



## The Impact of Frequency on Words' Mental Storage: A Study on Arab Speakers of English as a Second Language

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### ABSTRACT

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The presented study investigates the effect of frequency on the mental lexicon representation of English words. The study targets Arabic native speakers, who speak English as a second language. To test the hypothesized relation of frequency and words' storage, a questionnaire was developed and distributed to ten Arabs speaking English as a second language. The questionnaire was designed for the participants to rate how two pairs of words, complex words and their roots, are related in meaning. The words were divided into two groups, frequent and infrequent words. The findings revealed a significant difference in the responses between the two groups of words. This difference was in favor of the frequent words, which can be used as an indicator that users' mental lexicon stores frequent words of their second language as complex word forms, not separate morphemes.

### Keywords:

Lexicon; Word-forms; Morphemes; Suffixes; Root.

### 1. INTRODUCTION

How listeners and speakers store words in their mental lexicon is a key issue presented in the study of human language. There has been a major theoretical issue of whether the lexicon consists of word-forms, or separate morphemes that are constructed on the fly when used. Given that lexical entries serve as the essential building blocks of morphological structure, this is a crucial area of study.

The mental lexicon and how words are stored in our minds is a very interesting topic of research, and yet a challenging one. It seems impossible to get inside someone's brain and look closely at the way it works, how the human brain sees words? how it memorizes them? and more importantly how it restores them when they are in need?

Research tools of the recent decades have made this investigation possible, in many ways, although not in a crystal-clear way, but efficient enough. In this paper, I intend to investigate the possible factors that affect the way words are stored in the lexicon, investigating the relationship between word-form storage and frequency. More specifically, the effect of the frequency of the complex words on the way non-native speakers of a language store them.

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To do so, the presented paper tries to answer the questions of whether words with high usage frequency get stored in the lexicon as complex word-forms or not, and if so, would words with low frequency get stored as separate morphemes, and speakers construct them on the fly? For the purpose of testing the hypothesized relation between frequency and word storage, primary data were collected via a questionnaire, which was developed and distributed to speakers of English as a second language to answer a series of questions in order to make a prediction about the relationship between complex words and their roots, in which these words have different ranges according on their frequency. Next, the responses were gathered and analyzed.

The presented paper is structured as follows. First, section 2 reviews the literature related to the given topic. Next, section 3 involves the methodology used for the presented study along with the targeted subjects and the data analysis. Section 4 presents the findings. In section 5, I provide a brief discussion of the findings. Finally, in section 6, I conclude the paper with a conclusion providing a summary and the limitations of this paper.

### 2. PREVIOUS STUDIES

#### 2.1 English Lexicon

The literature on complex words' representation in the English mental lexicon seems inconsistent and conflicting. Marslen-Wilson et al., (1994) seem to have assumed a good reason for such discrepancies. They believe that such conflict is the reflection of the absence of factors that determine the

lexical representation and the way it is accessed. These factors consist of looking for the language-specifics. That is, to look at the morphological category of the affixes whether they are derivational, inflectional, prefixes, or suffixes morphemes. A second factor is to look at the nature of the relationship between stems and their affixed forms, is it a relation of phonological or semantic transparency? Based on those factors, Marslen-Wilson et al., (1994) carried out six experiments to determine the structure of the lexical representation with speakers of English language. The first three experiments were conducted with derived suffixed words, the other two were conducted with prefixed words, and the last one looked at the relation between prefixed and suffixed word forms. The results of the first three experiments showed that the derived suffixed forms prime their stems, and this effect cannot be attributed to any phonetic overlap, that is, phonetically related pairs do not prime each other but morphologically related pairs do. The second experiment indicated that semantic link could cause priming between pairs, although that does not mean that the effects are not morphological in nature. The results of the third experiment confirmed the results of experiment two. The results of the fourth experiment showed that the morphological type has a significant effect on prefixed word forms. Moreover, there is a strong effect of semantic transparency. The results of the fifth experiment showed no priming in the phonological control and pseudoprefixed conditions. The results of the fifth experiment similarly showed an absence of priming for the bound-stem conditions. The results of the sixth experiment showed that the stem-derived pairs do not prime (e.g., between apart/apartment), that is, they do not share a stem morpheme in the lexical entry, in contrast to that, prefix-suffix and suffix-prefix do prime because they share a lexical entry.

In conclusion, the findings of Marslen-Wilson et al., (1994) study confirms that derivational forms are stored according to the morpheme-based lexicon. Although, it should be considered that the morpheme-based include all entities as morphemes on linguistic and diachronic grounds. Thus, for instance, the linguistically polymorphemic form apartment can behave like unanalyzed simple forms.

## **2.2 Arabic Lexicon**

Boudelaa (2014) raised the question of what mental lexicon does Arabic language have, is it a morpheme-based or stem-based lexicon? The first view, morpheme-based lexicon, holds that the word form of Arabic language consists of a root and a word pattern. On the other hand, the view of stem-based lexicon holds that the word forms of Arabic language consist of stems as basic units of the lexicon. As for the root and pattern view, according to Boudelaa (2014), there exist at least three different versions. The first version (which dates to medieval Arab grammarians) is that the morphological system consists of two morphemes: a consonantal root and a vocalic word pattern. The second version put forward by

structuralist linguists as Cantineau (1950), Cohen (1951), and a more recent work by Hilaal (1990), sees every form as a combination of a root and a word pattern and the lexicon of roots and patterns with a set of rules to associate them with each other. The third version is a model of autosegmental phonology developed by (McCarthy 1979, 1981, 1982). Here, the Arabic morphology is seen as an open oration of three morphemes a consonant a route, a vocalic melody and the CV-Skeleton. Moving to the word-based (e.g., stem-based) view of the lexicon, this view also has its different versions. That is, one represented by Heath (1987, 1997, 2003) in which he distinct between lexical presentations, morphological derivation, and lexical processing. He argues that the consonantal root is better "consigned to oblivion" (Heath 2003, p. 115). Other version of the word-based view is that it dispenses with the roots and patterns altogether (Benmamoun 1998, 2003; Ratcliffe 1998, 2004). The third version lines with the Generalized Template Theory (GTT). That is, the word formation in Semitic languages is guided by constrains that detects the minimum and maximum prosodic word length.

The findings of Boudelaa's (2014) study showed through a priming experiment that Arabic has a morpheme-based lexicon. Moreover, the same approach applies to all Semitic languages.

Furthermore, other evidence from a neuropsychological point of view demonstrated that the Semitic lexicon is a morpheme-based lexicon. According to the findings of several neuropsychological researchers who focus on damaged brain systems found that Arabic and Hebrew languages have a morpheme-based lexicon (Prunet et al., 2000; Barkai, 1980).

## **3. METHODOLOGY**

### **3.1 Design and Procedure**

The suffix '-ity' was chosen for the current experiment to study. The chosen suffix is often attached to monomorphemic bases, not only to an already-derived stem. A list of ten words containing the suffix '-ity' was created to be used in this experiment. The list of the chosen words was divided into two groups according to their frequency (e.g., frequent and infrequent), as shown in Table 1.

The list of target words included five filler words. The filler words were derived lexemes with varying degrees of semantic resemblance to their roots (e.g., the range between upper and lower limits on a certain scale), and they lacked the chosen suffix '-ity', as shown in Table 2. The filler words are used to generate a variety of word pairs. Furthermore, they aid in deterring participants from the study's objective (i.e., examining the impact of frequency), as they serve as a warning that "people do strange things when they think they know what you want them to say!" (Haspelmath & D. Sims, 2010, p.78). The filler words were sorted at random within the list of the targeted words.

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An online questionnaire was developed to test the hypothesized relationship between lexical mental storage and frequency. The frequent, infrequent, and filler words were mixed and listed randomly in the questionnaire. Each complex word with the chosen suffix was displayed with its root (such as obscurity-obscure). The participants were asked to rate how closely the first word relates in meaning to the second word on a scale of one to seven, where 7 is 'very close' and 1 is 'not at all close'.

**Table 1. Examples of words used in the experiment.**

<i>Complex word</i>	<i>Frequent/ Infrequent</i>	<i>Root</i>
<i>rapidity</i>	Infrequent	<i>rapid</i>
<i>acidity</i>	Infrequent	<i>acid</i>
<i>modernity</i>	Infrequent	<i>modern</i>
<i>personality</i>	Frequent	<i>personal</i>
<i>priority</i>	Frequent	<i>prior</i>
<i>security</i>	Frequent	<i>secure</i>

**Table 2. Examples of filler words.**

<i>Complex word</i>	<i>Root</i>
<i>thoughtful</i>	thought
<i>awful</i>	awe
<i>artful</i>	art

**3.2 Subjects**

Ten Saudi graduate female students, aged 23 to 30, received the questionnaire. They all obtained their degrees within at least four years specializing in an English-related major, such as English Translation and English Literature.

**3.3 Analysis**

The percentage of each of the questions was gathered and analyzed using IBM SPSS Statistics (Version 25) predictive analytics software. The responses were divided into two groups according to the word's frequency. Several procedures were performed on the data to obtain the results from descriptive and inferential statistical analysis.

**4. FINDINGS**

Data analysis revealed that, for speakers of English as a second language, frequency does in fact influence how words are stored in the mental lexicon. In other words, individuals were more likely to link complex words with higher frequency to their roots than they did with low-frequency words. The mean of rating responses associated with frequent words was 5.24, while for those associated with infrequent words it was 4.16, as shown in Table 3.

Following the descriptive analysis of the responses, inferential statistics were employed to confirm the significance of these findings and allow prediction from the data. An independent t-test was carried out to examine if there was a statistically significant difference between the outcomes of the two groups (see Table 4). If the p-value was

(0.05), as is known, we cannot assume that the inferential test has a statistically significant result. However, as shown in Table (4), the p-value was less than 0.05 (P=0.043). As a result, the descriptive findings are statistically significant, and the findings can be generalized to larger populations.

**Table 3. Descriptive Statistics.**

<i>Group</i>	<i>N</i>	<i>Mini- mum</i>	<i>Maxi- -mum</i>	<i>Me- an</i>	<i>Std. deviation</i>
Frequent words	5	1	7	5.24	0.9
Infrequent words	5	1	7	4.16	0.5

**Table 4. Independent t-test results**

Frequent		Infrequent		T	Sig.
Mean	Sd.	Mean	Sd.	2.396	0.043
5.24	.9	4.16	.5		

**5. DISCUSSION**

The findings of this study present a valid indicator that frequency and semantic transparency affect each other, which is considered as an indicator of their relationship with the lexicon content. Based on other studies discussed earlier in this paper, it appears that Arabic speakers store Arabic words in a method differently than they store their second language words. That is, the Arabic lexicon is a morpheme-based lexicon, while on the other hand, Arabic speakers store English words in a complex word-based lexicon. Moreover, it appears that native speakers of English also store words differently (i.e., morpheme-based ) than second-language English speakers (i.e., word-form lexicon).

Even though the data presented here is not sufficient enough for such indication, but there might be a relation between how words are stored in the lexicon, and the language used. That is, speakers may have a morpheme-based lexicon for their native language, but a word-form lexicon for their second language, as is the case for the presented study.

**6. CONCLUSION**

**6.1 Summary**

The presented study discussed whether frequency affects how second language users store words in the mental lexicon. Frequency was predicated to have an effect on the method of how words are stored e.g., word-based, or morpheme-based lexicon. To test this hypothesis an investigation was carried out to test Arabic native speakers who speak English second language. Ten participants were tested via a questionnaire. The questionnaire was designed to test the effect of frequency on complex words' storage in the lexicon. The target words were five frequent and five infrequent. The participants were asked to rate each complex word with its root from one to seven. The results showed that frequency has an effect on

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word storage, that is, frequent words are stored as complex word forms in the lexicon.

### 6.2 Limitations

Despite the significant results represented here, the study also has its limitation. First, the target words were not presented face-to-face with the participants. Accordingly, their initial response was not recorded immediately, and they might have accessed different resources to give accurate responses. Second, the frequency of English words used among English native speakers might not be the same as it is for speakers of English as a second language. Unfortunately, such corpora are not available to benefit from. The gathered results provide evidence for this limitation. For instance, when asked to rate how closely the complex word 'personality' and its root 'personal' are related in meaning, 70% of the participants selected 7 as "very related in meaning". The fact that such finding has not been replicated for any other word suggests that it may be due to the fact that the words 'personal-personality' are more commonly used among Arabic native speakers than any of the other targeted words in this study.

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