homograph and with context they selected the appropriate one. Therefore, a Resource-Free Parallel Model would be suggested for a non-cost in constructing multiple representations (Mitchell, 1994).

3.2.3.2. Garden/non-Garden-Path Structures

The results did show support for both stated predictions of the effect of garden-path structure on reading comprehension product and reading time of Arab adults (1k & 1l in Hypotheses section). Accordingly, based on the collected data, the current study failed to reject the null and direct hypotheses (1k & 1l in Hypotheses section).

For reading comprehension, the participants' correct responses on average did not differ significantly on the basis of garden-path structure. Although the participants were forced not to regress because of the design of the moving window task, the garden-path structure did not affect their comprehension; that is, they did not need to regress in order to understand a garden-path sentence. The overall mean for the garden-path sentences was, M = .8914; and the overall mean for the non-garden-path sentences was, M = .8286. As indicated by the means, the participants did very well on both types of structures, garden-path and non-garden-path.

As was laid out earlier (*Homographic/non-Homographic Initials* section), the result was not a surprise due to the fact that, in addition to the other factors, Arab adults exploit their knowledge of the *trilateral/quadrilateral-root* model of words in Arabic (Abu-Rabia, 1995-2003; some additional support from Cole, Segui & Taft, 1997; Taft, 1981).

For reading time, the results revealed a significant effect for the garden-path structure on the time it took the participants on average to read the garden-path sentence versus the non-garden-path sentence. On average, it took the participants longer to read the garden-path sentences compared to the non-garden-path sentences (M = 6747.14 & M = 6259.30, respectively).

As mentioned earlier, this finding was consistent with the stated prediction (11 in Hypotheses section) which was based on experimental and observational studies. Psycholinguists proposed different models in their attempt to examine how people convert a string of words into a structural representation (Mitchell, 1994). From the former, the effect of garden-path was cited in which different models were suggested to explain such effect (Mitchell, 1994). From the latter, the running-record procedure that was conducted during the reading accuracy task demonstrated explicitly the effect of garden-path. For example, while reading the implemented garden-path sentences, the participants hesitated over the onset (word initial) of the garden-path sentence. They would activate one of the possible forms of the initial in the sentence. Later, after arriving at the ambiguous region, they would go back in order to re-analyze their first choice in case that choice was not the appropriate one.

This re-analysis process would result in a delay, and subsequently, extra reading time was needed to process the sentence. However, the question became how the extra reading time that was found to be associated with the garden-path structure could be explained in the moving window task. This question was legitimate for two reasons. First, regression was not allowed by the moving window technique. Second, the previous finding of the homographic/non-homographic variable did not show any significant effect on reading time. However, as was presented earlier, the garden-path sentence, in one way or another, is a subtype of the homographic-initial-led sentences. The only difference is that the garden-path sentence is structured in a way that leaves the predicate of the subject far from each other. For the current study the predicate and the subject were 5-words apart. Therefore, unlike the homographic that does not garden-path the reader, the homographic that did garden-path the reader required extra reading time. This extra reading time can be explained on the basis of the implicit "checking process" that operates with a delay cost, or on the basis of the processing load in the ambiguous region that was demonstrated by several studies that employed different techniques, eye-tracking studies (Ferreira & Henderson, 1990, Experiment 1), first fixation data (Frazier & Rayner, 1982), and in self-paced reading tasks (Mitchell, Corley & Garnham, 1992, Experiment 1: cited in Mitchell, 1994, p. 381), as well as the self-paced reading task of Experiment 1 in the current study.

Hence, the Resource-Free Parallel Model that was suggested to account for the finding of no difference in reading time between a homographic versus non-homographic initial was not supported with the garden-path structure finding. Only a resource-limited parallel model accounts for the discrepancy in reading time between a garden-path and a non-garden path sentence. Subsequently, an "annotated serial analysis" model with a "lexical frame-driven strategies" as a mechanism in initial choice will be proposed to account for the current finding (Mitchell, 1994). That is, the existence of unexplored options might somehow be tagged or marked at the choice point, perhaps providing the basis for relatively efficient re-analysis procedures (cf. Frazier & Rayner, 1982, cited in Mitchell, 1994, p. 378). It is suggested that tagging or marking, for Arabic, is based on the core element, the root, that the alternative forms of the homograph initial share.

3.2.3.3. Reading Condition Representation

The finding from the plain reading condition analysis led us to assume a redundant role for short vowels by themselves or in combination with diacritics in reading comprehension and reading time for homographic-initial versus non-homographic-initial sentences, since no significant results were found (Tables 11 & 12). Further, the finding from the plain reading condition led us, too, to assume a redundant role for short vowels by themselves or in combination with *shaddah* in reading comprehension, since no significant result was found over the reading comprehension data (Table 14). However, the results showed a significant effect for garden-path structure on reading time (Table 13).

Therefore, the question that was raised was whether short vowels and *shaddah* would speed the reading process of garden-path sentences, but not whether short vowels and *shaddah* would facilitate comprehension. In other words, could the short vowels and diacritics: *shaddah*, *skun*, etc. minimize the reading time load; would they speed the "checking process" in a way that would minimize the processing load in the ambiguous region? In addition, what would be the effect of the presence of short vowels and *shaddah* (correct and incorrect positions) on reading process, particularly, reading time? Was their presence redundant in a serial processing task, where the participants were asked to read some sentences silently? Further, what was the effect of wrong short vowels and *shaddah* representation on reading process as reflected in the reading time?

Despite the aforementioned logical reasons for not testing the role of short vowels and *shaddah* on the basis of reading comprehension, the analyses of the effect of those reading conditions were conducted in order to be compelled with the study design. Further, the analyses were helpful in testing some claims that emerged from the findings of Experiment 1; for example, does the wrong short vowels-plus-*shaddah* representation have an effect on the reading process of adult Arabs?; what relation does short vowels-plus-*shaddah* representation have to the homographic/non-homographic variable?; would an economical representation of short vowels and diacritics be efficient in speeding the reading process as reflected in reading time?

The two-way repeated measures analysis of variance was conducted on the data of reading conditions 1, 2, 3 and 4. The effect of the two independent factors and particularly the interaction, reading condition and homographic/non-homographic on reading time and reading comprehension was tested.

For the reading comprehension data, the analysis did not reveal any significant effect of the manipulated variables, reading condition and homographic/non-homographic-initial, on reading comprehension (Table 17). Further, there was no significant interaction. Accordingly, neither of these variables affected word integration as reflected in the percentages of the comprehension product outcome.

These findings supported the stated predictions (1m, 1i, and 1o in Hypotheses section). The analysis showed that the performance of the participants was on average the same regardless of the reading condition. By taking together this last finding and the previous ones, it can be stated that, adult Arabs' understanding of a sentence was not affected by the absence of short vowels and *shaddah*. However, their reading process as indicated by the time it took them to read the sentence was affected.

The result showed that only the manipulated variable, reading condition representation, was correlated with the dependent variable, reading time. Reading condition representation had a main effect on the process of word integration as was indicated by the time it took the participants on average to read the sentences. Although the finding did support part of the predicted hypothesis (1n in Hypotheses section), it did not support the direction part of the hypothesis. Further, the analysis failed to refute the null hypothesis which predicted no significant interaction exists between reading condition representation and a homographic/non-homographic variable (1p. in Hypotheses section). The predicted hypothesis (1n in Hypotheses section) was that a significant difference in the reading time of skilled adult Arab readers would be observed when they read vowelized versus unvowelized sentences; however, the effect would be in favor of the vowelized sentences (short vowels and *shaddah*) which would take less time to process than the plain unvowelized sentences. Indeed, the post hoc analysis showed that significant differences were found between reading conditions 1 and 2, 1 and 4, 2 and 3, and 3 and 4, respectively. That is, as shown in Table 16, it took less time to read a sentence in its plain representation than in its vowelized representation, including the short vowels-plus-*shaddah*, the short vowels only, and the wrong short vowels-plus-*shaddah*. Further, a consistent pattern among the statistical pair comparisons was observed. That is, there appeared to be a correlational pattern between time increase and the presented number of short vowels and *shaddah* signs. Examining the reading conditions' means showed that the more the short vowels and *shaddah* signs were provided, the more time it took the participants to read the sentences. On average, reading condition 1 was the fastest while reading condition 4 was the slowest (6311.55 msec, 6435.31 msec, 6661.88 msec, 7596.74 msec, for reading conditions 1, 3, 2 and 4, respectively; Table 16).

This finding may indicate that the short vowels and diacritics were not ignored while the participants were reading the sentences, but were being processed. Justification for the aforementioned claim was supported by the gradual increase in reading time as the structure of the word included more short vowels and *shaddah* signs. The relationship between the number of short vowels and *shaddah* presented and reading time appears to be a positive correlation. As will be explained later in the word naming experiment, this last finding was consistent with the word naming findings.

As noted earlier, the garden-path structure did not hurt the participants' reading comprehension product, but it did slow their reading time process. Accordingly, testing the effect of short vowels and *shaddah* on the reading comprehension of garden-path would not be reasonable. If on average Arab adults comprehended both garden-path and non-garden-path sentences equally, then the question of what facilitating role those short vowels and diacritics had in the comprehension product is self-answering.

On the other hand, the previous finding (Table 15) showed that the short vowels and diacritics were being processed. Indeed, it showed a gradual increase in reading time as the structure of the word included more short vowels and *shaddahs* (Table 16)

For this reason, asking how much short vowels and diacritics were needed in order to facilitate the reading process of garden-path sentences in terms of reading time was legitimate. The concern was then over the fact that adding short vowels and diacritics might not contribute more information to the consonants; they might be redundant. In fact, the trade would be a cost with no payoff; slowing the reading process with no additional benefit. Thus, seeking economical representation of short vowels and diacritics was of practical use. Therefore, manipulating the garden-path sentences in terms of one of the intended conditions should help provide an answer to the proposed question, "What role does the economical representation of the diacritic, *skun*, or case-ending markings have in resolving garden-path ambiguity as examined in terms of reading time?" Thus, the initial words of the garden-path sentences were manipulated on the basis of four reading conditions. In the first, the initials of the garden-path sentences were presented plain; in the second, they were presented with short vowels-plus-*shaddah*; in the third, they were provided with only the *skun* sign; and in the fourth condition, they were provided with case-marking endings. The question was whether the participants would take less time to process garden-path sentences that were provided with any of these four reading conditions.

The analyses did not show any significant results for reading condition for either reading time (Table 19) or reading comprehension (Table 21). That is, for the reading time, regardless of the reading condition represented, it took the participants on average the same time to read the garden-path sentences (Table 20). The finding did not support the stated prediction (1r & 1t in Hypotheses section). According to the result, the participants' reading process time, on average, did not differ on the basis of the reading condition: plain versus *skun*-only versus case-ending markings-only versus short vowels-plus-*shaddah*.

As was laid out earlier, if the diacritic, *skun* or the case-ending marking signs were assembled with the consonants, their provision to the homographic initial of a garden-path sentence should eliminate the garden-path phenomenon, or at the least narrow the activation of the word neighboring size of the homographic initial of the garden-path sentence. That is, they should reduce the neighboring word size to only one legal option, and thus, reading time processing should not be affected by the parallel activation or the load processing that was expected over the ambiguous region of a garden-path sentence. Indeed, examining the obtained means (Table 20) demonstrated that the plain garden-path sentences took on average 6747.14 milliseconds; while, it took 6997.33 milliseconds and 7230.64 milliseconds, respectively, on average to process the garden-path sentences that were provided with *skun*-only and case-ending markings-only, a result that was not consistent with the stated predictions (1r & 1t in Hypotheses section). Although the word initial that was presented plain would garden-path the reader while the presence of *skun* or case-ending-marking signs on the initial word might not, the reading process time was on average for both.

As will be explained in detail later, this finding can be modeled by the Two-Cycle processing theory (Berent et al., 1995). The only difference would be the assumption of a first-cycle dominant mechanism. For this model, there are two cycles of processing in Arabic, the first cycle for consonants and the second for the non-consonants, such as short vowels, diacritics, and case-ending markings. Therefore, as a result of the long experience and exposure to plain print that is devoid of short vowels and diacritics, Arab adults may not pay attention to the provided short vowels and diacritics. The onset words of the garden-path sentences were provided with only *skun* or only case-ending marking, which were represented by very tiny symbols: " ْ ", " ُ ", " َ ", " ِ ". Indeed, the reading accuracy task and the following word naming task substantiate the claim. For example, positioning the short vowel, *Dhammah*, " ُ," over the initial consonant, 'alif;' " ا ," in a verb, indicates that the verb is a passive-voice form. Despite the presence of the short vowel, *Dhammah*, " ُ ", the participants very often did not pay attention to it in the first place, and thus would not assemble the short vowel with the initial consonant. This subsequently led them to activate the active-voice form of the verb (Qualitative section in Experiment 1).

On the other hand, as expected (1q & 1s in Hypotheses section), the analysis did not show a significant effect of reading condition on reading comprehension product (Table 21). The percentages of correct responses were on average the same among the reading conditions. As indicated by the means in Table 22, the participants did very well regardless of the reading condition.

For convenience and clarity, Figure 10 summarizes and brings together the hypotheses in correlation with the findings.

Hypothesis ID	Hypothesis Statement	Finding
Alternative Hypothesis 1i	"There is no significant difference in the reading comprehension of skilled adult Arab readers when reading sentences with homographic initials versus sentences with non-homographic initials regardless of the reading condition representation"	Supported
Alternative Hypothesis 1j	"There is a significant difference in the reading time of skilled adult Arab readers when reading plain sentences with homographic initials versus plain sentences with non-homographic initials in favor the sentences with the non-homographic initials which should take less time to read"	Not supported
Alternative hypothesis 1k	"There is no significant difference in the reading comprehension of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences"	Supported
Alternative hypothesis 1l	"There is a significant difference in the reading time of skilled adult Arab readers when reading garden-path sentences versus non-garden-path sentences in favor of the non-garden-path sentences which should take less time to process"	Supported
Alternative Hypothesis 1m	"There is no significant difference in the reading comprehension of skilled adult Arab readers when reading vowelized versus unvowelized sentences."	Supported
Alternative Hypothesis 1n	"There is a significant difference in the reading time of skilled adult Arab readers when reading vowelized versus unvowelized sentences in favor of the vowelized sentences (short vowels and *shaddah*) which would take less time to process."	Supported/ not supported; see the narrative analysis
Alternative hypothesis 1o	"There is no significant interaction between the homograph/non-homograph variable and reading condition representation on the reading time process of skilled adult Arab readers."	Supported
Null Hypothesis 1p	"There is no significant interaction between the homograph/non-homograph variable and reading condition representation on the reading time process of skilled adult Arab readers."	Supported
Alternative Hypothesis 1q	"There is no significant effect for the diacritic, *skun* on the comprehension of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with *skun* versus a garden-path sentence whose initial word is not provided with *skun*."	Supported
Alternative hypothesis 1r	"There is a significant effect for the diacritic, *skun* on the reading time process of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with *skun* versus a garden-path sentence whose initial word is not provided with *skun*, and this will be in favor of the garden-path sentence that is provided with *skun* which should take less time to read."	Not supported
Alternative Hypothesis 1s	"There is no significant effect for the case-ending marking on the comprehension of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with a case-ending marking versus a garden-path sentence whose initial word is not	Supported

	provided with a case-ending marking."	
Alternative Hypothesis 1t	"There is a significant effect for the case-ending marking on the reading time process of skilled adult Arab readers when reading a garden-path sentence whose initial word is provided with a case-ending marking versus a garden-path sentence whose initial word is not provided with a case-ending marking, and this will be in favor of the garden-path sentence that is provided with a case-ending marking which should take less time to read."	Not supported

Figure 10: Hypotheses Statements and Findings of Moving Window Experiment

3.3. EXPERIMENT 3: WORD NAMING TASK

Overview

The aim of Experiment 3 was threefold. The first purpose was to investigate the effects of short vowels per se and in combination with *shaddah* on the speed (reading latency) of word recognition of skilled adult Arab readers while reading a pool of isolated words: homographic and non-homographic. Also investigated was the default of adult Arab readers who have encountered a stimulus that has more than one legal reading, a result that would either support or refute the researcher's claim regarding the way Arab readers approach a homographic word. According to Experiment 1 observations, a consistent pattern was found in the participants' reading responses to homographic words. The participants would either activate the basic active voice form once they encountered a homograph of a verb category, or they would activate the high-frequency aspect of the word when its low-frequency aspect was intended.

The purpose of the wrong short vowels-and-*shaddah* reading condition was to investigate whether the distorted phonological representation of a word would hinder processing its graphemic representation; note that the participants were warned about the phonological distortion in this reading condition (wrong short vowels-plus-*shaddah*).

Given that in many cases the affixational elements in a word are built out of consonants, taking this affixation into account as a factor in the analysis should reveal indirectly whether the first cycle of processing focused on the consonants.

Evaluating the effect of affixation would put the researcher in a better position to propose the claim that there is a dominant one-cycle processing in the Arabic reading process. The reading latencies of the affixated words were compared with those of the non-affixated words within the plain reading condition. By focusing on only the plain reading condition the researcher proposed that it would be possible to determine a pure effect of the affixation variable on the Arabic reading process.

Finally, the role of word frequency by itself and in correlation with short vowels-plus-*shaddah* in word recognition was investigated. However, because a homographic variable was involved, the high- and low-frequency words were blocked on the homographic/non-homographic variable. Therefore, the effect of word-frequency was evaluated in correlation with both variables, homographic/non-homographic and reading condition (plain versus short vowels-plus-*shaddah*). The isolated words matched the head words of the moving window task sentences on all variables, and hopefully represented every possible form the initial word of an Arabic sentence could take.

In this section, I outline and detail the methodological elements of each part of the experiment and the justification and rationale of each element in the experiment: *Participants*, *Materials*, *Measures*, *Data Collection*, *Design* and *Analysis*, and *Procedures*.

3.3.1. Method

3.3.1.1. Rationale

The word-naming technique is the "most widely used naming method" (Haberlandt, 1994, p. 22). The method helps assess availability in working memory as opposed to strength in long-term memory (Haberlandt, 1994, p. 22). Its strength draws from its naturalness; "pronouncing a word is more natural to subjects than having to decide whether a target is actually a word or not" (Forster, 1981, cited in Haberlandt, 1994). This method is based on the assumption that "highly active concepts are more available for pronunciation, and thus positive targets are named more quickly" (Potts et al., 1988; Seidenberg et al., 1982, 1984, cited in Haberlandt, 1994, p. 23).

3.3.1.2. Participants

The participants were exactly the same as those in the moving window task. They were 35 native Arabic speakers, aged 26-40, drawn from the sample of Experiment 1 (except for 4 new participants). Only the graduate participants who demonstrated efficient reading skills were included in this experiment. As before, all participants were graduate students pursuing their graduate studies and living temporarily in Pittsburgh or Indiana, Pennsylvania. Upon their completion of the study they were offered $ 7.50 as a compensation for their participation. Exactly the same criteria were used in choosing the participants for the word naming task as had been used for Experiment 2 (see *Participants* section in Experiment 2). All 35 participants completed the three sessions.

3.3.1.3. Materials

A hundred and twenty-four Arabic words were the actual stimuli in the word naming task. Another 10 words were chosen for practice purposes before the actual experiment. No wrong short vowels-plus-shaddah reading condition was represented in the practice session. The stimulus words were extracted from four sources: Abdu's (1979) book, "The Common Frequent Word in Arabic;" Lee's (1991) book, "Arabic Verb Frequency;" and the database of some Arabic printed and online newspapers that have a large readership among the Arab countries, e.g., the database of Asharq-Al-Awsat newspaper; and from the database of traditional Arabic books. The stimulus words were divided into six blocks and given in two sessions. One hundred and eleven words were given in session one and 13 words were given in session two. Of these 111 words, a first 30 were presented plain (only consonants were provided); a second 30 were presented with short vowels-plus-*shaddah*; and a third 30 were presented with short vowels, but without *shaddah* (short vowels-minus-*shaddah*). Eleven words of low frequency were presented with short vowels-plus-*shaddah*, and the last 10 words were low frequency words presented plain.

Except for the low-frequency words, all were from the 3,000 most common words in Arabic as investigated by Abdu (1979). Identifying the low-frequency words was based on the judgment of native Arab graduate students at the same level as the target population, as well as on the basis of an exclusion criterion. That is, the high-frequency words were not among the 3,000 most common words. The criteria in selecting those words, in addition to representativeness, in-sentence position and familiarity, were that the selected stimuli had to reflect the initial words of the sentences in the moving window task. That is, the initial word of each sentence in the moving window task was identified, pooled out, and a counterpart for each initial was searched for.

In general, the stimuli were selected on the basis of five axes. The first axis was word frequency: low and high. The second was word length: 3-consonant, 4-consonant, 5-consonant, and 6-consonant. The two-consonant and 7-consonant non-affixated words were not included in the stimuli pool for two reasons: first, non-affixated words composed of 2 or 7 consonants constitute a very minimal proportion of the Arabic vocabulary; and second, Arabic morphology is based on the *trilateral/quadrilateral*-root. The third axis was word morphological classification: noun, conjugated noun, preposition, basic verb, conjugated verb, etc. The fourth was the potential position a word takes in a sentence: initial, middle, and ending. The fifth axis was ambiguity, that is, the stimuli represented both homographic and non-homographic words.

The criteria for classifying the words on the basis of these axes and subsequently selecting the words on their basis were judged by a team of Arabic experts, Arabic high school teachers, and a sample from the target population.

Thus, 4 (length) x 5 (word type) x 2 (word frequency) x 2 (affixated vs. non-affixated) would result in 80 tokens that had to be reflected in the experimental stimuli pool according to this procedure. Further, three versions of each token had to be constructed to reflect the three reading conditions: plain, short vowels-plus-*shaddah*, and short vowels-minus-*shaddah*. Subsequently, 80 (tokens) x 3 (versions) resulted in 240 words to be included in the word naming task in order to achieve representativeness. That is, a total of 240 words comprised the stimulus words in the word naming task. However, based on some restrictions related to the nature of the Arabic morphs and from the position slot of the initial word in the sentence, some of these tokens were removed. For example, prepositions in Arabic fall within the range of 2-4 consonants. Therefore, 5 (length) x preposition (type) were removed from calculation as was the 6 (length) by preposition (type).

However, despite the claim that the word frequency effect was found to be "implicated in the search model's account of the ambiguity effect" (Underwood & Batt, 1996, p. 67), adding it to the tokens variables resulted in a three-way design (2 x 4 x 2): homograph versus short vowels and diacritics representation versus word frequency. As a result, there were two levels for the first independent variable (homographic versus non-homographic), four levels for the second independent variable (plain versus short vowels-plus-*shaddah* versus short vowels-minus-*shaddah* versus wrong short vowels-plus-*shaddah*), and two levels for the third independent variable (high-frequency versus low-frequency). Subsequently, interpreting word frequency effects was complicated. In addition, adding the word frequency increased the number of tokens that needed to be controlled. Despite that, a proportion of low-frequency words of both homographic and non-homographic forms were implemented in session 2, but under two reading conditions: plain versus non-plain (short vowels-plus-*shaddah*). Therefore, by employing the blocking procedure, word frequency was tested in a separate subset of data (21 words) that should have helped isolate the effect of word frequency in correlation with the reading condition representations: plain versus short vowels-plus-*shaddah* and the homographic variable.

Thus, by removing the word frequency axis from the stratifying procedure, 4 (length) x 5 (word type) x 2 (affixated vs. non-affixated) would end up with 40 tokens, that subsequently (40 tokens x 3 versions) would end up with 120 possible words.

However, closely examining these tokens revealed some resemblances among them. That is, some of the nouns were similar to each other except in length, that is, number of consonants. Therefore, the researcher found it to be very contrived to have them both included. Because the large stimuli would be a burden on the participant side, some tokens that were not uniquely different from other tokens were removed, leaving 30 tokens that needed to be reflected in the stimuli pool. Subsequently, three versions of 30 words each were made in order to reflect the three aforementioned reading conditions: 30 words presented plain (block 1), 30 words presented with short vowels-plus-*shaddah* (block 2), and 30 words with short vowels, but without *shaddah*, that is short vowels-minus-*shaddah* (block 3).

Despite the necessity of removing some axes, the current study still claimed that the incomplete stratifying procedure was not hurt, and subsequently the results of the experiment would not be affected. The claim was justified by the fact that the main purpose of the word naming task was to test the effect of the homograph/non-homograph variable on the reading process as indicated by reading time latency (RT) of adult Arab readers while reading homographs versus non-homographs. Having a pool of homographs and non-homographs and testing them in correlation with short vowels-plus-*shaddah* representation was the essential element for achieving that goal. The other 21 words reflected other conditions: 10 words for the plain low-frequency condition (block 5), and 11 words for the vowelized-plus-*shaddah* low-frequency condition (block 6). The 21 words were later blocked on the homographic variable: homographic versus non-homographic. The three 30-word versions and the 21 low-frequency words were presented in session 1.

For session two, using the aforementioned criteria, 13 words were chosen to reflect the wrong short vowels-plus-*shaddah* condition (block 4). That is, putting the short vowels only in the wrong positions, if assembled, would lead to non-words; i.e., the short vowels were put in a position that would lead to phonemic distortion and not to graphemic distortion.

All stimulus words were judged in terms of naturalness and authenticity, that is, the stimuli had to reflect the types of words that could be heard or read in a newspaper. All words were written with a familiar font, “Simplified Arabic,” of size, 16. They were transferred into image files by using the PAINT software and stored in a computer program, e.g., E-Prime software that was used to control the presentation and the time response latency for the target’s stimuli. Choosing the PAINT software for writing the stimuli was due to the fact that E-Prime, version 1.1, did not yet support Arabic script.

3.3.1.4. Measures

Two dependent variables were measured in this study: naming latency and word naming accuracy. Naming latency was measured to the nearest millisecond, and the word naming accuracy was measured dichotomously. One of the other purposes of the study was to identify the type of miscues Arabic readers made while naming the words; and further, it attempted to identify the default activation for the homographic stimuli, particularly the verbs, an observation that would either support or refute the aforementioned claim that was based on the running record that was kept during the oral reading. A running record procedure, which allowed for quantitative and qualitative analyses during the oral reading for the reading naming test, was conducted both to track the words that had been read correctly and incorrectly and to immediately classify the type of miscues readers made. The variable was coded dichotomously; thus, each word read correctly was marked and assigned "1;" otherwise, the reader was assigned "0." Correct reading was evaluated on the basis of integrating the consonants with the morphological short vowels and shaddah. However, assigning any case-ending marking (that resembled short vowels in form and pronunciation) to the last consonant of each word that was presented in isolation was accepted because (although there were some constraints) case-ending markings change according to the position of the word within the sentence. Further, the stimuli for this study represented both homographic and non-homographic words and due to the *trilateral/quadrilateral-root* characteristic of the Arabic word formation, any legal response to such isolated homographic words had to be considered correct.

Finally, the participants were selected to be a homogeneous group on the basis of their academic level (graduate and postgraduate) and the results of their reading accuracy and reading time in the reading text experiment. Therefore, only the dependent variable, time latency, was involved in the analysis. Subsequently, the main concern of the word naming task was to identify the type of activation of the homographic words and to identify whether there was any difference in time latency means in activating homographic and non-homographic words, taking into account the representation of short vowels and diacritics.

3.3.1.5. Data collection procedure

The same steps and setting in the moving window experiment were used for collecting the data in this experiment. In general, the testing setting was an empty, secured, and quiet room that was in convenient proximity to the participant. There were two sessions, given in one day.

The task was given individually by the primary researcher. Each participant was seated at a comfortable distance from the computer and then informed about the task. A training session and test trials with different sample of stimuli were conducted before the actual experiment. Individual instruction was provided for each participant.

The response of the participants was sensitized by a voice-activated microphone that was part of the Serial Box that accompanied the E-PRIME software, which was attached to the computer. Using a sensitive timer provided by the E-Prime software, the researcher was able to measure the time latency to the nearest millisecond.

The reading session was recorded by a voice-activated recorder that was put close to the participant. Thus, the time interval between presenting the target word and the reader's response was measured. In addition, a qualitative assessment of the type of response a reader made when naming the word was taken by the primary researcher, using the running record procedure.

3.3.1.6. Design and analysis

The main aim of Experiment 3, word-naming task, had three parts: 1) to investigate the role of the homographic variable by itself and in correlation with short vowels-plus-*shaddah*; 2) to evaluate the effect of word frequency by itself and in correlation with short vowels-plus-*shaddah*. The effect of word frequency under the two reading conditions (plain versus short vowels-plus-*shaddah*) on the homographic variable was examined by blocking the word frequency on the homographic variable; and 3) to examine the effect of word affixation. All three effects were evaluated on the basis of the reading time latency of Arab adult readers while reading orally a pool of stimuli that were presented individually. As a result of those discrete concerns, two designs were constructed. The first design covered the first and third aims, and the second design covered the second aim.

DESIGN ONE

A two-factor within-subjects design was employed for the experiment to evaluate the effect of the homographic variable in correlation with short vowels and *shaddah* representation (including the correct and wrong representations of short vowels and *shaddah*). In this design, there were two factors: factor *A* represented the reading condition: plain versus non-plain, and factor *B* represented the homographic variable: homographic versus non-homographic. There were four levels under factor *A* each of which represented a reading condition: plain (30 words), correct short vowels-plus-*shaddah* (30 words), short vowels-minus-*shaddah* (30 words), and wrong short vowels-plus-*shaddah* (13 words). Under factor *B*, there were two levels each of which represented the word form: homographic and non-homographic. Due to the nature of the reading conditions and other factors laid out in the *Data Collection Procedure*, this first design was implemented in two sessions. In session one, the participants read 90 words, plus 10 practice words, that represent the three reading conditions as shown in Diagram 4. In session two, they read 13 words that represented the last reading condition in Diagram 4: the wrong short vowels-plus-*shaddah* reading condition. Hence, by the end of the two sessions, all 35 participants had read 113 actual words and 10 practice words (Figure 11).

Two procedures were employed here separately for testing the effects of the independent variables: the dependent samples *t*-test procedure and the two-way repeated measures analysis of variance.

	Reading condition	Reading Condition (words stimuli)	Homographic Stimuli	Non-Homophonic-Stimuli
Group	1	Plain (consonants only)		
	2	Short vowels-plus-*shaddah*		
	3	Short vowels-minus-*shaddah*		
	4	Wrong short vowels-plus-*shaddah*		

Figure 11: Study design I for Experiment 3

DESIGN TWO

A two-factor within-subjects design was employed for this study to evaluate the effect of the word frequency variable in correlation with short vowels and *shaddah* representation on the reading time latency of Arab adult readers while orally reading a group of stimulus words. Next, the effect of word frequency under the two reading conditions (plain versus short vowels-and-shaddah) on the homographic variable was examined by blocking the word frequency on the homographic variable (Figure 13).

In this design, there were two factors: factor *A* represented the reading condition variable: plain versus non-plain, and factor *B* represented the word frequency variable: high frequency versus low frequency. Under factor *A* there were two levels each of which represented a reading condition: plain and short vowels-plus-*shaddah*. Under factor *B* there were two levels each of which represented the word frequency: high frequency and low frequency. For this design, the participants read 30 high-frequency words presented plain, 30 high-frequency words presented with short vowels-plus-*shaddah*, 10 low-frequency words presented plain, and finally, 11 low-frequency words presented with short vowels-plus-*shaddah*. Note that session 1 provided the data on the high-frequency words while session two provided the data on the low-frequency words. Hence, by the end of the two sessions, all 35 participants had read 81 words (Figure 12).

	Reading Condition (words stimuli)	High-Frequency Stimuli	Low-Frequency Stimuli
Group	Plain (consonants only)		
	Short vowels-plus-*shaddah*		

Figure 12: Study design II for Experiment 3

	Reading condition	Reading Condition (words stimuli)	Homographic Stimuli	Non-Homographic-Stimuli
Group	1	High-Frequency Plain		
	2	High-Frequency with Short vowels-plus-*shaddah*		
	5	Low-Frequency Plain		
	6	Low-Frequency with Short vowels-plus-*shaddah*		

Figure 13: Study design III for Experiment 3

3.3.1.7. Procedure

With some modifications in terms of the software, the stimuli, and the reading conditions, the procedure for this experiment was, generally speaking, similar to the one used by Koriat (1984). Presenting the stimulus words, rotating the order of their presentation for counterbalancing, collecting the vocal response, and measuring the time latency were all controlled by the E-Priming program software that was installed in a personal computer attached to an external 15 inch display. Each participant was seated in front of the computer at a convenient distance from the screen and asked to adjust the chair, the monitor, and the microphone to a position that felt comfortable. A voice-activated microphone was placed at a proper distance from the participant and was tested before starting the task and during the practice trials. Two digital and cassette recorders were set close to the participant.

Each participant was informed orally about the nature of the experiment; that is, he/she would read some individual words that would be presented by the E-Prime program. Further, he/she would be informed that the task involved two parts that would be given in two sessions. The participants were asked to read the words very quickly and naturally. The steps that followed were guided by the software program. That is, after starting the program, a small window would pop up asking the participant to enter the I.D. number that he/she had received from the researcher prior to the experiment. He/she was then asked to select the category age range and then press the "spacebar" to move to the "instructions" window (APPENDIX N). After this, the participant was guided by the researcher through the training part of the task which included practice trials of 10 words. When the practice portion of the task was finished, a small window popped up asking the participant whether he/she was ready to begin the actual task. The digital and cassette recorders were turned on. Once the participant began the actual task, the primary researcher conducted the running record procedure from a slight distance. After reading the last word in the experiment, a small window popped up saying "thank you" to the participant and indicating the end of the first session of the task.

In the second part of the task, the participant was given 13 individual words supplemented with wrong short vowels and *shaddah*. The same procedure was used for both sessions except that in session two, which included some words that were presented with wrong short vowels-plus-*shaddah*, the participants were informed before they started this portion that among the words they were going to read were some that had short vowels and *shaddah* put on the wrong position. The short vowels and *shaddah* were put in a position that, if assembled with the consonants, would lead to phonemic distortion, but not to graphemic distortion; that is, when assembling the short vowels and *shaddah* with the consonants, they would lead to reading a word that makes no sense in Arabic. The task was given individually and conducted and supervised by the primary researcher.

Generally speaking, for both sessions, the participants were asked first to pay attention to the words and second to speak the target words accurately and quickly into the voice-activated microphone that was attached to the computer. They were informed that if they hesitated over some words that they thought had more than one legal pronunciation they would need to respond very quickly by assigning the reading that first came to mind when they saw the target word. For each participant, the task included the following steps:

1. The participant was asked to focus on the center of the screen where there was a plus sign.

2. A ready signal was given and then the word was presented for a 5000-millisecond interval. Following this, the word disappeared and a blank screen with the plus sign appeared for 1000-milliseconds; then the second target word was presented for 5000 milliseconds.

3. The participant needed to respond immediately and correctly by reading the target word once and aloud as fast as he/she could.

4. The computer measured the time span between presentation of the target word and the reader's response, while the primary researcher took notes and determined the words that were missing because the program did not respond due to the vocal activation of the microphone. However, assessing the vocal responses for each participant was done later by listening to the audio recorders after the sessions were completed.

5. The target words were presented randomly for every participant. After the participants finished both sessions, the data were tabulated. That is, every participant's naming latency was tabulated and his/her correct/incorrect naming was analyzed and scored. Any response after the 5000-milisecond interval was excluded from the data automatically by the program which assigned "zero" timing for the target word. The variability in scores was coded dichotomously. That is, each correct reading was assigned "1;" otherwise, the response was assigned "0." The word naming task was counterbalanced with the moving window task for each second participant.

3.3.2. Analysis Results

Overview

For this task, there were two dependent variables: reading time latency (RT) and reading response accuracy. However, in accordance with the aforementioned justifications (*Measurement* section), only the reading time latency (RT) data were analyzed statistically. Different analyses were made over several subsets of the dependent variable (RT) data. First, by employing the dependent samples *t*-test procedure, the analysis looked at the reading condition 1 (the plain reading condition) by comparing the RT means for the homographic words with the non-homographic words. This analysis explained what goes on at a natural reading setting where texts and words are very often presented plain for Arab adults. This first analysis served as the baseline for subsequent analyses.

The second analysis was conducted on the four main reading conditions: 1, 2, 3 and 4 where the correlation of both the homographic variable and the reading condition were evaluated by using a two-way repeated measures analysis of variance. Testing this subset of data (reading conditions 1, 2, 3 and 4) shed some light on the previous findings. Bringing the previous findings together revealed the existence of a conflict between the two stated claims. That is, based on the running record observations, the first claim was that short vowels and *shaddahs* were not always processed (paid attention to), but ignored. Although the passive-voice verbs were supplemented with short vowels that should have helped the reader to pronounce the passive-voice form of the verb, the participants very often activated its active-voice form in the first place.

However, based on the moving window findings over reading time, a second claim was constructed: “a positive correlation existed between the structure of the word and the size amount of its characters (using character here to mean short vowels, diacritics: *skun*, *shaddah*, and case-ending markings, etc.)." That is, as the structure of the word got more characters, its fixated reading time got longer. However, it was necessary for the following reason to evaluate the claim of a positive correlation between the number of short vowels/*shaddah* and the reading time on the basis of whether the stimulus word was a homograph or a non-homograph. That is, by adding short vowels and *shaddah* to a homograph, its possible forms would either be reduced to one appropriate form or at the least, minimized. Therefore, the question became, "by adding short vowels and *shaddah* to a homograph would the positive correlation between the number of short vowels/*shaddah* and reading time be constant. In general, the analysis would respond to the question, "would the provision of short vowels and *shaddah* to the homographic versus non-homographic words make a difference to Arab adult readers in terms of reading speed as can be indicated by the reading time latency (RT)?" Put another way, would the absence of short vowels and *shaddah* hinder word naming to the degree that a reluctance and stoppage would be obvious?

In the third analysis, the overall effect of the word frequency variable on the reading time speed of Arab adults was evaluated. Subsequently, the effect of word frequency in correlation with the independent variables, homographic and reading condition (reading representation) was evaluated by employing the blocking procedure. Therefore, the data from reading conditions 1 and 2 from session one, and reading conditions 5 and 6 from session two were combined (Figure 13: *Design* III) and analyzed, using a two-way repeated measures analysis of variance.

Finally, the last analysis was conducted on the affixation variable. For simplicity, the analysis looked at only the reading condition 1 (the plain reading condition) by comparing the RT means for the affixated words with the non-affixated words.

In the following section, the analysis conducted on each subset of data for the manipulated variable is laid out. The analysis, including the means and standard deviations of the *t*-test were presented in one table. However, two tables were constructed for the repeated measures analysis of variance. The first represents the results of the analysis of variance and the second represents the corresponding cell and marginal means.

3.3.2.1. Results

For the first subset of analysis (Table 23) that was conducted over the homographic/non-homographic words for only the plain reading condition, a significant difference in the RT for the homographic and non-homographic words was found. That is, on average it took more time to read the homographic words than the non-homographic words (overall mean for homographic words, M = 725.8795 milliseconds; overall mean for non-homographic words, M = 692.4571 milliseconds).

Table 23: Results of *t*-test on Reading Time Latency (RT) of Homographic/non-Homographic Variable

Homographic Words		Non-Homographic Words				
M	SD	M	SD	t	df	p
725.88	219.22	692.46	210.26	-2.337	34	.025

In the second analysis, the means of reading time latencies (RT) in reading conditions 1, 2, 3 and 4 (Figure 11 in *Design* section) were compared in correlation with the homographic variable by employing a two-way repeated measures analysis of variance.

As presented in Table 24, in addition to the significant main effect for the reading condition, the analysis of variance revealed a significant interaction between reading condition and homographic variable. The interaction, as presented in graph 6, was disordinal. That is, the rank order of the effect of the independent variable, reading condition, was not constant but changed according to the level of the homographic variable: homograph versus non-homograph. Therefore, viewing the effect of reading condition was discussed on the basis of the homographic variable levels: homographic versus non-homographic (Pedhazur, 1982). The analysis, on the other hand, did not reveal any significant main effect for the homographic variable.

As indicated in the graph (Figure 14), the interaction showed that in reading conditions 1 and 4, the RT of homographic words was on average slower than the RT of non-homographic words. However, in reading condition 2, the RT on average was faster for the homographic words than for the non-homographic words (Table 25).

There was a general increase in condition means in going from condition 1 to condition 4, despite the fact that the rank order of the homographic versus non-homographic means was not constant across conditions. Since the results of Mauchly's test of sphericity were significant, Huynh-Feldt *p* values were reported (Table 24).

Table 24: Results of Two-Way Repeated Measures Analysis of Variance on Reading Time Latency (RT)

Source	SS	df[1]	MS	F	*p*
Reading Condition	821217.32	3	623341.78	8.341	.003
Error	3347370.29	102	74729.65		
Homograph/non-Homograph	2819.47	1	2819.47	0.413	.525
Error	232381.26	34	6834.74		
Homograph X Reading Condition	147240.92	3	77951.33	5.966	.005
Error	839060.09	102	13064.99		

[1] For confusion concern, the unadjusted degrees of freedom values are reported.

Table 25: Cell and Marginal Means on the Reading Time by Reading Condition and Homographic /non-Homographic Variable

		Homographic		Non-Homographic		
		M	SD	M	SD	Marginal
Reading Condition	Reading Condition (words stimuli)					
1	Plain	725.88	37.06	692.46	35.54	709.17
2	Short vowels-plus-*shaddah*	703.13	24.93	765.44	40.53	734.29
3	Short vowels-minus-*shaddah*	727.82	31.72	733.10	29.22	730.46
4	Wrong short vowels-plus-*shaddah*	877.52	63.34	817.96	49.76	847.74
	Marginal	758.59		752.24		

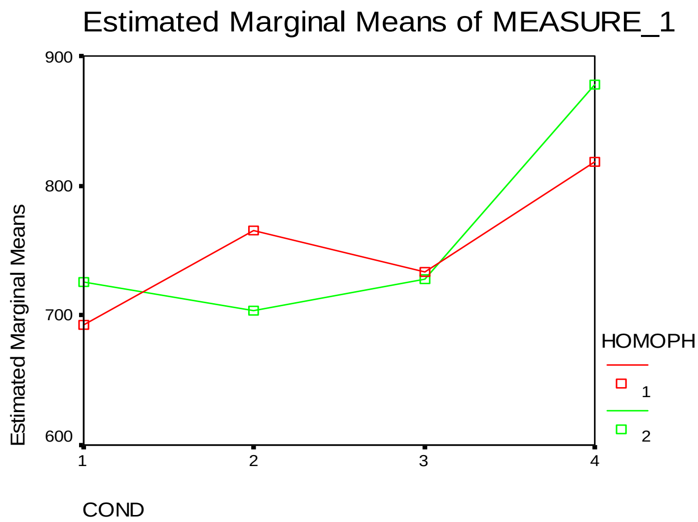

Figure 14: Interaction: Homograph/non-Homograph Variable x Reading Condition

Note: '1' stands for non-homographic words and '2' stands for homographic words

In the third analysis, the means of reading time latencies in reading conditions 1, 2, 5 and 6 (Figure 13 in *Design* section) were compared in correlation with the homographic variable by employing a two-way repeated measures analysis of variance. As presented in Table 26, in addition to the significant main effect for reading condition (reading representation), the analysis of variance revealed a significant interaction between reading condition and homographic variable. The interaction, as presented in the graph (Figure 15), is disordinal. Therefore, viewing the effect of reading condition was discussed on the basis of the homographic variable levels: homographic versus non-homographic (Pedhazur, 1982). The analysis, on the other hand, did not reveal any significant main effect for the homographic variable.

As indicated in the graph (Figure 15), the interaction showed that in reading conditions 1, 5 and 6, the RT for the non-homographic words was on average faster than the RT for the homographic words. However, in reading condition 2, the RT for the homographic words was on average faster than for the non-homographic words (Table 27).

Nevertheless, there was a general increase in the reading condition means in going from reading condition 1 to reading condition 4 despite the fact that the rank order of the homographic versus non-homographic means was not constant across conditions. Since the results of Mauchly's test of sphericity were significant, Huynh-Feldt *p* values were reported (Table 26).

Table 26: Results of Two-way Repeated Measures Analysis of Variance on Reading Time Latency (RT)

Source	SS	df[1]	MS	F	*p*
Reading Condition	83390.21	3	33336.19	4.957	.005
Error	572014.35	102	6725.57		
Homograph	13426.12	1	13426.12	1.895	.178
Error	240912.76	34	7085.67		
Homograph X Reading Condition	144596.68	3	54039.68	5.240	.003
Error	938228.52	102	10312.98		

[1] To minimize confusion, the unadjusted degrees of freedom values are reported.

Table 27: Cell and Marginal Means on Reading Time by Reading Condition and Homograph/non-Homograph Forms

		Homographic Words		Non-Homographic Words		
		M	SD	M	SD	Marginal
Reading Condition ID	Reading Condition (words stimuli)					
1	High-Frequency Plain	725.88	37.06	692.46	35.54	709.17
2 (v) [1]	High-Frequency with Short vowels-plus- *Shaddah*	703.13	24.93	765.44	40.53	734.29
5	Low-Frequency Plain	752.28	38.49	725.60	37.21	738.94
6 (v) [1]	Low-Frequency with Short vowels-plus- *Shaddah*	786.34	32.08	728.74	35.51	757.54
	Marginal	741.91		728.06		

1 (v) means short vowels-plus-*shaddah*

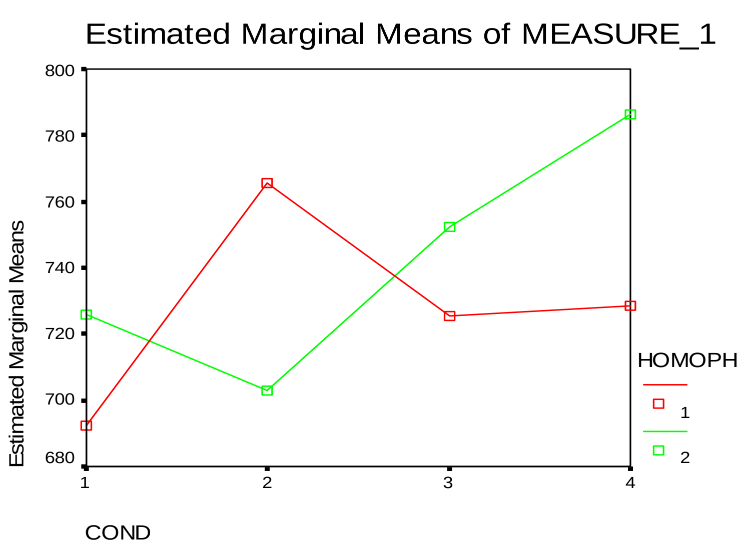

Figure 15: Interaction: Homograph/non-Homograph Reading Condition

Note: ‘1’ stands for non-homographic words and ‘2’ stands for homographic words

Finally, the last analysis that was conducted on the reading time latency RT for the affixated/non-affixated variable within reading condition 1 revealed no significant difference between the means of the RT (reading time latency) for the affixated words versus the means of the RT for the non-affixated words (Table 28). However, descriptively the means of the RT were on average faster for the non-affixated words than for the affixated words. As shown in Table 28, the overall means of the RT for the affixated words was M = 753.3102 milliseconds; while for the non-affixated words, M = 707.3590 milliseconds.

Table 28: Results of *t*-test on the RT of Affixated/non-Affixated Variable

Affixated Words		Non-Affixated Words				
M	SD	M	SD	*t*	*df*	*p*
753.31	328.75	707.36	186.81	-1.473	34	.150

3.3.3. Discussion and Interpretation

Overview

For this task, there were two dependent variables: reading time latency (RT) and reading response accuracy. The analyses, however, looked only at the reading time latency (RT) it took the participants to name a word, taking into account the following factors: its form- homographic/non-homographic; its frequency- high/low-frequency; and how it was presented in terms of short vowels and *shaddah*. Further, the factor, affixation, was also tested for support purposes.

The dependent variable, reading accuracy, was assessed qualitatively and presented in a separate section. The justification for excluding the data on the reading response accuracy was mentioned earlier in the *Measurement* section. The general reason for the exclusion was the fact that part of the stimuli included homographs that had more than one legal form of pronunciation in their plain representation (only consonants were presented). It is more precise to label this type of word as a heterophonic homograph, i.e., homographs that represent the consonantal root (*trilateral/quadrilateral*) that is shared by many words that are controlled by productive patterns or forms. Those patterns provided a general indication of whether the intended word was a verb or a noun; whether it was past or present tense, etc. Therefore, reading accuracy was examined qualitatively for identifying the nature of the miscues, and subsequently testing the claims that were stated on the basis of the previous analysis of identified miscues from Experiment 1 regarding the type of activation and whether the diacritics where processed or ignored.

Based on the literature review and the findings of Experiments 1 and 2, there were three predictions regarding reading individual words. The first prediction stated that the homographic/non-homographic factor had no effect on reading latency (RT). Recognizing individual words was possible even when the words were homographs that were presented plain. Therefore, it was expected that the time it took the participant to pronounce the words as measured by the reading latency, that is, from the time exposure of the word until the participant's response in naming the word, was on average the same for both groups of words: homographs and non-homographs. The similarity in reading time between homographs and non-homographs was expected for the high-frequency words. However, once the low-frequency factor was involved, the results should have taken another direction. That is, it was expected that the reading time of low-frequency homographs versus low-frequency non-homographs would be significantly different. This difference in reading time latency between low-frequency homographs and low-frequency non- homographs should have been explained in terms of the interaction between word frequency and the homographic form of the word, and not exclusively in terms of the homographic or non-homographic characteristic of the word form. Further, it was expected that the low-frequency homographs would take more time to read than their counterpart high-frequency homographs, a prediction based only on the frequency aspect of the stimulus word. That is to say, the effect of word frequency was additive. Further, once the reading condition was controlled, it was expected that the low-frequency homographs would take the participants more time to name than their high-frequency counterparts.

The second prediction was that adding the short vowels and *shaddah* to the consonants of the words would increase the reading latency (RT). Subsequently, presenting the low-frequency with short vowels-plus-*shaddah* would not speed the word naming process; on the contrary, it might slow the process of word naming. The justification for this last prediction was that short vowels and *shaddah* did not help in accessing the semantic aspect of the mental lexicon of the stimulus word. However, they might help in terms of choosing the right pronunciation of the stimulus word, only if the word was a homograph beforehand. Indeed, as will be explained later with more elaboration, the word might need only one short vowel, one diacritic, one case-ending, or a combination of short vowel and diacritic in order to resolve the ambiguity of its phonological representation. In other words, adding short vowels and *shaddah* to the consonants might have been redundant in that it was a post process, to be explained later by using the Dual-Route theory, and subsequently, would increase the reading time rate if the participants did not ignore them.

Based on Experiment 2, this increase of reading latency as expressed by the mean should have been positively correlated with the gradual increase of the number of short vowels and diacritics. That is, as the structure of the word got more short vowels and *shaddah*, it took the participants more time to name the word.

Blocking on the affixation factor in the plain reading condition was, on the other hand, essential for testing the effect of additional consonants on naming the word. Subsequently, it helped examine a proposal regarding the dichotomous processing of Arabic words. The question was whether a proposal that reading Arabic involves two cycles, the first for consonants and the second for short vowels and diacritics, was legitimate. Further, testing the effect of affixation would shed some light on the suggested proposal of equalizing the texts of Experiment 1 on the basis of the number of morphemes. In the following section, the results of the analyses that were conducted on the word naming task are laid out, discussed, and interpreted.

3.3.3.1. Results

From the first analysis that was conducted for the plain reading condition, the significant results showed that the participants on average took longer to read the homographic words (Table 23). It took the participants 725.88 milliseconds to name the homographic words, and

692.46 milliseconds to name the non-homographic words. This result was not in accord with the prediction of no difference in reading time latency between homographs and non-homographs. This lack of difference would be due to the fact that the participants should have no problem activating any legal reading of heterophonic homographs: the multiple-frame homographic word (1u in Hypotheses section). It was expected that experiencing any reluctance over the high-frequency homographic words should not, on average, result in a statistically significant difference. It was predicted that the high-frequency aspect of the high-frequency words would reduce the word neighboring size to its minimum by activating the most experienced frequency form of the high-frequency homographs. Note that before the word naming task began, the participants were instructed to respond quickly and further, they were instructed that once they saw a word that carried more than one legal reading, they should name the word according to what came to their mind spontaneously.

Despite those instructions (APPENDIX N), the homographic factor did affect their reading response time. One possible explanation for this finding was that possible forms of the homographs were activated spontaneously to the degree that the participants could not suppress their activation. That is to say, the activation of the alternative forms of a homographic word was automatic. However, this neighboring size did not interfere with their recognition of the homographs; it did not hinder their recognition, but it did interfere with the speed of their response (naming). Indeed, a 33 millisecond difference is still a small difference.

However, when the short vowels and *shaddah* variable was involved in analyzing the effect of the homographic variable, a significant disordinal interaction was found. That is, the effect of the reading condition depended on the type of word: homograph versus non-homograph. The effect of the presentation of short vowels-plus-*shaddah* was evaluated on the basis of whether the word was a homograph or non-homograph.

Examining the graph (Figure 15) shows that homographic words in their plain and wrong representations (reading conditions 1 & 4) took the participants on average more time to name than their counterpart non-homographic words (reading conditions 2 & 3). However, the homographic words in their correct short vowels-plus-*shaddah* representation (reading conditions 2 & 3) took the participants on average less time to name than their counterpart non-homographic words (however, the difference was slight for reading condition 3: only short vowels were presented).

This result indicates that unlike the other reading conditions, the presentation of short vowels/*shaddah* (reading condition 2, correct short vowels-plus-*shaddah*; and reading condition 3, short vowels-minus-*shaddah*) might have eliminated or at least minimized the word neighboring size of the homographs (alternative possible forms/patterns) to the degree that they speeded the naming process, compared with the other reading condition: plain (reading condition 1). However, presenting short vowels-plus-*shaddah* (reading condition 2) or short vowels-minus-*shaddah* (reading condition 3) to non-homographic words took the participants longer to name than their counterparts in reading condition 1 (Table 25). Further, the wrong short vowels-plus-*shaddah* reading condition was the slowest among the reading conditions, regardless of whether the words were homographic or non-homographic.

The only deviant pattern among the cell means was for reading condition 2 when the homographs and non-homographs were supplemented with short vowels and *shaddah*. Of course, reading condition 3 had the deviant means across the homographic variable (being faster with homographs and slower with non-homographs), however, the difference between the means for reading condition 3 was small (nearly 5 milliseconds; Table 25). Reading conditions 2 and 3 were alike for each aspect except that in reading condition 2, the words, if needed, were supplemented with the diacritic, *shaddah*. For control purposes, reading condition 4 was supplemented with wrong short vowels-plus-*shaddah* signs. Therefore, the discussion and the interpretation were centered on reading condition 2 and by analogy were applied to reading condition 3, which was justified by the fact that both reading conditions 2 and 3 reflected the same pattern, as will be explained later. Reading condition 4 (wrong short vowels-plus-*shaddah*) will be dealt with separately.

As explained earlier, adding short vowels-plus-*shaddah* to non- homographs contributed no more information to the consonant string. As Shimron (1993) put it, adding that visual information (short vowels and *shaddah*, in the case of Arabic), to non-homographic words, did not, “deliver any more visual information needed to discriminate among familiar word patterns beyond the information available in the letter strings proper” (p. 59). That is, naming the words and selecting the right possible form simultaneously would be possible with the absence of the short vowels and *shaddah*. On the other hand, adding short vowels and *shaddah* to homographs, to use Shimron’s words, delivers more visual information that is needed to discriminate among familiar word patterns beyond the information available in the letter strings proper. That visual information, short vowels and *shaddah*, would eliminate, or at the least minimize the activation of the word neighboring size of the homographs to its minimum. As a result, the reading time latencies were reduced as a function of the provision of short vowels and *shaddah*. The homographic words that were presented with short vowels-plus-*shaddah* were the fastest (with a range of 703.13 - 877.52; Table 25). However, the fact that participants were slow in processing non-homographs presented with redundant short vowels-plus-*shaddah* indicated that they were not ignored, but were being processed, and subsequently slowed the word naming as measured by the reading time latency (RT). Further, this slowness in the word naming process reached its maximum when the correct short vowels-plus-*shaddah* were replaced with wrong short vowels-plus-*shaddah* (reading condition 4 in Table 25), as will be elaborated on later. Proposing justifications for such results will be postponed until the results of Table 27 that involved low-frequency factor are discussed.

For now, it can be said that this finding was in agreement with the claim made by the current study that, "adding short vowels/*shaddah* redundantly slows the reading process." However, this claim did not hold when the presentation of short vowels and *shaddah* was not redundant (as when they contributed more information to the consonants; that is, as they disambiguated the homographs). Indeed, as indicated in Table 25, the RT means of both homographs and non-homographs that were presented with wrong short vowels-plus-*shaddah* were the slowest. Thus, a pattern emerged and the claim was re-constructed. That is, regardless whether the word was homographic or non-homographic, adding short vowels-plus-*shaddah* to the consonant strings was redundant, and subsequently was more time consuming, unless the words were of high-frequency and the representation of those short vowels-plus-*shaddah* contributed more information beyond what was available in the letter strings.

This finding was not in line with the stated prediction (1v in Hypotheses section) that regardless of the word form, homograph versus non-homograph, adding the short vowels and *shaddah* would have two results depending on whether the presented short vowels and *shaddah* was processed or ignored. If processed, it was predicted that the participants would take more time to name the word. However, if ignored, adding the short vowels and *shaddah* would not affect their response speed, and that should hold regardless of the word form, homograph/non-homograph. Generally speaking, it was predicted that vowelizing the words would make no significant difference in the speed of word recognition (RT) for skilled adult Arab readers when reading vowelized[1] versus unvowelized words.

Further, it was expected that experiencing any reluctance over the homographs, particularly the high-frequency homographs, would not on average result in a significant difference. Therefore, it was predicted that there would be no <u>interaction</u> between the presentation of short vowels/*shaddah* and the word form, homograph/non-homograph.

Note that the participants were instructed before conducting the word naming task to respond quickly; and further, they were instructed that once they ran into a word that carried more than one legal reading, they should name the word according to what first came to their mind spontaneously (APPENDIX N). Further, the results did not support the stated prediction (2v in Hypotheses section) which took into account the disordinal nature of the interaction. The results did support this hypothesis (2v in Hypotheses section) if the significant main effect of reading condition was taken into account.

Examining the marginal means of the reading condition variable <u>descriptively</u> showed the pattern of a gradual increase in the reading time latencies when moving from the plain condition (reading condition 1) to the wrongly vowelized condition (reading condition 4). That is, a positive correlation was sensed between the presented number of short vowels/*shaddah* and the time it took the participants on average to read the words under those reading conditions. As the consonants of the word carried more short vowels and *shaddah*, the reading time latency (RT) grew larger.

1. Vowelized means short vowels-plus-*shaddah*

As shown in Table 26, on average it took the participants 847.739 milliseconds to read the subset of words that were presented with wrong short vowels-plus-*shaddah*; 734.29 milliseconds to read the subset of words with short vowels-plus-*shaddah*; 730.460 milliseconds to read the subset of words with only short vowels; and 709.168 milliseconds for the subset of words that were presented plain. This last descriptive pattern is consistent with the moving window finding (*Moving Window Results* section). Therefore, it can be said that the results were consistent with the stated alternative hypothesis (2v in Hypotheses section).

The same pattern of a significant disordinal interaction between the reading condition and the homographic variable was found in the analysis of the subset data of reading conditions 1, 2, 5 and 6 (Table 26). Hence, the effect of the reading condition depended on the type of word: homograph versus non-homograph. Therefore, viewing the effect of reading condition should be discussed only on the basis of the homographic variable levels, homographic versus non-homographic (Pedhazur, 1982).

The interaction as represented by the graph (figure 15) shows that in reading conditions 1, 5 and 6, the RT for the non-homographic words was on average faster than the RT for the homographic words. However, in reading condition 2 this was reversed; the RT for the homographic words was on average faster than for the non-homographic words (Table 27).

Both observations showed a pattern that was consistent with the previous analysis (Table 25). Further, a proposed justification for such findings still held for both observations. Although word frequency was involved in testing the effect of reading representation, the effect of reading condition 2 (correct short vowels-plus-*shaddah*) still had a deviant effect on both word forms: homographs and non-homographs. As a reminder, reading condition 1 represented high-frequency words without short vowels or *shaddah* (plain); reading condition 2 represented high-frequency words with correct short vowels-plus-*shaddah*; reading condition 5 represented low-frequency words in plain condition; and finally, reading condition 6 represented low-frequency words with correct short vowels-plus-*shaddah*. The graph shows that for the homographic words, adding short vowels and *shaddah* minimized the word neighboring size of the homographs, and this was confined to the high-frequency stimuli. It took the participants on average 703.13 milliseconds to name the high-frequency homographs that were presented with short vowels-plus-*shaddah*; while it took them 725.88 to name the high-frequency words that were presented plain. However, for the low-frequency stimuli, it took the participants on average 786.34 to name the low-frequency homographs that were presented with short vowels-plus-*shaddah*, and 752.28 to name the low-frequency words that were presented plain. Therefore, the claim that the presence of short vowels-plus-*shaddah* resolved the ambiguity of the homographs to the degree it speeded the word naming process was not without constraints on the basis of the word frequency.

If this last claim was true, that "the automatic activation of the legal alternatives of the homographs was suppressed as a function of the provision of short vowels and *shaddah*," then the claim should be consistent regardless whether the stimulus was of high- or low-frequency. That is to say, the same pattern would be expected for the low-frequency words. However, as presented in Table 27, the vowelized low-frequency homographs took longer to name than their counterpart, plain low-frequency homographs (34 msec more). Note that the visual information conveyed by the short vowels and *shaddah* contributed more information beyond what was available from the consonant strings of the low-frequency words. Thus, adding them minimized the word neighboring size of the low-frequency words. Further, blocking the homographs on the word frequency variable showed that the low-frequency effect was consistent within the cell means at the homographic level. That is, regardless of the reading condition, the low-frequency homographs on average took longer to read than their counterpart high-frequency homographs. This finding is partially in line with the null hypothesis (1w in Hypotheses section).

To resolve this conflict by employing the Dual-Route theory (Coltheart et al. 1993; Besner, 1990), the suggested explanation for those findings was that the low frequency aspect of the homographs slightly hindered the address-route in accessing the mental lexicon. That is, for vowelized low-frequency words, the participants were forced to use the assemble-route (phonological route) in accessing the mental lexicon. Another suggestion came from adopting the Two-Cycle processing theory (Berent and Perfetti, 1995). In general, the proposed claim was that the first cycle (processing consonants) was the dominant cycle in processing a stimulus word of low-frequency. By adding short vowels/*shaddah* to the consonants that made up the low-frequency words, the second cycle would take action, which would result in more time processing. Later, in the General Discussion section, the claim will be elaborated on.

On the other hand, examining the cell means for the non-homographs showed that non-homographs that were presented with short vowels-plus-*shaddah* took the participants more time to name than the non-homographs in the other representations (reading conditions 1, 5 and 6). As represented in Table 27, it took the participants on average 765.44 milliseconds to name the high-frequency non-homographs that were presented with short vowels-plus-*shaddah*; while it took them 692.46 milliseconds to name the high-frequency non-homographs that were presented plain. On the other hand, it took the participants on average 728.74 milliseconds to name the low-frequency non-homographs that were presented with short vowels-plus-*shaddah*; while it took them 725.60 milliseconds (slight difference) to name the low-frequency non-homographs that were presented plain. Again, those findings can be discussed best in terms of whether the presentation of short vowels-plus-*shaddah* was or was not redundant (of practical usage).

As was presented earlier (Moving Window Results section), the provision of short vowels-plus-*shaddah* to non-homographs did not contribute more information to the consonants that made up the non-homographs. That is to say, the provision of short vowels-plus-*shaddah* to the consonants had a redundant function. Hence, it was expected that the redundancy would increase the time for the process of naming.

The redundant representation of short vowels-plus-*shaddah* to the consonants of high-frequency non-homographs affected the participants' reading process. By employing the notions of the Dual-Route theory (Coltheart et al. 1993; Besner, 1990), the participants could have switched from using the address-route to using the phonological-route in accessing the mental lexicon, which subsequently increased the reading time latency. However, if that claim held, then it was expected that the vowelized low-frequency non- homographs would take more time to name than their counterpart, vowelized high-frequency non-homographs. Examining the cell means (Table 27) showed that the participants on average took less time to name both the plain and vowelized low-frequency non-homographs. Further, blocking the non-homographs on the word frequency variable showed no consistent effect for the low-frequency aspect of the non-homographs. That is, both, plain and vowelized low-frequency non-homographs took on average more time to name than the plain high-frequency non-homographs; however, the plain and vowelized low-frequency non-homographs took less time to name than the vowelized high-frequency non-homographs (Table 27).

The proposed justification for this observation is that the effect of word-frequency might be the reason for the extra time it took the participants to name the low-frequency non-homographs (reading condition 5 versus reading condition 1). On the other hand, the effect of low-frequency was combined with the redundancy of short vowels-plus-*shaddah* in reading condition 6, which showed that the vowelized low-frequency non-homographs took more time to name than their plain counterparts (plain low-frequency non-homographs).

The latter deviant observation (which showed that vowelized high-frequency non-homographs took more time to read than their counterpart, low-frequency non-homographs) can be justified on the basis of adults' experience and familiarity with the current script where short vowels and diacritics are rarely presented in everyday reading materials. It could be that the adult participants used the direct, assemble-route by looking up the word in their mental lexicon; words become as images. Adding short vowels and *shaddah*, however, to non-homographic words which were so familiar to Arab adults and which are always presented plain in regular texts may have caused some hindrance to processing them as images, as was reflected in the reading time processing (note that adding short vowels and *shaddah* to non-homographs did not contribute more information to the consonants). That is to say, the adults looked up the non-homographs as sight words (using the assemble-route). However, since they were presented with short vowels and *shaddah*, a post-processing might have occurred, a strategy-switch that characterized the reading process in deep orthographies (Frost et al., 1987).

However, the adult readers used the assemble-route to look up the low-frequency non-homographic words (Table 27) which was the normal strategy that would be expected for processing such words. That is, there was no need for strategy switching that would consume more time as was observed for the high-frequency non-homographs. Only the address-route was operating for those low-frequency words.

Adding short vowels and *shaddah* to the low-frequency non-homographs did result in more time, but the difference was very slight (roughly 3 msec). This may indicate that only the lexical, address-route was operating. The participants were looking up the low-frequency words directly (both plain and vowelized-plus-*shaddah*). They were going from the grapheme to the meaning. This claim was justified by the fact that with long and frequent exposure to unvowelized print, the words, particularly the high-frequency non-homographic words, were processed as images and thus the address route, where the readers moved directly from the graphemes to meaning, became faster than a serial, piecemeal processing. This experience in reading led to lexical knowledge that went well beyond decoding (Stanovich & West, 1989). Practice builds specific lexical knowledge, as also suggested by the growth in lexical specificity (Perfetti, 1992) and "Experience with print strengthens word representations by increasing the quality of lexical representations, making spellings more reliable and more quickly accessed" (Perfetti, 1994, p. 868).

However, exposing the participants to a non-familiar print (the non-homographs were provided with extra, uninformative visual cues: short vowels/*shaddah*) forced them to switch to the primitive, assemble-route in order to process those extra visual cues. As a result of such switching, extra reading time process was expected (73 msec difference between the plain and the short vowels-plus-*shaddah* reading conditions). Obviously, this last explanation needs more investigation by controlling word frequency directly in a proper experimental design. Note that the current study used intuitive judgment with a small sample of less than 10 subjects, non-current lists of word frequency, and after-the-fact-blocking. This last concern is valid knowing that the sample involved native speakers of Arabic of many different nationalities. Further, note that there were non equal proportions of the stimuli in the reading conditions (30 plain HF, 30 short vowels-plus-*shaddah* HF; 10 plain LF; 11short vowels-plus-*shaddah* LF; and 13 wrong short vowels-plus-*shaddah*). Furthermore, the current study manipulated the short vowels and *shaddah* that were related only to the internal structure (morphological structure) of the word. That is, the diacritic, *skun*, which is represented with a small circle, " ْ ", and positioned above the consonant to indicate that the consonant has no short vowel, was not manipulated; neither were the case-ending markings of a syntactic function. The justification for this manipulation was presented earlier (pp. 48-51). However, it will be further elaborated in the *General Discussion* section. Hence, in addition to intuitive judgment, employing current indexes of word frequency in Arabic, controlling nationality, using equal proportions, and blocking the low-frequency stimuli before-the-fact were warranted.

Another result worth mentioning is that although presented vowelized, a difference in naming was found between the high- and low-frequency homographs. The presence of short vowels and *shaddah* was expected to speed naming both types of words if only the simple process of grapheme-to-phoneme conversion (GPC) (prelexical, phonological assembly) was involved in such naming process. However, the difference (83 msec difference; Table 27) would suggest that a lexical route was involved in the transparent aspect of Arabic orthography.

Finally, it is worth noting that examining the marginal means of the reading condition variable <u>descriptively</u> shows a pattern of gradual increase in the reading time latencies as we move from reading condition 1 to reading condition 6. Indeed, the analysis revealed that a statistically significant difference existed between the means. As shown in Table 28, on average, it took the participants 709.17 milliseconds to name the subset of high-frequency words that were presented plain; 734.29 milliseconds on average to name the subset of high-frequency words that were presented with short vowels-plus-*shaddah*; 738.94 milliseconds on average to name the subset of low-frequency words that were presented plain; and finally, 757.54 milliseconds on average for the subset of low-frequency words that were presented with short vowels-plus-*shaddah*. These results were consistent with the moving window findings (Table 16). Further, examining the marginal means of the homographs versus non-homographs descriptively shows that it took the participants on average more time to read the homographs versus the non-homographs (741.91 milliseconds & 728.06 milliseconds, respectively), a result that was consistent with previous analysis findings (Table 24).

Although the previous results, particularly Tables 25 and 27, gave some evidence that the route in recognizing an Arabic word for skilled adult Arab readers was a direct, visual-to-meaning route, it also provided another evidence that the phonological aspect that was represented by short vowels and *shaddah* was not ignored, but processed. Manipulating reading condition 4 (which represents wrong short vowels-plus-*shaddah*) was effective despite the fact that the participants were informed that assembling those wrong short vowels and *shaddah* would lead to constructing words with no meaning in Arabic; that is, the graphemic form of the words was intact while their phonological aspect was distorted. The sequence of the consonant string was correct and represented real Arabic words, but the combination of short vowels and *shaddah* with the consonants led to non-words.

Note that Arab readers are trained in reading consonantal script: words and texts (only consonant letters are presented), and that "the letter string is perceptually segregable from the vowel signs, which are located in a different horizontal layer" (Shimron, 1993, p. 60). For this reason, the direct, visual-to-meaning route was expected to be faster. However, the results (Table 25) showed that the presence of those wrong short vowels and *shaddah* affected their speed in naming the stimulus words making it the slowest reading condition among all. The participants were sensitive to this distortion and thus required extra visual processing that was reflected in the extra naming latencies.

To summarize, three main findings emerged from the word naming task. First, the short vowels and *shaddah* were not ignored even when they were not “informative”, and even when the participants were told that the words were presented with wrong short vowels-plus-*shaddah* which if assembled would lead to non-words in Arabic. The participants took more time to name such words regardless of whether they were homographic or non-homographic. In fact, there seemed to be a positive correlation between the reading latency means and the supplemented amount of short vowels and *shaddah*. The only exception was found for the high-frequency words that were presented with correct short vowels, particularly those presented with short vowels-plus-*shaddah*. As shown in Tables 25 and 27, the homographic high-frequency words that were presented with short vowels-plus-*shaddah* took on average less time to name than their counterparts in the other reading conditions (the HF/LF presented plain; the HF presented with only short vowels; and LF presented with short vowels-plus-*shaddah*). However, the results reversed once the stimuli were non-homographs. As shown in Tables 25 and 27, the non-homographic words that were presented with short vowels-plus-*shaddah* took on average more time to name than their counterparts (the HF/LF presented plain; the HF presented with only short vowels; and LF presented with short vowels-plus-*shaddah*). An explanation for this reversal in speed was suggested as follows: the presence of short vowels and *shaddah* with the consonants suppressed the possible alternative forms of the homographic word by eliminating or at least reducing its neighboring size to its minimum. However, the explanation for being the slowest was that adding short vowels and *shaddah* to the string of consonants that constituted non-homographs interfered with a long habit of exposure to print. As explained earlier, Arab adults, in everyday writing, are exposed to unvowelized print (only consonants are provided). Subsequently, in addition to the long development of processing print, they have become used to visualizing the words as images (Ehri, 1980a & 1980b). Thus, adding those short vowels and *shaddah* to the string of consonants may, as Shimron (1993) put it in the context of Hebrew, "cause task interference because they trigger unnecessary automatic word disambiguation processes" (p. 62).

Word recognition moves from letter-by-letter assembling, to syllable-by-syllable integrating, and finally to sight words processing. Since these gradual steps in reading evolve with practice, that is, by exposure to more and more print (Stanovich, 1981), Arab adults presumably have gone through tremendous exposure to printed texts that have enabled them to build knowledge of word spelling patterning, word structure, and their language morphology system. Further, this tremendous exposure would let them process words holistically, that is, as sight words. However, attaining sight-word level is not always the case for Arab adults; it would be affected by the nature of the word: its length, its frequency, and the way the script was presented, as this study has showed. Therefore, when the adults encountered low-frequency words, particularly vowelized ones, they would either process them as sight words or go back to a more primitive stage of word recognition, that is, to the serial, letter-by-letter processing which would result in more time processing.

The qualitative part of Experiment 1 substantiated those claims. Participants were more reluctant while they were reading the LF words; and further, their miscues always occurred with the LF words (APPENDIX J). Indeed, some slight reluctance or hesitation was observed when the participants were reading texts that were presented with short vowels-plus-*shaddah*. Indeed, in the word naming task, this slight hesitation was observed even for words that were presented with short vowels-plus-*shaddah*, and particularly for low-frequency words. Note particularly that the type of text that was used for the study (Experiment 1) was an expository (informative) type that represented the type of reading material the participants are exposed to in everyday print, e.g., newspapers, and that the stimuli (Experiment 2) were words used more or less frequently in the everyday print language, neither archaic nor passé.

In relating the current results of the word naming task to the previous studies (both word naming and lexical decision), both consistency and conflict in findings emerged. Regarding consistency, although some effect relating to the absence of short vowels was observed, this absence did not hinder the processes of word naming or lexical decision (Navon & Shimron, 1981-1982; Koriat, 1984 & 1985; Bentin & Frost, 1987; Baluch & Besner, 1991; Baluch 1993 & 1996). The participants were able to name the word and to respond in the lexical decision task.

On the other hand, the current study was not consistent with either Koriat's (1984) lexical decision study or Navon's and Shimron's (1985) word naming study, neither of which found any significant effect for short vowels (pointings in the case of Hebrew). However, Koriat (1984), Shimron and Navon (1981), and Shimron and Navon (1982) found that in a word naming task, vowelized words were named faster than the unvowelized words; note the inconsistencies between the old (1981, 1982) and new studies of Shimron and Navon (1985), and further, the inconsistency between Navon and Shimron (1985) and Koriat (1984, 1985). Navon and Shimron (1985) attributed such inconsistencies to the different procedures employed in the studies. Further, by manipulating the word frequency as an independent variable, Koriat's (1985) lexical decision task revealed that the presence of short vowels (pointings) reduced the number of errors and that effect was "stronger" for the low-frequency words (46 msec) than for the high-frequency words (20 msec). The author stated that, "although the presence of pointing improves the recognition of low-frequency words, it does not impair the recognition of high-frequency words" (p. 40). This last finding was consistent with Bentin and Frost (1987).

Taking into account the different procedures, those findings of Koriat, and Navon and Shimron are not consistent with the current results which showed that adding short vowels or short vowels-plus-*shaddah* to the consonant strings that constitute non-homographic words hindered the naming process (73 msec and 41 msec respectively; Table 25). This hindrance, both statistically and qualitatively, was noticeable. As will be elaborated on later, the conflict in findings between Koriat, and Navon and Shimron should not be seen as a surprise due to the kind of tasks employed (lexical decision versus word naming), the procedure (priming vs. nonpriming), and the type of stimuli, that is, only non-homographic words were the stimuli in those studies.

Bentin's and Frost's (1987) study on Hebrew orthography manipulated both the homographic/non-homographic and the word-frequency variables in a two-experiment study (lexical decision and word naming task). This type of manipulation, to a certain extent, makes the comparison and contrast between the current study and Bentin's and Frost's (1987) study more legitimate and more informative. Note that the other reading condition (so called regular non-words) was not discussed since the current study did not manipulate this type of stimuli ("regular non-word condition"), and that the descriptive analysis was emphasized due to the fact that the procedure of that study was also different from the current one, and that the current study revealed the disordinal interaction which would make it easier to compare and contrast using the graphs in both studies. Generally speaking, the presence of short vowels in the homographic words did not facilitate the lexical decision. Indeed, the means of the percent errors for the vowelized high/and low-frequency homographs (note that with the presence of short vowels, they were no longer homographs; the authors considered them, “ambiguous” since “their consonantal structure was shared by different words”, p. 15) were on average higher than the unvowelized homographs, and that the vowelized low-frequency homographs had the highest percentage among them all (3.19 for the HF vowelized and 13.67 for the vowelized LF). Further, the word-frequency was consistently effective for both vowelized and unvowelized conditions. By inspecting the provided graphs (Bentin & Frost, 1987, p. 16), the reaction time (RT) was found to be on average faster for the high-frequency words than for the low-frequency words, a result which, according to the authors (Bentin & Frost), indicated that, “when the element of ambiguity is eliminated (even by adding unfamiliar vowels), lexical decisions are based on a full analysis of the graphemic and the phonemic codes” (p. 18).

On the other hand, with the naming task, their analyses revealed the same consistent, significant effect for word frequency on the homographs. The naming process was always slower for the low-frequency stimuli. However, only the vowelized low-frequency homographs brought a significant difference compared with the other manipulated stimuli. The vowelized low-frequency homographs took on average longer to name than their counterpart vowelized high-frequency and the unvowelized “regular” non-words. Inspection of the provided graphs (p. 19) showed that the vowelized low-frequency homographs were the slowest to name (768 msec), compared to the vowelized high-frequency homographs (669 msec), the vowelized/unvowelized high-frequency non-homographs (674 msec and 634 msec, respectively), and the vowelized/unvowelized low-frequency non-homographs (690 msec and 671 msec, respectively).

Contrasting those results with the results of Table 27 shows that the current results to some degree replicate Bentin’s and Frost’s (1987) findings. However, deviant results for reading condition 2 (Table 27) may give the current study and part of the previous results of Bentin and

Frost (1987) a strong position in attributing the findings on the basis of orthographic familiarity and retrieval facilitation. Being the fastest, adding short vowels and *shaddah* to high-frequency homographs facilitated the word naming and "guided" the phonological retrieval of the high-frequency homographs. However, being slower, adding short vowels and *shaddah* to the high-frequency non-homographs "reduced the orthographic familiarity of the stimuli" and thus, interfered with the naming process (Bentin & Frost, 1987, p. 21). This reduction was obviously larger in the current study (62 msec; but 5 msec in Bentin's and Frost's study). Another consistent finding was that the difference between the vowelized and unvowelized low-frequency non-homographs was much larger in Bentin and Frost (81 msec; but 3 msec in the current study). Further, the difference between the vowelized and unvowelized high-frequency non-homographs was about 30 msec; while it was 73 msec for the current study.

On the other hand, the effect of the distortion of the phonological structure of the words, although it did not interfere with the reading naming process, it did hinder the speed of the naming process. As presented earlier, the presence of the wrong vowels and *shaddah* made the word naming process slower, which was consistent with Navon and Shimron (1981; 1982). The authors reported that adult participants were "sensitive" to phonemic distortion; their responses to the distorted vowelized reading condition were, on average, the slowest. However, note that Shimron and Navon included both distortions: phonemic and phonemic/graphemic; the current study manipulated the wrong short vowels and *shaddah* in a way that preserved the consonantal structure intact. That is, in the current study, processing the short vowels and *shaddah* with the consonants simultaneously would construct non-words; while ignoring their presence (short vowels and *shaddah*) would construct real words.

Based on the current findings coupled with those results from Hebrew studies, it can be concluded that in the case of Arabic, accessing the word representation in the mental lexicon was not hindered with the absence of short vowels and *shaddah* and this applied whether the word was a homograph or non-homograph. As was explained earlier, the morphological characteristic of Arabic words, particularly the *trilateral*/*quadrilateral*-root in words, and its patterns/forms, compensates for the lack of short vowels and *shaddah* from the script. In the absence of short vowels and diacritics from script, Arab readers would rely on the root, which is "the most important determinant of meaning" which "usually specifies a constrained semantic field that constitutes the basic information regarding the meaning of the word" (Frost's & Bentin's comments on the root in Hebrew, 1992b, p. 39). Further, the findings indicated that once the short vowels and *shaddah* signs were presented, their encoding was automatic; that is, their presence was not ignored. For convenience and clarity, Figure 16 presents the proposed hypotheses in correlation with the findings.

Hypothesis ID	Hypothesis Statement	Finding
Alternative Hypothesis 1u	"There is no significant difference in the speed of word recognition of skilled adult Arab readers when reading a homographic versus a non-homographic word."	Not supported
Alternative Hypothesis 1v	"Vowelizing the word makes no significant difference in the speed of word recognition (RT) for skilled adult Arab readers when reading a vowelized versus unvowelized word."	Supported/Not supported (see the discussion about this hypothesis)
Alternative hypothesis 2v	"Vowelizing the word slows the speed of word recognition (RT) for skilled adult Arab readers when reading a vowelized versus unvowelized word, and this holds regardless of whether the word is a homograph or non-homograph."	Supported/Not supported (see the discussion about this hypothesis)
Alternative hypothesis 1w	"Low-frequency words take more time to process than their high-frequency counterparts."	Partially Supported see the discussion about the low-frequency variable
Alternative hypothesis 1x	"Affixated words should take more time to process than their non-affixated counterparts."	Not Supported

Figure 16: Hypotheses Statements and Findings of Word Naming Experiment

3.3.3.2. Reading Accuracy Descriptive Analysis

Some of the patterns of miscues that were observed in the reading accuracy tasks of Experiment 1 have been observed here with the word naming task (e.g., ignoring the representation of short vowels-plus-*shaddah*, activating the active-voice form of a basic homographic verb, etc). Yet, the participants were processing both the plain and the vowelized words easily and smoothly. In the absence of short vowels and diacritics, no obvious hesitation or hindrance was experienced by the Arab adults except on very rare occasions and for a few participants when they attempted to give the short vowels and *shaddah* much attention. Note that the participants were instructed before conducting the word naming task to respond quickly;

and further, they were instructed that once they run into a word that carries more than one reading (a heterophonic homograph), they need to name the word according to what comes to their mind spontaneously (APPENDIX N).

Generally speaking, three patterns in the miscue data were identified. The first was related to the homographic words; the second was related to the vowelized words (non-plain); and the last was related to the low frequency words.

In the first pattern, the participants would activate the basic form of the homographic stimulus. To illustrate this, when the stimulus word was a verb that carried more than one legal pronunciation (a heterophonic homograph), the participants would activate its basic form. Indeed, even if the first consonant in the verb was supplemented with *dammah*, " ُ ", which indicates to the reader that the verb is a passive-voice form (one legal pronunciation), some participants still activated its basic active-voice form at the first place. To use the notions of the symbolic theory (Marcus et al., 1995), the active voice form was the default, particularly when the verb was presented plain. On the other hand, by employing the notions of the two-cycle theory (Berent & Perfetti, 1995), the last finding indicated that the dominant cycle in the two-cycle process theory was the first cycle that is reserved for processing the consonants in the word. For example, when the stimulus word was presented with short vowels-plus-*shaddah*, the first cycle took the action. That is, the participants would first process the consonants that reflect the default with a minimum of short vowels and *shaddah* and then they would, supposedly, realize the existence of the short vowels/*shaddah* and re-assemble them together with their consonants. This lag between the two cycles was noticed in the reading time latencies of the vowelized high-frequency homographs which took more time to name than the other stimuli. In the last pattern, the participants demonstrated some reluctance and hesitance while reading low frequency stimuli.

The conclusion that can be reached from both the reading accuracy task in Experiment 1 and the word naming task (Experiment 3) is that due to long experience with orthography that was devoid of short vowels/*shaddah*, the reading process of Arab adults has become a consonantal-based process that exploits the *trilateral/quadrilateral-root* model in Arabic words.

3.3.3.3. The role of context in reading Arabic

The results of studies conducted by Abu-Rabia (1995-2001) and Al-Fahad (2000) revealed, quantitatively and particularly qualitatively, the inevitable role of context in the absence of short vowels and diacritics in reading Arabic: reading comprehension and word recognition. Two types of contexts can be identified within the Abu-Rabia and Al-Fahad studies: a small, close, limited context (e.g., the sentence), and a large, open, unlimited context (e.g., discourse/or metaorthography). In general, the role of context was maximized regardless of the presence/absence of short vowels and diacritics as exemplified particularly in Al-Fahad's (2000) study. On the other hand, in Abu-Rabia's studies, context was maximized only for the homographic words and in the absence of short vowels and diacritics. However, in the presence of short vowels and diacritics, the role of context in word recognition was reduced or eliminated. Another distinction between Abu-Rabia and Al-Fahad in regard to the role of context is that, despite the level of reading process (text or word) and despite the mode of reading (silent or oral), Al-Fahad follows Goodman (1967) and Smith (1973) and views the Arabic reading process as a "psycholinguistic guessing game" that is, a context-driven process which relies heavily on the natural, innate faculty of language. As Perfetti (1994) put it, the idea of the so-called, "psycholinguistic guessing game" is that,

> because words are read in context, the learner has multiple cues available to identify words, or, more in the spirit of the psycholinguistic game, to figure out the meanings. There is nothing very 'psycholinguistic' about the process Goodman had in mind. It is mainly a matter of using context to glean meanings, and while 'graphonic' and 'syntactic' cues were also suggested, they appear to be secondary to the 'semantic' cuing system, which included everything in the context and the reader's nonlinguistic knowledge. This approach contradicts the assumption that the orthography and its mapping to phonology is privileged evidence in identifying a word. A different role for context is implied by word identification models, modular models, and even most interactive ones. Words are identified through sublexical processes that rely on orthographic and phonological components that, either serially or in some degree of interaction, lead to access of a word in memory. The role of context is to verify word identification and select contextually relevant meanings. Nearly all models of word identification, no matter how different they are in critical detail, are consistent with the claim that the hallmark of a skilled reader is context-free word identification (1989). Contrary to the Goodman-Smith claim, on this assumption, skilled readers' use of context is limited by their basic fluent abilities in identifying words. It is less skilled readers who use contexts to identify words, simply because their context-free word identification skills are not up to the task of reading. (p. 863)

However, to Abu-Rabia, context, in the absence of short vowels and diacritics, is essential, particularly in the oral reading process (reading accuracy) and word recognition for only homographs. Hence, the two types of contexts identified in the two studies of Abu-Rabia and Al-Fahad can be recognized, generally speaking, as a linguistic context in the case of Abu-Rabia and non-linguistic context in the case of Al-Fahad. In general, the impression one gets from those two studies is that, in the absence of short vowels and diacritics, word identification (particularly word naming) was not possible in the absence of context; word recognition was not automatic; and from Al-Fahad's, mapping phoneme-to-grapheme and word identification was not automated or an essential process in reading Arabic orthography. On the other hand, the current study held the premise that since the principle of the writing system of Arabic was alphabetical, where phonemes were mapped onto graphemes, and since its orthography was either deep or transparent as a result of the absence or presence of appropriate short vowels and diacritics, then, the claim was that for skilled Arab readers, word recognition was automatic and context-free, and that the role of context was limited.

The purpose of this section is to respond, in addition to those last claims of the current study, to the claims of Abu-Rabia (1995-2001) and Al-Fahad (2000) in light of their findings and in light of the current study's findings.

Although the current study did not employ any task that would assess directly the role of context, the employed tasks: reading accuracy, moving window, and word naming could be indirectly helpful in understanding the role of context in Arabic. Indeed, as can be deduced from the literature review, the assessment of the role of short vowels in reading Arabic is implicated with the role of context, and thus, understanding the role of short vowels necessarily enlightens our understanding of the role of context. Subsequently, it was claimed that, any time the presence of short vowels and diacritics seem or are found to be "superfluous," context is either unnecessary or at the least, limited. That is, if the presence of short vowels and diacritical signs did not contribute any information beyond the information conveyed by the consonant string, context was not necessary for recognizing or naming the word.

According to Abu-Rabia (1995), priming paradigms cannot be applied to reading Arabic because "poor" (Abu-Rabia's term) and skilled readers cannot read correctly unvowelized isolated words due to their visual similarity that gives each isolated word the possibility of carrying different meanings if read without vowels. Thus, according to Abu-Rabia, any correct response can by interpreted as a guess; therefore, he used the masking methodology in which with self monitoring the participants first read the first word of the sentence, and then the rest of the sentence was unmasked. This statement is an underestimate and did not give serious attention to the distinction between word naming and word recognition. Further, this statement overestimates the homography phenomenon in Arabic. In the absence of short vowels and diacritics, not every word in Arabic is a homograph, and this was supported, as shown in Experiment 3, by the classification of the stimulus words into homographic and non-homographic (see Materials section of Experiment 3).

For this last point, in the absence of short vowels and diacritics, the role of context was limited and thus, necessary for only the homographic words. Indeed, the heterophonic homographic aspect of the Arabic word was still constrained. Very often, at the core of all activated potential forms of the heterophonic homograph there will be a *trilateral/quadrilateral-root* which indicates the core semantic element that is very often shared by all activated forms. In addition, the form/pattern of the word (its skeletal tier, McCarthy, 1979) narrows the possible readings of the homographic word. Thus, on a lexical decision task, context is not essential even with the homographs in identifying the semantic aspect of the word. However, on a word naming task, context will be inevitable for naming correctly only the unvowelized homographic words. Some support, in addition to Abu-Rabia's studies on Arabic, comes from studies that share with Arabic the same characteristic of orthography, as does Hebrew (e.g., Frost, 1994) and Persian (e.g., Baluch and Besner, 1991).

In fact, for non-homographs, adding short vowels and *shaddah* may slow down word naming (Table 25 & 27). Further, there is no guarantee that adding short vowels to homographic words is sufficient to remove the ambiguity from the homographic words. As was explained earlier (p. 68), adding one short vowel, one diacritic, or one case-ending marking, if processed would be sufficient for turning the homographic aspect of a word into a non-homographic one. Thus, even with the presence of short vowels to the consonants of the homograph, they may not compensate for the absence of context. Choosing the appropriate short vowel or diacritics for the homographic words should render context superfluous.

In terms of context effect on skilled readers, Abu-Rabia's (1995) study revealed that contrary to the reading process of Latin alphabet languages, skilled readers of Arabic relied heavily on context to compensate for the missing short vowels in the script. His study was based on the fact that the basic verbal sentences represented the majority of sentence types in Arabic, a premise which was not linguistically accurate since Arabic, according to some linguists (Fehri, 1993), "exhibits structures which are best characterized as instantiating SVO order" (p. 27). In his comparison between MSA (Modern Standard Arabic) and Palestinian Arabic, Mohammad (1999) found that, "MSA appears more tolerant of word order variation than PA" and that, "In simple declarative clauses MSA allows all logically possible orders; while PA only allowed VSO, SVO, and VOS" (p. 46). Note that the official communication system in media and print in the Arab world is conveyed by using the Modern Standard Arabic.

However, Abu-Rabia's aforementioned conclusion (1995) contradicted solid findings obtained from studies conducted on Latin orthographies. That is, automaticity in word recognition is required as a first stage in reading and insufficient word recognition leads the poor reader to rely on context (Stanovich & West, 1987; Perfetti & Roth, 1981; Stanovich, 1980). These Latin-based orthographies share with Arabic the depth of the orthography when the short vowels are not presented and the transparency of the orthography when the short vowels are presented. In fact, not just the short vowels, but both the short vowels and the diacritics had to be included in combination for a transparent orthography to be constructed. That is, adding only short vowels could be redundant. To illustrate, the provision of short vowels to a word such as,

" عالمة ", ‘ female scholar,’ did not contribute any more information beyond the information conveyed by the consonant string. That is, in either form, vowelized or unvowelized, the word will have one legal reading. This form/pattern of, " فاعلة ", /fa?iluh/, has only one lexical entry in Arabic. Further, for a word such as, " نجّارة ", ‘a female carpenter,’ adding the short vowels to it, " نَجَّارَة ", ‘ a female carpenter,’ does not contribute any more information beyond the information conveyed by the consonant string; only one legal form is accepted. In fact, when removing the diacritic, *shaddah*,‘ ّ ’, strengthening/geminating, from the word, " نجّارة ", ‘ a female carpenter,’ an ambiguity may arise regarding whether the writer meant, almasdar[1], ‘gerund’ or a job (in terms of saying the word, but not in terms of recognition; both words have the same meaning which is based on the same semantic core element: ن ج ر). That is, in the absence of the diacritic, *shaddah* from a word such as, " نجارة ," the root, ن ج ر , in both spoken and written Arabic, is “the most important determinant of meaning” which “usually specifies a constrained semantic field that constitutes the basic information regarding the meaning of the word” (Frost & Benting’s comments on the root in Hebrew, 1992b, p. 39). On the other hand, this ambiguity can be resolved by adding only one short vowel, and that is, *fatha*, ‘ َ ’. Adding other short vowels to the word, "نجارة ", does not add more information beyond the information conveyed by the consonant string; they become redundant. However, for a word such as, "عمار ", ‘a common masculine name, adding the diacritic, *shaddah*, ‘ ّ ’, by itself or in combination with short vowels adds no more information to the consonant string; the presented consonants are sufficient for saying it correctly and recognizing it due to the fact that this form is a derivative from the root, ع , م , ر , and has only one representation (proper name) in the Arabic lexicon. Thus, context should have no role in accurately identifying and naming such a word.

Further, resolving an ambiguity could be achieved by adding a short vowel only, e.g., ـَ , ـُ, ـِ, or a diacritic only, e.g., *shaddah* or *skun*. For example, adding one short vowel to the first consonant of a verb is sufficient to indicate that the verb is a passive-voice and not an active one, e.g., " أخذ ", ‘has taken”, versus " أُخذ ", ‘has been taken’ (Al-Hamalawi, 2000). Hence, this phonological segment conveyed by the short vowel, " ُ ", is essential in naming the word accurately.

In fact, with the absence of short vowels and *shaddah*, other constraints come from the immediate adjoining word, or from the affixation internal clues within the word.

The discursive feature of the Arabic script and the allowable sequence of phonemes in such script still govern the possible occurrence of short vowels and diacritics. For example, adding only the short vowel, ـُ , *Dhammah*, to the first consonant of the verb, أخذ, would indicate that this verb is a passive-voice and not an active one. In Arabic, in addition to the internal change within the verb, the passive voice aspect is inflected by the addition of the short vowel, *Dhammah*, to the first consonant of the verb. Further, the expected form (“skeletal tier”) of this passive voice verb that has three consonants would lead to simultaneous generation of those missing short vowels. Furthermore, adding the phonological segment that is conveyed by the case-ending marking sign to the last consonant would constrain the multiple readings of the homograph; that is to say, the constraint would specify that this word should be read as a noun and not as a verb or vice versa, and thus, only one form of the heterophonic homograph is acceptable. In general, the facilitation of those constraints would always be helpful and obvious in terms of naming (pronouncing) the words, but not necessarily in terms of accessing their meaning. As was presented earlier, this facilitation in word recognition can be attributed to the morphological

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[1.] Masdars are “nominals formed from a verbal source to express a process (or event, or a result)” (Fehri, 1993, p. 232).

characteristic of words in Arabic: the *trilateral/quadrilateral-root* model of the word (Abu-Rabia, 2002) and its form/pattern.

However, it is worth noting that the redundancy of the presence of short vowels and diacritics and the compensatory constraints should be interpreted in the context of skilled experienced readers (e.g., adults, after a long exposure to print); what seems redundant for the skilled reader should not be generalized to the less skilled reader (e.g., children at the third or fourth grade level). Another way to put it is that adding those phonological aids conveyed by short vowels and diacritics to the consonant string of a non-homograph could be an essential step for building orthographical and word representation knowledge for the beginning reader. According to Perfetti (1994),

> Learning to read is the acquisition of increasing numbers of orthographically addressable words (quantity acquisition) and the alteration of individual representations along quality dimensions. The two quality dimensions are SPECIFICITY, an increase in the number of position-correct specific letters in a representation, and REDUNDANCY, the increasing establishment of redundant phonemic representations. The redundancy concept rests on the assumption that word names (pronunciations) are part of the child's earliest representations and that phonemes are added in connection with individual letters with learning. Important in establishing these sublexical connections is first phonemic awareness and then increasing context-sensitive decoding knowledge. Thus, the phonological representations become redundant, existing both at the lexical level and the phonemic level. Together, increasing specificity and redundancy allow high-quality word representations that can be reliably activated by orthographic input. As individual words become fully specified and redundant, they move from the functional lexicon, which allows reading, to the autonomous lexicon, which allows resource-cheap reading. (p. 857)

Studies have shown that the correlation between phonemic awareness and learning to read is causal (for example, Bradley & Bryant, 1983). Further,

> [the] phonemic awareness-reading relationship has also received support from studies of adult illiterates (Morais, Cary, Alegria, & Bertelson, 1979; Morais, Bertelson, Cary, & Alegria, 1986). These studies find that adult

> illiterates are very weak in tasks requiring analysis of phonemic structure, although they do much better at syllable-level and rhyming tasks. Such results suggest the limited level of phonological awareness that can be developed outside literacy contexts. (Perfetti, 1994, p. 855)

According to Perfetti (1994):

> young children are likely to have only dim awareness of the phonological structure of their language. Because phonemes are abstractions over highly variable acoustic events, detecting their status as discreet speech segments that exist outside ordinary word perception is a problem. This abstractness may be a special problem for stop consonants, which both lack acoustic duration and vary greatly in their acoustic properties depending on their vowel environments. (p. 854)

Thus, adding short vowels and diacritics signs to the reading materials of a beginning reading learners may facilitate building the lexical representation of his/her language vocabulary.

Al-Fahad (2000), on the other hand, attempted to demonstrate that the psycholinguistic game of reading process that was proposed by Goodman (1967, 1997) is supportively applicable to the reading process of Arabic. Goodman's universal view of reading process that maximizes the role of natural language knowledge while minimizing the role of print in reading suggests the minimal impact of orthography on the reading process. Al-Fahad (2000) employed three tasks for examining the reading process in Arabic: "Diacritic Placement Task (DPT)," a writing activity in which 15 participants were asked to supplement the diacritics of 5 sentences that began with a basic homographic verb (heterophonic homograph); "Text Reading Task," in which the same participants were asked to read two versions of the same story: one version was presented plain (only consonants presented), and the second was "diacriticized" (with short vowels, diacritics, and case-ending markings); and finally, the "Playback Interview," in which the participants were asked to comment on their reading performance while listening to the recording tapes. Four summarizing statements that came from Al-Fahad's study deserve discussion. The first was that "the reader was not decoding; rather, he was processing the language and making guesses that were determined by both the characteristics of the text and his own intuitions as a native speaker of the language" (p. 122). The second statement was, "All these observations suggest that reading is not a process of accurate word identification. If it were so, reading in Arabic would have been almost impossible, because most Arabic texts are written in Modern Standard Arabic in which the phonology is not completely represented. Reading in Arabic involves mainly inference and guessing" (p. 132). Third, the "diacriticized" text took more time to read because, "the readers felt obliged to use most of them in reading. The readers thought that, since all the diacritics were present, they had to use them in the most appropriate fashion. As they said [referring to the participants], they had no excuse to ignore the diacritics" (119). Fourth, "The hypothesis that skillful readers are able to determine most of the possible readings for an ambiguous sentence does not hold. Most readers were not able to provide even half of the possible readings for the 5 sentences on the DPT" (p. 130). Finally, "[t]he presence of diacritics made reading relatively slower and "less natural", because readers saw it as a "controlling system" which they had to follow. This preoccupation with using all the diacritics distracted the readers' attention and made them focus more on the syntactic cue and almost ignore the other cues. Both reading situations, however, revealed through miscues that readers were not decoding. They were searching for meaning encoded in the text" (pp. 130-131).

Because there is no shared ground between the current study and Al-Fahad's (2000) study in terms of the guided framework, the approach, the analysis procedure, etc, any attempt to discuss, compare and contrast the findings from the two studies should take into account their different frameworks and approaches.

Indeed, you can agree with the Al-Fahad's results that the presence of short vowels and *shaddah* may slow the reading process in the reading accuracy task (that was done by examining the "reading rate" of each individual without averaging). Indeed, 3 of the 15 participants took more time to read the plain version than the 'diacriticized' version. The interviews of his study revealed that the participants preferred reading without diacritics. Indeed, part of this last finding is in line, although with constraints, with the results from the findings of sentence and word reading tasks, but not from the text comprehension task. Adding short vowels and *shaddah* to the consonants slowed down the reading process of sentences; however, adding them to texts made no difference in the reading time process. Further, in all tasks, this presence or absence did not interfere with the flow of a smooth reading. The reading time was not affected by the presence/absence of short vowels and *shaddah*. The only manipulated variable that was effective was word frequency. Hence, it was the word level that affected the direction of the results.

However, examining descriptively the means in Table 8 for the reading accuracy task shows that the high-frequency text that was presented with short vowels and *shaddah* took on average more time to read than the plain one (134 sec for the texts of short vowels-plus-*shaddah*, and 127.43 sec for the plain text). Although the short vowels-plus-*shaddah* made a difference in the reading accuracy task, this difference did not hold for the comprehension task. Examining descriptively the reading time means of the reading time in Table 2 shows that the high-frequency texts that were presented with short vowels-plus-*shaddah* took on average less time to read than the plain texts (195.95 sec for the texts of short vowels-plus-*shaddah*, and, 200.67 sec for the plain text).

As was presented earlier, the distinction between reading naming versus reading recognition and orthographic familiarity should be considered in order to understand the role of short vowels/*shaddah* in the Arabic reading process, and further, to understand the inconsistencies between reading for accuracy (naming or oral reading) and reading for meaning (comprehension) in this process in the absence of the proper short vowels and diacritics.

On the other hand, the current results of the word naming task showed that the high-frequency homographs that were supplied with short vowels and *shaddah* took less time to read than their counterparts: plain high-frequency, etc, (Table 25 & 27). However, this advantage in speed for the vowelized with *shaddah* homographs did not hold once the homographs were of low-frequency. Further, the wrongly vowelized-plus-*shaddah* words and sentences took on average more time to read than their counterparts. However, as was mentioned earlier, the reading process, qualitatively and quantitatively, was not hindered or disturbed, even with the wrongly vowelized-plus-*shaddah* condition.

These are indications that the individual words, including those visual signs (short vowels and diacritics) were processed as indicated by the extra reading time required in the presence of those short vowels and diacritics. This is indicated by the shorter time it took the participants to read the high-frequency homographs that were supplemented with short vowels-plus-*shaddah* versus the plain (both high and low) and the low-frequency presented with short vowels-plus-*shaddah* (Tables 25 & 27). However, the inconsistencies in the two findings, slowing the reading process in one situation and speeding the reading process in another situation, should be explained in terms of the adults' long reading experience and reading exposure to print (see the Discussion section in Experiment 3).

In general, this last finding says something about the contribution of phonological aids as represented by the presence of short vowels and *shaddah* signs. Further, it indicates something about the essential decoding process of words even for skilled readers. Although the presence of short vowels and *shaddah* increased the amount of visual information that needed to be processed, it made the word naming faster, a result that may indicate that "the phonological processing is instrumental in reading" (Shimron's comment on the role of pointings in Hebrew, 1993, p. 59) which can also be applied to reading Arabic.

The result that showed that the vowelized high-frequency homographs took on average less time to name than their counterparts (Table 25 & 17) may demonstrate that, as Perfetti (1994) put it,

> orthography and its mapping to phonology is privileged evidence in identifying a word. A different role for context is implied by word identification models, modular models, and even most interactive ones. Words are identified through sublexical processes that rely on orthographic and phonological components that, either serially or in some degree of interaction, lead to access of a word in memory.
> (p. 683)

Unlike the participants in Al-Fahad's study who, according to the author, saw the presence of short vowels and *shaddah* as "a 'controlling system' which they had to follow" (p. 130), some of the participants in the current study expressed their concern over the absence of the short vowels and diacritics from the initial words of the garden-path sentences while they were reading texts and paragraphs for accuracy (from Experiment 1). Indeed, according to one of the participants, "once the word was not given the *shaddah*, ' ّ ', I would assume that the word has no doubled consonant" (that is, no gemination). That is, if the writer intended this letter to be a doubled consonant, he/she should have provided the consonant with the *shaddah* sign, otherwise it would be assumed to be a basic consonant.

Further, the claim that, "Reading in Arabic involves mainly inference and guessing" as a result of the incomplete representation of phonology in written texts (Al-Fahad, 2000, p. 132) is not totally accurate. Indeed, the inferences and guessings that are suggested might be valid, although with constraints, for only very narrow situations, that is, in naming individual homographic words due to the sublexical representation of the words in Arabic.

On the other hand, claiming that Arab readers need to read the sentences back and forth in order to understand them is not supported by the current data. Their comprehension was not hurt even though the participants were forced by the moving window procedure not to reanalyze their first reading. Further, the reading time was not affected; regardless of the reading condition, the reading time was on average the same. However, their reading time was affected by the garden-path structure; garden-path sentences took on average longer to read than non-garden-path sentences (Table 13), a normal result in Latin-based alphabetic languages, e.g., English (Mitchell, 1994); however, their comprehension was not affected (Table 14).

On the other hand, attributing comprehension and understanding in the absence of short vowels and diacritics to paralinguistic factors is not without constraints caused by the word orthography; even with the absence of short vowels and diacritics from print, the form of an Arabic word restricts its semantic meaning. Indeed, in addition to their pattern/form, Arabic words have this *trilateral/quadrilateral-root* which indicates the core semantic element that is shared by all derivative forms of a word (word family); note that the Arabic language is highly affixated.

Thus, taking together all the findings from the reading accuracy task in Experiment 1, the word naming task in Experiment 2, and the analytic investigation of the word form in Arabic (*Materials* section in Experiment 3), it is clear that the presence of the right short vowels and *shaddah* was essential in the Arabic reading process and that the role of context in this process is limited.

In fact, the consonant string of a word, including both the core of the word and its form/pattern, represents both the semantic and the phonemic aspects of the word. The phonological route is essential in the Arabic word recognition process, a role which becomes obvious once short vowels and diacritics are provided. Accordingly, as Frost (1994) put it for Hebrew,

> If prelexical phonology plays a significant role in the reading of pointed Hebrew [and this can be applied to vowelized Arabic] by readers who are trained to use mainly the addressed routine for phonological analysis, then the plausible conclusion is that, in any orthography, assembled phonology plays a much greater role in reading than the alternative view would assume. (p. 128)

As Perfetti (1994) put it, "Nearly all models of word identification, no matter how different they are in critical detail, are consistent with the claim that the hallmark of a skilled reader is context-free word identification (Perfetti, 1989)" (p. 863). If their context-free word identification is not "up to the task of reading" (Perfetti, 1994, p. 863), then it can be claimed that context is inevitable. Therefore, the claim that Arab readers, including highly skilled readers, need context in order to recognize the word, and further to figure out the meaning of a sentence with a homographic initial was challenged by the current study's claim of a limited role for context.

The question that needs to be proposed is not whether phonology is essential in the reading process of Arabic, but how large a role it plays in this process for experienced adult readers. Second, it is the knowledge of orthography, more than linguistic knowledge that facilitates word recognition in the absence of short vowels and diacritics in the case of Arabic. Note that this extended effort to build the orthographic representation of words in Arabic might have benefited from the linguistic knowledge which children bring with them to school, for example, the constraints in sentence order construction, etc.

However, it is worth mentioning that the current proposed claims for the role of context in reading Arabic takes into account the reading skill of the examined population, in this case, skilled readers of Arabic. Those claims need to be interpreted by taking into account the degree of reading skill. For a more comprehensive view of the role of context in the process of reading Arabic, both skilled and unskilled readers of Arabic need to be examined (e.g., college students versus third graders).

4. CHAPTER FOUR: GENERAL DISCUSSION

In this chapter, the findings that emerged from the three experiments are combined in order to give a larger picture of the role of short vowels by themselves, the role of short vowels in combination with *shaddah*, and finally, the role of the context in the Arabic reading process. Although they differ according to the level of representation being processed - word, sentence, or text - a consistent pattern for these roles was found. To employ the notions of the repeated measures analysis of variance, no overall role for short vowels by themselves or in combination with *shaddah* was found. Nor was an overall role for context in the Arabic reading process detected. However, mini- or sub-roles were found that differed between and within the levels of reading representations. Subsequently, the claims of the previous studies (Abu-Rabia, 1995-2001) that adding the short vowels to the Arabic texts would help word recognition, sentence parsing, or text comprehension are overgeneralizing statements that are not supported by the findings of the current three-experiment-study.

In Experiment 1, the only manipulated variable that was operating was word frequency. However, the word-frequency effect was correlated only with the reading time dependent variable (word frequency did not affect reading comprehension as was measured by its product). On the other hand, the other manipulated variable, text representation in terms of short vowels and *shaddah*, was not effective (it did not correlate with the two dependent variables: reading time and reading comprehension).

Although the percentage rate of low-frequency words in the Experiment 1 texts did not exceed 15 percent, the rate was affective. Previous studies have proposed that adult readers can "comprehend passages where up to 30 % of words are deleted from a passage (Stratton & Nacke, 1974) (Ryder & Hughes, 1985). Further, giving fifth graders two versions of a text where one of them represented a high-frequency text and the other a low-frequency text where 25 % of the "substance words" were replaced with low-frequency counterparts did not affect their comprehension (Ryder & Hughes, 1985). Despite that, the participants in this experiment on average took longer to read the low-frequency text than the high-frequency text. This was consistent whether the mode of reading was silent or oral (194.13 and 206.32 seconds, respectively in the comprehension reading task; 131.55 and 136.78 seconds, respectively in the reading accuracy task). Further, no significant interaction was found between the variables, word-frequency and reading condition representation. Therefore, the effect of word frequency was found to be consistent and unconditional, which is an overall main effect.

On the sentence level, by employing the moving window technique, reading time was found to be correlated with sentence representation in terms of the short vowels and *shaddah*. The more short vowels and *shaddah* were supplemented, the more time the participants took to process the sentence. The gradual increase in reading time was found to be consistent regardless of the structure type of the sentence: garden or non-garden path.

In a plain reading representation, the garden-path sentences took longer to process than both their counterparts, non-garden-path sentences and sentences with homographic initials. The explanation for this difference is that there was a 5-word filling that separated the initial of the sentence, for example, the subject from the disambiguating region in the sentence, e.g., the predicate. However, presenting the short vowels and *shaddah* with the consonants did not play a facilitative role in the participants' understanding of the sentence. The participants comprehended the sentence very well, regardless of the structure type of the sentence (homographic versus non-homographic-initials; garden-path versus non-garden-path) or the short vowels and *shaddah* representations (plain versus vowelized) - that is, their comprehension was not affected whether the skilled adult Arab readers read a sentence that began with a nonambiguous or ambiguous word. Descriptively speaking, a consistent pattern of positive correlation between the number of short vowels and *shaddah* and the percentage of correct responses was observed.

However, for two reasons, this positive correlation should not be interpreted as an indication that the short vowels and *shaddah* signs contributed to or explained the variability in the reading comprehension. First, no significant effect for reading condition on reading comprehension was revealed. Second, the range of the means of correct responses was between 85 and 91 (Table 18) which indicates that Arab readers do better with a sentence that is presented plain as well as with a sentence that is presented non-plain: short vowels only or short vowels-plus-*shaddah*. Nevertheless, the pattern of positive correlation should at the least indicate that those visual signs of short vowels and *shaddah* were processed and not ignored, and that their processing seems to be automatic. Once those visual signs are presented, the adult Arab reader cannot help but process them, and this adds extra time to his/her processing. However, this can be expected to be different once those visual signs are presented with a consonantal string that constructs a homographic high-frequency word; that is, less time processing will be expected once the stimulus word is ambiguous and of high-frequency (prior to the provision of short vowels and *shaddah*)

On the word level, although presenting homographic words without short vowels and *shaddah* may take more time to process, it did not interfere with recognition; only a small difference of 34 milliseconds between the overall means of homographic and non-homographic words was found (Table 23). Further, the running record procedure showed that the participants did not experience any kind of hesitation or reluctance in naming the homographs that were presented plain (only consonants were presented). On the other hand, severe hesitation and reluctance was observed over the homographic initial of a sentence within a connected text, particularly the ones that garden-pathed the reader. This reaction happened only when the participants were expected to say the right form of the heterophonic homograph orally. As explained before, the initial in a garden-path sentence that is presented plain is a homographic word (or heterophonic homograph) which carries only the consonants that are available for accessing the word representation in the mental lexicon. However, the consonants are not sufficient for choosing the right pronunciation of the heterophonic homograph. Arab adults very often needed to activate (always, the basic form of a word or its more frequent form) and hang on to the basic form of the word until they reached the disambiguating region in a garden-path sentence. This delay in decision was found not to interfere with their understanding of the sentence.

On the other hand, for a sentence that began with a homographic word that did not lead to a garden-path phenomenon, the activation of all multiple forms of the word would be restricted and constrained either from the word neighboring or from the interior sublexical clues of the homograph word. This last type of homographs required context in order to choose the intended accurate pronunciation, but not to access their meanings. Although the homographs may carry more than two forms, those forms very often share the same main consonants (root) that are essential for recognizing the core meaning of the forms. Arab adults, as explained earlier, exploit their knowledge of the *trilateral/quadrilateral root* model in Arabic words and the virtually rule-governed patterns/forms of those roots.

By presenting homographs plain (without short vowels and *shaddah*), the role of context is inevitable in order for the Arab reader to say the word accurately. By the same token, context plays no role in saying non-homographs. Blocking the stimuli on homographic/non-homographic variable was possible. In fact, seven out of 30 words in the plain reading condition were non-homographs, and subsequently, did not require context to be named accurately. Further, the claim that by adding short vowels to the homographs only one legal reading would be possible was not supported. Blocking the stimuli in the word naming task on the homographic/non-homographic variable was still possible even when the homographs were supplemented with short vowels. In fact, it was still possible to block the words in the homographic variable even when short vowels and *shaddah* were provided. The blocking still held even when *skun* only, *shaddah* only, or case-ending markings only were provided to the consonants. In fact, sometimes, providing only one short vowel, or one *shaddah*, or one *skun*, or one case-ending marking was enough to turn the homographic aspect of the word into a non-homographic.

Subsequently, diacritising the whole word with short vowels, *shaddah*, or *skun* is a redundant process of no significance. A positive correlation between the reading latency means and the presented number of short vowels and *shaddah* signs can be inferred. In fact, although the distortion of the phonemic structure of the words did not interfere with recognition of the word, it did slow the process of recognition. Thus, providing the short vowels and diacritics to the consonants should be based on whether the provision is functional and of practical use or not. The maximal and minimal usage of short vowels and diacritics should be restricted to the usefulness of their presence. The question is, what type (*fathah*, ـَ , *kasrah*, ـِ , or *dhammah*, ـُ) and number of short vowels and diacritics (*shaddah*, ّ, *skun*, ْ , or case-ending marking) are needed to eliminate the ambiguity of the homographic aspect of a word?

Therefore, a claim that the role of context in reading Arabic is inevitable in the absence of short vowels is an overestimate that ignores, in addition to the aforementioned facts, the constraints of other factors, e.g., the frequency of word form, the affixation clues, etc.

Finally, for an attempt to bring the role of short vowels, diacritics, consonants, context, and affixation, to a substantive close, the two-cycle theory notion (Berent & Perfetti, 1995) was used for describing each role by itself and in combination with other factors. The current study adopted the Two-Cycling process theory for modeling how Arabic print may be processed. One cycle is for processing consonants, and the second is for processing short vowels and diacritics. Two principles may lead this two-cycling process. The first is that one of the cycles is independent and the other is dependent. That is to say, cycle 1 that is for consonant processing is an indispensable, independent main process; while cycle 2 is a supplementary, dependent sub-process. Cycle 1 may operate independently or simultaneously with the sub-process, cycle 2. However, cycle 2, which is reserved for any visual cues other than the consonants (e.g., short vowels and diacritics), operates only in congruence with cycle 1. In the first, the operation of cycle 1 is linear, and in the second, the operation of cycle 1 is circular. However, cycle 2 operates only as a complementary sub-process. Hence, it may operate redundantly.

To illustrate, for a text level processing, although the two independent variables were manipulated- reading condition in terms of short vowels and *shaddah*, and word frequency- only word frequency was correlated with the dependent variables, reading time or comprehension. Based on the proposed two-cycle notion, the only cycle that was dominantly operating was cycle 1. The only factor that correlated with consonant processing was word frequency. As put earlier, Arab adults would exploit their knowledge of consonants in processing a text; they would exploit their knowledge of the *trilateral/quadrilateral root* model in Arabic words, the word patterns/forms, the affixation, etc. On the other hand, cycle 2 would be redundant in processing a text.

For sentence-level processing, a dominant process of cycle 1 was suggested. However, a simultaneous process of both cycles was observed when the sentences were presented vowelized: short vowels-minus-*shaddah*, short vowels-plus-*shaddah*, or wrong short vowels-plus-*shaddah*. The moving window technique demonstrated that the more the short vowels and *shaddah* signs were presented, the more time it took the participants to process a sentence. On the other hand, the garden-path structure was found to be correlated with reading time. Garden-path sentences took more time to process than non-garden-path sentences (Table 13).

For word-level processing, on the other hand, word frequency and affixation were found to be implicated in the word-naming task. Further, being a homographic word did not hinder its recognition. Indeed, although, on average, it took the participants 725.88 milliseconds to name the homographic words versus 692.46 milliseconds to name their non-homographic counterparts, a 33.42 milliseconds difference should not be interpreted on the basis of severe hindrance, but on the basis of word neighboring activation effect. Exploiting the word consonants was sufficient for recognizing the word. As explained earlier, in addition to the presence of the consonants, the characteristics of Arabic morphology (*trilateral/quadrilateral-root* model of words; the predictablitly/productivitly of word forms/patters; affixation, etc.) compensate for the lack of short vowels and diacritics in print. Therefore, only cycle 1 was dominantly operating. Cycle 1 processing could be sensed and was efficient when the stimulus word was a plain non-homograph. However, if the stimulus word was homographic or non-homographic supplemented with short vowels and *shaddah*, both cycles 1 and 2 operated simultaneously. This simultaneous processing would consume time; indeed, that was only when adding the short vowels and *shaddah* is redundant. However, if the presence of short vowels and *shaddah* was useful in minimizing the word neighboring size of the homographs, then no extra time processing was expected.

This last finding holds only when the homograph is of high-frequency (high-frequency homographs presented with short vowels-plus-*shaddah*). However, if the homograph was of low frequency, the pattern changed. That is, providing the consonants with short vowels-plus-*shaddah* did not speed the time process; the plain low-frequency homographs, on average, took 752.28 milliseconds, while the vowelized low-frequency, on average, took 786.34 milliseconds. Although a possible explanation could be proposed, further study with a different subset of stimuli of both high- and low-frequency stimuli is warranted. For now, the possible explanation is that, for a low-frequency word, a reader is accustomed to use the address-route, and by adding short vowels-plus-*shaddah* to the low-frequency words, he/she would be forced to use the phonological-route in processing those visual cues that represent short vowels/*shaddah*; hence, due to this unfamiliarity and strategy switching in employing routes, extra time would be needed.

To come up with non confounding results, the current study went through a rigorous controlling procedure to minimize extraneous variables in order to detect directly the role of short vowels in the Arabic reading process and indirectly the role of context in reading individual words. Variables that are implicated in such a role for short vowels were considered and controlled.

For the word naming task and in order to investigate the facilitative role of short vowels-minus/plus-*shaddah* or context in recognizing or naming individual words, the word homography (being a homographic or non-homographic) was considered. The same thing was applied too when examining the role of short vowels-minus/plus-*shaddah* in sentence processing. Taking into account the structure type of the sentence (garden-path versus non-garden-path) and the initial types of a sentence (homographic versus non-homographic) was essential for examining whether an overall role for short vowels-minus/plus-*shaddah* in reading time and reading comprehension exists.

When the stimuli were text-level, controlling other factors, such as text type and word-frequency, was indispensable for detecting an unconfounding role of short vowels-minus/plus-*shaddah* in reading accuracy and reading comprehension. Further, the study as a whole attempted to exhaust all possible conditions in terms of full/partial presentation of the phonemes of the language in order to detect the role of short vowels, particularly in reading Arabic. This restored the difference between short vowels and diacritics.

In Experiment 1 (reading texts), the first reading condition was totally devoid of short vowels and *shaddah*. This meant that the orthography was incomplete in terms of consonants and short vowels. That is, by presenting a text, a sentence, or a word without *shaddah*, one of the consonants of the diphthong was not be represented. Subsequently, both consonants and short vowels would not be fully presented. Therefore, in a plain text, sentence, or word, there would be double missing information, that is, some having to do with the consonants and some having to do with the short vowels. Taking this into account was warranted in all three experiments.

In the second reading condition which was labeled, "*shaddah* only," only the consonants were fully presented. In the third reading condition, labeled, "vowelized-plus-*shaddah*," both short vowels and consonants were fully presented, that is, the consonants and the short vowels that were related to the internal (morphological) form of the word in the sentence were presented; however, the syntactic case-ending markings that employ the short vowels symbols were not supplemented. That is to say, the constant short vowels that do not change according to the changing position of the words in the sentence were provided. However, the short vowels that do change according to word position in the sentence and syntactic function were not presented, particularly in Experiments 1 and 3. This was one of the notions of full representation that the current study adopted for control purposes. Manipulating case-ending markings in the moving window task, however, was for the purpose of detecting whether partial economical representation would be enough to prevent the potential garden-path phenomenon. This was in acknowledgement of the fact that case-ending markings and garden-path phenomenon are syntactically related, and deal with the structure of the sentence.

In the fourth reading condition only short vowels (short vowels-minus-*shaddah*) that are part of the morphological structure of the words were presented; that is, the constant short vowels that do not change according to the changing position of the words in a sentence. This condition was built in the study for control purposes. Manipulating the short vowels in this manner, although it is a deviant representation as was explained before, was essential to restore the difference between short vowels and diacritics. Further, this reading condition would help in detecting whether there was a pure facilitative role of short vowels in the reading process in the absence of other diacritics, e.g., *shaddah*. Doing so would correct a misconception and confusion in previous studies, for example, Abu-Rabia's (1995-2001) attempt to investigate the role of short vowels in the Arabic reading process. The current study took the stand that the short vowels and diacritics should not be used exchangeablly. Abu-Rabia's (1995-2001) manipulation of the short vowels was not accurate. He included the diacritics *shaddah* and *skun* within short vowels. As explained before, when the diacritic, *shaddah*, that is given the symbol, " ّ " and placed over the consonant, is provided, this indicates that the consonant should be pronounced as a double consonant. However, the diacritic, *skun*, that is designated with the symbol, " ْ ", and placed over the consonant, indicates that the consonant is devoid of any short vowel. The aforementioned functions of both *shaddah* and *skun* (and case-ending markings, too) would lead a researcher not to include them within the short vowels category. Subsequently, when controlling for the effect of short vowels one must consider controlling those diacritics, too.

This kind of manipulation takes into account the differentiation between reading as a strategy versus reading as a representation; or the benefits of short vowels and diacritics as a strategy versus as a representation.

In the fifth reading condition, the short vowels and *shaddah* were presented wrongly. That is, the short vowels-plus-*shaddah* were placed in a way that, when assembled, would not lead to a real word or even a pseudo word, but to a non-word. The distortion was given to the phonological part while the graphemic aspect of the word was left intact (the consonantal string and its order). As in reading condition four, this deviant condition was built into the study, too, for control purposes. That is, by building those two reading conditions into the design (reading conditions 4 and 5; Figure 1), the role of short vowels hopefully would be revealed purely. For both moving window and word naming tasks, reading condition 1 was plain; reading condition 2 was provided with short vowels-plus-*shaddah*; reading condition 3 was provided with only short vowels; and reading condition 4 was provided with wrong short vowels-plus-*shaddah*. Other supplemented reading conditions were provided in the moving window task for testing their effect on the garden-path phenomenon, e.g., *skun*-only and case-ending markings-only reading conditions.

Accordingly, the findings of the three experiments can be generalized as follows: Arab adults would can read without vowelization or *tashded* (adding *shaddah*), and they can read, too, with partial presentation of the phonemes in the script. The only exception to these generalizations was when reading individual homographic words. That is, in a word naming task that intends to assess reading accuracy, unlike the phonological representation, recognizing the semantic representation of the homographic word is attainable. However, choosing the appropriate form of the multiple-form homographic word (heterophonic homograph), in terms of phonological representation, is not possible in the absence of the appropriate short vowels and diacritics or context. The reason for emphasizing diacritics, here, is that even by adding short vowels and *shaddah* to a homographic word, there is no guarantee that the possible forms will be reduced to one legal form, that is, no guarantee that the homographs will turn into non-homographs.

Recognition of homographic or non-homographic word is not affected even if the word is presented plain and in isolation. As stated earlier, Arab adults exploit their knowledge of Arabic morphology, the *trilateral/quadrilateral root* model of words in Arabic, and the derivation process in Arabic morphology (affixation) in accessing the mental lexicon of the word representations. The consonantal *trilateral/quadrilateral root* of a word (the core semantic element of the word) is enough for accessing the mental lexicon, particularly, its semantic representation. The claim is supported by sources of knowledge: the nature of the Arabic morphological system, which can be characterized, generally speaking, as agglutinative in which the morphemes and, most of the time the morphs are substantially realized (or agglutinative/fusional); the findings of studies conducted on Arab subjects, e.g., Badry's (1982) study which revealed that Moroccan children, aged 3 to 6, were aware of the underlying morphological root in their spoken language and this awareness was reflected in the production stage of their Acquisition.

In fact, in his attempt to suggest a reading model of the Arabic reading process, Abu-Rabia's recent research (2002) emphasized the role of morphology in reading Arabic. Further, studies conducted on orthographies that are similar to Arabic orthography revealed a similar role of morphology in the reading process, e.g., studies conducted on Israeli subjects while they were reading Hebrew texts, (e.g., see Navon and Shimron, 1981; Shimron and Sivan, 1994). Finally, Taft's (1981) experiments demonstrated that "prefix stripping occurs in word recognition and this, in turn, implies that prefixed words are accessed through a representation of their stem" (p. 296). Arab adults are exposed to textual materials that are very often presented plain (devoid of short vowels and diacritics). This absence of short vowels and diacritics, according to Abu-Rabia (1995-2001), would prevent reading from proceeding smoothly and make it a cumbersome task that could affect comprehension negatively. However, this claim was not supported at all by the current study (Experiment 1). As discussed earlier, the absence of short vowels and diacritics from adults' reading materials was compensated by other factors, e.g., knowledge of morphology, particularly the *trilateral/quadrilateral root* model of words, the predictablitly/productivitly of word forms/patterns, and their affixation characteristic.

4.1. LIMITATIONS

The current study would like to draw attention to two categories of concerns that emerged during and after conducting the experiments. The first category includes issues raised before implementing the experiment, e.g., the targeted population and the accessible sample units; the experiment materials, particularly, the reliability of its alternative forms; and finally, the procedure for conducting the two sessions that were 10-14 days apart. The concerns in the second category emerged after implementing the experiment, e.g., text reading representations (reading conditions) on the basis of vowelization; the criteria and the procedure of evaluating word frequency; and finally, the homogeneity of the real sample that was involved in the experiment.

In the first category, the shortage and the difficult accessibility to Arabic native speakers in the United States, particularly in Pittsburgh, made it necessary to permit any undergraduate/graduate or postgraduate native Arabic speaker to participate in the experiment although there were some post-criteria for inclusion and exclusion as described in *Participants* section). That criterion led to the heterogeneity of sample participants in terms of their nationality. Such heterogeneity would be a concern only in regard to word frequency, since every country has its own local newspapers; thus, the words that would be of low frequency for some participants could not be of low frequency for others.

However, this acceptance of any accessible Arab adult for participation in the study did not go without support and conditional basis for inclusion. Concerning support, any Arab adult who had finished his/her high school level in an Arabic country is supposed to have passed the stage of learning to read, and to have been exposed gradually to huge amounts of print in school and in the media. Thus, reading skill was assumed to be correlated with the participants' academic levels (undergraduate/graduate/postgraduate) and his/her exposure to print that can be measured roughly with the academic level. In spite of that assumption, some criteria to ensure the homogeneity of the sample (participants) were applied, for example, including only those who had earned their high school certificate in an Arabic country, and who had been exposed to Arabic print on a daily basis, for example, by reading Arabic daily newspapers. Further, the running record procedure of the miscues which was conducted in the reading accuracy task was used as a post-criterion for excluding the data from the participants who demonstrated non-fluent reading skill (*Participants* section).

In addition to the precautions adopted for participants' inclusion and exclusion from the experiment, the randomization assignment procedure was used for assigning the participants to the five reading conditions. With this randomization technique, the study hoped to have put together equal groups within the reading conditions. That was a concern in the first experiment; however, in the subsequent experiments (moving window and word naming), a filtering procedure was used for selecting a homogeneous sample. That is, the participants who were close to the mean on the basis of reading time and number of miscues were contacted again for participating in the second and third parts of the study (moving window and word naming experiments).

In regard to the materials of the experiment, in order to build word frequency into the design, the current study had to design two identical passages for testing comprehension and two other identical passages for testing reading accuracy. To achieve identicity except in word frequency, the study used the parallelizing procedure in constructing two alternative forms. So, both texts had to be equal in all aspects, grammatical difficulty, semantic difficulty, word neighboring size, script background, etc., except word frequency; a procedure that is considered to be a difficult goal to achieve, particularly when attempting to control for word frequency only - that is, to have both texts similar from all aspects except in word frequency. The parallelizing alternative format was adopted to help enhance the participants' recall and particularly their responses to the multiple-choice tests, because the two texts were given in two sessions that were 10-14 days apart. This short lapse of 10 to 14 days was chosen because the participants live only temporarily in the United States, and it was feared that the dropout rate might increase if the interval between the two sessions was longer. However, the current study predicted that the word level, e.g., word frequency, and vowelization would not affect a participant's reading comprehension, and by using a counterbalancing procedure between text type and order, the effect, if any, could be properly detected.

One of the concerns which emerged after conducting the study was related to reading conditions. That is, in one of the reading conditions the participants were given passages that included only *shaddah*, " ّ ", strengthening (reading condition 2 in Experiment 1), or included only short vowels (reading condition 4 in Experiment 1). Those reading conditions, particularly the ones in which only short vowels were provided, are deviant. However, including such a condition in addition to the wrong short vowels-plus-*shaddah* condition, was necessary to allow the researcher to detect the real influence of short vowels compared with short vowels-plus-*shaddah* on comprehension. On the other hand, using the *shaddah*-only reading condition was based on the fact that when including only *shaddah*, the researcher only presented the consonantal phonemes. Thus, by providing *shaddah* only or short vowels only (reading conditions 2 and 4, respectively, in Experiment 1), the orthographies would be partially represented. However, by presenting only the short vowels, which still was a partial representation of the orthography, its effect if found would be appropriately attributed to their presentation. The condition that would combine both representations was the one in which both short vowels and *shaddah* were presented (short vowels-plus-*shaddah* reading condition). In Experiment 1, this reading condition was labeled reading condition 3. Short vowels and *shaddah* were manipulated for control purposes in order to ensure the role of short vowels in the Arabic reading process; such manipulation was neglected in the previous studies.

The current study differentiated between short vowels and the diacritic, s*haddah*, a differentiation that was not taken into account in the previous studies that considered diacritics, *shaddah* and *skun*, part of the short vowels category. However, the *skun*, that takes the sign, " ْ" and which is used to indicate that the consonant does not have a short vowel, was not involved in Experiments 1 and 3, because *skun* is neither part of the short vowels nor part of the *shaddah*. That is, *skun* is a sign that stands alone and is placed over the consonant to indicate that the consonant is voweless. Therefore, involving *skun* as part of the full short vowels representation and attributing the results to the short vowels is misleading. The current study attempted to isolate the function of short vowels by considering *skun* as a separate sign that needs to be dealt with individually and in combination with other short vowels and diacritics.

The symbols that take the form of short vowels and play the role of case-ending markings were not manipulated for two reasons. First, in Modern Arabic, the semantic clues that case-endings convey can be substituted/compensated with other factors, e.g., the affixated characteristics of word form in Arabic, the order of the sentence, and the context of the sentence. It is said with emphasis, ‘semantic clues’ because some of the case-ending markings do not convey meaning. Second, in practice, those case-ending markers are ignored in the spoken mode and to a great degree in the writing mode. Therefore, this study, particularly in the reading text experiment, did not manipulate the case-ending markers. However, for reading sentences the case-ending markings were included to represent one reading condition that was designed for detecting the role of case-ending markings in reading Arabic sentences. This was to test how those case-ending markings, when compared with other manipulated variables would facilitate reading garden-path sentences, particularly on the basis of reading time, a manipulation that takes into account the difference between a technique and a representation in the Arabic reading process. The facilitating effect was restricted to reading time and not to reading comprehension (as measured by the comprehension product) because the current study predicted that Arab readers would exploit their knowledge of morphology: consonants, affixation, etc. in comprehending the print. Providing those case-ending markings should demonstrate their role in speeding the processing time. That is to say, how case-ending markings would help in selecting the right form of the homographic initial of the garden-path sentence.

For this reason, having another study that investigates the roles of the diacritic, *skun* and case-ending markings separately and in combination with short vowels is encouraged. Such an investigation would differentiate between a reading process based on a technique and a reading process based on a representation degree (phonological representation).

Concerning the criteria and the procedure of evaluating word frequency, as there was no accessible current index for word frequency in Arabic, the current study used intuitive judgment for fulfilling the evaluation, in addition to the available indexes for word frequency in Arabic. Although, "frequencies determined by such a procedure [intuitive judgment] could be better predictors of word frequency latencies than standard objective word frequency counts (Gernsbacher, 1984; Gordon, 1985)" (Baluch, 1993, p. 24), the variability of sample in terms of nationality may limit the validity of judgment particularly in the absence of current and accessible indexes of word frequency in the Arab world. The step was to scan a huge number of articles that resembled the theme of the experimental passages in order to identify frequent words in those targeted themes. Those words were considered high-frequency words. Their low-frequency counterparts were searched for in Modern Arabic dictionaries and were selected on the basis that they were not from Abdu's index of The Most Common 3000 Words. Later, a group of LF and HF words were matched in pairs and introduced to a group of seven persons: two Arabic experts and five graduate students, to judge their frequencies. The group was asked to judge the target words in terms of their encounter on a scale of "always", "sometimes", and "rarely." Only the pairs whose frequency the consulted group agreed on were included. The survey went through some modifications and revisions before it is was conducted and verified.

A follow-up procedure was also conducted. After each last session, the participants were consulted about their opinions of the LF words that they had read in the two passages of the two sessions; that is, whether they encountered those words very frequently, frequently or less frequently. The follow-up results were found to be virtually in agreement with the survey's results.

Despite the precautions that the current study took, such a basis of judgment has limitations and thus, it would not be sufficient to categorize the word frequency on such judgment, knowing the influence of individual variability (in terms of nationality), and the small size sample that rated the surveys.

4.2. RECOMMENDATIONS

4.2.1. Theoretical Recommendations

Based on the aforementioned limitations, this study's recommendations are intended to draw the attention of future research to each aspect of those concerns that were noted in the *Limitations* section. Those identified aspects can be grouped into three categories: one related to the targeted population; one related to the materials, and one related to reading conditions.

For the first category, the current study targeted skilled readers as represented by graduate and postgraduate students, that is, the role of short vowels and context were examined and discussed in reference to skilled adult Arab readers. Therefore, replicating the same procedure for non-skilled readers is encouraged. Based on the results of the current study, particularly Experiment 1, adding the short vowels and *shaddah* to print does not facilitate or hinder the reading comprehension process of skilled readers: reading time and reading comprehension product. Indeed, the provision of short vowels and *shaddah* to consonants, as was found on sentence and word level processing (Experiments 2 and 3), were found to slow the reading process without any significant effect on comprehension. Hence, the trade would be a cost with no payoff: slowing the reading process with no explicitly additional benefit.

This finding of no explicit additional benefit, but a cost with no payoff, is an appealing finding for preserving the current status of Arabic script where only consonants are represented. Note that some of those findings are based on silent mode reading tasks (Experiment 1, part one, and Experiment 2), and second, the target population was composed of skilled readers (graduate/postgraduate students). Therefore, testing short vowels and *shaddah* with a different population at a non-skilled reading level would help in understanding whether such a general statement is consistent for non-skilled readers. The justification for the recommendation, in addition to the task mode of reading and the target population, was the fact that the control procedure of previous studies (Abu-Rabia, 1995-2001) was not sufficient for isolating the role of short vowels in the Arabic reading process, particularly, for comprehension. Therefore, assessing the role of short vowels and *shaddah* on less skilled readers (e.g., third graders versus sixth graders) following the controlling procedures of the current study would be helpful in determining their roles in reading Arabic print, and thus assessing the generalizability of the nil role of short vowels on comprehension. It would be recommended that the same study be replicated exactly with young children, and somewhat older children, e.g., third graders and sixth graders, taking into account the appropriate experimental reading materials and the control procedure adopted by the current study.

The current study adopted very strict controlled conditions for isolating the role of short vowels and diacritics in order to detect their effects on comprehension and reading accuracy. Subsequently, the hypothesis that stated that short vowels play a positive role in comprehension was refuted. The strong stand this study takes is based on its control procedure. Despite the criteria used as a measure of assuming reading skillness (age and educational level, in addition to the post-criterion analysis of the participants miscues), it may still fall short for controlling the variations between and within the groups. In fact, the current study used the reading accuracy session for evaluating the participants' reading skill although the passages used in this session were not the same in terms of short vowels and *shaddah* representation. To compensate for such limitation, the type of miscues was used as a judgment criterion for inclusion and exclusion. The participants who made errors that indicated an insufficient reading level were excluded. On the other hand, the participants who made miscues that were not related to reading deficiency were included - that is, miscues that did not reflect insufficient reading skill. Although no participant was excluded on the basis of his/her poor reading skill, the post-criterion evaluation that was used would have been better had it been based on reading the same passage in terms of reading condition representations - that is, by having all students read a text in which only consonants were presented. Any future study that attempts to replicate the current study needs to take the aforementioned limitation into account in judging the reading skill of the participants.

Further, the current study could not exhaust all possible combinations of short vowels and diacritics representations. It only manipulated the short vowels and *shaddah* to the degree that would help the researcher to support or refute the claim that short vowels play a role in the Arabic reading process: reading comprehension and reading accuracy. However, additional manipulated variables may need to be examined. For example, combining short vowels and diacritics or presenting diacritics by themselves would be worth such investigation, e.g., short vowels with *skun*, short vowels with case-ending markings, case-ending markings by themselves, etc.

4.2.2. Pedagogical Recommendations

Based on the results of the current study, vowelizing every consonant in the word seems not only to be unnecessary, but at times auxiliary and cumbersome. To illustrate this point, the spelling system in Arabic has some features that allow only specific short vowels to be automatically figured out for some consonants, knowledge that Arab natives possess. For example, the consonant, ‘alif’, " ا ", is preceded by only the short vowel, ‘fatha’, " ـَ ". Thus, if ‘alif’, " ا ", consonant exists, a prior ‘fatha’, " ـَ " sound is inevitable. That is, the Arab native tongue cannot pronounce the consonant, ‘alif’, " ا " if the ‘fatha’, " ـَ " sound is not assumed and pronounced. Due to the fact that the results neither showed any role for short vowels by themselves nor any role for short vowels in combination with *shaddah* in regard to comprehension, presenting short vowels and *shaddah* should be based only on whether they would play a role in resolving ambiguity or not, particularly in regard to reading accuracy. That is, the short vowels and diacritics in combination play a role sometimes with homographic words, although presenting them does not guarantee ambiguity will be solved. In fact, for some homographs, only adding the diacritic, *skun*, " ْ ", resolves the ambiguity, regardless of whether the short vowels are supplemented or not. With providing *skun* only, the short vowels may be redundant and vice versa. Thus, the role of short vowels in resolving semantic ambiguity overlaps other orthographic representations such as diacritics and affixation. Accordingly, the pedagogical implication of the current study findings is related to Arabic print representation in general and reading material representation in particular. Subsequently, the targeted audience for such implication is the writer, whomsoever. That is, the only person who would be able to decide how many short vowels and diacritics, *shaddah* and *skun* are needed for a text representation is the writer. S/he needs to figure out the areas of the text that might mislead the reader or force her/him to regress when the <u>appropriate</u> short vowels or diacritics are not provided.

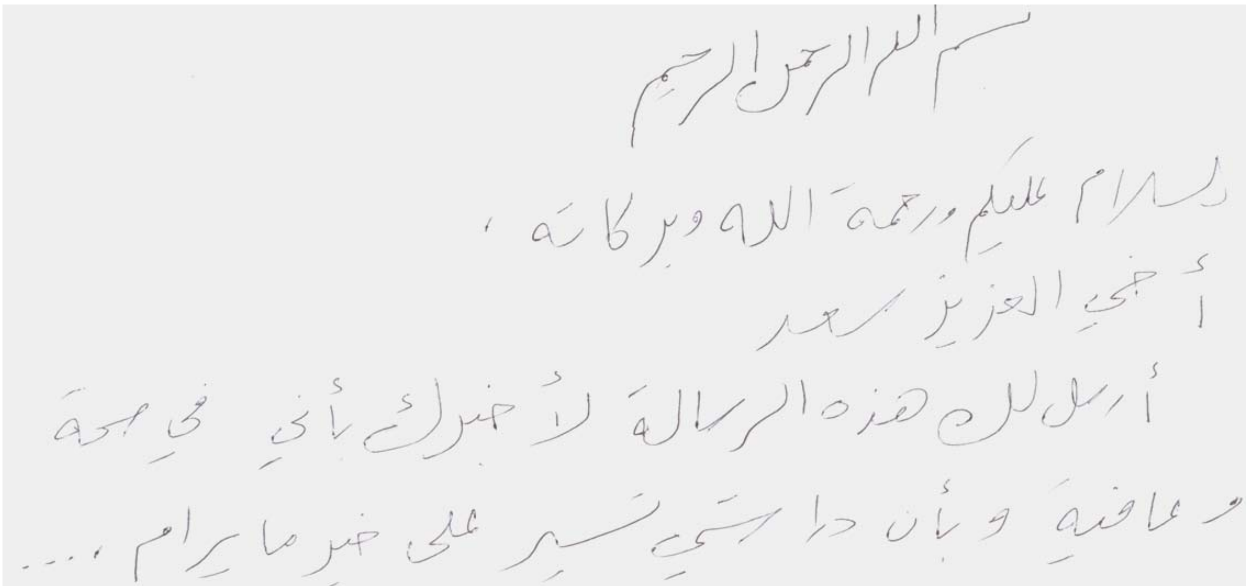
This current study has substantiated the following findings: homographs and garden-path sentences take more time to process, and the more the short vowels and *shaddah* presented, the more time the processing. Based on these findings, presenting short vowels and *shaddah* should be done more practically. That is, the writer needs to be economical and efficient in presenting the short vowels and *shaddah* and add them only to the areas of a text which might otherwise be ambiguous.

APPENDICES

APPENDIX A

Samples of students' writings

First Example:



بسم الله الرحمن الرحيم

السلام عليكم ورحمة الله وبركاته ،

أخي العزيز سعد

أرسل لك هذه الرسالة لأخبرك بأني في صحة

وعافية وبأن دراستي تسير على خير ما يرام ، ...

Second Example: excerpt from the “Introduction” in the Science textbook, third grade, 2004 (p. 20) [1]

المقدمة

الحمد لله ربّ العالمين ، والصلاة والسلام على أشرف المرسلين ، وبعد :

بين يديك كتاب العلوم للصف الثالث الابتدائي في ثوبه الجديد ، أُعد وفق منهج تربوي يسعى إلى زيادة فاعليّة التلميذ في المواقف التعليمية . فالتلميذ هو الذي يلاحظ ، ويتساءل ، ويجرّب ، ويبحث ، ويفسّر ، ويكتشف ، ويبتكر .. وهذا يفرض نمطاً فعّالاً من النشاط التعليمي الذي يجب أنّ يخطط له المعلّم الناجح بعناية ، نمطاً من أهم وسائله النفسيّة: استثارة التلاميذ، وحفزهم بطرح السؤال أو القصّة أو الطرفة أو عرض الوسيلة التعليميّة ، حتى إذا ما أوقفهم على قمّة التشوّف والترقّب تركهم برهة من الزمن لأنفسهم ؛ليصلوا هم عبر حوارات ومناقشات إلى العتبة الأولى من عتبات المعرفة التي خطط للوصول إلى قمتها ، ثم لم يمهلهم بعد حتى يفتح لهم نوافذ جديدة من نوافذ المعرفة تسكت لها أنفاسهم وتشرئب أعناقهم وتتسع أعينهم ، وهم بين هذا وذاك يجربون بأنفسهم فيخطئون ويصيبون وهو معهم يقوّمهم ويسدّدهم ، وفي ذلك كله يسلك بهم خطو العلماء وهم يسعون أوّل مرّة في تطلّب حقيقة الظواهر وتفسير المشاهدات .

…………………………………………………………..
……………………………………………………………
…………………………………………………..

أخي المعلم : التخطيط السليم في أي عمل هو أساس النجاح في تنفيذه ، لذا فإن من عوامل نجاحك في تدريس هذا الكتاب أن ترسم خطة زمنية دقيقة واضحة لسير الدروس حسبما تتوقعه في مطلع الفصل مراعياً المرونة في عرض مفاهيم الدرس بين التقديم والتأخير والإسهاب والاختصار ، وكذلك مراعياً المرونة في ترتيب الدروس، وليكن رائدك في ذلك كله : تقدير مصلحة التلاميذ وخبراتهم وخصوصية بيئتهم وتحقيق أهداف تلك الدروس . وقد وضعت بعض المقترحات التي قد تساعد في تنفيذ الدرس أسفل صفحات الكتاب . آملين أن تكون عوناً على أداء رسالتك ، ولا يهولنك عدد صفحات الكتاب ؛ فإن خصائص الطفل في هذه السن تستدعي استخدام صور ، وأشكال ، وحروف كتابية كبيرة .

[1] Note: those examples were taken from the third grade textbooks used in Saudi Arabia classrooms

APPENDIX B
Samples of school textbooks

First example from Reading textbook, third grade, first term, 2004 (p. 33) [1]

الدَّرْسُ السَّادِسُ

مَعْرِفَةُ اللهِ تَعَالَى

اللَّهُ ـ سُبْحَانَهُ وتَعَالَى ـ رَبُّ كُلِّ شَيْءٍ وَمَلِيكُهُ، رَبُّ السَّمَاوَاتِ وَالْأَرْضِ، ومَا فِيهَا مِنْ مَخْلُوقَاتٍ، فَهُوَ الَّذي خَلَقَنَا، ومَنَحَنا الصِّحَّةَ وَالْعَافِيَةَ، خَلَقَنا لِنَعْبُدَهُ وَحْدَهُ، ولاَ نُشْرِكَ بِهِ شَيْئًا.

إِنَّهُ سَمِيعٌ بَصِيرٌ، يَسْمَعُ أَدْنَى الْأَصْوَاتِ، ويُبْصِرُ أَصْغَرَ الْأَشْيَاءِ فِي أَشَدِّ الظُّلُمَاتِ، وَيَعْلَمُ خَفَايَا النُّفُوسِ، ولاَ يَخْفَى عَلَيْهِ شَيْءٌ فِي الْأَرْضِ وَلاَ فِي السَّمَاءِ، لَهُ ـ جَلَّ شَأْنُهُ ـ الْأَسْمَاءُ الْحُسْنَى وَالصِّفَاتُ الْعُلَى.

اقْرَأ النَّصَّ التَّالِيَ * وَتَأَمَّلْ صِفَاتِهِ سُبْحَانَهُ وَتَعَالَى:

١ - اللَّهُ جَلَّ شَأْنُهُ   لَهُ الصِّفَاتُ الْبَاقِيَةْ

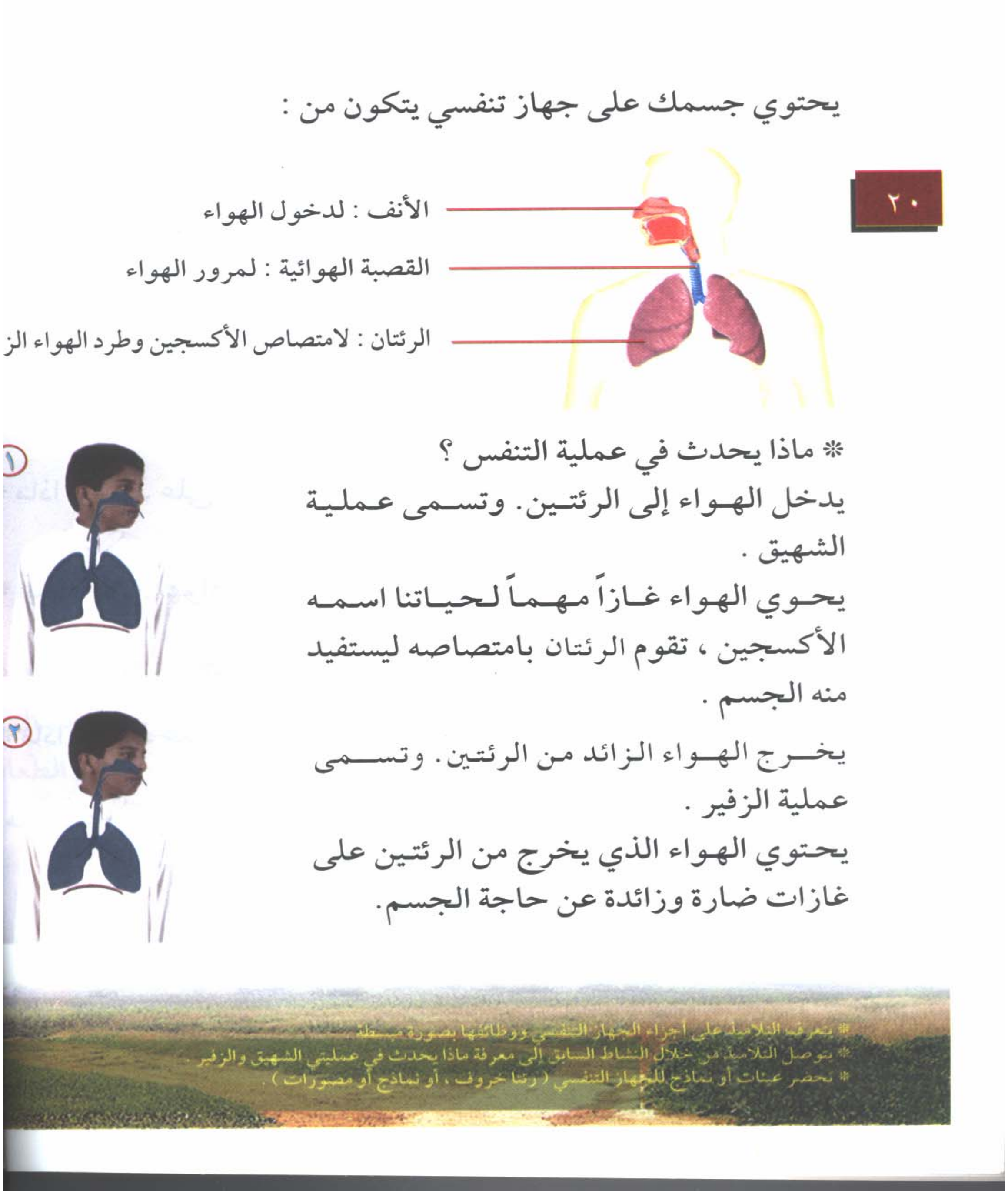
٢ - رَبُّ السَّمَاءِ وَالْأَرَا   ضِي وَالْمِيَاهِ الْجَارِيَةْ

* لمحمد الهراوي.

٣٣

[1] Note: those examples were taken from the third grade textbooks used in Saudi Arabia classrooms

Second example from the Science textbook, third grade, 2003 (p. 20) [1]



يحتوي جسمك على جهاز تنفسي يتكون من :

٢٠

الأنف : لدخول الهواء

القصبة الهوائية : لمرور الهواء

الرئتان : لامتصاص الأكسجين وطرد الهواء الز

١

* ماذا يحدث في عملية التنفس ؟

يدخل الهواء إلى الرئتين. وتسمى عملية الشهيق .

يحوي الهواء غازاً مهماً لحياتنا اسمه الأكسجين ، تقوم الرئتان بامتصاصه ليستفيد منه الجسم .

٢

يخرج الهواء الزائد من الرئتين. وتسمى عملية الزفير .

يحتوي الهواء الذي يخرج من الرئتين على غازات ضارة وزائدة عن حاجة الجسم.

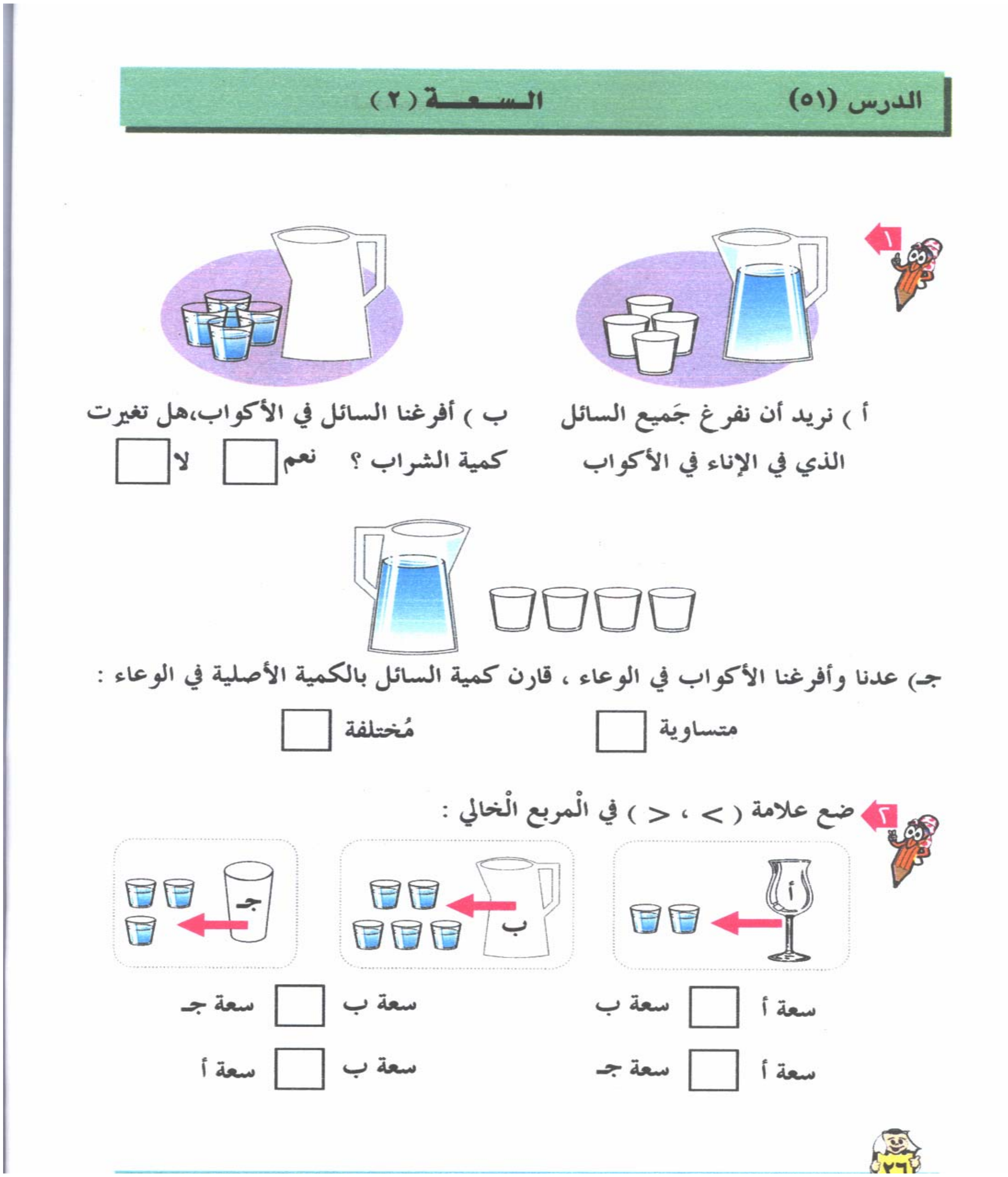
* يتعرف التلاميذ على أجزاء الجهاز التنفسي ووظائفها بصورة مبسطة

* يتوصل التلاميذ من خلال النشاط السابق إلى معرفة ماذا يحدث في عمليتي الشهيق والزفير .

* نحضر عينات أو نماذج للجهاز التنفسي (رئتا خروف ، أو نماذج أو مصورات) .

[1]Note: those examples were taken from the third grade textbooks used in Saudi Arabia classrooms

Third example from Mathematics textbook, third grade, second term, 2003 (p. 26) [1]



الدرس (٥١) السعة (٢)

١

أ) نريد أن نفرغ جَميع السائل الذي في الإناء في الأكواب

ب) أفرغنا السائل في الأكواب،هل تغيرت كمية الشراب ؟ نعم ☐ لا ☐

جـ) عدنا وأفرغنا الأكواب في الوعاء ، قارن كمية السائل بالكمية الأصلية في الوعاء :

متساوية ☐ مُختلفة ☐

٢ ضع علامة (> ، <) في الْمربع الْخالي :

سعة أ ☐ سعة ب   سعة ب ☐ سعة جـ

سعة أ ☐ سعة جـ   سعة ب ☐ سعة أ

٢٦

[1]Note: those examples were taken from the third grade textbooks used in Saudi Arabia classrooms

APPENDIX C
Samples of public printed materials

Sample 1 (poetic type) [1]

أتانـــا بعــد يــأس

أغرُ عليه للنبوة خاتم ... من الله مشهودُ يلوح ويشْهدُ
وضم الاله اسم النبي إلى اسمه ... إذا قالَ في الخَمسِ المؤذن أشهد
وشق له من اسمه ليجِله ... فذو العرشِ محمود وهذا محمد
نبي أتانا بعد يأسلٍ وقَتْرة ... من الرسل والأوثان في الأرضِ تُعبد
فأمسى سراجاً مستنيراً وهادياً ... يلوح كما لاح الصقيلُ المهند
وأنذرنا ناراً وبشر جنةً ... وعلمنا الإسلام فاللهَ نحمد
وأنت إله الخلق ربي وخالقي ... بذلك ماعمرت في الناسِ أشهد
تعاليتَ رب الناسِ عن قول من دعا ... سواك إِلهاً أنتَ أعلى وأمجد
لك الخَلقُ والنعماء والأمر كُله ... فإياك نَستَهدي وإياك نَعبد

[1]The poet: Hassan Ibn Thabit (Radhi Allahu Ta'ala Anhu): Source: http://www.geocities.com/diwan3rab//7ssan1.html

Sample 2 (excerpt of narrative type)[1]

* كنت دائماً أرى ما لا يرى، في النوم أرى قناديل تضحك، وعيوناً تلتمع ... في آخر الليل، كنت أتنبه فجأة، وأمشي وأنا شبه نائم نحو الثلاجة في طرف الغرفة، أسكب ماءً وأشرب، دون أن ينقطع ما أراه وأسمعه!!

في الصباح أصحو، وأقص على أمي ما رأيت، كانت تقول هذه كوابيس، يا ولدي الحلم خفيف كالفراشة، لكن أحلامك ثقيلة مثل الحجارة!! قبل أن أنام تنصحني دوماً: سم باسم الله.

نهضت بتثاقل، وتذكرت وصية أمي، فأمسكت بالشرشف الأزرق من أطرافه، ثم نفضته بقوة مفاجئة، لتتطاير من أنحائه ما **يشبه الحشرات المضيئة، ارتبكت وأنا افكر برؤياي الليلية المستمرة، هل هذه الأحلام التي قالت عنها أمي: أنها ثقيلة مثل حجارة!! نفضت الشرشف ثانية ...

[1] Author: يوسف المحيميد: Source: أكتوبر 2000م الرياض, available: http://www.alriyadh-np.com/01-02-2001/page6.html#10

Sample 3 (expository type) [1]

وافق مجلس الامن التابع للأمم المتحدة على إرسال بعثة إلى أثيوبيا واريتريا من المتوقع أن تطلب من البلدين التقيد بحكم من المنتظر أن تصدره لجنة دولية بشأن حدودهما المشتركة التي كانت السبب الرئيسي لحرب حدودية دامية استمرت عامين.ومن المتوقع أن تصدر اللجنة حكماً نهائياً بشأن رسم الحدود المتنازع عليها بين البلدين والتي تمتد لمسافة ألف كيلومتر بحلول الثامن والعشرين من فبراير/شباط وذلك بمقتضى اتفاق سلام وقعه البلدان قبل نحو عام.ولإبراز هدف البعثة أكد مجلس الأمن في بيان قريء في اجتماع رسمي (الأربعاء) أن حكم اللجنة الدولية "نهائي وملزم" ويحظي "بالتأييد الكامل للمجتمع الدولي".وستكتفي اللجنة برسم خط الحدود على خارطة. والخطوة التالية ستكون تعليم الحدود فعليا على الأرض وهى عملية صعبة ستمر بمناطق تعج بالألغام البرية.ومن المتوقع أن تبدأ مهمة البعثة التي تستمر أسبوعاً في حوالي الحادي والعشرين من فبراير.

[1] Source: al-Riyadh newspaper: http://www.alriyadh-np.com

APPENDIX D
Experiment Materials

I. Comprehension High-Frequency Texts
Text 1: High-Frequency Plain

حدثت هذه السرقة في حي ستانفورد، في مدينة سياتل، في العاشر من ديسمبر 1990. هذا الحي لم يعرف السرقة ولا الجريمة لتسعة عشر عاما. المستغرب في الأمر أن السرقة وقعت في الواحدة ظهرا من يوم الأربعاء، في محل كبير لبيع المواد الغذائية ومع ذلك لم يكتشف مرتكبها؛ فالشارع الذي ارتكبت فيه السرقة كان مزدحما في تلك الساعة بالموظفين العاملين في المؤسسات الحكومية والشركات التجارية التي عرف الحي بها. المؤسسات والشركات في هذا الحي تعطي موظفيها ساعة واحدة للغداء، وذلك من الساعة الواحدة والنصف حتى الساعة الثانية والنصف؛ لذا كان متوقعا أن يكون الشارع الذي وقعت فيه السرقة مزدحما بشهود العيان، ومع ذلك لم يأت أحد يدلي بشهادته كشاهد عيان على السرقة، ويعطي ملامح مرتكبها حتى ولو تقريبية. وقوع هذه السرقة في وقت النهار دون الإمساك بالسارق أدخل الرعب والخوف على الناس الذين يسكنون في حي ستانفورد، كما أشار إلى ذلك التقرير الذي صدر عن اللجنة المسؤولة عن السرقات والجريمة في مدينة سياتل. اتهم الناس الذين يسكنون في الحي مركز الشرطة بتقصيره في استتباب الأمن وبتقصيره في التواجد في مكان يزدحم بالناس كهذا الشارع. كذلك اتهموا لجنة التحقيق بالتكاسل والإخفاق في الإمساك بالسارق. أسفر عن هذه الحادثة أن سرق كل المال الذي كان في خزينة المحل، وكذلك مقتل زبونة في المحل حينما كانت تتجاذب الحديث مع أحد البائعين الذي كان يعد لها الأغراض. قدر المال الذي سرق عشرة آلاف دولار. هذا المال المسروق كان ربح المحل في ذلك اليوم واليوم الذي كان قبله؛ لأن المحاسب المسؤول عن جمع مكاسب المحل اليومية قد أصيب بمرض فلم يأت في ذلك اليوم. صوت من الرصاص، قيل طلقة أو طلقتين، سمعت آتية من المحل الذي حصلت فيه السرقة والجريمة، كما أخبر بذلك صاحب المخبز الذي يقع بجوار محل بيع المواد الغذائية. اتهم مركز الشرطة بالتقصير والتكاسل؛ لأنه لم يوفر الأمن اللازم في مكان يزدحم بالناس. كذلك حين وقوع هذه السرقة والجريمة استجابة مركز الشرطة وحضوره الى مكان الحادث لم يكن فوريا، وإنما كان بطيئا، الأمر الذي دعا ببلدية المدينة إلى تغيير إدارة الشرطة كلها بطاقم آخر. أما لجنة التحقيق فوصفت بالفشل؛ لأن هوية السارق القاتل لم تكتشف علما بأن أحد شهود العيان قدم وصفا تقريبيا للسيارة الواقفة بجانب المحل وقت ارتكاب السرقة، والتي انطلقت بطريقة مفاجئة بعد أن سمعت طلقات الرصاص بقليل. فتح ملف هذه السرقة والجريمة بعد حوالي ثلاثة عشر عاما من وقوعها أعاد للأذهان ذلك النقاش الطويل والصراع المرير الذي عاشه حي ستانفورد في ذلك الزمن. كذلك خوف الناس على أنفسهم وممتلكاتهم عاد من جديد. استئناف ملف هذه القضية كان بسبب ما أذاعته اللجنة المفوضة بمتابعة السرقة والجريمة عن توصلها إلى دليل مادي قد يوصل إلى مرتكب السرقة والجريمة. الإعلان كان في الحقيقة لجريمة أخرى وقعت في نفس الحي سنة 2002، ولم يكن لجريمة 1990. النتيجة التي يتوقعها خبراء الجريمة والسرقات أن المحققين في سرقة وجريمة كهذه، والتي تتصف بقلة الأدلة لن يتوصلوا إلى نتيجة. كما توقع خبراء الجريمة والسرقات، فقد أغلق ملف القضية مرة أخرى وللأبد من بعد ثلاثة عشر يوما من استئنافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 2: High-Frequency only-*shaddah* Text

حدثت هذه السرقة في حي ستانفورد، في مدينة سياتل، في العاشر من ديسمبر 1990. هذا الحي لم يعرف السرقة ولا الجريمة لتسعة عشر عاما. المستغرب في الأمر أن السرقة وقعت في الثّانية ظهرا من يوم الأربعاء، في محلّ كبير لبيع المواد الغذائية ومع ذلك لم يكتشف مرتكبها؛ فالشّارع الّذي ارتكبت فيه السرقة كان مزدحما في تلك الساعة بالموظّفين العاملين في المؤسسات الحكومية والشّركات التّجارية الّتي عرف الحي بها. المؤسسات والشّركات في هذا الحي تعطي موظّفيها ساعة واحدة للغداء، وذلك من الساعة الواحدة والنّصف حتّى الساعة الثّانية والنّصف؛ لذا كان متوقّعا أن يكون الشّارع الّذي وقعت فيه السرقة مزدحما بشهود العيان، ومع ذلك لم يأت أحد يدلي بشهادته كشاهد عيان على السرقة، ويعطي ملامح مرتكبها حتى ولو تقريبية. وقوع هذه السرقة في وقت النّهار دون الإمساك بالسارق أدخل الرعب والخوف على النّاس الّذين يسكنون في حي ستانفورد، كما أشار إلى ذلك التّقرير الّذي صدر عن اللجنة المسؤولة عن السرقات والجريمة في مدينة سياتل. اتّهم النّاس الّذين يسكنون في الحي مركز الشّرطة بتقصيره في استتباب الأمن وبتقصيره في التّواجد في مكان يزدحم بالنّاس كهذا الشّارع. كذلك اتّهموا لجنة التّحقيق بالتّكاسل والإخفاق في الإمساك بالسارق. أسفر عن هذه الحادثة أن سرق كلّ المال الّذي كان في خزينة المحلّ، وكذلك مقتل زبونة في المحلّ حينما كانت تتجاذب الحديث مع أحد البائعين الّذي كان يعد لها الأغراض. قدر المال الّذي سرق عشرة آلاف دولار. هذا المال المسروق كان ربح المحلّ في ذلك اليوم واليوم الّذي كان قبله؛ لأن المحاسب المسؤول عن جمع مكاسب المحلّ اليومية قد أصيب بمرض فلم يأت في ذلك اليوم. صوت من الرصاص، قيل طلقة أو طلقتين، سمعت آتية من المحلّ الّذي حصلت فيه السرقة والجريمة، كما أخبر بذلك صاحب المخبز الّذي يقع بجوار محلّ بيع المواد الغذائية. اتّهم مركز الشّرطة بالتّقصير والتّكاسل؛ لأنّه لم يوفّر الأمن اللاّزم في مكان يزدحم بالنّاس. كذلك حين وقوع هذه السرقة والجريمة استجابة مركز الشّرطة وحضوره الى مكان الحادث لم يكن فوريا، وإنّما كان بطيئا، الأمر الّذي دعا ببلدية المدينة إلى تغيير إدارة الشّرطة كلّها بطاقم آخر. أما لجنة التّحقيق فوصفت بالفشل؛ لأن هوية السارق القاتل لم تكتشف علما بأن أحد شهود العيان قدم وصفا تقريبيا للسيارة الواقفة بجانب المحلّ وقت ارتكاب السرقة، والّتي انطلقت بطريقة مفاجئة بعد أن سمعت طلقات الرصاص بقليل. فتح ملفّ هذه السرقة والجريمة بعد حوالي ثلاثة عشر عاما من وقوعها أعاد للأذهان ذلك النّقاش الطّويل والصراع المرير الّذي عاشه حي ستانفورد في ذلك الزمن. كذلك خوف النّاس على أنفسهم وممتلكاتهم عاد من جديد. استئناف ملفّ هذه القضية كان بسبب ما أذاعته اللجنة المفوضة بمتابعة السرقة والجريمة عن توصلها إلى دليل مادي قد يوصل إلى مرتكب السرقة والجريمة. الإعلان كان في الحقيقة لجريمة أخرى وقعت في نفس الحي سنة 2002، ولم يكن لجريمة 1990. النّتيجة الّتي يتوقّعها خبراء الجريمة والسرقات أن المحقّقين في سرقة وجريمة كهذه والّتي تتّصف بقلّة الأدلّة لن يتوصلوا إلى نتيجة. كما توقّع خبراء الجريمة والسرقات، فقد أغلق ملفّ القضية مرة أخرى وللأبد من بعد ثلاثة عشر يوما من استئنافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 3: High-Frequency vowelized and *shaddah* Text

حدثت هذه السرِقَة في حي ستَانفُورد، في مدينَة سياتل، في العاشر من ديسمبر 1990. هذَا الحي لَم يعرِف السرِقَة ولا الجريمة لِتسعة عشَر عاما. المستَغرب في الأَمر أَن السرِقَة وقَعت في الثانية ظُهرا من يوم الأَربِعاء، في محلّ كَبِير لِبيع المواد الغذَائِية ومع ذَلِك لَم يكتَشَف مرتَكبها؛ فَالشارِع الذي أُرتُكبت فيه السرِقَة كَان مزدحما في تلك الساعة بِالموظفين العاملين في المؤَسسات الحكُومية والشرِكَات التجارِية التي عرِف الحي بِها. المؤَسسات والشرِكَات في هذَا الحي تُعطي موظفيها ساعة واحدة لِلغَداء، وذَلِك من الساعة الواحدة والنصف حتى الساعة الثانية والنصف؛ لِذَا كَان متَوقعا أَن يكُون الشارِع الذي وقَعت فيه السرِقَة مزدحما بِشُهود العيان، ومع ذَلِك لَم يأت أَحد يدلِي بِشَهادته كَشَاهد عيان علَى السرِقَة، ويعطي ملامح مرتَكبها حتى ولَو تَقرِيبِية. وقُوع هذه السرِقَة في وقت النهار دون الإِمساك بالسارِق أَدخَل الرعب والخَوف علَى الناس الذين يسكُنُون في حي ستَانفُورد، كَما أَشَار إِلَى ذَلِك التقرِير الذي صدر عن اللَجنَة المسؤُولَة عن السرِقَات والجرِيمة في مدينَة سياتل. اتهم الناس الذين يسكُنُون في الحي مركَز الشرطَة بِتَقصيره في استتباب الأَمن وبِتَقصيره في التواجد في مكَان يزدحم بِالناس كَهذَا الشارِع. كَذَلِك اتهموا لَجنَة التحقيق بِالتكَاسل والإِخفَاق في الإِمساك بِالسارِق. أَسفَر عن هذه الحادثَة أَن سرِق كُلّ المال الذي كَان في خَزِينَة المحلّ، وكَذَلِك مقتَل زبونَة في المحلّ حينَما كَانت تَتَجاذَب الحديث مع أَحد البائِعين الذي كَان يعد لَها الأَغراض. قَدر المال الذي سرِق عشرة آلَاف دولَار. هذَا المال المسروق كَان رِبح المحلّ في ذَلِك اليوم واليوم الذي كَان قَبلَه؛ لِأَن المحاسب المسؤُول عن جمع مكَاسب المحلّ اليومية قَد أُصيب بِمرض فَلَم يأت في ذَلِك اليوم. صوت من الرصاص، قيل طَلقَة أَو طَلقَتَين، سمعت آتية من المحلّ الذي حصلت فيه السرِقَة والجرِيمة، كَما أَخبر بِذَلِك صاحب المخبز الذي يقَع بِجِوار محلّ بيع المواد الغذَائِية. أُتهم مركَز الشرطَة بِالتقصير والتكَاسل؛ لِأَنه لَم يوفر الأَمن اللازِم في مكَان يزدحم بِالناس. كَذَلِك حين وقُوع هذه السرِقَة والجرِيمة استجابة مركَز الشرطَة وحضوره إِلَى مكَان الحادث لَم يكُن فَورِيا، وإِنما كَان بطيئا، الأَمر الذي دعا بِبلَدية المدينَة إِلَى تَغيير إِدارة الشرطَة كُلّها بِطَاقم آخَر. أَما لَجنَة التحقيق فَوصفت بِالفَشَل؛ لِأَن هوِية السارِق القَاتل لَم تُكتَشَف علما بِأَن أَحد شُهود العيان قَدم وصفا تَقرِيبِيا لِلسيارة الواقفَة بِجانب المحلّ وقت ارتكَاب السرِقَة، والتي انطَلَقت بِطَرِيقَة مفَاجِئَة بعد أَن سمعت طَلَقَات الرصاص بِقَليل. فَتح ملَفّ هذِه السرِقَة والجرِيمة بعد حوالَي ثَلَاثَة عشَر عاما من وقُوعها أَعاد لِلأَذهان ذَلِك النقَاش الطوِيل والصراع المرِير الذي عاشه حي ستَانفُورد في ذَلِك الزمن. كَذَلِك خَوف الناس علَى أَنفُسهم وممتَلَكَاتهم عاد من جديد. استئنَاف ملَفّ هذه القَضية كَان بِسبب ما أَذَاعته اللَجنَة المفَوضة بِمتَابعة السرِقَة والجرِيمة عن تَوصلها إِلَى دلِيل مادي قَد يوصل إِلَى مرتَكب السرِقَة والجرِيمة. الإِعلان كَان في الحقيقَة لِجرِيمة أُخرى وقَعت في نَفس الحي سنَة 2002، ولَم يكُن لِجرِيمة 1990. النتيجة التي يتَوقعها خُبراء الجرِيمة والسرِقَات أَن المحققين في سرِقَة وجرِيمة كَهذه، والتي تَتصف بِقلة الأَدلة لَن يتَوصلُوا إِلَى نَتيجة. كَما تَوقع خُبراء الجرِيمة والسرِقَات، فَقَد أُغلق ملَفّ القَضية مرة أُخرى ولِلأَبد من بعد ثَلَاثَة عشَر يوما من استئنَافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 4: High-Frequency only-vowelized Text

حدثت هذه السرِقة في حي ستَانفُورد، في مدينَة سياتل، في العاشر من ديسمبر 1990. هذَا الحي لَم يعرِف السرِقة ولا الجريمة لِتسعة عشَر عاما. المستَغرب في الأمر أَن السرِقة وقَعت في الثَانية ظُهرا من يوم الأَربِعاء، في محل كبِير لِبيع المواد الغذَائِية ومع ذَلِك لَم يكتَشَف مرتَكبها؛ فَالشَارِع الذِي أُرتُكبت فيه السرِقة كَان مزدحما في تلك الساعة بِالموظَفين العاملين في المؤَسسات الحكُومية والشَرِكات التجارِية التِي عرِف الحي بِها. المؤَسسات والشَرِكات في هذَا الحي تُعطي موظَفيها ساعة واحدة لِلغَداء، وذَلِك من الساعة الواحدة والنصف حتى الساعة الثَانية والنصف؛ لِذَا كَان متَوقَعا أَن يكُون الشَارِع الذِي وقَعت فيه السرِقة مزدحما بِشُهود العيان، ومع ذَلِك لَم يأت أَحد بِدلِي بِشَهادته كَشَاهد عيان علَى السرِقة، ويعطي ملامح مرتَكبها حتَى ولَو تَقرِيبية. وقُوع هذه السرِقة في وقت النَهار دون الإِمساك بالسارِق أَدخَل الرعب والخَوف علَى النَاس الذِين يسكُنُون في حي ستَانفُورد، كما أَشَار إِلَى ذَلِك التَقرِير الذِي صدر عن اللَجنَة المسؤُولَة عن السرِقَات والجرِيمة في مدينَة سياتل. اتَهم النَاس الذِين يسكُنُون في الحي مركز الشُرطَة بِتَقصيره في استتباب الأَمن وبِتَقصيره في التَواجد في مكان يزدحم بِالنَاس كهذَا الشَارِع. كذَلِك اتَهموا لَجنَة التَحقيق بِالتَكاسل والإِخفَاق في الإِمساك بِالسارِق. أَسفَر عن هذه الحادثَة أَن سرِق كُل المال الذِي كَان في خَزِينَة المحل، وكذَلِك مقتَل زبونَة في المحل حينَما كانت تَتَجاذَب الحديث مع أَحد البائِعين الذِي كَان يعد لَها الأَغراض. قَدر المال الذِي سرِق عشرة آلاَف دولاَر. هذَا المال المسروق كَان رِبح المحل في ذَلِك اليوم واليوم الذِي كَان قَبلَه؛ لِأَن المحاسب المسؤُول عن جمع مكاسب المحل اليومية قَد أُصيب بِمرض فَلَم يأت في ذَلِك اليوم. صوت من الرصاص، قيل طَلقَة أَو طَلقَتَين، سمعت آتية من المحل الذِي حصلت فيه السرِقة والجرِيمة، كما أَخبر بِذَلِك صاحب المخبز الذِي يقَع بِجِوار محل بيع المواد الغذَائِية. أُتُهم مركز الشُرطَة بِالتَقصير والتَكاسل؛ لِأَنَه لَم يوفر الأَمن اللازِم في مكان يزدحم بِالنَاس. كذَلِك حين وقُوع هذه السرِقة والجرِيمة استجابة مركز الشُرطَة وحضوره إِلَى مكان الحادث لَم يكُن فَورِيا، وإِنَما كَان بطيئا، الأَمر الذِي دعا بِبلَدية المدينَة إِلَى تَغيير إِدارة الشُرطَة كُلها بِطَاقم آخَر. أَما لَجنَة التَحقيق فَوصفت بِالفَشَل؛ لِأَن هوية السارِق القَاتل لَم تُكتَشَف علما بِأَن أَحد شُهود العيان قَدم وصفا تَقرِيبيا لِلسيارة الواقفَة بِجانب المحل وقت ارتكاب السرِقة، والتي انطَلقَت بِطَرِيقَة مفَاجِئَة بعد أَن سمعت طَلقَات الرصاص بِقَليل. فَتح ملَف هذِه السرِقة والجرِيمة بعد حوالَي ثَلاثَة عشَر عاما من وقُوعها أَعاد لِلأذهان ذَلِك النقَاش الطَوِيل والصراع المرِير الذِي عاشه حي ستَانفُورد في ذَلِك الزمن. كذَلِك خَوف النَاس علَى أَنفُسهم وممتَلَكاتهم عاد من جديد. استئنَاف ملَف هذه القَضية كَان بِسبب ما أَذَاعته اللَجنَة المفَوضة بِمتَابعة السرِقة والجرِيمة عن تَوصلها إِلَى دلِيل مادي قَد يوصل إِلَى مرتَكب السرِقة والجرِيمة. الإِعلان كَان في الحقيقَة لِجرِيمة أُخرى وقَعت في نَفس الحي سنَة 2002، ولَم يكُن لِجرِيمة 1990. النَتيجة التي يتَوقَعها خُبراء الجرِيمة والسرِقَات أَن المحققين في سرِقة وجرِيمة كهذه، والتي تَتَصف بِقلَة الأَدلَة لَن يتَوصلُوا إِلَى نَتيجة. كما تَوقَع خُبراء الجرِيمة والسرِقَات، فَقَد أُغلق ملَف القَضية مرة أُخرى ولِلأَبد من بعد ثَلاثَة عشَر يوما من استئنَافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 5: High-Frequency wrongly-vowelized Text

حدثت هذه السرِقَة في حي ستَانفُورد، في مدينَة سياتل، في العاشر من ديسمبر 1990. هذَا الحي لُم يعرِف السرِقَة ولا الجرِيمة لَتُسعة عشَر عاما. المستَغرب في الأمر ُأن السرِقَة وقَعت في الثانية ظُهرا من يوم الأربِعاء، في محلّ كُبِير ِلبيع المواد الغذَائِية ومع ذُِلك لَم يكتَشَف مرتَكبها؛ فَالشارِع الذي اُرتَكبت فيه السرِقَة كَان مزدحما فُي تلك الساعة بِالموظفين العاملين فُي المؤَسسات الحكُومية والشرِكَات التجِارية التي عرِف الحي بِها. المؤسسات والشرِكَات في هذَا الحي تُعطي موظفيها ساعة واحدة لَلغداء، وذَِلك من الساعة الواحدة وِالنصف حتى الساعة الثانية والنصف؛ ِلذَا كَان متَوقعا َأن يكُون الشارِع الذي وقَعت فيه السرِقَة مزدحما بِشُهود العيان، ومع ذُِلك لَم يأت َأحد يدِلي بِشَهادته كُشَاهد عيان علَى السرِقَة، ويعطُي ملامح مرتَكبها حتى ولَو تُقرِيبِية. وقُوع هذه السرِقَة في وِقت النهار دون الإِمساك بِالسارِق ِأدخُل الرعب والخَوف علَى الناس الذُين يسكُنُون في حي ستَانفُورد، كَما ُأشُار ِإلَى ذَِلك التقرِير الذي صدر عن اللَجنَة المسؤُولَة عن السرِقَات والجرِيمة في مدينَة سياتل. اتهم الناس الذين يسكُنُون في الحي مركَز الشرطُة بِتَقصيره في استتباب الأمن وبتَقصيره في التواجد في مكان يزدحم بالناس كَهذَا الشارِع. كَذَِلك اتهموا لَجنَة التحقَيق بِالتكاسل والإِخفَاق في الإِمساك بالسارِق. َأسفَر عن هذه الحادثَة ُأن سرِق كُلّ المال الذي كُان في خَزِينَة المحلّ، وكُذَِلك مقتَل زبونَة في المحلّ حينَما كُانت تَتَجاذَب الحديث مع َأحد البائُعين الذي كَان يعد لَها الأَغراض. قَدر المال الذي سرِق عشرة آلَاف دولَار. هذَا المال المسروق كَان رِبح المحلّ في ذُِلك اليوم واليوم الذي كُان قَبلَه؛ لَِأن المحاسب المسؤُول عن جمع مكَاسب المحلّ اليومية قَد ُأصيب بِمرض فَلَم يأت في ذُِلك اليوم. صوت من الرصاص، قيل طُلقُة َأو طَلقَتَين، سمعت آتية من المحلّ الذي حصلت فيه السرِقَة والجرِيمة، كَما َأخبر بِذَِلك صاحب المخبز الذي يقَع بِجِوار محلّ بيع المواد الغذَائِية. ُأتهم مركُز الشرطَة بِالتقصير والتكاسل؛ لَأنه لُم يوفر الأمن اللازِم في مكُان يزدحم بِالناس. كَذَِلك حين وقُوع هذه السرِقَة والجرِيمة استجابة مركُز الشرطَة وحضوره ِإلَى مكَان الحادث لَم يكُن فَوريا، وِإنما كُان بطيئا، الأمر الذي دعا بِبلَدية المدينَة ِإلَى تَغيير ِإدارة الشرطَة كُلّها بِطَاقم آخَر. َأما لَجنَة التحقيق فَوصفت بِالفُشل؛ لَِأن هوِية السارِق القَاتل لَم تُكتُشُف علما بِأن َأحد شُهود العيان قدم وصفا تَقرِيبِيا ِللسيارة الواقفَة بِجانب المحلّ وقت ارتكَاب السرِقَة، والتي ُانطُلُقت بِطَرِيقَة مفَاجِئَة بعد َأن سمعت طلُقَات الرصاص بِقَليل. فَتح ملَفّ هذه السرِقَة والجرِيمة بعد حوالَي ثلاُثَة عشَر عاما من وقُوعها ِأعاد ِللأذهان ذَِلك النقَاش الطوِيل والصراع المرِير الذي عاشه حي ستَانفُورد في ذَِلك الزمن. كُذَِلك خَوف الناس علَى َأنفُسهم وممتَلَكَاتهم عاد من جديد. اَستُئنُاف ملَفّ هذه القَضية كَان بِسبب ماأَذُاعته اللَجنَة المفَوضة بِمتَابعة السرِقَة والجِرِيمة عن تَوصلها ِإلَى دِليل مادي قُد يوصل ِإلَى مرتَكب السرِقَة والجِرِيمة. الإِعلاَن كَان في الحقيقَة لُجِرِيمة ُأخرى وقَعت في نَفس الحي سنَة 2002، ولَم يكُن ِلجرِيمة 1990. النتيجة التي يتَوقعها خبراء الجرِيمة والسرِقَات َأن المحققُين في سرِقَة وجرِيمة كُهذه، والتي تَتصف بِقلة الأدلة لُن يتَوصلُوا ِإلَى نَتيجة. كَما تَوقع خبرِاء الجرِيمة والسرِقَات، فَقَد ُأغلق ملُفّ القَضية مرة ُأخرى ولِلأبد من بعد ثَلَاثَة عشَر يوما من اُستُئنُافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

II. Comprehension Low-Frequency Texts
Text 1: Low-Frequency Plain

ارتكبت هذه الجريمة في حي الريفيرا، في مدينة باريس، في العشرين من نوفمبر 1988. هذا الحي لم يخبر الجريمة ولا السرقة لسبعة عشر حولا. المدهش في الأمر أن الجريمة وقعت في الثانية والنصف ظهرا من يوم الجمعة، في محل صغير لبيع المشروبات الطازجة ومع ذلك لم يكتشف مرتكبها؛ فالشارع الذي حدثت فيه الجريمة كان مكتظا في ذلك الوقت بالموظفين العاملين في الشركات التجارية والمؤسسات الحكومية التي عرف الحي بها. الشركات والمؤسسات في هذا الحي تعطي موظفيها ساعة ونصفا للغداء، وذلك من الساعة الثانية حتى الساعة الثالثة والنصف؛ لذا كان مترقبا أن يزدحم الشارع الذي وقعت فيه السرقة بشهود العيان، ومع ذلك لم يأت أحد يدلي بشهادته كشاهد عيان على الجريمة ويصف ملامح مرتكبها حتى ولو تقريبية. وقوع هذه الجريمة في وضح النهار دون الإمساك بالمجرم أدخل الهلع والجزع على الناس الذين يقطنون حي الريفيرا، كما أشار إلى ذلك التقرير الذي صدر عن اللجنة المسؤولة عن الجريمة والسرقات في مدينة باريس. أدان الناس الذين يعيشون في الحي مركز الشرطة لتقصيره في استتباب الأمن ولتقصيره في التواجد في مكان يكتظ بالناس كهذا الشارع. كذلك أدانوا لجنة التحقيق بالتقاعس والإخفاق في الإمساك بالمجرم. أسفر عن هذا الحدث أن قتلت بائعة في المحل بينما كانت تتحاور مع زبون لها كانت تحادثه وهي تعد له المشروب، وكذلك سرقة نصف المال الذي كان في خزانة المحل. قدر المال الذي سرق ثلاثة آلاف فرنك. هذا المال المسروق كان ريع المحل في ذلك اليوم واليوم الذي كان قبله؛ إذ لم يأت المحاسب المسؤول عن جمع مكاسب المحل اليومية؛ إذ أصيب بحادث في ذلك اليوم. صوت من الرصاص، قيل طلقتين أو ثلاث طلقات، سمعت مدوية من المحل الذي حدثت فيه الجريمة والسرقة، كما أخبر بذلك صاحب المغسلة التي تقع بجوار محل المشروبات الطازجة. أنب مركز الشرطة لتقصيره وتقاعسه؛ لأنه لم يوفر الأمن اللازم في مكان يكتظ بالناس. كذلك حين وقوع هذه الجريمة والسرقة استجابة مركز الشرطة وحضوره إلى مكان الحدث لم يكن آنيا، وإنما كان بطيئا، الأمر الذي دعا بعمدة المدينة إلى استبدال إدارة الشرطة كلها بطاقم آخر. أما لجنة التحقيق فنعيت بالفشل؛ لأن هوية القاتل السارق لم تكتشف علما بأن أحد شهود العيان قدم وصفا للسيارة الواقفة بجانب المحل ساعة ارتكاب الجريمة، والتي انطلقت بطريقة مباغتة بعد أن سمعت طلقات الرصاص بقليل. فتح ملف هذه الجريمة والسرقة بعد حوالي خمسة عشر حولا من وقوعها أحيا في العقول ذلك الجدل الطويل والصراع المحتدم الذي عاشه حي الريفيرا في ذلك الزمن. كذلك جزع الناس على أنفسهم وممتلكاتهم عاد من جديد. استئناف ملف القضية كان بسبب ما أذاعته اللجنة الموكلة بمتابعة الجريمة والسرقة عن عثورها على دليل مادي قد يوصل إلى مرتكب الجريمة والسرقة. البلاغ كان في الحقيقة لجريمة أخرى وقعت في نفس الحي سنة 2003، ولم يكن لجريمة 1988. النتيجة التي يتنبأ بها خبراء الجريمة والسرقات أن المحققين في جريمة وسرقة كهذه، والتي تتسم بقلة الأدلة لن يتوصلوا إلى حل. كما تنبأ خبراء الجريمة والسرقات، فقد سكر ملف القضية مرة أخرى وللأبد من بعد سبعة عشر يوما من استئنافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 2: Low-Frequency only-*shaddah* Text

ارتكبت هذه الجريمة في حي الريفيرا، في مدينة باريس، في العشرين من نوفمبر 1988. هذا الحي لم يخبر الجريمة ولا السرقة لسبعة عشر حولا. المدهش في الأمر أن الجريمة وقعت في الثّانية والنّصف ظهرا من يوم الجمعة، في محلّ صغير لبيع المشروبات الطّازجة ومع ذلك لم يكتشف مرتكبها؛ فالشّارع الّذي حدثت فيه الجريمة كان مكتظّا في ذلك الوقت بالموظّفين العاملين في الشّركات التّجارية والمؤسسات الحكومية الّتي عرف الحي بها. الشّركات والمؤسسات في هذا الحي تعطي موظّفيها ساعة ونصفا للغداء، وذلك من الساعة الثّانية حتّى الساعة الثّالثة والنّصف؛ لذا كان مترقّبا أن يزدحم الشّارع الّذي وقعت فيه السرقة بشهود العيان، ومع ذلك لم يأت أحد يدلي بشهادته كشاهد عيان على الجريمة ويصف ملامح مرتكبها حتّى ولو تقريبية. وقوع هذه الجريمة في وضح النّهار دون الإمساك بالمجرم أدخل الهلع والجزع على النّاس الّذين يقطنون حي الريفيرا، كما أشار إلى ذلك التّقرير الّذي صدر عن اللجنة المسؤولة عن الجريمة والسرقات في مدينة باريس. أدان النّاس الّذين يعيشون في الحي مركز الشّرطة لتقصيره في استتباب الأمن ولتقصيره في التّواجد في مكان يكتظّ بالنّاس كهذا الشّارع. كذلك أدانوا لجنة التّحقيق بالتّقاعس والإخفاق في الإمساك بالمجرم. أسفر عن هذا الحدث أن قتلت بائعة في المحلّ بينما كانت تتحاور مع زبون لها كانت تحادثه وهي تعد له المشروب، وكذلك سرقة نصف المال الّذي كان في خزانة المحلّ. قدر المال الّذي سرق ثلاثة آلاف فرنك. هذا المال المسروق كان ريع المحلّ في ذلك اليوم واليوم الّذي كان قبله؛ إذ لم يأت المحاسب المسؤول عن جمع مكاسب المحلّ اليومية؛ إذ أصيب بحادث في ذلك اليوم. صوت من الرصاص، قيل طلقتين أو ثلاث طلقات، سمعت مدوية من المحلّ الّذي حدثت فيه الجريمة والسرقة، كما أخبر بذلك صاحب المغسلة الّتي تقع بجوار محلّ المشروبات الطّازجة. أنّب مركز الشّرطة لتقصيره وتقاعسه؛ لأنّه لم يوفّر الأمن اللاّزم في مكان يكتظّ بالنّاس. كذلك حين وقوع هذه الجريمة والسرقة استجابة مركز الشّرطة وحضوره إلى مكان الحدث لم يكن آنيا، وإنّما كان بطيئا، الأمر الّذي دعا بعمدة المدينة إلى استبدال إدارة الشّرطة كلّها بطاقم آخر. أما لجنة التّحقيق فنعيت بالفشل؛ لأن هوية القاتل السارق لم تكتشف علما بأن أحد شهود العيان قدم وصفا للسيارة الواقفة بجانب المحلّ ساعة ارتكاب الجريمة، والّتي انطلقت بطريقة مباغتة بعد أن سمعت طلقات الرصاص بقليل. فتح ملفّ هذه الجريمة والسرقة بعد حوالي خمسة عشر حولا من وقوعها أحيا في العقول ذلك الجدل الطّويل والصراع المحتدم الّذي عاشه حي الريفيرا في ذلك الزمن. كذلك جزع النّاس على أنفسهم وممتلكاتهم عاد من جديد. استئناف ملفّ القضية كان بسبب ما أذاعته اللجنة الموكّلة بمتابعة الجريمة والسرقة عن عثورها على دليل مادي قد يوصل إلى مرتكب الجريمة والسرقة. البلاغ كان في الحقيقة لجريمة أخرى وقعت في نفس الحي سنة 2003، ولم يكن لجريمة 1988. النّتيجة الّتي يتنبأ بها خبراء الجريمة والسرقات أن المحقّقين في جريمة وسرقة كهذه والّتي تتّسم بقلّة الأدلّة لن يتوصلوا إلى حلّ. كما تنبأ خبراء الجريمة والسرقات، فقد سكّر ملفّ القضية مرة أخرى وللأبد من بعد سبعة عشر يوما من استئنافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 3: Low-Frequency vowelized and *shaddah* Text

أُرتُكبت هذه الجرِيمة في حي الريفيرا، في مدينَة بارِيس، في العشرِين من نُوفمبر1988. هذَا الحي لَم يخبر الجرِيمة ولا السرِقَة لِسبعة عشَر حولا. المدهش في الأَمر أَن الجرِيمة وقَعت في الثانية والنصف ظُهرا من يوم الجمعة، في محلّ صغير لِبيع المشروبات الطازجة ومع ذَلِك لَم يكتَشَف مرتَكبها؛ فَالشارِع الذي حدثت فيه الجرِيمة كَان مكتَظّا في ذَلِك الوقت بِالموظفين العاملين في الشرِكَات التجارِية والمؤَسسات الحكُومية التي عرِف الحي بِها. الشرِكَات والمؤَسسات في هذَا الحي تُعطي موظفيها ساعة ونصفا لِلغَداء، وذَلِك من الساعة الثانية حتى الساعة الثالِثَة والنصف؛ لِذَا كَان متَرقبا أَن يزدحم الشارِع الذي وقَعت فيه السرِقَة بِشُهود العيان، ومع ذَلِك لَم يأت أَحد يدلِي بِشَهادته كَشَاهد عيان علَى الجرِيمة ويصف ملامح مرتَكبها حتى ولَو تَقرِيبِية. وقُوع هذه الجرِيمة في وضح النهار دون الإمساك بِالمجرِم أَدخَل الهلَع والجزع علَى الناس الذين يقطُنُون حي الريفيرا، كَما أَشَار إِلَى ذَلِك التقرِير الذي صدر عن اللَجنَة المسؤُولَة عن الجرِيمة والسرِقَات في مدينَة بارِيس. أَدان الناس الذين يعيشُون في الحي مركَز الشرطَة لِتَقصيره في استتباب الأَمن ولِتَقصيره في التواجد في مكان يكتَظّ بِالناس كَهذَا الشارِع. كَذَلِك أَدانُوا لَجنَة التحقيق بِالتقَاعس والإِخفَاق في الإِمساك بِالمجرِم. أَسفَر عن هذَا الحدث أَن قُتلت بائِعة في المحلّ بينَما كَانت تَتَحاور مع زبون لَها كَانت تُحادثه وهي تُعد لَه المشروب، وكَذَلِك سرِقَة نصف المال الذي كَان في خزانَة المحلّ. قَدر المال الذي سرِق ثَلاثَة آلاَف فرنك. هذَا المال المسروق كَان ريع المحلّ في ذَلِك اليوم واليوم الذي كَان قَبله؛ إِذ لَم يأت المحاسب المسؤُول عن جمع مكاسب المحلّ اليومية؛ إِذ أُصيب بِحادث في ذَلِك اليوم. صوت من الرصاص، قيل طَلقَتَين أَو ثَلاَث طَلَقَات، سمعت مدوية من المحلّ الذي حدثت فيه الجرِيمة والسرِقَة، كَما أَخبر بِذَلِك صاحب المغسلَة التي تَقَع بِجِوار محلّ المشروبات الطازجة. أُنب مركَز الشرطَة لِتَقصيره وتَقَاعسه؛ لِأَنه لَم يوفر الأَمن اللازِم في مكان يكتَظّ بِالناس. كَذَلِك حين وقُوع هذه الجرِيمة والسرِقَة استجابة مركَز الشرطَة وحضوره إِلَى مكان الحدث لَم يكُن آنيا، وإِنما كَان بطيئا، الأَمر الذي دعا بِعمدة المدينَة إِلَى استبدال إِدارة الشرطَة كُلّها بِطَاقم آخَر. أَما لَجنَة التحقيق فَنُعيت بِالفَشَل؛ لِأَن هوِية القَاتل السارِق لَم تُكتَشَف علما بِأَن أَحد شُهود العيان قَدم وصفا لِلسيارة الواقفَة بِجانب المحلّ ساعة ارتكَاب الجرِيمة، والتي انطَلَقت بِطَرِيقَة مباغتَة بعد أَن سمعت طَلَقَات الرصاص بِقَليل. فَتح ملَفّ هذه الجرِيمة والسرِقَة بعد حوالَي خَمسة عشَر حولا من وقُوعها أَحيا في العقُول ذَلِك الجدل الطوِيل والصراع المحتَدم الذي عاشه حي الريفيرا في ذَلِك الزمن. كَذَلِك جزع الناس علَى أَنفُسهم وممتَلَكَاتهم عاد من جديد. استئنَاف ملَفّ القَضية كَان بِسبب ما أَذَاعته اللَجنَة الموكلَة بِمتَابعة الجرِيمة والسرِقَة عن عثُورها علَى دلِيل مادي قَد يوصل إِلَى مرتَكب الجرِيمة والسرِقَة. البلاغ كَان في الحقيقَة لِجرِيمة أُخرى وقَعت في نَفس الحي سنَة 2003، ولَم يكُن لِجرِيمة 1988. النتيجة التي يتَنَبأ بِها خُبراء الجرِيمة والسرِقَات أَن المحققين في جرِيمة وسرِقَة كَهذه، والتي تَتسم بِقلة الأَدلة لَن يتَوصلُوا إِلَى حلّ. كَما تَنَبأ خُبراء الجرِيمة والسرِقَات، فَقَد سكر ملَفّ القَضية مرة أُخرى ولِلأَبد من بعد سبعة عشَر يوما من استئنَافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 4: Low-Frequency only-vowelized Text

حدثت هذه السرِقَة في حي ستَانفُورد, في مدينَة سياتل، في العاشر من ديسمبر 1990. هذَا الحي لم يعرِف السرِقَة ولا الجريمة ِلتسعة عشَر عاما. الغَرِيب في الأمر َأن السرِقَة وقَعت في الواحدة ظُهرا من يوم الأرِبعاء، في محل كَبِير ِلبيع المواد الغذَائِية ومع ذَلِك لم يكتَشَف مرتَكبها، فَالشَارِع الذي أُرتُكبت فيه السرِقَة كان مزدحما في تلك الساعة بِالموظَفين العاملين في المؤَسسات الحكُومية والشَرِكات التجارِية التي عرِف الحي بِها. المؤَسسات والشَرِكات في هذَا الحي تُعطي موظَفيها ساعة واحدة ِللغَداء، وذَلِك من الساعة الواحدة والنصف حتَى الساعة الثَانية والنصف؛ ِلذَا كان متَوقَعا َأن يكُون الشَارِع الذي وقَعت فيه السرِقَة مزدحما بِشُهود العيان، ومع ذَلِك لم يأت َأحد بِدلِي بِشَهادته كَشَاهد عيان علَى السرِقَة، ويعطي ملامح مرتَكبها حتَى ولو تَقرِيبية. وقُوع هذه السرِقَة في وقت النَهار دون الإمساك بالسارِق َأدخَل الرعب والخَوف علَى النَاس الذين يسكُنُون في حي ستَانفُورد، كما َأشَار ِإلَى ذَلِك التَقرِير الذي صدر عن اللَجنة المسؤُولَة عن السرِقَات والجرِيمة في مدينة سياتل. اتَهم النَاس الذين يسكُنُون في الحي مركز الشُرطَة بِتَقصيره في استتباب الأمن وبِتَقصيره في التَواجد في مكان يزدحم بِالنَاس كهذَا الشَارِع. كَذَلِك اتَهموا لَجنَة التحقيق بِالتَكاسل والإِخفَاق في الإمساك بِالسارِق. َأسفَر عن هذه الحادثَة َأن سرِق كُل المال الذي كان في خَزِينَة المحل وكَذَلِك مقتَل زبونَة في المحل حينَما كانت تَتَجاذَب الحديث مع َأحد البائِعين الذي كان يعد لَها الأغراض.

قَدر المال الذي سرِق عشرة آلاف دولار. هذَا المال المسروق كان رِبح المحل في ذَلِك اليوم واليوم الذي قَبلَه، لأن المحاسب المسؤُول عن جمع مكاسب المحل اليومية قَد ُأصيب بِمرض فَلَم يأت في ذَلِك اليوم. صوت من الرصاص، قيل طَلَقَة َأو طَلقَتَين سمعت آتية من المحل الذي حصلت فيه السرِقَة والجرِيمة كما َأخبر بِذَلِك صاحب المخبز الذي يقَع بِجِوار محل بيع المواد الغذَائِية. اُتُهِم مركز الشُرطَة بِالتَقصير والتَكاسل لأنَه لم يوفر الأَمن اللازِم في مكان يزدحم بِالنَاس. كَذَلِك حين وقُوع هذه السرِقَة والجرِيمة لم تَكُن استجابة مركز الشُرطَة وحضور َأفراده ِإلَى مكان الحادث فَورِيا، وِإنَما كان بطيئا، الأمر الذي دعا بِلَدية المدينَة ِإلَى تَغيير ِإدارة الشُرطَة كُلها بِطَاقَم آخَر. َأما لَجنَة التَحقيق فَوصفت بِالفَشَل لأن هوية السارِق القَاتل لم تُكتَشَف علما بِأن َأحد شُهود العيان قَدم وصفا تَقرِيبيا ِللسيارة الواقفة بِجانب المحل وقت ُأرتُكبت السرِقَة، والتي انطَلَقت بِطَرِيقَة مفَاجِئَة بعد َأن سمع طَلَقَات الرصاص بِقَليل. فَتح ملَف هذه السرِقَة والجرِيمة بعد حوالَي ثَلاثَة عشَر عاما من وقُوعها َأعاد ِللأذهان ذَلِك النقَاش الطَوِيل والصراع المرِير الذي عاش حي ستَانفُورد في ذَلِك الزمن. كَذَلِك خَوف الناس علَى َأنفُسهم وممتَلَكاتهم عاد من جديد. استئنَاف ملَف هذه القَضية كان بِسبب ما َأذَاعته اللَجنَة المفَوضة بِمتَابعة السرِقَة والجرِيمة عن تَوصلها ِإلَى دِلِيل مادي قَد يوصل ِإلَى مرتَكب السرِقَة والجرِيمة. الإِعلان كان في الحقيقَة ِلجرِيمة ُأخرى وقَعت في نَفس الحي سنَة 2002، ولَم يكُن ِلجرِيمة 1990.

النَتيجة التي يتَوقَعها خُبراء الجرِيمة والسرِقَات َأن المحققين في سرِقَة وجرِيمة كَهذه والتي تَتَصف بِقلَة الأدلَة لن يتَوصلُوا ِإلَى نَتيجة. كما تَوقَع خُبراء الجرِيمة والسرِقَات، ُأغلق ملَف القَضية مرة ُأخرى وللأبد من بعد ثَلاثَة عشَر يوما من استئنَافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 5: Low-Frequency wrongly-vowelized Text

أرتُكبت هذه الجريمة في حي الريفيرا، في مدينَة باريس، في العشرين من نُوفمبر1988. هذَا الحي لُم يخبر الجريمة ولا السرقَة لَسبعة عشَر حولا. المدهش في الأمر ُأن الجريمة وقَعت في الثانية والنصف ظُهرا من يوم الجمعة، فُي محلّ صغير لِبيع المشروبات الطازجة ومع ذَلِك لَم يكتَشَف مرتَكبها؛ فَالشارِع الذي حدثت فيه الجريمة كُان مكتَظّا في ذَلِك الوقت بالموظفين العاملين في الشرِكات التجارية والمؤَسسات الحكومية التي عرِف الحي بها. الشرِكات والمؤَسسات في هذَا الحي تُعطي موظفُيها ساعة ونصفا لِلغَداء، وذَلُك من الساعة الثانية حتى الساعة الثالِثَة والنصف؛ لِذَا كان متَرقبا ُأن يزدحم الشارِع الذي وقَعت فيه السرقة بشُهود العيان، ومع ذَلِك لُم يأت َأحد بدِلي بشَهادته كشَاهد عيان علَى الجريمة ويصف ملامح مرتُكبها حتى ولُو تَقريبية. وقُوع هذه الجريمة في وضح النهار دون الإمساك بالمجرِم َأدخَل الهلَع والجزع علَى الناس الذين يقطُنُون حي الريفيرا، كما َأشَار إلَى ذَلِك التقرير الذي صدر عن اللَجنَة المسؤُولَة عن الجريمة والسرقَات في مدينَة باريس. َأدان الناس الذين يعيشُون في الحي مركز الشرطَة لِتَقصيره في ُاستَتْباب الأَمن ولِتَقصيره في التواجد في مكان يكتَظّ بالناس كهذَا الشارِع. كذَلِك َأدانُوا لَجنَة التحقيق بالتقَاعس والإخفَاق في الإمساك بالمجرِم. َأسفَر عن هذَا الحدث َأن قُتلت بائِعة في المحلّ بينَما كانَت تَتَحاور مع زبون لَها كانت تُحادثه وهي تعد لَه المشروب، وكذَلِك سرِقَة نَصف المال الذي كان في خزانَة المحلّ. قَدر المال الذي سرِق ثلاثَة آلاَف فرنك. هذَا المال المسروق كُان ريع المحلّ في ذَلِك اليوم واليوم الذي كان قَبله؛ إذ لُم يأت المحاسب المسؤُول عن جمع مكاسب المحلّ اليومية؛ إذ ُأصيب بحادث في ذَلِك اليوم. صوت من الرصاص، قيل طَلَقَتَين َأو ثَلاَث طَلَقَات، سمعت مدوية من المحلّ الذي حدثت فيه الجريمة والسرِقَة، كما ِأخبر بِذَلِك صاحب المغسلَة التي تقُع بجِوار محلّ المشروبات الطازجة. ُأنب مركُز الشرطَة لِتَقصيره وتَقَاعسه؛ لأَنه لُم يوفر الأَمن اللازِم في مكُان يكتَظّ بالناس. كذَلِك حين وقُوع هذه الجريمة والسرِقَة استجابة مركُز الشرطَة وحضوره إلَى مكان الحدث لَم يكُن آنيا، وإنما كُان بطيئا، الأمر الذي دعا بعمدة المدِينَة إلَى استبدال إدارة الشرطَة كلّها بطَاقم آخَر. َأما لَجنَة التحقيق فَنُعيت بالفُشل؛ لأَن هوية القَاتل السارِق لَم تكتُشُف علما بَأن َأحد شُهود العيان قدم وصفا لِلسيارة الواقفَة بجانب المحلّ ساعة ارتكاب الجريمة، والتي انطَلَقت بطَريقُة مباغتَة بعد َأن سمعت طلَقَات الرصاص بقَليل. فَتح ملَفّ هذه الجريمة والسرِقَة بعد حوالَي خمسة عشَر حولا من وقُوعها ِأحيا في العقُول ذَلِك الجدل الطويل والصراع المحتَدم الذي عاشه حي الريفيرا في ذَلِك الزمن. كُذَلِك جزع الناس علَى َأنفُسهم وممتَلَكاتهم عاد من جديد. ُاستُئنُاف ملَفّ القَضية كان بسبب ماأُذُاعته اللَجنَة الموكلَة بمتَابعة الجريمة والسرِقُة عن عثُورها علَى دلِيل مادي قُد يوصل إلَى مرتَكب الجريمة والسرِقُة. البلاغ كان في الحقيقَة لُجِريمة ُأخرى وقَعت في نَفس الحي سنَة 2003 ولَم يكُن لِجريمة 1988. النتيجة التي يتَنَبأ بها خُبراء الجريمة والسرِقَات َأن المحققُين في جريمة وسرِقَة كُهذه، والتي تَتسم بقلة الأَدلة لُن يتَوصلُوا إلَى حلّ. كما تَنَبأ خبراء الجريمة والسرِقَات، فَقَد سكر ملُفّ القَضية مرة ُأخرى ولِلأَبد من بعد سبعة عشَر يوما من ُاستُئنُافه.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

III. Reading Accuracy High-Frequency Texts
Text 1: High-Frequency Plain

وقع انفجار مساء الأربعاء، في مدينة ساباولو البرازيلية، في أمريكا الجنوبية. كان الانفجار قويا، وقد أعلن الخبر في كل الوسائل المرئية والسمعية في أمريكا الجنوبية. حدث الانفجار في منطقة تجارية اشتهرت بتجمع المارة للتسوق والتنزه حيث المحلات التجارية وأماكن الترفيه. أسفر عن هذا الانفجار مقتل تسعة أشخاص من المارة؛ خمس من هؤلاء الضحايا كانوا نساء وأربعة منهم كانوا رجالا مسنين. لم يقتل في هذا الانفجار أي طفل. إذاعة الخبر أدخلت الرعب على كل من كان يسكن المدينة، كما أشارت إلى ذلك بعض المصادر المحلية. أيضا تسبب عن هذا الانفجار أن أفزعت الأقلية الصينية في هذه المدينة القديمة والمتميزة بوجود أقليات أجنبية عديدة. عمل كهذا في مدينة اتسمت بالهدوء ولد بلبلة وشغبا في مكان الحادث. وحول الممتلكات التي دمرت، فقد أوضح المصدر بأن الانفجار قد ألحق أضرارا بمساكن ومحلات تجارية مجاورة، وبأن زجاج الأبواب والنوافذ لهذه البيوت والمحلات قد تحطم. كذلك أكد المصدر أن الانفجار كان في سيارة مفخخة، وأن الجاني كان امرأة في العشرين من عمرها. الجانية -كما أوضح المصدر- تنتسب إلى حركة المتمردين اليسارية، وأن هذا التفجير كان لغرض الضغط على الحكومة البرازيلية اليمينية التي عرفت بعدم الاعتناء بالمشاكل المحلية والتي ترتبط بالمستوى المعيشي والصحي للفقراء. مستوى الفقر في البرازيل في ظل هذه الحكومة وصل إلى أعلى مستوياته؛ إذ بلغ متوسط دخل الفرد ألفا ومئتي دولار، وهو مستوى لم تعرفه البرازيل في الثلاثين سنة الأخيرة؛ إذ كان متوسط دخل الفرد عشرة آلاف دولار، وذلك قبل أن تتولى هذه الحكومة الحالية مقاليد السلطة.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 2: High-Frequency only-*shaddah* Text

وقع انفجار مساء الأربعاء، في مدينة ساباولو البرازيلية، في أمريكا الجنوبية. كان الانفجار قويا، وقد أعلن الخبر في كلّ الوسائل المرئية والسمعية في أمريكا الجنوبية. حدث الانفجار في منطقة تجارية اشتهرت بتجمع المارة للتّسوق والتّنزه حيث المحلاّت التّجارية وأماكن التّرفيه. أسفر عن هذا الانفجار مقتل تسعة أشخاص من المارة؛ خمس من هؤلاء الضحايا كانوا نساء وأربعة منهم كانوا رجالا مسنّين. لم يقتل في هذا الانفجار أي طفل. إذاعة الخبر أدخلت الرعب على كلّ من كان يسكن المدينة، كما أشارت إلى ذلك بعض المصادر المحلّية. أيضا تسبب عن هذا الانفجار أن أفزعت الأقلّية الصينية في هذه المدينة القديمة والمتميزة بوجود أقلّيات أجنبية عديدة. عمل كهذا في مدينة اتّسمت بالهدوء ولّد بلبلة وشغبا في مكان الحادث. وحول الممتلكات الّتي دمرت، فقد أوضح المصدر بأن الانفجار قد ألحق أضرارا بمساكن ومحلاّت تجارية مجاورة، وبأن زجاج الأبواب والنّوافذ لهذه البيوت والمحلاّت قد تحطّم. كذلك أكّد المصدر أن الانفجار كان في سيارة مفخّخة، وأن الجاني كان امرأة في العشرين من عمرها. الجانية - كما أوضح المصدر- تنتسب إلى حركة المتمردين اليسارية، وأن هذا التّفجير كان لغرض الضغط على الحكومة البرازيلية اليمينية الّتي عرفت بعدم الاعتناء بالمشاكل المحلية والّتي ترتبط بالمستوى المعيشي والصحي للفقراء. مستوى الفقر في البرازيل في ظلّ هذه الحكومة وصل إلى أعلى مستوياته؛ إذ بلغ متوسط دخل الفرد ألفا ومئتي دولار، وهو مستوى لم تعرفه البرازيل في الثّلاثين سنة الأخيرة؛ إذ كان متوسط دخل الفرد عشرة آلاف دولار، وذلك قبل أن تتولّى هذه الحكومة الحالية مقاليد السلطة.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 3: High-Frequency vowelized and *shaddah* Text

وقَع انفجار مساء الأَربِعاء، في مدينَة ساباولُو البرازِيلية، في أَمرِيكا الجنُوبِية. كان الاِنفجار قَوِيا، وقَد أُعلن الخَبر في كُلّ الوسائِل المرئِية والسمعية في أَمرِيكا الجنُوبِية. حدث الانفجار في منطقَة تجارِية أُشتُهِرت بِتَجمع المارة لِلتسوق والتنَزه حيث المحلات التجارِية وَأماكن الترفيه. أَسفَر عن هذَا الانفجار مقتَل تسعة أَشخَاص من المارة؛ خَمس من هؤُلاَء الضحايا كانُوا نساء، وَأربعة منهم كانُوا رِجالا مسنين. لَم يقتَل في هذَا الانفجار أَي طفل. إِذَاعة الخَبر أَدخَلت الرعب علَى كُلّ من كان يسكُن المدينَة، كما أَشَارت إِلَى ذَلِك بعض المصادر المحلية. أَيضا تَسبب عن هذَا الانفجار أَن أُفزِعت الأَقَلية الصينية في هذه المدينَة القَديمة والمتَميزة بِوجود أَقَليات أَجنَبِية عديدة. عمل كهذَا في مدينَة اتسمت بِالهدوء ولد بلبلَة وشَغَبا في مكان الحادث. وحول الممتَلَكات التي دمرت، فقَد أَوضح المصدر بِأَن الانفجار قَد أَلحق أَضرارا بِمساكن ومحلات تجارِية مجاوِرة، وبِأَن زجاج الأَبواب والنوافذ لِهذه البيوت والمحلات قَد تَحطم. كذَلِك أَكد المصدر أَن الانفجار كان في سيارة مفَخخَة، وَأن الجاني كان امرأَة في العشرِين من عمرها. الجانية - كما أَوضح المصدر- تَنتَسب إِلَى حركَة المتَمردين اليسارِية، وَأن هذَا التفجِير كان لِغَرض الضغط علَى الحكُومة البرازِيلية اليمينية التي عرِفت بِعدم الاعتنَاء بِالمشَاكل المحلية والتي تَرتَبِط بِالمستَوى المعيشي والصحي لِلفُقَراء. مستَوى الفَقر في البرازِيل في ظلّ هذه الحكُومة وصل إِلَى أَعلَى مستَوياته؛ إِذ بلَغ متَوسط دخل الفَرد أَلفا ومئَتي دولاَر، وهو مستَوى لَم تَعرِفه البرازِيل في الثلاَثين سنَة الأَخيرة؛ إِذ كان متَوسط دخل الفَرد عشرة آلاَف دولاَر، وذَلِك قَبل أَن تَتَولى هذه الحكُومة الحالِية مقَالِيد السلطَة.

هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 4: High-Frequency only-vowelized Text

وقَع انفجار مساء الأَربِعاء، في مدينَة ساباولُو البرازِيلية، في أَمرِيكا الجنُوبِية. كَان الِانفجار قَوِيا، وقَد أُعلِن الخَبر في كُل الوسائِل المرئِية والسمعية في أَمرِيكا الجنُوبِية. حدث الانفجار في منطقَة تجارِية أُشتُهِرت بِتَجمع المارة لِلتَسوق والتَنَزه حيث المحلاَت التجارِية وأَماكن التَرفيه. أَسفَر عن هذَا الانفجار مقتَل تسعة أَشخَاص من المارة؛ خَمس من هؤُلاَء الضحايا كُن نساء، وأَربعة منهم كَانُوا رِجالا مسنين. لَم يقتَل في هذَا الانفجار أَي طفل. إِذَاعة الخَبر أَدخَلت الرعب علَى كُل من كَان يسكُن المدينَة، كَما أَشَارت إِلَى ذَلِك بعض المصادر المحلية. أَيضا تَسبب عن هذَا الانفجار أَن أُفزِعت الأَقَلية الصينية في هذه المدينَة القَديمة والمتَميزة بِوجود أَقَليات أَجنَبِية عديدة. عمل كَهذَا في مدينَة اتَسمت بِالهدوء ولَد بلبلَة وشَغَبا في مكَان الحادث. وحول الممتَلَكَات الَتي دمرت، فَقَد أَوضح المصدر بِأَن الانفجار قَد أَلحق أَضرارا بِمساكن ومحلاَت تجارِية مجاوِرة، وبِأَن زجاج الأَبواب والنَوافذ لِهذه البيوت والمحلاَت قَد تَحطَم. كَذَلِك أَكَد المصدر أَن الانفجار كَان في سيارة مفَخَخَة، وأَن الجاني كَان امرأَة في العشرِين من عمرها. الجانية – كَما أَوضح المصدر- تَنتَسب إِلَى حركَة المتَمرِدين اليسارِية، وأَن هذَا التَفجِير كَان لِغَرض الضغط علَى الحكُومة البرازِيلية اليمينية الَتي عرِفت بِعدم الاعتنَاء بِالمشَاكل المحلية والَتي تَرتَبِط بِالمستَوى المعيشي والصحي لِلفُقَراء. مستَوى الفَقر في البرازِيل في ظل هذه الحكُومة وصل إِلَى أَعلَى مستَوياته؛ إِذ بلَغ متَوسط دخل الفَرد أَلفَا ومئَتَي دولاَر، وهو مستَوى لَم تَعرِفه البرازِيل في الثَلاثين سنَة الأَخيرة؛ إِذ كَان متَوسط دخل الفَرد عشرة آلاَف دولاَر، وذَلِك قَبل أَن تَتَولَى هذه الحكُومة الحالِية مقَالِيد السلطَة.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 5: High-Frequency wrongly-vowelized Text

وقَع انفجار مساء الأَربِعاء، فُي مدينَة ساباولُو البرازِيلية، في أَمريكا الجنُوبِية. كَان الِانفجار قَوِيا، وقَد أُعلن الخَبر في كَلّ الوسائِل المرئِية والسمعية في أَمريكا الجنُوبِية. حدث الانفجار في منطُقَة تجارِية أُشتُهرت بِتَجمع المارة لُلتسوق والتنَزه حيث المحلاُت التجارِية وَأماكن الترفيه. أَسفَر عن هذَا الانفجار مقتَل تسعة أَشخَاص من المارة؛ خَمس من هؤُلاَء الضحايا كَانَوا نَساء، وَأربعة منهم كَانُوا رجالا مسنين. لَم يقتَل في هذَا الانفُجار أَي طفل. إِذَاعة الخَبر أَدخلت الرعب علَى كُلّ من كُان يسكُن المدينَة، كَما أَشَارت إلَى ذَِلك بعض المصادر المحلية. أَيضا تَسبب عن هذَا الانفجار أَن أُفزِعت الأُقلية الصينية في هذه المدينَة القَديمة والمتَميزة بِوجود أَقَليات أَجنَبِية عديدة. عمل كَهذا في مدينَة اتسمت بِالهدوء ولد بلبلَة وشَغَبا في مكُان الحادث. وحول الممتَلَكات التُي دمرت، فَقَد أَوضح المصدر بِأَن الانفُجار قَد أَلحق أَضرارا بِمساكن ومحلاُت تجارِية مجاوِرة، وبِأَن زِجاج الأَبواب والنوافذ ِلهذه البيوت والمحلاُت قَد تَحطم. كَذَِلك أَكد المصدر أَن الانفجار كَان في سيارة مفَخخَة، وَأن الجاني كُان امرَأة في العشرِين من عمرها. الجانية -كَما أَوضح المصدر- تَنتَسب ِإلُى حركَة المتَمردين اليسارِية، وَأن هذا التفجِير كَان ِلغَرض الضغط علُى الحكُومة البرازِيلية اليمينية التي عرِفت بعدم الاعتنَاء بِالمشَاكل المحلية والتُي تَرتَبِط بِالمستَوى المعيشي والصحي ِللفَقُراء. مستَوى الفَقر في البرازِيل فُي ظلّ هذه الحكُومة وصل ِإلُى أَعلَى مستَوياته؛ ِإذ بلَغ متَوسط دخل الفَرد أَلفا ومئَتَي دولار، وهو مستَوى لَم تَعرِفه البِرازِيل في الثلاَثين سنَة الأَخيرة؛ ِإذ كُان متَوسط دخل الفَرد عشرة آلاَف دولار، وذَِلك قَبل أَن تتولى هذه الحكُومة الحاِلية مقَاِليد السلطُة.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

IV. Reading Accuracy Low-Frequency Texts
Text 1: Low-Frequency Plain

وقع انفجار ظهر الاثنين، في مدينة بوغوتا الكولومبية، في أمريكا اللاتينية. كان الانفجار شديدا، وقد أشيع النبأ في كل الوسائل السمعية والمرئية في أمريكا اللاتينية. وقع الانفجار في بقعة تجارية عرفت بتكدس المارة للشراء والتنزه حيث المحال التجارية وأمكنة الترفيه. أسفر عن هذا الانفجار هلاك بضعة أشخاص من المارة؛ أربع من هؤلاء الضحايا كن نساء وثلاثة منهم كانوا رجالا معمرين. لم يصب في هذا الانفجار أي وليد. إشاعة النبأ أدخلت الهلع على كل فرد كان يقطن المدينة، كما أشارت إلى ذلك بعض المصادر المحلية. أيضا تسبب عن هذا الانفجار أن أفزعت الأقلية التايلندية في هذه المدينة العتيقة والمتسمة بتكتل أقليات أجنبية عديدة. فعل كهذا في مدينة اتسمت بالهدوء ولد بلبلة وشغبا في مكان الحدث. وحول الممتلكات التي قوضت فقد أبان المصدر بأن الانفجار قد ألحق أضرارا بمساكن ومحال تجارية مجاورة، وبأن زجاج النوافذ والأبواب لهذه البيوت والمحال قد تهشم. كذلك أكد المصدر أن الانفجار كان في سيارة ملغمة، وأن الفاعل كان كهلا في الأربعين من عمره. الجاني -كما أوضح المصدر- ينتسب إلى الحركة الانفصالية الماركسية، وأن هذا التفجير كان لغرض الضغط على الحكومة الكولومبية اليمينية التي عرفت بعدم الاعتناء بالقضايا المحلية والتي تتعلق بالمستوى المعيشي والصحي للمعوزين. مستوى الفقر في كولومبيا في ظل هذه الحكومة وصل إلى أعلى مستوياته؛ إذ بلغ متوسط دخل الفرد ألفين ومائة دولار، وهو مستوى لم تخبره كولومبيا في العشرين سنة الأخيرة؛ إذ كان متوسط دخل الفرد سبعة آلاف دولار وذلك قبل أن تتولى هذه الحكومة الآنية مقاليد الحكم.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 2: Low-Frequency only-*shaddah* Text

وقع انفجار ظهر الاثنين، في مدينة بوغوتا الكولومبية، في أمريكا اللاّتينية. كان الانفجار شديدا، وقد أشيع النّبأ في كلّ الوسائل السمعية والمرئية في أمريكا اللاّتينية. وقع الانفجار في بقعة تجارية عرفت بتكدس المارة للشّراء والتّنزه حيث المحالّ التّجارية وأمكنة التّرفيه. أسفر عن هذا الانفجار هلاك بضعة أشخاص من المارة؛ أربع من هؤلاء الضحايا كن نساء وثلاثة منهم كانوا رجالا معمرين. لم يصب في هذا الانفجار أي وليد. إشاعة النّبأ أدخلت الهلع على كلّ فرد كان يقطن المدينة، كما أشارت إلى ذلك بعض المصادر المحلّية. أيضا تسبب عن هذا الانفجار أن أفزعت الأقلّية التّايلندية في هذه المدينة العتيقة والمتّسمة بتكتّل أقلّيات أجنبية عديدة. فعل كهذا في مدينة اتّسمت بالهدوء ولّد بلبلة وشغبا في مكان الحدث. وحول الممتلكات الّتي قوضت فقد أبان المصدر بأن الانفجار قد ألحق أضرارا بمساكن ومحالّ تجارية مجاورة، وبأن زجاج النّوافذ والأبواب لهذه البيوت والمحالّ قد تهشّم. كذلك أكّد المصدر أن الانفجار كان في سيارة ملغّمة، وأن الفاعل كان كهلا في الأربعين من عمره. الجاني -كما أوضح المصدر- ينتسب إلى الحركة الانفصالية الماركسية، وأن هذا التّفجير كان لغرض الضغط على الحكومة الكولومبية اليمينية الّتي عرفت بعدم الاعتناء بالقضايا المحلّية والّتي تتعلّق بالمستوى المعيشي والصحي للمعوزين. مستوى الفقر في كولومبيا في ظلّ هذه الحكومة وصل إلى أعلى مستوياته؛ إذ بلغ متوسط دخل الفرد ألفين ومائة دولار، وهو مستوى لم تخبره كولومبيا في العشرين سنة الأخيرة؛ إذ كان متوسط دخل الفرد سبعة آلاف دولار وذلك قبل أن تتولّى هذه الحكومة الآنية مقاليد الحكم.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 3: Low-Frequency vowelized and *shaddah* Text

وقَع انفجار ظُهر الاثنَين، في مدينَة بوغُوتَا الكُولُومبية، في أَمرِيكا اللاتينية. كَان الانفجار شَديدا، وقَد أُشيع النبأ في كُلّ الوسائِل السمعية والمرئية في أَمرِيكا اللاتينية. وقَع الانفجار في بِقعة تجارِية عرِفت بِتَكدس المارة ِللشراء والتنَزه حيث المحالّ التجارِية وَأمكنَة الترفيه. أَسفَر عن هذَا الانفجار هلاك بِضعة أَشخَاص من المارة؛ أَربع من هؤُلاَء الضحايا كُن نساء وثَلاثَة منهم كَانُوا رِجالا معمرِين. لَم يصب في هذَا الانفجار أَي ولِيد. إِشَاعة النبأ أَدخَلت الهلَع علَى كُلّ فَرد كَان يقطُن المدينَة، كَما أَشَارت إِلَى ذَلِك بعض المصادر المحلية. أَيضا تَسبب عن هذَا الانفجار أَن أُفزِعت الأَقَلية التايلَندية في هذه المدينَة العتيقَة والمتسمة بِتَكَتل أَقَليات أَجنَبِية عديدة. فعل كَهذَا في مدينَة اتسمت بِالهدوء ولد بلبلَة وشَغَبا في مكَان الحدث. وحول الممتَلَكَات التي قُوضت فَقَد أَبان المصدر بِأَن الانفجار قَد أَلحق أَضرارا بِمساكن ومحالّ تجارِية مجاورة، وبِأَن زجاج النوافذ والأَبواب لِهذه البيوت والمحالّ قَد تَهشم. كَذَلِك أَكد المصدر أَن الانفجار كَان في سيارة ملَغمة، وأَن الفَاعل كَان كَهلا في الأَربعين من عمره. الجاني -كَما أَوضح المصدر- ينتَسب إِلَى الحركَة الانفصالِية الماركسية، وأَن هذَا التفجِير كَان لِغَرض الضغط علَى الحكُومة الكُولُومبِية اليمينية التي عرِفت بِعدم الاعتنَاء بِالقَضايا المحلية والتي تَتَعلق بِالمستَوى المعيشي والصحي لِلمعوزِين. مستَوى الفَقر في كُولُومبِيا في ظلّ هذه الحكُومة وصل إِلَى أَعلَى مستَوياته؛ إِذ بلَغ متَوسط دخل الفَرد أَلفَين ومائة دولَار، وهو مستَوى لم تَخبره كُولُومبِيا في العشرِين سنَة الأَخيرة؛ إِذ كَان متَوسط دخل الفَرد سبعة آلاَف دولَار وذَلِك قَبل أَن تَتَولى هذه الحكُومة الآنية مقَالِيد الحكم.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 4: Low-Frequency only-vowelized Text

وقَع انفجار ظُهر الاثنَين، في مدينَة بوغُوتَا الكُولُومبِية، في أَمريكا اللاتينية. كَان الانفجار شَديدا، وقَد أُشيع النَبأ في كُل الوسائِل السمعية والمرئِية في أَمريكا اللاَتينية. وقَع الانفجار في بِقعة تجارِية عرِفت بِتَكدس المارة لِلشراء والتَنَزه حيث المحال التجارِية وَأمكنَة التَرفيه. أَسفَر عن هذَا الانفجار هلاَك بِضعة أَشخَاص من المارة؛ أَربع من هؤُلاَء الضحايا كُن نساء وثَلاثَة منهم كَانُوا رِجالا معمرِين. لم يصب في هذَا الانفجار أَي ولِيد. إِشَاعة النَبأ أَدخَلت الهلَع علَى كُل فَرد كَان يقطُن المدينَة، كَما أَشَارت إِلَى ذَلِك بعض المصادر المحلية. أَيضا تَسبب عن هذَا الانفجار أَن أُفزِعت الأَقَلية التَايلَندية في هذه المدينَة العتيقَة والمتَسمة بِتَكَتُل أَقَليات أَجنَبِية عديدة. فعل كَهذَا في مدينَة اتَسمت بِالهدوء ولَد بلبلَة وشَغَبا في مكَان الحدث. وحول الممتَلَكات الَتي قُوِضت فَقَد أَبان المصدر بِأَن الانفجار قَد أَلحق أَضرارا بِمساكن ومحال تجارِية مجاوِرة، وبِأَن زجاج النَوافذ والأَبواب لِهذه البيوت والمحال قَد تَهشَم. كَذَلِك أَكَد المصدر أَن الانفجار كَان في سيارة ملَغَمة، وَأن الفَاعل كَان كَهلاَ في الأَربعين من عمره. الجاني -كَما أَوضح المصدر- ينتَسب إِلَى الحركَة الانفصالِية الماركسية، وَأن هذَا التَفجِير كَان لِغَرض الضغط علَى الحكُومة الكُولُومبِية اليمينية الَتي عرِفت بِعدم الاعتنَاء بِالقَضايا المحلية والَتي تَتَعلَق بِالمستَوى المعيشي والصحي لِلمعوزِين. مستَوى الفَقر في كُولُومبِيا في ظل هذه الحكُومة وصل إِلَى أَعلَى مستَوياته؛ إِذ بلَغ متَوسط دخل الفَرد أَلفَين ومائَة دولاَر، وهو مستَوى لم تَخبره كُولُومبِيا في العشرِين سنَة الأَخيرة؛ إِذ كَان متَوسط دخل الفَرد سبعة آلاَف دولاَر وذَلِك قَبل أَن تَتَولَى هذه الحكُومة الآنية مقَالِيد الحكم.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

Text 5: Low-Frequency wrongly-vowelized Text

وقَع انفجار ظُهر الاثنَين، فُي مدينَة بوغُوتَا الكُولُومبِية، في أَمريكا اللاتينية. كَان الانفجار شَديدا، وقَد أُشيع النبأ في كَلّ الوسائِل السمعية والمرئِية في أَمريكا اللاتينية. وقَع الانفجار في بِقعة تَجارِية عرِفت يتَكَدس المارة ِللشراء والتنَزه حيث المحالّ التجارِية وأَمكنَة الترفيه. أَسفَر عن هذَا الانفجار هلاك بِضعة أَشخَاص من المارة؛ أَربع من هؤُلاَء الضحايا كُن نَساء وثَلاثَة منهم كَانَوا رجالاَ معمرِين. لَم يصب في هذَا الانفُجار أَي ولِيد. إِشَاعة النبأ أَدخات الهلَع علَى كُلّ فَرد كُان يقطُن المدينَة، كَما أَشَارت إِلُى ذَلِك بعض المصادر المحلية. أَيضا تَسبب عن هذَا الانفجار أَن أُفزِعت الأَقلية التايلَندية في هذه المدينَة العتيقَة والمتسمة بِتَكَتل أَقَليات أَجنَبِية عديدة. فَعل كَهذَا في مدينَة اتسمت بِالهدوء ولد بلبلَة وشَغَبا في مكُان الحدث. وحول الممتَلَكَات التُي قُوضت فَقَد أَبان المصدر بِأَن الانفُجار قَد أَلحق أَضرارا بِمساكن ومحالّ تجارِية مجاوِرة، وبِأَن زِجاج النوافذ والأَبواب ِلهذه البيوت والمحالّ قَد تَهشم. كَذَلِك أَكد المصدر أَن الانفجار كَان في سيارة ملَغمة، وأَن الفَاعل كُان كَهلاَ في الأَربعين من عمره. الجاني -كَما أَوضح المصدر- ينتَسب إِلُى الحركَة الانفصالِية الماركسية، وأَن هذَا التفجِير كَان ِلغَرض الضغط علُى الحكُومة الكُولُومبِية اليمينية التي عرِفت بعدم الاعتنَاء بِالقَضايا المحلية والتُي تَتَعلق بِالمستَوى المعيشي والصحي ِللمعوزِين. مستَوى الفَقر في كُولُومبِيا فُي ظلّ هذه الحكُومة وصل إِلُى أَعلَى مستَوياته؛ إِذ بلَغ متَوسط دخل الفَرد أَلفَين ومائَة دولار، وهو مستَوى لم تَخبره كُولِومبِيا في العشرِين سنَة الأَخيرة؛ إِذ كُان متَوسط دخل الفَرد سبعة آلاَف دولار وذَلِك قَبل أَن تتولى هذه الحكُومة الآنية مقَالِيد الحكم.

ملحوظة: هذا النص ليس بالضرورة صحيحا وإنما صمم لغرض التجربة

APPENDIX E

Exemplary of the reading conditions in Roman alphabet

Original Part:

الجريمة هذا الحي لم يعرف السرقة ولا حدثت هذه السرقة في حي ستانفورد, في مدينة سياتل, في العاشر من ديسمبر 1990. لتسعة عاما عشر.

I. In plain format:
ARABIC VERSION:

ROMANIZED VERSION:

Hdtht h*th*h asrqh fi: Hi sta:nfo:rd fi: mdi:nt sya:tl, fi: al?shr mn di:smbr 1990. H*th*a: alHy lm y?rf asrqh wla: aljri:mh lts?t ?shr ?a:mun.

II. In vowelized with *shaddah* format:

ARABIC VERSION:

ROMANIZED VERSION:

Hadatht hathih assariqah fi: Hayy sta:nfo:rd fi: madi:nut siya:tel, fi: al?a:shir min di:sambar 1990. Hatha: alHay lam ya?rif assariqah wala: aljari:mah litis?at ?ashar ?a:mun.

III. In only-*Shaddah* format

ARABIC VERSION:

ROMANIZED VERSION:

Hdtht h*th*h assrqh fi: Hyy sta:nfo:rd fi: mdi:nt siya:tl, fi: al?shr mn di:smbr 1990. H*th*a: alHyy lm y?rf assrqh wla: aljri:mh lts?t ?shr ?a:mun.

IV. In only-vowelized format:
ARABIC VERSION:
ROMANIZED VERSION:

Hada*th*t ha*th*ih asariqah fi: Hay sta:nfo:rd fi: madi:nut siya:tel, fi: al?a:shir min di:sambur 1990. Ha:*th*a: alHay lum ya?rif asariqah wala: aljari:mah litis?at ?ashar ?a:mun.

V. In only-wrongly vowelized format
ARABIC VERSION:

ROMANIZED VERSION:

Hada*th*t ha*th*ih assariqah fi: Hiyy sta:nfo:rd fi: madi:nut siya:tel, fi: al?a:shor min di:sambur 1990. Ha:*th*a: alHay lom ya?rif assariqah wala: aljari:mah litis?at ?ashar ?a:mun.

APPENDIX F
Experiment Materials

I. Multiple-Choice Comprehension Test for the High-Frequency Text

الاختبار الأول للنص الأول

رقم المشترك في الدراسة:

بعد قليل ستجيب على عشرة أسئلة من نوع أسئلة الاختيار من متعدد. لكل سوآل أعطيت لك أربع إجابات.

من فضلك أجب عن الأسئلة التالية باختيار إجابة واحدة فقط، والتي تظن أنها الأصح بناء على ما قرأت من النص فقط.

1. وقعت هذه السرقة والجريمة في حي ستانفورد، في الوقت التالي:
- الصباح من يوم الأربعاء ( )
- الظهر من يوم الأربعاء ( )
- الصباح من يوم الجمعة ( )
- الظهر من يوم الجمعة ( )

2. عدد طلقات الرصاص التي سمعت:
- طلقة واحدة ( )
- أربع طلقات ( )
- لايتجاوز طلقتين ( )
- لايقل عن ثلاث طلقات ( )

3. حي ستانفورد الذي وقعت فيه السرقة والجريمة عرف بأنه حي:
- سكني ( )
- تجاري وحكومي ( )
- خطير وإجرامي ( )
- كل الإجابات غير صحيحة ( )

4. من المقتول من جراء هذه السرقة؟
- زبونة في المحل ( )
- بائع في المحل ( )
- زبون في المحل ( )
- بائعة في المحل ( )

5. عثر على دليل مادي ولكنه **لم** يوصل إلى مرتكب سرقة وجريمة 1990، و ذلك لأن الدليل:
- كان كاذبا ( )
- كان غير كاف ( )
- لم يوضح نوع السيارة ولا لونها ( )
- كان مرتبطا بجريمة وقعت سنة 2002 ( )

6. استخدم السارق القاتل لارتكاب جريمته ______:

- مطرقة ( )
- سكينا حادة ( )
- عصا خشبية ( )
- كل الإجابات غير صحيحة ( )

7. النتيجة التي يتوقعها خبراء الجريمة والسرقات بخصوص هذه السرقة والجريمة:

- أنها تحتاج إلى دليل مادي وستحل قريبا ( )
- أنها تحتاج إلى ستة أشهر أخرى لحلها ( )
- أن هذه السرقة والجريمة ذات أدلة كثيرة ولكنها غير مادية ( )
- كل الإجابات السابقة غير صحيحة ( )

8. الوصف الذي تقدم به أحد شهود العيان كان:

- وصفا تقريبيا لملامح السارق القاتل وهو خارج من المحل ( )
- وصفا تقريبيا للون القميص الذي كان يلبسه السارق القاتل ( )
- وصفا تقريبيا للسيارة الواقفة بجانب المحل وقت ارتكبت السرقة والجريمة ( )
- كل الإجابات السابقة غير صحيحة ( )

9. حي ستانفورد الذي وقعت فيه هذه السرقة والجريمة عرف بأنه:

- قبل وقوع هذه السرقة والجريمة، هذا الحي قد اعتاد السرقة والجريمة ولزمن طويل ( )
- قبل وقوع هذه السرقة والجريمة، هذا الحي لم يعرف السرقة والجريمة لخمس سنوات ( )
- قبل وقوع هذه السرقة والجريمة، هذا الحي لم يعرف السرقة ولا الجريمة لزمن طويل لايقل عن عشر سنوات ( )
- كل الإجابات السابقة غير صحيحة ( )

10. الموظفون والعاملون في الشركات في حي ستانفورد يأخذون وقتا محددا للغداء وهو:

- ساعة واحدة وذلك من الثانية حتى الثالثة ( )
- ساعة واحدة وذلك من الثانية عشرة حتى الواحدة ( )
- ساعة واحدة وذلك من الواحدة والنصف حتى الثانية والنصف ( )
- ساعة واحدة وذلك من الثانية عشرة والنصف حتى الواحدة والنصف ( )

II. Multiple-Choice Comprehension Test for the Low-Frequency Text

الاختبار الأول للنص الثاني

رقم المشترك في الدراسة:

بعد قليل ستجيب على عشرة أسئلة من نوع أسئلة الاختيار من متعدد. لكل سوآل أعطيت لك أربع إجابات.

من فضلك أجب عن الأسئلة التالية باختيار إجابة واحدة فقط، والتي تظن أنها الأصح بناء على ما قرأت من النص فقط.

1. عدد طلقات الرصاص التي سمعت:
   - أربع طلقات ( )
   - طلقة أو طلقتين ( )
   - لايتجاوز ثلاث طلقات ( )
   - لايقل عن أربع طلقات ( )

2. عرف حي الريفيرا الذي وقعت فيه الجريمة بأنه:
   - ترفيهي ( )
   - خطير وإجرامي ( )
   - سكني وترفيهي ( )
   - كل الإجابات السابقة غير صحيحة ( )

3. وقعت هذه الجريمة والسرقة في حي الريفيرا، في وقت:
   - الصباح من يوم الأربعاء ( )
   - الظهر من يوم الأربعاء ( )
   - الصباح من يوم الجمعة ( )
   - الظهر من يوم الجمعة ( )

4. من المقتول في هذه الجريمة؟
   - الزبون الذي كان في المحل ( )
   - الزبونة التي كانت في المحل ( )
   - البائع الذي كان في المحل ( )
   - البائعة التي كانت في المحل ( )

5. عثر على دليل مادي ولكنه **لم** يوصل إلى مرتكب جريمة 1988، وذلك لأن الدليل:
   - كان كاذبا ( )
   - كان غير كاف ( )
   - كان لجريمة وقعت سنة 2003 ( )
   - لم يوضح نوع السيارة ولا لونها ( )

6. حي الريفيرا الذي وقعت فيه الجريمة عرف بأنه:

- قبل وقوع هذه السرقة والجريمة، هذا الحي قد اعتاد السرقة والجريمة ولزمن طويل ( )
- قبل وقوع هذه السرقة والجريمة، هذا الحي لم يعرف السرقة والجريمة لست سنوات ( )
- قبل وقوع هذه السرقة والجريمة، هذا الحي لم يعرف السرقة ولا الجريمة لزمن طويل لايقل عن عشر سنوات ( )
- كل الإجابات السابقة غير صحيحة ( )

7. الخلاصة التي توصل لها خبراء الجريمة والسرقات عن هذه الجريمة هي:

- أنها تحتاج إلى وقت طويل لحلها ( )
- أنها ذات أدلة قليلة ولن يتوصل إلى حلها ( )
- أنها ذات أدلة كثيرة وسيتوصل إلى حلها قريبا ( )
- أنها ارتكبت من قبل عصابة منظمة وتحتاج إلى دليل مادي ( )

8. الوصف الذي تقدم به أحد شهود العيان كان:

- وصفا تقريبيا لعمر المجرم السارق ( )
- وصفا تقريبيا للون القميص الذي كان يلبسه المجرم السارق ( )
- وصفا تقريبيا لأشباه المجرم السارق وهو خارج من محل المشروبات الطازجة ( )
- كل الإجابات السابقة غير صحيحة ( )

9. الموظفون والعاملون في حي الريفيرا يأخذون للغداء وقتا محددا، وهو:

- ساعة واحدة وذلك من الثانية حتى الثالثة ( )
- ساعة واحدة وذلك من الثانية عشرة حتى الواحدة ( )
- ساعة ونصف وذلك من الثانية حتى الثالثة والنصف ( )
- ساعة ونصف وذلك من الواحدة والنصف حتى الثالثة ( )

10. استخدم المجرم لارتكاب جريمته ______:

- مطرقة ( )
- مسدسا ( )
- سكينا حادة ( )
- عصا خشبية ( )

APPENDIX G

Experiment Materials

Comprehension Texts Propositions Analysis

I. High-Frequency Test (Propositions)

هناك سرقة

هناك جريمة

السرقة و الجريمة وقعت في مدينة سياتل

.... في حي من أحياء سياتل

... في حي سياتل

في العاشر

في ديسمبر

1990

حي سياتل لم يعرف الجريمة لسبعة عشر عاما

السرقة وقعت في الواحدة ظهرا

السرقة وقعت في يوم الأربعاء

السرقة وقعت في محل كبير

السرقة ارتكبت في محل لبيع المواد الغذائية

مرتكب السرقة و الجريمة لم يكتشف

السرقة و الجريمة ارتكبت في شارع

الشارع كان مزدحما

الشارع كان مزدحما بالموظفين العاملين

الموظفين تابعين للمؤسسات والشركات

المؤسسات و الشركات تجارية

الموظفين يأخذون ساعة واحدة للغداء

ساعة الغذاء تبدأ من الساعة الواحدة والنصف حتى الساعة الثانية والنصف

كان متوقعا أن الشارع الذي وقعت فيه السرقة مزدحما بشهود العيان

لم يأت يتقدم أحد كشاهد عيان يشهد على السرقة و الجريمة

لم يعط أحد أوصاف لمرتكب الجريمة و السرقة

حصول هذه السرقة و الجريمة دون الإمساك بالسارق جعل الناس في الحي يخافون

حصول هذه السرقة و الجريمة دون الإمساك بالسارق جعل الناس في الحي لا ينامون

التقرير جاء من اللجنة المسؤولة عن السرقات و الجريمة في مدينة سياتل

اتهم مركز الشرطة بتقصيره في توفير الأمن

اتهم مركز الشرطة بتقصيره في التواجد في مكان يزدحم بالناس كهذا الحي

اتهمت لجنة التحقيق بالتكاسل والإخفاق في الإمساك بالمجرم السارق

المتهم هو الناس الذين يسكنون في الحي
نتج من هذا الحادث سرقة نصف المال الذي كان في خزانة المحل
كان هناك زبونة في المحل
قتلت هذه الزبونة
قتل الزبونة كان حينما كانت تتخاطب مع البائع
البائع كان يحضر لها الأغراض
قدر المال الذي سرق أربعة آلاف دولار
المسروق كان من مدخول المحل في ذلك اليوم و كذلك اليوم الذي كان قبله
مدخول المحل قبل السرقة بيوم ترك في الخزينة
سبب ترك المال في الخزينة أن المحاسب المسؤول عن جمع مكاسب المحل اليومية أصيب بمرض فلم يأت في ذلك اليوم الجريمة كا نت بمسدس
صوت من الرصاص سمع آتيا من المحل
صوت الرصاص قدر بطلقة أو طلقتين
الذي سمع صوت الرصاص هو صاحب المخبز
المخبز يقع بجوار محل بيع المواد الغذائية
اتهم مركز الشرطة بالتقصير والتكاسل
حين وقوع السرقة استجابة مركز الشرطة وحضورهم الى مكان الحادث بطيئا
إدارة الشرطة استبدلت كلها بطاقم آخر
الذي عمل التغيير هو بلدية المدينة
لجنة التحقيق وصفت بالفشل
لجنة التحقيق وصفت بالفشل على الرغم من و جود وصف للسيارة الواقفة بجانب المحل
السيارة كان واقفة بجانب المحل
السيارة استقلها المجرم بعد ارتكاب جريمته و سرقته
السيارة انطلقت بسرعة هائلة
انطلاق السيارة صار بعد سماع طلقات الرصاص بقليل
الجريمة و قعت قديما
الجريمة و قعت منذ أحد عشر سنة
فتح ملف هذه السرقة و الجريمة بعد حوالي أحد عشر عاما
من نتائج فتح ملف هذه القضية إحياء النقاش الطويل والصراع الذي عاشه حي سياتل في ذلك الزمن
خوف الناس على أنفسهم عاد من جديد
خوف الناس على ممتلكاتهم عاد من جديد
فتح ملف القضية جاء بعد إعلان اللجنة االموكلة بمتابعة الجريمة عن توصلها إلى دليل مادي
الدليل المادي كان يظن أنه يوصل إلى مرتكب الجريمة
الإعلان كان في الحقيقة لجريمة أخرى
الجريمة وقعت في نفس الحي
الجريمة وقعت سنة 2002
خبراء الجريمة والسرقات يتوقعون أن المحققين لن يتوصلوا إلى نتيجة

فتح ملف القضية استمر ثلاثة عشر يوما
توقع هؤلاء الخبراء ناتج من قلة الأدلة لهذه الجريمة
توقع هؤلاء الخبراء كان صائبا
ملف القضية أغلق مرة أخرى
ملف القضية لن يستأنف أبدا

II. Low-Frequency Test (Propositions)

هناك جريمة

هناك سرقة

الجريمة و السرقة حدثت في مدينة باريس

.... في حي من أحياء باريس

... في حي اسمه حي الريفيرا

في العشرين

في نوفيمبر

1988 حي الريفيرا لم يعرف الجريمة لخمسة عشر عاما

الجريمة و السرقة وقعت في الثانية و النصف ظهرا

الجريمة و السرقة وقعت في يوم الجمعة

الجريمة و السرقة وقعت في محل

الجريمة و السرقة وقعت في محل لبيع العصائر الطازجة

مرتكب الجريمة و السرقة لم يكتشف

الجريمة و السرقة ارتكبت في شارع

الشارع كان مزدحما

الشارع كان مزدحما بالموظفين العاملين

الموظفين تابعين للمؤسسات والشركات

المؤسسات و الشركات تجارية

الموظفين يأخذون ساعة ونصف للغداء

ساعة الغذاء تبدأ من الساعة الثانية حتى الساعة الثالثة و النصف

كان متوقعا أن الشارع الذي وقعت فيه االسرقة مزدحما بشهود العيان

لم يأت يتقدم أحد كشاهد عيان يشهد على الجريمة و السرقة

لم يعط أحد أوصاف لمرتكب الجريمة و السرقة

حصول هذه الجريمة و السرقة دون الإمساك بالمجرم السارق جعل الناس في الحي يخافون

حصول هذه الجريمة و السرقة دون الإمساك بالمجرم السارق جعل الناس في الحي لا ينامون

التقرير جاء من اللجنة المسؤولة عن الجرائم و السرقات في مدينة باريس

اتهم مركز الشرطة بتقصيره في توفير الأمن

اتهم مركز الشرطة بتقصيره في التواجد في مكان يزدحم بالناس كهذا الحي

اتهمت لجنة التحقيق بالتكاسل والإخفاق في الإمساك بالمجرم السارق

المتهم هو الناس الذين يسكنون في الحي

نتج من هذا الحادث سرقة كل المال الذي كان في خزانة المحل

كذلك قتلت بائعة في المحل

كان هناك زبون

قتل البائعة كان حينما كانت تتحادث مع الزبون

قتل البائعة كان حينما كانت تصلح العصير للزبون
قدر المال الذي سرق عشرة آلاف دولار
المسروق كان مدخول المحل في ذلك اليوم و كذلك اليوم الذي كان قبله
مدخول المحل قبل السرقة بيوم ترك في الخزينة
سبب ترك المال في الخزينة أن المحاسب المسؤول عن جمع مكاسب المحل اليومية أصيب بحادث فلم يأت في ذلك اليوم الجريمة كا نت بمسدس
صوت من الرصاص سمع آتيا من المحل
صوت الرصاص قدر بطلقة أو طلقتين
الذي سمع صوت الرصاص هو صاحب المغسلة
المغسلم تقع بجوار محل بيع العصائر الطازجة
اتهم مركز الشرطة بالتقصير والتكاسل
حين وقوع السرقة استجابة مركز الشرطة وحضورهم الى مكان الحادث بطيئا
إدارة الشرطة استبدلت كلها بطاقم آخر
الذي عمل التغيير هو عمدة المدينة
لجنة التحقيق وصفت بالفشل
لجنة التحقيق وصفت بالفشل على الرغم من و جود وصف للسيارة الواقفة بجانب المحل
السيارة كان واقفة بجانب المحل
السيارة استقلها المجرم بعد ارتكاب جريمته و سرقته
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توقع هؤلاء الخبراء كان صائبا
ملف القضية أغلق مرة أخرى
ملف القضية لن يستأنف أبدا

APPENDIX H

(Oral script)

"You are going to read a one page article or a report; you need to read the passage from the beginning to the end silently, and there would be no time restriction; after you finish, I will ask you some question about what you read. Please, after you finish reading the article, flip the sheet up side down to indicate to me that you finished reading the passage."

APPENDIX I

Oral Script for Multiple-Choice Test

"Your have 10 multiple-choice questions, and four optional responses given for each questions; you need to answer each question based on the text you just read. However, if you find that any of these questions are not related to the text you just read, or you find yourself enforced to guess the answer randomly, or when the sentence does not make sense to you, you are asked to response to such circumstances with the phrase, "I don't know." However, if you find that your are hesitating between two optional items, try to make an educational guessing, that is, to see which one is close to what you have in that moment in your mind and select the item that fits best with your mind representation."

APPENDIX J

<u>The Miscues of Group I</u>

I. When reading an initial word of a sentence they first tray out the active voice and keep reading; however, some gets back and reanalyze their first decision, e.g., in the sentence,"عمل كهذا في مدينة كهذه ولد"
or in a sentence, "وحول الممتلكات التي دمرت فقد أوضح المصدر بأن الانفجار ولد أضرار بمساكن ومحلات تجارية مجاورة"

In these two sentences, the participants assigned a basic past tense to both initial words in the sentences; that is, they read, عمل, as "عَمِل", and for, "حول", they read it as, "حَوّلَ"; however, although the majority of the students reanalyzed their first decision when they reached the disambiguating regions in the sentences, that is, when they read, "ولد" for the first sentence and, "فقد", for the second sentence. However, some participants hesitated over their first decision they assigned to the words and pausing and still reluctant over this decision, and so, before passing the initial word, they gave all potential readings these initial words may take and later they chose one and kept reading the remain of the sentence. However, some participants, they were not a few, after they assign their first decision, they would keep reading and never reanalyze their first decision even when it is incorrect. However, they may sometimes, pause over the disambiguating region, and this pause may stay long, and then continue reading.
Another observation related to this type of sentences, the participants who make the correct reading for these initial words of the sentences in the first time, they would pause before reading these initial words, and this pause may stay long. This pause is very noticeable. For the first type of participants who get back and reanalyze their first initial decision, the correction takes place in different regions of the sentence; in fact, it happens sometimes before the region of disambiguity: some of them their correction was direst before passing the initial word; some of them later after passing the word, and sometimes over the first letter from the second words in the sentence, e.g.,
كهذا, ك, في, الممتلكات, التي, قوضِّت

II. When the participants encounter a sentence that start with a passive voice verb, they first assign to it the active voice, and then correct their first decision and then they attempt to use the passive voice as their first choice or a default for the next sentences, within the same text, *Overgeneralization* or *Overextension*.
e.g., لم يصب, عرفت ,أعلن, أفزعت, لم يقتل, ألحق

III. They always attempt to drop the demonstrative pronoun, "هذا", the preposition, "عن", or "في" from the following sentences, but they very often correct their mistakes
"تسبّب (هذا) عن الانفجار"
أدخلت الرعب (في)
"أسفر (عن) هذا الخبر"

IV. Pause over some words that are strengthened, e.g., "تسبب"

V. Trying to spell long and foreign words, and words of low-frequency, e.g. ," ساباولو , تخبره ,التايلندية ,بوغوتا, كولومبيا, الريفيرا "

VI. Extensive reluctance over initial word that is of passive voice,"أن أفزعت"

VII. Extensive reluctance over low-frequency words such as, "معوزين"

VIII. The majority read, "ألفا" as a dual of, "ألف"

IX. They sometimes Ignore the punctuation

X. Reading "حول" as "حَوّلَ" because they think that the preposition, "و" functions as a relations preposition and not for what is called in Arabic, "استئناف"

XI. Words of low frequency appears to some participants as they are typos, e.g., "ريع"

XII. The majority of the participants pause over the words,"إذاعة" and "أفزعت"

XIII. They attempt to assemble the letters while reading long words or words that have neighboring similar or close sounds,
e.g., "تسَبَّب, بلبلة, المتسمة , بتكتل"

XIV. They read verbs without strengthening unless you are enforced to do so, e.g., ,ملغمة "ولد, الآني,معمرين "

XV. The silent letter "ا" in "مائة" was always pronounced

XVI. It appears that the participants' initial sentence default is the verb and not the noun or the preposition which Arabic allows.

XVII. Five or more subjects read the word, "الآنيَّة" as "الآتية", and some corrected their first reading and some not

XVIII. Always they read "ألفين" as "ألفِين" with the sound /f/ (مكسور)

XIX. Some participants read, "اليمنيَّة" instead of "اليمينيَّة" and "بعض" instead of "بضعة"

XX. They sometimes add more letters that don't exist to especially the foreign words, e.g., "بوغواتانا, بُوغوَاتا"

XXI. Sometimes when they read a part they were not familiar with (a rule: passive instead of their initial reading, active," they attempted to over-apply or overextend the rule to the subsequent parts, e.g., أربع منهن كانوا نساء وثلاثة منهن كانوا رجالا معمرين

XXII. Some subjects attempted to use the English pronunciation in say the foreign names, e.g., "ساباولو, بوغوتا, أمريكا"

<u>The Miscues of Group II</u>

I. As that the active-voice verbs is the default when reading a text, even when the sentence does lead logically to a passive voice more that an active voice, they first tray out the active voice and keep reading; however, some gets back and reanalyze their first decision, e.g., لم يصب, عرفت ,أعلن, أفزعت, لم يقتل

II. Most of them hesitated over the word, "مفخخة", "إذاعة" and "أفزعت"

III. Majority of the participants read the word, "أعلن" as a verb of active voice, "أعلن" and did not reanalyze their first incorrect decision

IV. They always paused and hesitated over "أن" from the phrase, "أن أفزعت"

V. They always attempted to spell out the word,"اليمينية"

VI. Some participants read the word,"تنتسب " as "تَتَسَبَّب"

VII. They always attempt to drop the demonstrative pronoun, "هذا", the preposition, "عن", or "في" from the following sentences, but they very often correct their mistakes
"تسبّب (هذا) عن الانفجار"
أدخلت الرعب (في)
"أسفر (عن) هذا الخبر"

VIII. The silent letter "ا" in "مائة" was always pronounced
IX. Some participants read, "اليمنيَّة" instead of "اليمينية"
X. Extensive reluctance over low-frequency words such as,"قوضت , يقطن,أمكنة ,بضعة, محال, معوزين, تخبره, معمرين, الهلع "
XI. Ignoring, sometimes, the strengthening mark, "ّ" from words such as, "الآنية, ملغمة"
XII. The dialects of some participants were noticeable in some participants readings
XIII. Some subjects attempted to use the English pronunciation in say the foreign names, e.g., "ساباولو, بوغوتا, أمريكا"

The miscues of Group III

I. Most participants hesitated over the word, "تنتسب"
II. Some participants read the word, "أعلن" as an active voice though it was marked by, " "ُ, *dhammah*.
III. Always they read "ألفين" as "ألفِين" with the sound /f/ (مكسور)
IV. The silent letter "ا" in "مائة" was always pronounced
V. They always attempt to drop the demonstrative pronoun, "هذا", the preposition, "عن", or "في" from the following sentences, but they very often correct their miscues.
"تسبّب (هذا) عن الانفجار"
أدخلت الرعب (في)
"أسفر (عن) هذا الخبر"
VI. Substituting some words in the text with other words, e.g.,
The word, "الانفجار" was substituted with,"الحادث" in the sentence,
"وقد أسفر عن هذا (الحادث) ...
VII. The dialects of some participants were noticeable in some participants readings
VIII. Trying to spell long and foreign words, and words of low-frequency, e.g. ,"ساباولو , تخبره ,التايلندية ,بوغوتا, كولومبيا, الريفيرا "
IX. Some participants read the word,"تنتسب " as "تَتَسَبَّب"
X. Deleting some letters as the definition article, "ال", from some words, as in " من ثلاثين سنة الأخيرة,"and, "أ" from أفزعت and the second "ت" sound from, "ترتيط"

XXIII. When the participants encounter a sentence that start with a passive voice verb, they first assign to it the active voice, and then correct their first decision and then they attempt to use the passive voice as their first choice or a default for the next sentences, within the same text, *Overgeneralization* or *Overextension*.
e.g., "لم يصب, عرفت, أدخلت ,أعلن, أفزعت, لم يقتل, ألحق "

XXIV. Most of them hesitated over the word, "إذاعة"
XXV. Some subjects attempted to use the English pronunciation in say the foreign names, e.g., "ساباولو, بوغوتا, أمريكا"

XXVI. Some participants attempted to construct a verb-lead sentence. That is, even when the sentence begins with a noun, a gerund, or a preposition, a type of sentences that Arabic allows, they would convert it to a verb, e.g.,"استئناف" was read as, "استأنف,

and "إذاعة" was read as "أذاعت," and, "جَزَعٌ" as "جَزَعَ", and "فَتحُ" as "فَتَحَ." However, they would reanalyze their first decision correctly.

XXVII. Ignoring, sometimes, the strengthening mark, "ّ" from words such as,"ملغمة"

XXVIII. The participants who read the HF text first benefited from it in avoiding the GP in the LF text and by making a few miscues.

XXIX. Some participants read, "اليمينية" instead of "اليمنية"

XXX. Some subjects attempted to use the English pronunciation in say the foreign names, e.g., "ساباولو,بوغوتا,أمريكا"

XXXI. They attempt to assemble the letters while reading long words or words that have neighboring similar or close sounds, e.g., "تسَبَّب,بلبلة,المتسمة ,بتكتل"

The Miscues of Group IV

I. Trying to spell long and foreign words, and words of low-frequency, e.g. " تخبره ,التايلندية ,ساباولو "بوغوتا,كولومبيا,الريفيرا

II. Most of them hesitated over the word, "إذاعة"

III. When the participants encounter a sentence that start with a passive voice verb, they first assign to it the active voice, and then correct their first decision, "أُعلن" as, "أَعلن",though it was marked by, "ُ", *Dhamma*.

XI. They always attempt to drop the demonstrative pronoun, "هذا", the preposition, "عن", or "في" from the following sentences, but they very often correct their miscues.

"تسبّب (هذا) عن الانفجار"

أدخلت الرعب (في)

"أسفر (عن) هذا الخبر"

XII. Always they read "ألفين" as "ألفِين" with the sound /f/ (مكسور)

XIII. The silent letter "ا" in "مائة" was always pronounced

XIV. Extensive reluctance over low-frequency words such as, "معوزين" and "بلبلة"

XV. Ignoring, sometimes, the strengthening mark, "ّ" from words such as, "الآنية,ملغمة"

XVI. Some participants read, "اليمنيَّة" or "اليمانيَّة" instead of "اليمينيَّة" and "بعض" instead of "بضعة," and, "وهو مستوى" was read as "وهو متوسط"

XVII. Sometimes when they read a part they were not familiar with (a rule: passive instead of their initial reading, active," they attempted to over-apply or overextend the rule to the subsequent parts, e.g.,

أربع منهن كانوا نساء وثلاثة <u>منهن</u> كانوا رجالا معمرين

XVIII. The clause, "أن أفزعت" was read as "أن أفرغت"

The Miscues of Group V

I. When the participants encounter a sentence that start with a passive voice verb, they first assign to it the active voice, and then correct their first decision, "أُعلن" as, "أَعلن",though it was marked by, "ُ", *Dhamma*.

II. Some participants read, "اليمينية" instead of "اليمنية" and "أدخلت الرعب في" instead of, "أدخلت الرعب على", and, "بعض" instead of, "بضعة"

III. Some participants read the word,"تنتسب " as "تَتَسَبَّب"

IV. Pause and extensive reluctance over low-frequency words such as, "أفزعت,المتَّسمة,المعوزين,ولَّد,إذاعة"

V. Deletion "و" from the clause, "والتي ترتبط"

VI. Some participants read the clause, "إذ كان" as, "إذا كان"

VII. They always attempt to drop the demonstrative pronoun, "هذا", the preposition, "عن", or "في" from the following sentences, but they very often correct their miscues.

"تسبّب (هذا) عن الانفجار"

أدخلت الرعب (في)

"أسفر (عن) هذا الخبر"

VIII. The majority read, "ألفا" as a dual of, "ألف"

IX. Reluctant over the word, "اشتهرت"

X. The word, "الجانية", which is a beginning of a sentence, was deleted although a punctuation mark, a period, was placed before the word

XI. Some participants read, "المسموعة" instead of "السمعية"

XII. Reading, "ملغَّمة" as "ملغومة" and never corrected

XIX. Sometimes when they read a part they were not familiar with (a rule: passive instead of their initial reading, active," they attempted to over-apply or overextend the rule to the subsequent parts, e.g.,

أربع منهن كانوا نساء وثلاثة منهن كانوا رجالا معمرين

IV. Trying to spell long and foreign words, and words of low-frequency, e.g.

" تخبره ,التايلندية ,ساباولو",بوغوتا,كولومبيا,الريفيرا

APPENDIX K
EXPERIMENT 2 MATERIALS

SENTENCES/QUESTIONS/ANSWERS

GROUP 1

PRACTICE SENTENCES

1. أشهر الصيف في فرانكفورت تبدأ من شهر مايو وتنتهي في أغسطس
أشهر الصيف في فرانكفورت هي من مايو حتى أغسطس؟
نعم

2. استنفار الشعب للمشاركة في الحرب كان بسبب دخول العدو للمدينة فجأة
دخل العدو للمدينة فجأة؟
نعم

3. جَاء خَالِد مِن سَفَره الَّذِي غَاب فِيه عَن البَلَد لِزَمَن طَوِيل
ابتعد خالد عن بلده لمدة طويلة؟
نعم

4. بعض أنواع المشروم البري يعرف بأنه غير صالح للأكل ويجب تجنبه
كل أنواع المشروم صالحة للأكل؟
لا

5. أذيعت بالأمس نتائج اختبارات الثانوية العامة للأولاد بعد طول انتظار إعلانها
إعلان نتائج الثانوية العامة كان سريعا؟
نعم

6. قلد الرئيس العام لنادي الشباب وسام الشرف لمدير منتخب كرة الطائرة
الفائز بوسام الشرف لهذا العام هو مدرب كرة القدم؟
لا

7. علم النفس التربوي كان من المواد الإجبارية على كل طلاب الجامعة
علم النفس التربوي كان من المواد المقررة على كل التخصصات؟
نعم

ACTUAL SENTENCES

8. لام الأب ابنه على تكاسله وعدم اجتهاده في اجتياز الاختبارات النهائية
لم يكن الأب راضيا على سلوك ابنه؟
نعم

9. حدث فزع شديد لمعظم السكان بعد أن دمر المدينة زلزال قوي
حُدُوث الرُعب الشَّدِيد لسكَّان المدينة كان بِسَبَب الفَيَضَانات الجارفَة؟
لا

10. فر فريق الإطفاء عن مكان الحريق بعد أن سقط جدار المبنى
قَبْلَ سُقُوط الجدار هَرَبَ فَريقُ الإطفاء؟
لا

11. مرض من أمراض هذا القرن المنتشرة يرتبط بسرعة عجلة الحياة اليومية
نَمَطُ الحياة السريع يُؤدِّي إلى انتشار أحد الأمراض؟
نعم

12. سر الطالب بنيله شهادة الثانوية العامة ونجاحه بتوفق على طلاب فصله
كان الطالبُ سعيدا بتفوقه؟
نعم

13. ظلمت أقلية كانت تعيش في هذا البلد الكبير فقررت الرحيل نهائيا
رَحَلَت الأَقَلِيَّة بِسَبَب سُوء الأحوال الاقتِصادِيّة؟
لا

فرق المتظاهرون الجنود الواقفين لحراسة المؤتمر من غير خوف من أحد
فَرَّقَ الجُنُود حشود المتظاهرين؟
لا

انتصرت منظمات حقوق الإنسان في قضية الإفراج عن سجناء سياسيين قدماء
دافعت منظمات حقوق الإنسان عن السجناء السياسيين القدماء؟
نعم

من هو الطفل الذي لون هذه الصورة الجميلة المعلقة على الجدار؟
الذي رسم الصورة هو الطفل؟
لا

من أسباب تجارة السلاح في هذا البلد انتشار تجارة المخدرات فيها
تجارة السلاح أدت إلى انتشار المخدرات؟
لا

إن تداول العملة العالمية أو الاحتفاظ بها في هذا البلد ممنوع
في هذا البلد لايُسمح بيع أو شراء العُملة الأجنبية؟
نعم

صور المعرض العسكري تركزت على إظهار بطولة الذين شاركوا في الثورة

بطولة المشاركين في الثورة نالت حظها من هذا المعرض؟
نعم

كل الأشخاص الراكبين في السيارة تعرضوا لكسور ورضوض إلا محمدا وسعدا
نجاة جميع ركاب السيارة من إي إصابات في الحادث؟
لا

الذي عزف النشيد الوطني للحفل كان طالبا في الصف الثالث الابتدائي
استضافت المدرسة عازفا محترفا لعزف النشيد الوطني؟
لا

تأجير الشقق الصغيرة في العمارة البعيدة من محيط الجامعة مكلف جدا
ارتفاع أسعار الشقق الصغيرة البعيدة عن الجامعة ؟
نعم

سوى المحاسب جميع المعاملات البنكية المختلف عليها من دون أخطاء حسابية
لم يكن المحاسب ماهرا؟
لا

نزول الأمطار في فصل الخريف لم يستمر بسبب تقلبات الجو المستمرة
قلة نزول الأمطار في فصل الخريف؟
نعم

استعادة ملكية السيارة المسروقة لصاحبها قد يكون من قبل بلدية المدينة
قد تساعد بلديّة المدينة على استرداد السيّارات المسروقة؟
نعم

مساءلة المتورطين في ارتكاب الجريمة من قبل المحققين أخذت وقتا قصيرا
التحقيق مع المتورِّطين في الجريمة استمرّ طويلا؟
لا

استكبر خالد على قومه الذين أعانوه لسنين طويلة تجاوزت عشر سنوات
عدم حفظ خالد لمعروف قومه الذين ساعدوه؟
نعم

سيقام غدا احتفال في صالة الألعاب بمناسبة فوز فريق كرة السلة
ستمتلئ صالة الألعاب بمحبى كرة الطائرة؟
لا

أوفد مجلس الأمن التابع للأمم المتحدة بعثته الأمنية لمدة عشرة أيام
البعثة الأمنية التابعة للأمم المتحدة لم تُرسل بعد؟
لا

يشجع كثير من التجار جلب الأقمشة النسائية إلى هذه القاعدة العسكرية

تُوجَد مجموعة من النساء في هذه القاعدة العسكرية؟
نعم

لم يصل رجال الإطفاء إلى مكان الحريق في أسواق القرية البعيدة
أخمَد رجال الإطفاء حريق السوق؟
لا

استفد من مشاورة ونصح أبناء خالك هو ما قاله له جده
نصحَهُ جدّه بأن يأخذ بمشورة أبناء عمّه؟
لا

نقل معدات المصنع الجديد لمقره المحدد فريق من مهندسي المصنع المختصين
نَقَلَ مُعدّات المصنع مجموعة من المهندسين؟
نعم
GP

كتب مقرر مادة الأدب الأموي من قبل مجموعة من مشرفي الوزارة
الذي كَتَبَ مقرّر مادة الأدب فريق من المشرفين؟
نعم
GP

فتح باب القبول في الكلية العسكرية بدأ منذ منتصف الشهر الجاري
باب القبول في الكلية العسكرية مازال مفتوحا؟
نعم
GP

فصل مدير المؤسسه لموظفي العلاقات العامة لم يعق سير عمل المؤسسة
التخلّي عن موظفي العلاقات العامة لم يؤثر على عمل المؤسسة؟
نعم
GP

أبلغ المسؤول في لجنة مكافحة الشغب لتزايد موجات غضب طلاب السكن
بِسَبَب شغب طلاب السكن أُخبرَ المسؤول؟
نعم
GP

لأن مُدِير الشَّرِكَة لِمَطَالِب مُوَظَّفِيه بزِيَادةِ الأجر الشَّهرِي لِكُلّ المُوَظَّفِين العَامِلِين
لم يَعتَرِض مُدِير الشَّرِكَة أَبَدَا عَلَى زِيَادَة أُجُور المُوَظَّفِين؟
لا

غَرِق جُنُود فِرقَة المُشَاة البَحرِيَّة بَعد أن بَدَّل الخُطَّة قَائِدهَا العَام
مَوتُ الجُنُود كان بِسَبَب خطأ القَائِد؟
نعم

رَقّ التَّاجِر لِحَال الرَّجُل الفَقِير بَعد أن وَجَده نَائِما بِجَانِب المَحَلّ

أشفقَ التَّاجِر على الرَّجُل الفَقِير بَعدَ أن رَأى مَنزِله؟
لا

عَمَل مِن أعمَال لَجنَة المَسرَح الوَطَنِيَّة يَتَحَدَّث عَن مُشكِلاَت المُجتَمَع الثَّقَافِيَّة
للجنة المسرح الوطني أعمالٌ عديدة منها مناقشة مشكلات ثقافية؟
نعم

جُرّ الخَرُوف إلى مَكَان الذَّبح مِن أجل إعدَاد وَلِيمَة اِحتِفَال العُرس
مِن أجل إعداد وليمة العرس نُقِل خروف لمكان الذبح؟
نعم

جُرِحت خَمس نِسَاء كُنّ بِالقُرب مِن مَكَان الانفِجَار فَتَمّ إسعَافهنّ فَورَا
قُتِلت خَمس نساء من جرَّاء قُوَّة الانفجار؟
لا

وَزَّع المُتَبَرِّعُون كُتُبا وَأشرِطَة عَلَى الحُجَّاج مِن غَير أخذ إذن المَسؤُولِين
أخَذ المتبرعون إذنا من المسؤولين لتوزيع بعض الكتب والأشرطة؟
لا

اِشتَرَكت كُلّ المُؤَسَّسَات وَالمرَاكِز الحُكُومِيَّة فِي حَملَة الإرشَاد بِشَأن مَخَاطِر التَّدخِين
رَفَضت بَعض المؤسَّسات والمراكِز الحكوميَّة الاشتراك فِي حَملَة الإرشاد؟
لا

مَن هُوَ ذَلِك القَائِد الَّذِي فَكّ أسر الجُندِيّ المُحَارِب التَّابِع لِلعَدُوّ؟
فكُّ الجندي المأسور كان من قِبَل زميله الجندي؟
لا

مِن عَلاَمَات اِزدِهَار اِقتِصَاد هَذَا البَلَد تَحوِيل تُجَّاره أموَالهم لِدُوَل أخرَى
نَقلُ التُّجار أموالهم إلى الخارج اُعتُبِرَ عَلامةً من علامات ازدهار الاقتصاد؟
نعم

إن اِستِلاَم القَائِد العَسكَرِيّ المَعرُوف بِجَبَرُوته لِجَائِزَة الدَّولَة أحزَن كُلّ مُوَاطِنِيهَا
اِستِلام القَائد للجائزة لم يُغضِب الشَّعب؟
لا

دُور الرِّعَايَة الاِجتِمَاعِيَّة تَجَهَّزَت لإيوَاء الأطفَال الَّذِين فَقَدوا أسَرهم بِسَبَب الحَرب
فَقَدَ الأطفال أسرهم من جرّاء حوادث السيارات؟
لا

كُلّ الطُلاَّب المُتَفَوِّقِين فِي دِرَاستِهم تَجَمَّعوا لاِستِلاَم جَوَائِزهم إلاَّ خَالِدا وَأحمَد
جَميعُ الطلاب المتخرجين تجمعوا لاستلام جوائزهم؟
لا

الَّذِي بَنَى هَذِه المَكتَبَة الكَبِيرَة كَان رَجُلا غَنِيّا مِن خَارِج البَلَد

بناءِ مكتبة البلدة كَانَ بسبب تبرُّعات أهلها؟
لا

تَقرِير حُكم المَحكَمَة الشَّرعِيَّة فِي قَضِيَّة جَرِيمَة التَّزوِير مُعَدّ مِن الكَاتِب
أعَدَ التقريرَ قاضِي المحكمة؟
لا

ضَحَّى الأب بِجَمِيع مَاله لِشِرَاء سَيَّارَة لابنه مِن دُون رَصِيد كَاف
كَانَ الأبُ غنيّا؟
لا

سُرُور الطِّفل بِلِعبَته الجَدِيدَة لم يَستَمِرّ بِسَبَب سُقُوطهَا مِن يَدِه وَانكِسَارهَا
شُعورُ الطفلِ بالحزن على لعبته؟
نعم

اِستِمرَار تَعذِيب السُّجَنَاء السِّيَاسِيِّين قَد يَكُون مُثِيرا لِغَضَب مُنَظَّمَة حُقُوق الإِنسَان
استمرار تعذيب السُّجناء السِّياسيِّن قد لا يثير غضب منظمة حقوق الإنسان؟
لا

اِنتِهَاك عُمدَة مَدِينَة رُومَا لِمَوَاثِيق المَجلِس البَلَدِيّ أثَار غَضَب الشَّارِع عَلَيه
ثَارَ الناسُ في روما على عمدة بلديّتهم؟
نعم

اِستَعَان مَالِك المَنزِل بِجِيرَانه عَلَى المُستَأجِر لِدَفع أجَار تَجَاوَز ثَلاثَة أشهُر
لجوء مالك المنزل للشرطة بسبب تأخُّر المستأجر في الدفع؟
لا

سَيُعقَد غَدا اِجتِمَاع فِي نَادِي الطُّلاَّب بِالجَامِعَة بِمُنَاسَبَة تَخَرُّج دِفعَته الثَّانِيَة
سَيَكُونُ غدا اِحتفالُ الدفعة الأولى من طلاب النادي؟
لا

أوقَف حَاكِم الوِلاَيَة أحَد وُزَرَائهَا لِتَهَاونه فِي أعمَاله الإِدَارِيَّة لِمُدَّة سَنَة
عُوقِبَ الوزيرُ بالسجن؟
لا

يُفَضِّل سُكَّان هَذِه المدِينَة إقَامَة حَفل مَهرَجَانِيّ بِمُنَاسَبَة اِنتِصَار الحِزب الوَطَنِيّ
اِنتِصارُ الحزبِ الوطني في المدينة لم يَكُن ذا أهميّة كبرى؟
لا

لَم يَكُن بنَاء السُّفُن البَحرِيَّة مَصدَر الدَّخل الأسَاسِيّ لِهَذِه المَدِينَة السَّاحِلِيَّة
تَعدُّدُ أوجه الكسب والدخل في هذه المدينة الساحلية؟
نعم

اِستَعِد لِمُوَاجَهَة القَضَاء بِالأدِلَّة القَوِيَّة المُوَثَّقَة هُو مَا قَاله لَه عَمُّه

نَصَحَه عَمّهُ بإعداد أدلّة قويّة؟
نعم

وَضع مَلَفّ السَّرِقَة وَالقَتل أَمَام القُضَاة مَجمُوعَة مِن مُحَقّقِيّ الجَرِيمَة المُختَصّين
وَضَعَ القُضاةُ ملفَّ السرقة والقتل أمام المحققين؟
لا

عُرِف تَزوِير خَتم الوَزِير الجَدِيد مِن قِبَل مَجمُوعَة مِن المُقَرَّبين مِنه
اكتشَفَ مجموعةُ من المحققين خَتمَ التّزوير؟
لا
GP

.حُبّ فُقَرَاء الحَيّ لارتِيَاد المَطعَم الصِينِيّ سَاعَد عَلَى بَقَائِه وَزِيَادَة مَكَاسِبِه
اِرتِفاعُ مكاسبِ المطعم كَانَ بسبب ارتياد فقراء الحي له؟
نعم

.كَشف مَعمَل الأدوِيَة لِلتّلَوّث المُصَاحِب لِلإبَر لَم يَمنَع بَيعهَا فِي الأسوَاق
مازالت الإبَرُ الملوثةُ تُبَاعُ في الأسواق؟
نعم
GP

أُخرِج مُدَرِّب نَادِي ضُبَّاط الحَرَس الوَطَنِيّ من مُسَابَقَة شَخصِيَّة السَّنَة المُتَمَيِّزَة
أُختيرَ مدرب نادي الضباط ليكون الشخصية المتميزة
لا
GP

حَصَل كُل مِن عَالِم الفِيزيَاء وَعَالِمَة الذرَة عَلَى جَائِزَة لِمَوَاقِفهمَا الإنسَانِيَة
حُصُول العَالِمَين عَلَى الجائِزَة كان بِسَبَب إنتاجِهما العِلمِي؟
لا

سَقَط كَأس المَاء بَعد أن حَرَك طَاوِلَة الطعَام أَحَد الجَالِسِين عَلَيهَا
سَقَطَ كَأسُ المَاء بَعد أن حَرَك طَاوِلَة الطعَام أحد العامِلِين في المَطعَم؟
لا

رَد إِسمَاعِيل كِتَاب زَيد عَلَيه بَعد أن اِستَعَاره مِنه لِسَبعَة أَيَام
اِستَرجَعَ زَيد كِتابه مِن إسمَاعِيل؟
نعم

فَصل مِن فُصُول رِوَايَة الكَاتِب الكُومِيدِيَة يَتَكَلَم عَن ظُلم حَاكِم المَدِينَة
عَدلُ حاكم المدينة كان موضوع فصلٍ من فصول الرواية؟
لا

حُل اِمتِحَان مَادَة الرِيَاضِيَات لِنِصف هَذِه السَنَة بِسُرعَة فَائِقَة بِسَبَب سُهُولَته
امتِحان مادَّة الرياضيَّات أَخَذ وَقتا طَويلا؟
لا
بِيعت سَيَارَات قَدِيمَة كَانت فِي المَزَاد العَلَنِي وَتَبَقَت فَقَط السَيَارَات الجَدِيدَة

بيعَت كُلّ السيارت في المَزاد العَلَني؟
لا

جَهَز الحَاضِرون آرَاءهم فِي وزَارَة الصحِة مِن غَير تَدَخُل مُقَدِم البَرنَامَج
كانت هُناك حُرِّيَّة في إبداء الرأي في هذا البرنامج؟
نعم
اِمتَنَعت لجنَة حُقُوق الإنسَان الدَولِيَة عَن الدِفَاع عَن قِيَادَات الحَرب السَابِقِين
دافعت لجان حقوق الإنسان الدولية عن قيادات الحرب السابقين؟
لا

مَن هُو الطِفل الذِي كَسَر زُجَاج نَافِذَة البَيت الوَاقِع أمَام الحَدِيقَة؟
الذي كُسِر كان زجاج أبواب المنزل؟
لا

مِن مَصلَحَة البَلَد عَدَم بِنَاء سُدُود ضَخمَة بِالقُرب مِن مَجَارِي السُيُول
بناءُ السدود ليسَ دائما من مصلحة البلد؟
لا

إن اِستِخدَام المَاء لِزرَاعَة الحُبُوب عَمَل مَسمُوح به فِي بَعض الأوقَات
ليست هناك قُيُود على استخدام الماء في زراعة الحبوب؟
لا

فِرَق الإطفَاء وَالإسعَاف تَجمَعت كُلهَا لإسعَاف الذِين أُخرجوا مِن حَرِيق المَبنَى
اِنحجز كُل من كان في المبنى ولم يستطيعوا الخروج؟
لا

كُل الطُلاَب المُتَخَرِجِين تَجَمَعوا فِي صَالَة الحَفل المَدرَسِي مَاعَدَا زَيدا وَإبرَاهِيم
لم يتغيّب أحد من الطلاب عن حفل التخرج؟
لا

الذِي سَرَق بَضَائِع مَحَل الأزيَاء كَان اِبنا لِمَالِك هَذا المَحَل المَسرُوق
اِبنُ مالِك محل الأجهزة الكهربائية كَانَ هو السارقَ؟
لا

تَخطِيط مَنطِقَة الحُدُود بَين الدَّولَتَين المُتَنَازِعَتَين مُجَهَز مِن لَجنَة العَدل الدَولِيَة
كَان تَجهيزُ التخطيط من قِبَل لجنة التخطيط الدوليّة؟
لا

دَوَى اِنفِجَار فِي مَدِينَة المَلاَهِي المُزدَحِمَة بِالنَاس مِن دُون خَسَائِر بَشَرِيَة
قوة انفجار مدينة الملاهي أودى بحياة بعض الأفراد؟
لا

ظُهُور أعرَاض مَرَض خَطِير بِالقَريَة لم يَكُن بِسَبَب وُجُود المُستَنقَعَات المُلَوَثَة
أدَّت المستنقعات الملوثة إلى ظهور أعراض مرضٍ خطير؟
لا
اِستِتبَاب الأمن فِي هَذِه القَريَة قَد يَكُون بِسَبَب تَظَافُر جُهُود سُكَانِهَا

تَعاون أهل القرية فيما بينهم قد يَكُونُ سبب أمنهم؟
نعم

مُقَاتَلَة جُنُود تَحرِير الوَطَن لِقُوَات المُستَعمِر الغَازِي دَامت مُدَة عِشرِين سَنَة
مُقاومة المستعمر أخذت عشر سنوات؟
لا

اِستَغرَق بِنَاء الجِسر المُمتَد بَين المَدِينَتَين وَقتا طَوِيلا تَجَاوَز عَشر سَنَوَات
بناء الجسر أخذ أكثر من سبع سنوات؟
نعم

سَيُجرَى قَرِيبا تَبَادُل أسرَى الحَرب بَين الدَولتَين المُتَحَارِبَتَين مِن أجل السَلاَم
تَبادل الأسرى بين الدولتين سَبيل للسلام؟
نعم

أصدَر قَاضِي المَحكَمَة حُكما بِالسِجن عَلَى مُرتَكِب الجَرِيمَة لِمُدَة عَشر سَنَوَات
حُكِمَ على مُرتكِب الجريمة بالإعدام؟
لا

يُنَظِم أعضَاء هَيئَة التَدرِيس بِالجَامِعَة حَفلا تَودِيعِيا بِمُنَاسَبَة اِنتِهَاء العَام الدِرَاسِي
كَانَ هناك اِحتفالٌ بمناسبة بدء العام الدراسي؟
لا

لم يَكُن بَيع اللُحُوم البَحرِيَة العَمَل المُربِح فِي هَذِه المَدِينَة السَاحِلِيَة
قِلة الأرباح العائدة من بيع اللحوم البحرية؟
نعم

اِستَعِن بِأخِيك الأصغَر عَلَى أعمَالك هِي الجُملَة التِي قَالتها له أمه
نَصَحَته أمّه بالاستعانة بأخيه الأكبر؟
لا

فَتح مَشرُوع التَحلِيَة لِلمَدِينَة السَاحِلِيَة الإسبَانِيَة وَزِير التَحلِيَة وَالمِيَاه فِي المَنطِقَة
لم تحدّد شخصيّة الذي فَتَحَ مشروع التحليّة؟
لا
GP

دَرس مَشرُوع مَدَارِس مَحو الأمِيَة مِن قِبَل فَرِيق مِن الأكَادِيمِيين المُختَصِين
الذي دَرَسَ مشروع محو الأميّة مجموعة من الأكاديميين؟
نعم

شُرب العَصِير الطَازِج المَصنُوع مِن الفَوَاكِه نَصَح بِه قَلِيل مِن الأطِبَاء
نَصَحَ كثير من الأطباء بشُرب عصير الفواكهة الطازج؟
لا
GP

ضَرب أستَاذ مَادَة التَارِيخ أحَد الطُلاَب لم يَردَع غَيره عَن الشَغَب

اِمتناعُ الطلاب عن الشغب بعد ضرب الأستاذ لواحد منهم؟
لا
GP

أُعلِمِ مُدِيرِ المَطعَم المُنَاوِب لِتِلك الليلَة عَن تَسَمُم أَحَد زَبَائِن المَطعَم
تلقَّى مُدِيرُ المطعم المُناوِب خبر وقوع حالة التَّسمُّم؟
نعم

GROUP 2

PRACTICE SENTENCES

أشهر الصيف في فرانكفورت تبدأ من شهر مايو وتنتهي في أغسطس
أشهر الصيف في فرانكفورت هي من مايو حتى أغسطس؟
نعم

استنفار الشعب للمشاركة في الحرب كان بسبب دخول العدو للمدينة فجأة
دخل العدو للمدينة فجأة؟
نعم

جَاء خَالِد مِن سَفَره الَّذِي غَاب فِيه عَن البَلَد لِزَمَن طَوِيل
ابتعد خالد عن بلده لمدة طويلة؟
نعم

بعض أنواع المشروم البري يعرف بأنه غير صالح للأكل ويجب تجنبه
كل أنواع المشروم صالحة للأكل؟
لا

أذيعت بالأمس نتائج اختبارات الثانوية العامة للأولاد بعد طول انتظار إعلانها
إعلان نتائج الثانوية العامة كان سريعا؟
لا

قلد الرئيس العام لنادي الشباب وسام الشرف لمدير منتخب كرة الطائرة
الفائز بوسام الشرف لهذا العام هو مدرب كرة القدم
لا

علم النفس التربوي كان من المواد الإجبارية على كل طلاب الجامعة
علم النفس التربوي كان من المواد المقررة على كل التخصصات
نعم

ACTUAL SENTENCES

حولّ المشتريات التي سرقت فقدْ كان سبب سرقتها إهمال عامل المحل
كان عامل المحل حريصا في عمله؟
لا

عدّل قاضي المحكمة في حكمه لهذه القضية سيرْضي عنه المذنب الجاني
سيتضايق المُذنِب من حُكم القاضي؟
لا
GP

أدْخل متخصص في برامج الحاسوب المتقدمة في السجن لتلاعبه بمعلومات الشركة
عُوقِب متخصص الحاسوب بالسجن؟
نعم
GP

نقّل بعض موظفي وزارة التربية والتعليم كان بقرار من نائب الرئيس
قرارُ نقلِ الموظفين كانَ مِن قِبَل الرئيس؟
GP

خلّف الجسر الواقع على النهر توجد الفرق العسكرية بمافيها القيادات الكبرى
معسكر الجيوش موجود بالقرب من النهر؟
نعم

كتبُ المقررات الدراسية فيْ القسم كانت توزع فقط من قبل أساتذته
أساتذة القسم كانوا المسؤولين عن توزيع الكتب؟
نعم
GP

قفلُ أبواب منتجع السياحة في هولندا كان بسبب انتشار أمراض معدية
قَدْ يكون هناك علاقة بين انتشار المرض والمنتجع السياحي؟
نعم
GP

كتبُ منهجِ الكيمياءِ الحيويةِ في مكتبةِ الجامعةِ تباعُ بسعرٍ زهيدِ الثمنِ
أسعارُ الكتب المنهجية للكيمياء في هذه الجامعة ليست غالية؟
نعم
GP

حملُ سالمٍ على ابنِ أخيهِ الصغيرِ كانَ بسببِ كذبهِ الدائم عليهِ
عُرِفَ ابن أخ سالم بعدم صدقه؟
نعم
GP

حولَ المنتدياتِ الأدبيةِ وَالمجالسِ السياسيةِ فقدْ سمحَتْ السلطةُ الحكوميةُ باستمرارِ عملِها
رَفَضت السلطةُ الحاكمةُ بأن تكون هناك أي مجالس سياسية أو منتديات أدبية؟
لا
أجبرَ مالكُ محلِّ الموادِّ الغذائيةِ المستوردةِ على عدمِ بيعِ الأصنافِ المحليةِ
لايَستطِيعُ صاحِبُ هذا المحل بَيعَ المواد الغذائية المحلية؟
نعم
GP

GROUP 3

PRACTICE SENTENCE

ذهِب المُدينُة يعتِبر نوعِا مُن الأنواع الثمُينة ولِكنه لِيس بُالنِوع الأفضِل
ذَهَبُ المدينة ليس بالنوع الأفضل؟
نعم

ACTUAL SENTENCES

ثِبَت أن سعُيدا كُان هوِ السُّارَق لمَمُتلكُات أبَيَه الذِي مِات مَريَضَا
إدانة سعيد بسرقة ممتلكات عمّه؟
لا

عُمُارُة مِسجِد الحُي تَمُت يسُبَب تبِرع مجمَوعة مِن أصِحُاب دخِل مُحدِود
تَبَرَّعَ أغنياء الحي ببناء المسجد؟
لا

اَنتقِدِت كَل الطوِائف الدُيُنُية محِاولِة فِنان تشكُيُلي زخِرفة ضرُيح قِبر شهُيُدة
معارضة الطوائف الدينية زخرفة القبر؟
نعم

مُن تُعْلُيمات صاحُب المُنزُل عدِم طرِق بُاب غرِفَته بعِد سُاعُة الغُذُاء
صاحب المنزل لايحب أحدا أن يطرق بيته قبل ساعة الغذاء؟
لا

فُي شهِر حزُيران مُن 2003 وقِع البلُدِان اتَفَاقاً لُوقف إطُلاق النُار
قَبْلَ شهر حزيران من 2003 كان البلدان يتحاربان؟
نعم

اَرتفِعت معُدلات بُطُالة البُلِد بعِد أن أغُلِقت شرُكُة كبِرى بعِض فِروَعُها
ارتفاع معدلات البطالة كان بسبب إغلاق الشركة لكلّ فروعها؟
لا

عمِل مجِلس البُلِديَّات عُلَى إزُالة المحُلات المتِنقلة يقِابله اَعتُرُاض الرأي العِام
قَرَارُ البلديَّة بإزالة المَحَلات المتنقِلة لا يَلقَى اعتراضا؟
لا

APPENDIX L
INSTRUCTIONS

SESSION I

أهلا بك إلى تجربة قراءة الجملة
في هذه الصفحة تُقَدَّم لك المعلومات حول الكيفية المطلوبة منك لأداء التجربة.
من فضلك اقرأ هذه التعليمات بعناية ودقة, وإن كان لك أي سؤال فعليك أن
.تطرحه قبل غلق هذه الصفحة
اسم وهويّة المشترك لن تكون معلنة أبدا؛ فقط رقم المشترك سيكون
.معلنا, وكلّ الإجابات ستحفظ في مكان آمن
ستحتاج إلى استخدام إما أزرار الأسهم الموجودة على لوحة المفاتيح أو
الفارة للتحرّك إلى أسفل هذه الصفحة حتى تتمكّن من قراءة كل الإرشادات.
في هذه التجربة سيطلب منك قراءة بعض الجمل. الجمل السبع الأولى منها ستكون تمرينا,
وبعد ذلك ستقرأ جمل التجربة الفعليَّة. ستَقرأ كُلّ جملة كلمةً كلمةً بالسرعة التي ترغبها
للانتقال من كلمة إلى كلمة تالية تحتاج إلى نقر زرّ
SPACE BAR
الذي على لوحة المفاتيح.
ستظهر لك الكلمة الأولى بعد أن تَنقُر زرّ
,SPACE BAR
ثمّ بعد أن تنقر مرّة أخرى هذا الزرّ ستظهر لك الكلمة الثانية وتختفي الكلمة الأولى
وهكذا تحتاج إلى أن تَنقُر هذا الزر حتى تظهر لك الكلمات التالية واحدة تلو الأخرى بينما
تختفي الكلمات السابقة إلى أن تأتيك الكلمة الأخيرة والمعلّمة بنقطة تليها للدلالة على
نهاية الجملة, ومن ثمَّ يأتيك في نافذة صغيرة سؤال الفهم الخاص بالجملة التي قرأتها التّو
مع ثلاثة اختيارات: "نعم", "لا", و "لا أدري" للإجابة عن السؤال.
الأزرار من لوحة المفاتيح والتي تحتاجها للإجابة عن السؤال هي على النحو التّالي:
"N", "Y", و "D"
.وذلك للإجابة ب: "نعم", "لا", و "لا أدري" بشكل تراتبي مشابه
لك أن تستخدم إما الأزرار المشار إليها سابقا أو بواسطة الفارة وذلك بنقر أحد
الصناديق الثلاثة المزوّدة لك في نافذة السؤال والتي تُمثّل الاختيارات الثلاثة.
من فضلك حاول أن تقرأ كل جملة بعناية وبسرعة ولكن بشكل طبيعيّ. الجمل
السبع الأولى ستكون تمرينا قبل بدء قراءة جمل التجربة الفعليّة, والتي ستنبّه عنها قبل بدئها.
إجابتك على السؤال يجب أن تكون مبنيّة فقط على المعلومات التي تعطيكَ إيّاها الجملة
وليس على أي شيئ آخر. إذا ترى أنك مضطر إلى التخمين أو الاختيار
العشوائي للإجابة على السؤال, فعليك أن تختار إجابة "لا أدري". ليس هناك أي
تبعات على اختيار إجابة "لا أدري" إذا كنت لا تعرف الإجابة.
بَعْدَ قراءتك لآخر جملة وإجابة سؤال الفهم الخاص بها, ستُنَبَّه عن نهاية التجربة.
الآن وبعد أن ترى أنك قد انتهيت من قراءة وفهم التعليمات, فإن كان لك أي
أسئلة وإلا فلك أن تُغلِق نافذة التعليمات لبدء التجربة وذلك بنقر الصندوق الصغير
الذي في الجانب الأعلى الأيمن من النافذة الأولى والذي يحمل علامة إكس
X
شُكرا على مشاركتك في هذه التجربة!

SESSION II

أهلا بك إلى تجربة قراءة الجملة
في هذه الصفحة تُقَدَّم لك المعلومات حول الكيفية المطلوبة منك لأداء التجربة.
من فضلك اقرأ هذه التعليمات بعناية ودقة, وإن كان لك أي سؤال فعليك أن
.تطرحه قبل غلق هذه الصفحة
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في هذه التجربة سيطلب منك قراءة بعض الجمل. الجمل السبع الأولى منها ستكون تمرينا,
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SPACE BAR
الذي على لوحة المفاتيح.
ستظهر لك الكلمة الأولى بعد أن تَنقُر زرّ
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من فضلك حاول أن تقرأ كل جملة بعناية وبسرعة ولكن بشكل طبيعيّ. الجمل
السبع الأولى ستكون تمرينا قبل بدء قراءة جمل التجربة الفعليّة, والتي ستنبّه عنها قبل بدئها.
إجابتك على السؤال يجب أن تكون مبنيّة فقط على المعلومات التي تعطيكَ إيّاها الجملة
وليس على أي شيئ آخر. إذا ترى أنك مضطر إلى التخمين أو الاختيار
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الذي في الجانب الأعلى الأيمن من النافذة الأولى والذي يحمل علامة إكس
X
شُكرا على مشاركتك في هذه التجربة!

SESSION III

أهلا بك إلى الجزء الثالث من التجربة
الطريقة والتعليمات لهذا الجزء من التجربة هي نفس طريقة وتعليمات
الجزء الأول والثاني منها. نفس الأزرار التي استخدمتها في الجلسة الأولى
والثانية من التجربة ستستخدمها هنا في هذه الجلسة وبنفس الطريقة.
الاختلاف في هذه الجزء من التجربة سيكون بخصوص نوعية الجمل التي ستقرأها.
ذلك أنك في هذه الجلسة ستقرأ بعضا من الجمل والتي قد شُكّلت لك ولكن بوضع خاطئ.
هذا التشكيل الخاطئ مبني على وضع الحركات بشكل يؤدّي إلى تغيير الكلمة إلى كلمة
أخرى لا معنى لها في العربية؛ ذلك أن قراءتك للكلمة بهذا التشكيل الخاطئ سيؤدي
بك إلى أن تقرأ كلمة لاتحمل معنى أبدا.
بعد قراءتك للجملة سيكون هناك سؤال خاص لها والذي يتطلب منك فهم الجملة. من فضلك
إجابتك على السؤال يجب أن تكون مبنيّة فقط على المعلومات التي تعطيك إياها
الجملة وليس على أي شيئ آخر. إذا ترى أنك مضطر إلى التخمين أو الاختيار
العشوائي للإجابة على السؤال, فعليك أن تختار إجابة "لا أدري". ليس هناك أي
تبعات على اختيار إجابة "لا أدري" إذا كنت لا تعرف الإجابة.
ستكون هناك جملة واحدة للتمرين قبل بدء التجربة الفعلية.
بَعْدَ قراءتك لآخر جملة وإجابة سؤال الفهم الخاص بها, سَتُنَبَّه عن نهاية التجربة.
الآن وبعد أن ترى أنك قد انتهيت من قراءة وفهم التعليمات, فإن كان لك أي
أسئلة وإلا فلك أن تُغلِق نافذة التعليمات لبدء التجربة وذلك بنقر الصندوق الصغير
الذي في الجانب الأعلى الأيمن من النافذة الأولى والذي يحمل علامة إكس
."X"
شُكرا على مشاركتك في هذه التجربة!

APPENDIX M
EXPERIMENT 3 MATERIALS

STIMULI

ID					
Word ID	**Word**	**Type**	**Word ID**	**Word**	**Type**
Group I			Group II		
1	قال	Non-Homograph (NH)	31	أَدخَلَ	NH
2	درس	Homograph (H)	32	التي	NH
3	دق	H	33	ابتَكَرت	H
4	فرح	H	34	انفعال	NH
5	زرعت	H	35	إِن	NH
6	احترقت	H	36	استَعاد	NH
7	من	H	37	استَمع	NH
8	من	H	38	استقرار	NH
9	إن	H	39	فَعل	NH
10	سور	H	40	وُك	NH
11	كل	H	41	جهر	H
12	التي	NH	42	كُلّ	NH
13	تأخير	NH	43	لَم	NH
14	قوى	H	44	من	NH
15	عدول	NH	45	من	H
16	استفادة	NH	46	مرور	NH
17	محاكمة	NH	47	نَجى	NH
18	استنكر	H	48	نَظَر	NH

19	سيعاد	NH	49	قُيضت	H
20	أرسل	H	50	رن	H
21	لم	H	51	رب	NH
22	لم	H	52	سال	NH
23	انتبه	H	53	سينجز	NH
24	نشر	H	54	شُهد	NH
25	غاق	H	55	سور	NH
26	وعد	H	56	تَقدير	NH
27	أجمع	H	57	طَرح	H
28	جمع	H	58	أُنتُقد	NH
29	جعل	H	59	وكل	NH
30	سد	H	60	يدرس	NH
Group III			Low Frequency		
61	أَبعد	NH	91	أَدلَج	NH
62	الَتي	NH	92	عواء	NH
63	باع	NH	93	عنوة	NH
64	ابتَعد	NH	94	عس	NH
65	إِن	H	95	أوعز	NH
66	اقتَربت	H	96	بصيرة	NH
67	استَعرض	NH	97	ضئيل	NH
68	استمتَاع	NH	98	دفينة	NH
69	خُروج	NH	99	اعتلال	NH
70	كُل	H	100	افتقَار	NH
71	أُف	H	101	غبطَة	NH

72	أوى	H	102	جرف	H
73	أم	NH	103	عرف	H
74	من	NH	104	خضب	H
75	مجادلة	NH	105	خَرم	NH
76	من	H	106	خر	H
77	نَقل	H	107	لج	NH
78	قفل	H	108	مسبار	NH
79	قتل	H	109	قرطاس	NH
80	قُرب	H	110	صولة	NH
81	سرق	H	111	زج	NH
82	شُد	H			
83	سمع	H	Wrongly Vowelization		
84	صرِفت	H	1WR	أنتشرت	H
85	سيروى	NH	2WR	أعترِفت	H
86	تَمديد	NH	3WR	فعل	H
87	طُرق	NH	4WR	فُي	NH
88	أُرسل	NH	5WR	ٱستَغفُار	NH
89	ودع	NH	6WR	نُجارة	NH
90	يقَرِر	NH	7WR	قرِأ	NH
			8WR	سمع	H
			9WR	مات	NH
			10WR	انصرفت	H
			11WR	سأُلمة	NH

			12WR	ثِقَّة	NH
			13WR	صفوة	NH

Note: the letter, “H” indicates that the word is considered to be a homograph, and “NH” indicates that the word is considered to be a non-homograph.

APPENDIX N
INSTRUCTIONS

SESSION I

مرحبا بك إلى التجربة
في هذه التجربة سيُطلب منك أن تقرأ بعض الكلمات والتي ستقدم لك بشكل منفرد. أولا, سترى علامة الزائد والتي عليك أن تثبت عينيك عليها. في هذه المنطقة التي فيها علامة الزائد ستقدم لك كلمات التجربة.
علامة الزائد ستبقى على الشاشة لمدة 1000
بعدها ستختفي علامة الزائد وستظهر لك الكلمة الأولى؛ المطلوب منك هو أن تقرأ
الكلمة بصوت عالٍ وبشكل سريع وصحيح. حينما تجد أن الكلمة تحتمل أكثر من قراءة حاول أن تختار القراءة التي تتبادر إلى ذهنك للوهلة الأولى. بعد أن تستجيب بقراءة الكلمة, ستختفي الكلمة وستظهر علامة الزائد مرة أخرى وستليها الكلمة الثانية وهكذا إلى أن تَقرأ كل كلمات التجربة.
الآن ستبدأ بعمل بعض التمارين قبل بدء التجربة الفعليّة.
إن كان لك أي أسئلة من فضلك اذكرها الآن قبل بدء التمارين.
شكرا على اشتراكك في التجربة.
اضغط مفتاح
SPACEBA لبدء التجربة.

INSTRUCTIONS

SESSION II (For the Wrongly Vowelized Condition)

مرحبا بك إلى التجربة
في هذه التجربة سيُطلب منك أن تقرأ بعض الكلمات والتي قد شُكّلت لك بشكل خاطئ
قراءة الكلمة بشكل الخاطئ سيؤدي بك إلى أن تقرأ كلمة لا وجود لها في العربية. ستقدم لك الكلمات بشكل منفرد. أولا, سترى
علامة الزائد والتي عليك أن تثبت عينيك عليها. في هذه المنطقة التي فيها علامة الزائد ستقدم لك كلمات التجربة.
علامة الزائد ستبقى على الشاشة لمدة 1000
بعدها ستختفي علامة الزائد وستظهر لك الكلمة الأولى؛ المطلوب منك هو أن تقرأ
الكلمة بصوت عالٍ وبشكل سريع وصحيح. حينما تجد أن الكلمة تحتمل أكثر من قراءة حاول أن تختار القراءة التي تتبادر إلى
ذهنك للوهلة الأولى. بعد أن تستجيب بقراءة الكلمة, ستختفي الكلمة وستظهر علامة الزائد مرة أخرى وستليها الكلمة الثانية
وهكذا إلى أن تَقرأ كل كلمات التجربة.
الآن ستبدأ بعمل بعض التمارين قبل بدء التجربة الفعليّة.
إن كان لك أي أسئلة من فضلك اذكرها الآن قبل بدء التمارين.
شكرا على اشتراكك في التجربة.
اضغط مفتاح
SPACEBAR لبدء التجربة.

APPENDIX O

Announcement

Dear Friends,

You are invited to participate in a research project about the role of short vowels in Arabic. You will be asked to read four short passages for the first session in which two of them you will be asked to retell what you have read and answer seven true/false questions. For the second session, you will be asked to read 80 pairs of words. The entire experiment will take approximately 50 minutes.

The study does not involve any sort of foreseeable risks and no direct benefits for participating. You will be paid $5 for each session you attend for a total of $10 if you complete all parts of this study. All data collected during this research project will be kept confidential. Your participation in this project is completely voluntary, and you are free to withdraw at any time for any reason without penalty. You are also free to decline to answer any questions you do not wish to answer.

If you have any questions about this research project, please contact me at:

Principal Investigator: Abdullah Seraye

Telephone: (000) 000-0000

Email: amsst98+@pitt.edu

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