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How learners make mental links with words

Abstract. The term *word association* is used in a very particular sense in the psycholinguistic literature. (Generally speaking, subjects respond quicker than normally to the word *nurse* if it follows a highly associated word such as *doctor*.) We will extend the term to provide the basis for a statistical description of a variety of interesting linguistic phenomena, ranging from semantic relations of the *doctor/nurse* type (content word/content word) to lexico-syntactic co-occurrence constraints between verbs and prepositions (content word/function word). The present study explores the associations second language users make between words in their mental lexicon by carrying out the word association test as outlined in McCarthy (1990:152). The data were collected from 21 English learners (elementary, intermediate, and advanced) at the Kish English Institute in Kashan. All subjects were asked to take a word association test and jot down the very first words to come to their minds for each stimulus. The results were interpreted according to McCarthy's three points of evaluation and revealed that word association tests provide interesting information on how learners make mental links between learned words. Furthermore, the study illustrated that the types of associations made were not necessarily a factor of respondent level or word characteristic alone but rather of the frequency with which respondents actively had used the stimulus word. Another significant result was that Iranian Students had a tendency toward syntagmatic responses. Finally, it was shown that multiple-response WATs are a more accurate means of investigating the ways in which learners make connections between words they have learned.

Key Words: mental lexicon, word association test, syntagmatic associations, paradigmatic associations.

1. Introduction

Over the past several decades there has been increased interest in the study of how second language learners organize words in their mental lexicon. Learning or acquiring your first language was a *piece of cake*, right? So why then, is it so difficult for some people to learn a second language? For starters, many learners might be wondering why I referred to a dessert in the opening sentence of a paper concerning vocabulary. The point here is summed up neatly by McCarthy (1990):

No matter how well the students learn grammar, no matter how successfully the sounds of L2 are mastered, without words to express a wide range of meanings, communication in an L2 just cannot happen in any meaningful way (p. viii).

A large number of recent studies focus on the ways in which learners make associations between words they have learned. These associations are usually determined by means of word association tests (WATs) where subjects are asked to respond with the first words that come to their mind when they hear particular stimuli. Results from these tests are useful in aiding theoreticians in the development of mental lexicon models, as well as providing teachers with information of pedagogical importance.

This paper, based on Task 123 of McCarthy's *Vocabulary* (ibid: 152), aims to explore the L2 mental lexicon. A simple word association test consisting of eight stimulus words will be administered to low-level, mid-level and high-level Iranian EFL students. The results are interpreted according to McCarthy's three points of evaluation and show that word association tests provide useful information about how learners make mental links between learned words.

2. Review of Literature

The following gives a general view of the literature related to word association and mental lexicon. First of all, the notion of mental lexicon is discussed. Second, word association and association types are discussed. Finally, a number of studies related to word association test are presented.

2.1 The Mental Lexicon

The mental lexicon is “a person’s mental store of words, their meaning and associations” (Richards and Schmidt, 2002: 327). The term itself is a metaphor, as *lexicon* is the Greek word for ‘dictionary’. Scholars admit that little is actually known about the mental lexicon (Aitchison, 2003; Channell, 1988; McCarthy, 1990) and all attempt to define and describe it rely on more metaphors that produce incomplete models. McCarthy (1990) gives the following examples: The mental lexicon is like a dictionary, a thesaurus, an encyclopedia, a library, a computer and a net (p. 34). Brown (2006) offers a more modern metaphor, comparing it to the Internet and World Wide Web (p.37). Despite the obvious differences between the above metaphors, they all have the concepts of *input*, *storage* and *retrieval* in common. Of particular importance to this study is the complexity of *storage* in the mental lexicon, with current research findings dictating expansion to previous models:

...the total model for the place of any word in the lexicon will have to be three-dimensional, with phonological nets crossing orthographic ones and criss-crossing semantic and encyclopaedic [personal knowledge] nets (McCarthy, 1990: 41).

The information in the mental lexicon, like a library or computer, is always being updated. New words are added, new connections to existing words are made and unused words may be forgotten. This is true for both native speakers and L2 learners. Research on the mental lexicon of native speakers (NS) and bilinguals is fairly well established but has neglected second language (L2) learners. This leaves the question of how

the L2 mental lexicon is organized open and in need of further exploration. Another issue to consider is the relationship between the L1 and L2 mental lexicon.

Research in this area has produced conflicting results with some studies pointing to separate word stores and others finding evidence to support a single one. However, the majority of studies show that there is a clear link between the L1 and L2 mental lexicons of individual speakers (Channell, 1988). Although previous studies had found no substantial evidence that the L1 and L2 mental lexicons are organized in the same way (*ibid*), newer research is demonstrating that they are in fact structurally similar (Wolter, 2001).

2.1.1. Exploring the Mental Lexicon

Aitchison (2003) lists four main methods for researching the mental lexicon: 1) word searches (tip-of-the-tongue or TOT states) and slips of the tongue, 2) linguistics and linguistic corpora, 3) speech disorders and brain scans and 4) psycholinguistic experiments (p. 16-17).

2.2. Word Association

The majority of word association literature focuses on the two main organizing principles of language: *syntagmatic* (chain) and *paradigmatic* (choice) relations. *Snytagmatic associations* are those that would be related by a phrase or syntactic structure. *Paradigmatic associations* on the other hand, involve other words that could replace the target word. Previous research has shown a tendency for native speakers to respond to word association stimuli paradigmatically and for non-native speakers to respond syntagmatically (Coulthard et al., 2000: 27; Meara, 1982). In addition to the paradigmatic/syntagmatic distinction, word associations can be based solely on their *phonological or orthographic relations*. These responses, sometimes labeled *clang responses*, are far less common and usually given by low-level language learners. Finally, some responses are related to one's personal knowledge about the word; these are referred to as *encyclopaedic responses*.

2.2.1 Paradigmatic Relations

Co-ordination

Co-ordination (including antonymy) refers to words “on the same level of detail” e.g. *dog* and *cat*. Co-ordination and antonymy can be further classified into *complementarity*, *gradable antonyms*, *converses* and *mutual incompatibles*. Previous word association research has shown co-ordination to be the most common type of response for native speakers (Aitchison, 2003: 86 cited in McCarthy, 1990: 39-40).

Complementarity occurs between words that exclude each other and cannot be graded such as *dead/alive*. *Gradable antonyms* on the other hand, have different degrees between two core opposites: *long*, *medium-length*, *shoulder-length* and *short*. *Converses* are antonyms that reciprocate each other and have interdependent meanings such as *husband* and *wife*. Finally, *mutual incompatibles* are co-ordinates or pseudo-antonyms that belong to the same semantic field (e.g. colour) and therefore exclude each other. If it is blue, it cannot also be red (Carter, 1998: 20-21; Coulthard et al., 2000: 25).

Hyponymy and Hypernymy

Hyponymy encompasses the hierarchical relationships of superordination (*hypernymy*) and subordination (*hyponymy*). *Pet* is the hypernym of *dog*, which is in turn a hyponym of *pet*. *Dog*, *cat*, *parakeet* and *iguana* are referred to as *co-hyponyms* in this paradigm (Carter, 1998: 21; Coulthard et al., 2000: 26). *Co-hyponymy* is a form of *co-ordination*. Additionally, Hasan (1984, cited in Carter, 1998) coined the term *meronymy* to describe part-whole relationships where *bedroom*, *bathroom* and *kitchen* would be *co-meronyms* of the hypernym *house*. Superordination is the third most common word association response for native speakers (Aitchison, 2003).

Synonymy

If two words can be used interchangeably in all sentence contexts, they are *strict synonyms* (Jackson, 1988: 65-66). This is highly uncommon however; a more useful term is *loose synonymy* which is a relationship of similar meaning across many but not necessarily all

contexts (Coulthard, et al., 2000: 24). *Tall* and *high* are synonymous but not strict synonyms. We do not typically refer to a person as being really high (with reference to height). Aitchson (2003) found synonymy to be the fourth most common type of word association response for native speakers.

2.2.2. Syntagmatic Relations

Collocation

Collocation (literally ‘placing together’) is the tendency for some words to regularly co-occur together. These co-occurrences are not random and can be either lexical or grammatical.

Although *lexical collocation* does involve syntactic structure, the lexical items are responsible for the repeated pattern. *Grammatical collocation*, also referred to as *colligation*, depends on syntactic relationships such as prepositional or verb particle choice, e.g. *buckle up*. *Restricted collocation* occurs when there are very few words that can co-occur with a specific word – *auburn* is lexicogrammatically restricted as it can only be used to describe hair colour.

Collocation is the second most common word association response for native speakers (Aitchison, 2003).

Computerized corpora such as the Bank of English have drastically changed the way in which collocation can be studied, making statistical analysis much easier. The word being investigated is labeled the *node* and the words that co-occur with it are its *collocates*. A *nine-word span*, the standard method for finding a node’s collocates, involves counting the words that occur within the four words preceding it and the four words following it. Statistically, collocations can be either strong (significant) or weak (insignificant). (Carter, 1998; Coulthard et al., 2000; Jackson, 1988; Sinclair, 1991).

Multi-Word Items

Multi-word item is an umbrella term that refers to phrases or groups of words that function as single lexical items (Coulthard et al., 2000: 62) and can be thought of as “extreme cases of fixed collocations” (Moon, 1997: 43). For NS, the mental lexicon decodes multi-word items

as ‘chunks’ (McCarthy, 1990: 44), whereas L2 learners, who often find idioms difficult, are most likely breaking them down and analyzing each word individually. The following table shows the major types of multi-word items found in English listed by Alexander (1984), which he refers to as *fixed expressions*.

Encyclopaedic Knowledge

McCarthy (1990) briefly discusses *encyclopaedic* responses. These responses are related to one’s personal knowledge acquired over time concerning the target word that creates “a web-like set of associations” (p. 41). A native speaker would therefore have all of their encyclopaedic knowledge linked together with associative words. If the structure of the L1 and L2 mental lexicons are organized in the same way, L2 learners would produce encyclopaedically based word associations less often as their L2 mental lexicon and encyclopaedic knowledge base would be much less developed.

2.2.3 Phonological and Orthographical Relations

In addition to a semantically organized mental lexicon, there is evidence for phonetic and orthographic organization as well (ibid: 35). The *bathtub effect*, a term coined by Aitchison (2003), describes the tendency for people to remember the beginning and end of words more easily than the middle:

as if the word were a person lying in a bathtub, with their head out of the water at one end and their feet out at the other. And, just as in a bathtub the head is further out of the water and more prominent than the feet, so the beginnings of words are, on average, better remembered than the ends (p. 138).

Words with similar uncommon spellings may also be linked or stored together, such as the ‘silent <k>’ in *knife*, *know* and *knight* (McCarthy, 1990: 35). Further evidence for a phonetically organized mental lexicon can be found in research on *malapropisms*, speech errors caused by related pronunciation rather than meaning, e.g. first → fast; finally → formally etc. (Fay and Cutler, 1977, cited in Channell, 1988: 87). Lower level learners and children are more inclined to produce phonetically based *clang* associations. This is likely

due to their inability to make spontaneous collocational associations and sometimes from the subject mishearing the stimulus word (McCarthy, 1990; Meara, 1982; Wolter, 2001).

3. 2. Empirical Studies Related to Word Association Tests

Word association tests have been used in cognitive psychology and applied linguistics with such frequency that it is impossible to list any more than a small fraction of them here.

However, several of the more notable projects relating to second language word association tests are briefly summarized below:

Meara (1982) – Meara offers a report on the Birkbeck Vocabulary Project. His findings show that second language learners' responses tend to be rather “unhomogeneous” compared to those of native speakers. He also points out the problems in using the Kent-Rosanoff list of stimuli and the need to consider stimulus word-list construction more carefully.

Söderman (1993) – Here the researcher explores the shift from syntagmatic to paradigmatic responses thought to be characteristic of second language learners. Results of WATs on native Finnish EFL students showed that this shift is not very great, though there does seem to be a decrease in phonological associations with high frequency words.

Maréchal (1995) – Singleton (1999) describes Maréchal's study on French WAT results, stating that while most responses were semantically associated, second language learners responded with more phonological associations.

Wolter (2001) – In this study on native Japanese subjects, it was found that stimulus words which were well known by the subject tended to elicit more semantic responses while those that were unknown, or not well-known, tended to elicit more phonological responses.

Yoneoka (2001) – Yoneoka addresses the tendency for Japanese subjects to respond more frequently with syntagmatic responses. She compares this tendency with a similar tendency in Korean subjects and discusses the possible linguistic and cultural reasons for the “anomaly”.

In word association tests over hundreds of years, native speakers of English and other Indo-European languages have consistently given responses showing a paradigmaticⁱ relationship to stimulus words. In addition, Nigerian (Folarin 1989), Navaho (Ervin and Landar 1963) and Chinese (Lin 1996) speakers have been reported to show similar patterning. Such results seem to support tentative claims by McCarthy (1990) such that “there seems to be a great uniformity in people's responses to certain stimulus words” and “people respond in consistent ways, even if the words they respond with are different, in word-association tests” (p 39), and we find many scholars agreeing to at least the possibility that paradigmatic patterning is a general human trait. On the other hand, Deignan et al (1996) stated that for (at least some) non-native speakers of English, associated words are often collocational (or syntagmatic) rather than semantic (or paradigmatic). For example, Soekman (1993) observed that over 40% of the responses of her ESL students (of who over 60% were Japanese or Korean) were what she calls *affective* (= associations that show a visual image, opinion, emotional response or personal past experience) i.e. syntagmatic. Recent studies find that Japanese speakers tend to respond syntagmatically in English, especially with lower level learners (87.3% of classifiable responses in Yoneoka 1987, 69% of all responses in Orita 1999) and lower frequency stimulus words (37% of all responses for high frequency words, but 63.9% for lower frequency words in Wolter 1999).

When tested in Japanese, the percentage of syntagmatic responses of Japanese speakers tends to be even higher. According to Yoneoka (1987), 95% of classifiable responses and according to Wolter (1999), 62% of all responses are paradigmatic. Furthermore, Yoneoka (2000) found that this percentage may be significantly influenced by the test administration method: directions requesting content-oriented responses showed 92.4% syntagmatic responses, whereas directions requesting time-oriented responses resulted in only 68.6% of the classifiable responses being syntagmatic.

It has been clearly demonstrated, then, that Japanese adult response patterns to word association tests are more syntagmatic than Western ones, and that this response pattern is affected by language of response, choice of stimulus words and test administration methods. Next, the natural question to ask is, ‘why?’.

There are many possible causes for this phenomenon—one can immediately imagine cultural, educational, societal, national character, neurological and linguistic causes, or any combination of these factors. Teasing these factors apart, however, is no easy matter. Comparison with other national groups that have some similar traits but not others, however, may provide a clue.

3. Statement of the Problem

Both vocabulary teaching and learning has been a concern in second language acquisition. Throughout the years, researchers have explored a number of approaches and techniques to enhance acquisition. Learning how to link between words is one of the most significant ways of learning vocabulary in foreign language acquisition and this aspect of vocabulary acquisition has not received the attention it deserves among Iranian English learners and it is usually neglected. By doing this research, it is hoped that word association be paid more attention and regarded as one of the most important part of the vocabulary acquisition syllabus.

3.1 Overview and hypotheses

To gain a better understanding of the mental lexicon and lexical development of L2 learners, the word associations of higher- and lower-level learners were compared. The experimental procedure followed Task 123 of McCarthy’s *Vocabulary*:

1) Draw up a list of six to eight words to be used as stimuli in a simple word association test.

Try to vary the test items, to include:

– at least one grammar/function word (e.g. preposition, pronoun).

- one or two items from the everyday physical environment (e.g. *table*, ‘car’).
- a relatively uncommon or low-frequency word but one which your students will nonetheless know (this will depend upon the group’s level: elementary- level students might require a word like ‘drink’, but an advanced group can probably cope with a word like ‘surrender’; your own experience will tell you what is suitable).

- a mix of word-classes (e.g. noun, adjective, verb).

- 2) Deliver the test to the class, asking them to write down the very first word that occurs to them when each item is heard.
- 3) Gather in the results and see if any patterns emerge from the responses.

The following three evaluation points are included in Task 123:

- 1) Does such a word-association test tell you anything about how your learners are making mental links between words they have learnt?
- 2) At lower levels, are phonological similarities playing an important role?
- 3) Do the results bear out the characteristic types of response discussed in 3.2?

Aitchison’s word association results need to be viewed with caution however, since they are based on responses to nouns and adjectives only: *butterfly*, *hungry*, *red*, and *salt*.

Wolter (2001) challenges the view that there is a shift from predominantly syntagmatic responses to predominantly paradigmatic responses in lexical development. He argues that most word association tests rely on common, high frequency words as prompts, such as those on the Kent-Rosanoff list and therefore limit models of the mental lexicon based on these words. When using low frequency words, the responses of NS, L2 learners and NS children all produce similar responses (p. 5). As some of the prompt words in the current study would be considered low frequency words, Wolter’s hypotheses will also be considered when evaluating the results.

3.2 Research Question

1. Does a word-association test tell you anything about how your learners are making mental links between words they have learnt?
2. At lower levels, are phonological similarities playing an important role?
3. Are there differences between higher and lower level students?
4. Which kind of semantic responses do the subjects use more: syntagmatic or paradigmatic?

4. Method

4.1 Participants

Data were collected from 21 English learners in Kish English Institute in Kashan, Iran. The participants ranged in age from 16 to 30. Respondents were organized into three proficiency-based levels: low (L1-L7), mid (M1-M7), and high (H1-H7).

4.2. Procedure

4.2.1 Stimulus Selection

Meara (1982) blames the lack of adequate L2 mental lexicon models on the minimal consideration given to stimulus words. This type of research produces results that merely describe the types of responses that L2 learners produce (p. 32). Although the types of stimulus in the current study adhere to the specifications set by McCarthy's (1990) Task 123, I attempted to choose stimulus words that would be considered both high and low frequency in order to investigate Wolter's (2001) hypotheses discussed earlier. So, eight stimulus words were chosen in accordance with the suggested criteria in McCarthy (1990:152). The selected stimuli represent both *high and low frequency words*, *abstract and concrete words*, and *four separate word classes* (noun, verb, adjective and preposition). Table 1 lists the selected words and their characteristics.

Table 1. Selected prompts and their characteristics

Stimulus Word	Quality	Frequency	Word Class
<i>book</i>	concrete	115658	Noun

<i>vacation</i>	abstract	3360	Noun
<i>think</i>	abstract	381993	Verb
<i>surf</i>	concrete	4460	verb
<i>fast</i>	concrete	43464	adjective
<i>boring</i>	abstract	8279	adjective
<i>of</i>	abstract	11559219	preposition
<i>under</i>	concrete	266261	preposition

The frequencies listed above were obtained from the Cobuild/Birmingham Bank of English corpus. In order to ensure that the majority of respondents recognize all the stimuli, words with extremely low frequencies (ie. under 1000) were avoided. For the purposes of this paper words were classified as either “high” or “low” frequency, relatively, within their own word class pair. Thus, for example, *book* was classed as “high frequency” while *vacation* was classed as “low”.

4.2.2 Classes of Association Used in the Study

4.2.2.1 Semantic

Semantic associations are associations based on word meaning as opposed to word form.

Syntagmatic

-collocation

Paradigmatic

- synonymy (x means the same as y)
- antonymy (x means the opposite of y)
- hyponymy (x is a kind of y; also referred to as “subordination”)
- co-hyponymy (x and y are both kinds of z; also referred to as “co-ordination”)
- hypernymy (x has y as one of its kinds; also referred to as “superordination”)
- meronymy (x is a part of y; also referred to as “paronymy”)

4.2.2.2 Formal

These are associations based on word form rather than meaning.

Phonological: Sometimes referred to as “clang” responses, these are associations made on the basis of sound only. This includes such things as rhyme and the “bathtub effect”. Some examples include: *up – cup, of – have, think – thank*. In these cases the respondent agrees that it is purely a phonological association.

Orthographic: Words linked based on the spelling or physical shape of the word are considered orthographic responses (ex. *night – weigh, there – three*).

4.2.2.3 Other types

This catchall category can be sub-divided into:

Random: These are responses where there is no clear link and the subject fails to adequately explain the connection. This category also includes responses that are simply a repetition of the stimulus word as well as responses to words that the subject misheard.

No response: The subject left the space blank.

4.2.3 Main word association test

Following McCarthy (1990:152), the *oral-written* method was chosen as a means of administration. Response forms were distributed and subjects were asked to write the first three single words that came to mind upon hearing each of the stimuli. Subjects were instructed to answer in English but not to think too long or deeply about their responses. They were also instructed not to worry about spelling and informed that there were no wrong answers.

4.2.2 Follow up: interview and “frequency of word usage” survey

Immediately after administering the test, short interviews were conducted in which the respondents could make comments on the nature of any unclear associations. Following the interviews a short “frequency of word usage” survey was administered (Table 2):

How often do you use these words (in speaking or writing)?

1. book Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>	2. fast Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>	3. under Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>	4. think Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>	5. vacation Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>
6. of Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>	7. surf Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>			
		8. boring Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/>		

Table2: Frequency of word usage survey

4.3 Analyzing the Data

In total, 504 responses were collected for the eight stimulus words. All of the responses were first classified into paradigmatic, syntagmatic and phonological associations; the paradigmatic responses were further classified into co-ordination, hyponymy/ hypernymy and synonymy.

Percentages of each association type were calculated for each respondent. The data were analyzed: 1) as a whole; 2) in groups according to respondent proficiency level; and 3) in groups organized according to stimulus word characteristics. The data were then analyzed according to frequency of stimulus usage.

4.3.1 Exploring the mental lexicon of the L2 learner

1. Does such a word-association test tell you anything about how your learners are making mental links between words they have learnt?

To say that the mental lexicon is complex and highly organized would be an understatement. With that in mind, it is important to realize that our knowledge of it is limited and all representative models are speculative and metaphorical. The word association test is simple and easy to administer, but this simplicity is also its downfall. While it cannot provide a true reflection of the workings of the mental lexicon, it does allow us to briefly peek inside. As a language teacher, the results are very informative as to how students make mental links with their L2 vocabulary. Nearly all types of word association were represented in the students' responses, which have obvious implications for teaching vocabulary in the EFL classroom. The summarized general results of the WAT are shown below in Table 3:

Respondent	Response	Semantic		Formal		Other
		Syntagmatic	Paradigmatic	phonological	orthographic	Random
L1	8	37.5%	37.5%	12.5%	0	12.5%
L2	8	75%	25%	0	0	0
L3	8	37.5%	37.5%	0	0	25%
L4	8	50%	50%	0	0	0
L5	8	12.5%	50%	12.5%	0	25%
L6	8	50%	25%	12.5%	0	12.5%
L7	8	50%	37.5%	0	0	12.5%
Mean %		44.64	37.51	5.35	0	12.5
M1	8	62.5	25	0	0	12.5
M2	8	87.5	12.5	0	0	0
M3	8	50	37.5	0	0	12.5
M4	8	25	50	12.5	0	12.5
M5	8	37.5	37.5	0	0	25

M6	8	87.5	12.5	0	0	0
M7	8	62.5	25	0	0	12.5
Mean %		58.92	28.57	1.56	0	10.95
H1	8	50	37.5	0	0	12.5
H2	8	62.5	37.5	0	0	0
H3	8	50	50	0	0	0
H4	8	62.5	37.5	0	0	0
H5	8	62.5	37.5	0	0	0
H6	8	50	50	0	0	0
H7	8	37.5	50	0	0	0
Mean %		50.1	42.85	0	0	1.78

Table 3. General results of the WAT

The table clearly shows that the WAT does indeed provide information about how respondents make links between words they have learned. More specifically, results of the test show a tendency for subjects to make semantic associations over formal ones (Sem = 85.8%, Form = 5.9%; significance: $p = 1.21 \cdot 10^{-42}$).

Further inspection of semantic responses reveals a higher degree of syntagmatic responses over paradigmatic (Syn = 51.5%, Par = 36.28%; significance: $p = 0.028$). With regard to formal associations all counts were of a phonological nature. There were no discernable instances of orthographic links. This is likely due to the nature of the oral-written method of administration. Without visual stimulation, orthographic associations are less naturally activated. In addition to the general syntagmatic tendencies of the above data, interesting, albeit less clear, patterns have emerged showing relations between word characteristic and type of association.

Association	Frequency		Quality		Word Class			
	High	Low	Con	Abs	N	ADJ	pre	V
Syntagmatic	51	36	42	45	17	27	21	23
Paradigmatic	27	43	40	29	27	14	13	17
Phonological	7	3	3	7	0	0	3	7
Orthographic	0	0	0	0	0	0	0	0
Random	7	6	1	11	1	3	1	5

Table 4. Association type counts based on word characteristic

A Brief Discussion of Table 3

Stimulus word frequency: The resulting response counts indicate that higher frequency words elicited more syntagmatic responses (Syn = 51; Par = 27) while lower frequency words elicited more paradigmatic (Par = 43; Syn = 36). It is interesting, however, that more phonological (7) and random (7) responses were encountered with high frequency words than with low (3 and 6 respectively)

Stimulus word quality: Here abstract words, if only marginally, elicited more syntagmatic responses (45) than did concrete words (42). It can also be seen that the concrete words elicited more paradigmatic responses (40) than did abstract words (29). This is interesting in that unlike with frequency-based associations – where the theoretically more difficult words, the low frequency words, elicited more paradigmatic responses – the theoretically easier words, the concrete words, elicited the most paradigmatic responses. An explanation for this could be that the abstract-paradigmatic count has been, in effect, artificially lowered by the somewhat larger proportion of random and phonological responses made with abstract words. It is, however, not surprising to see such high counts of phonological (7) and random (11) falling in the abstract category, abstract words being theoretically more difficult and therefore more likely to be unknown by the respondent.

Stimulus word class: Nouns elicited the largest number of paradigmatic responses (27) while adjectives elicited more syntagmatic responses (27). These results are not very surprising considering that adjectives are modifiers of nouns and thus perhaps more collocational by nature. The most surprising result however is that nouns elicited significantly less syntagmatic responses (17) than they did paradigmatic (27). This may be due in part to a bias resulting from the location of most of the WATs in this study. As many of them are situated in a classroom environment it is not unreasonable to expect the stimulus *book* to elicit other classroom nouns, ie. paradigmatically associated words, that are very likely present in the respondent's direct line of sight. With regard

to *vacation*, it is interesting to note that *trip*, *travel* and *holiday*, words that Iranian learners tend to prefer over *vacation*, figured prominently in the responses.

4.3.2. Do phonological similarities play an important role at lower levels?

Phonologically based responses were very uncommon, even with the lowest level students.

Based on statistical analysis of the data in Table 3 above, the only statistically significant correlation between level and type of association that can be made is with regard to random responses (Table 5)

Association	Low	Mid	High	Significance
Syntagmatic	44.2	58.6	47.3	No significance
Paradigmatic	34.1	35.9	45.6	No significance
Phonological	8.25	3.12	6.1	No significance
Orthographic	0	0	0	NA
Random	12.5	10.95	1.78	0.01

Table 5: Summary of association mean percentages by level

The quantitative results of this WAT do not clearly indicate that low level respondents rely on phonological associations any more than do higher level respondents.

4.3.3 Do differences between higher and lower level students appear?

The difference in responses between the higher and lower level L2 learners was minimal. The higher-level students responded paradigmatically 19.9% of the time compared to 19.1% for the lower-level students. When the results are broken down for the individual words as shown in Table 5 it is evident that the results vary according to the word and word class more than the level of the students' English. Table 6 below gives a summary of results among three groups.

Individual Prompt Results

		Elementary			Intermediate			Advance		
		P	S	C	P	S	C	P	S	C
vacation	frequency	7	14	0	9	12	0	10	11	0
	Percentage%	33	77	0	46.8	53.2	0	48.8	51.2	0

book	frequency	10	11	0	8	13	0	6	15	0
	Percentage%	48.8	51.2	0	41.2	59.8	0	41.2	59.8	0
surf	frequency	2	18	1	2	19	0	1	20	0
	Percentage%	6.9	90.7	2.4	6.9	93.1	0	2.4	97.6	0
think	frequency	9	12	0	10	11	0	4	17	0
	Percentage%	46.8	53.2	0	41.2	59.8	0	13.8	86.2	0
boring	frequency	1	19	1	1	20	0	1	20	0
	Percentage%	2.4	95.2	2.4	2.4	97.6	0	2.4	97.6	0
fast	frequency	2	19	1	0	21	0	8	13	0
	Percentage%	6.9	90.7	2.4	0	100	0	29.6	70.4	0
under	frequency	5	16	0	3	14	0	5	16	0
	Percentage%	29.6	70.4	0	17.6	82.4	0	26.1	74.9	0
of	frequency	11	9	1	11	9	1	9	12	0
	Percentage%	51.2	46.4	2.4	51.2	46.4	2.4	46.4	53.6	0

Table 6. A summary of results among three groups

P: Paradigmatic S: Syntagmatic C: Clang

4.3.4 Analysis of Semantic Responses

There is a general consensus in the literature concerning word association of a tendency for NS to respond paradigmatically and for non-native speakers and children to respond syntagmatically (Carter, 1998; Coulthard et al., 2000; Deese, 1965; Meara, 1982).

The following two sections discuss the syntagmatic and paradigmatic associations made by subjects of the WAT and show their relation to the characteristic responses in McCarthy (1990:39-40).

4.3.3.1 Syntagmatic responses

As has been shown above, the results here (Syn = 51.5%, Par = 36.28%; significance: $p = 0.028$) do coincide with the statement above. The results do, however, support the growing body of evidence that seems to indicate a general tendency for Iranian respondents to respond with syntagmatic associations.

4.3.3.2 Paradigmatic Responses

With regard to paradigmatic responses, the results of the study support McCarthy's characteristic associations. Table 7 below lists the paradigmatic subcategories and total number of responses as they occurred in the data.

Type	book	fast	under	think	vacation	of	surf	boring	Total
Meronym	6							8	14
Synonym		3	3	1	8	1	1	2	16
Antonym	2							3	6
Co-hyponym	2	5		1					8
Hyponym	2			1					3
Hypernym	1	2			2				5
Others	2	1	1	1	8	1	1	1	16

Table 7: Subcategories of paradigmatic association

There were also many paradigmatic responses that defied classification. These were indeed of the same grammatical class, and therefore paradigmatic, but could not reasonably be placed in any particular subcategory. Furthermore, they did not collocate with the stimulus word strongly enough to warrant classifying them as syntagmatic. For example, *vacation* elicited a number of place names that are difficult to classify in relation to the stimulus.

4.4. Interview Results

There is one important point that has not been adequately addressed in the above discussion. This is the apparent lack of connection between low level subjects and phonological associations. As was hinted at in section 5.2.2, with regard to high level phonological associations, it may not be so much level, as familiarity with the stimulus word that determines the type of association elicited. Stolz and Tiffany (1972), in support of this view, discovered that adult subjects tend to respond in a more “child-like” manner to unfamiliar stimuli.

Results of the frequency of word usage survey were grouped into two categories: low frequency usage, which consists of “never” and “rarely” scores; and high frequency usage, consisting of “sometimes” and “often” scores. As Table 8 below indicates, there is a strong correlation between both phonological and random responses and low frequency usage.

Association	High	Low	Significance
Syntagmatic	38.2	61.8	No significant
Paradigmatic	43	57	No significant
Phonological	79.6	20.4	0.049.13
Orthographic	0	0	NA
Random	89	11	0.00005

Table 8 *Frequency of usage mean percentages (single response)*

Low = stimulus marked as "never" or "rarely"

High = stimulus marked as "sometimes" or "often"

5. Conclusions

The purpose of this paper was to gain insight into the lexical development of the second language learner. In interpreting the above word association test results according to McCarthy's three evaluation points (190:152), the following conclusions have been made: 1) word association tests do indeed provide information on how learners make mental links between words in their second language mental lexicon; 2) phonological links are not necessarily a factor of respondent level; and 3) Iranian WAT responses do not coincide with the common responses listed in McCarthy's 3.2 but an Iranian Students tendency toward syntagmatic responses. Additionally, it was also shown that: 1) links are not necessarily a factor of respondent level or word characteristic alone but rather of the frequency with which respondents actively use the stimulus word; and 2) multiple response WATs are a more accurate means of investigating the ways in which learners make connections between words they have learned.

6. Implications for Teaching

The results of the word association test show just how highly organized the mental lexicon is. This has important implications for language teaching: words are meaningfully connected in the mental lexicon and should therefore be taught in a similar way. Wolter's (2001) Depth of Individual Word Knowledge Model states that semantic links become stronger and overtake phonetic links as the understanding of individual words increases.

It seems evident then that simply telling students the meaning of new words is not enough to fully incorporate them into the mental lexicon. Result of this study suggests that students keep a 'vocabulary journal' in which they could write new words and all of the connections that they can think: part of speech; spelling, syllables and stress; words with similar meanings; opposites; categories the words belong to; words that usually connect to the word and personal experiences etc. By writing down all of these connections, the English learners would be assisting their mental lexicon in building stronger links between words which in turn would help them remember the new vocabulary.

Appendix A

Name : _____
Word Association

Please write down the first word or words that you think of after reading each of the following stimulus words:

vacation

book

think

Surf

fast

boring

under

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