WORD ASSOCIATIONS OF INTERMEDIATE AND ADVANCED LEARNERS OF ENGLISH AS A FOREIGN LANGUAGE AND OF ENGLISH NATIVE SPEAKERS: PROBING INTO LEXICAL NETWORK KNOWLEDGE

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Abstract: In this research study, the analysis of word associations produced by intermediate and advanced learners of English, and native speakers of English using a productive Word Association Task, and a receptive Word Connection Test will be performed. These tests intend to reveal the structure of the mental lexicon of native speakers and L2 learners and to assess the type of lexical knowledge they possess. In the productive test, informants are asked to respond to a list of prompt words with the first word that comes to mind. It is assumed that the answers given are those which the informants have the fastest access to. In the receptive Word Associates test, informants are asked to choose, from a set of eight words, four lexical items which are meaning-related to the stimulus word. The objective is to analyse the differences in the mental lexicon between learners and native speakers of English in such aspects as size and structural properties.

Key words: mental lexicon, breadth, depth, words, lexical knowledge.

Asociaciones léxicas de aprendientes de inglés como lengua extranjera de nivel intermedio y avanzado y hablantes nativos: explorando el conocimiento de redes léxicas

Resumen: En el presente estudio se analizarán las asociaciones léxicas producidas por hablantes nativos y aprendientes no nativos de inglés. Se utilizarán dos pruebas de conocimiento léxico; una productiva y otra receptiva. Estas pruebas revelarían la estructura del léxico mental y conocimiento léxico tanto de dichos aprendientes como de los hablantes nativos. En la prueba productiva, los informantes deben responder a una lista de palabras con aquellas que primero vengan a la mente. Se cree que las respuestas que los sujetos dan son aquellas que establecen con mayor

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rapidez. En la prueba receptiva, los informantes deben relacionar una palabra clave con un set de ocho y elegir las cuatro más cercanas en significado. El objetivo es analizar las diferencias entre los aprendientes y hablantes nativos en aspectos como tamaño de vocabulario y propiedades estructurales.

PALABRAS CLAVE: *léxico mental, amplitud, profundidad, palabras, conocimiento léxico.*

1.0. INTRODUCTION

The first attempts at trying to understand how it is that our mind integrates and organises vocabulary concentrated on the links between two words. These early studies contributed to later ones which have demonstrated the need to approach the study of the mental organisation of lexical items as some kind of web or network (Aitchison 2003). According to this view, words are stored in groups held together by semantic links. So, for example, the word 'day' is closely related to the words 'night', 'awake', and 'light'. In addition, the network is not a rigid structure; it does not consist of fixed internal parts. On the contrary, it is in constant change, shifting internal links and creating new ones with frequency of use playing a fundamental role in the strengthening of links between words.

Early research on second language acquisition, heavily influenced by theoretical linguistics, concentrated on different aspects such as phonology, morphology and syntax (Meara 1984). Since 1980, though, research on vocabulary acquisition has gained a growing interest. This interest in vocabulary led to a concern for the study of the mental lexicon. The study of vocabulary acquisition also motivated researchers to design and apply instruments to probe the complex aspects of word knowledge. These instruments or tests intend to reveal the structure of the mental lexicon of native speakers and L2 learners and to assess the type of lexical knowledge they possess. One of these tests, the Word Association Task is the most well known (Palermo 1971, Meara 1978, Wolter 2001). In this type of test, informants are asked to respond, under time constraints, to a list of prompt words. It is assumed that the answers given are those which the informants have the fastest access to. Responses are classified according to response types, for example, phonological, syntagmatic or paradigmatic associations. Some responses given by native speakers in productive word tests gain a 'canonical' status due to their frequency of occurrence, for instance, 'butter' as a response to 'bread'. Other vocabulary knowledge tests include Read's (1993) receptive Word Associates format which assesses the quality of word knowledge by means of word associations. In the test, informants are asked to choose, from a set of eight words, four lexical items which are meaning-related to the stimulus word. The responses can have various relationships with the prompt word: paradigmatic, syntagmatic, or analytic (Greidanus et al. 2004). Research studies using the productive word tests have revealed that native speakers produce a larger proportion of paradigmatic responses

when compared to the responses given by a group of advanced learners and a group of beginners. Naturally, the L2 mental lexicon, due to less exposure to the target language, differs from the native speakers' mental lexicon in such aspects as size and structural properties. Studies using the Word Associates format, which is a receptive test, have revealed similar results; 'very advanced' learners identified a greater number of correct links than 'advanced' learners (Greidanus and Nienhuis 2001).

In this research study, the analysis of word associations produced by intermediate and advanced learners of English, and native speakers of English using a productive Word Association Task, and a receptive Word Connection Test will be performed. In the second section, the objectives, the method applied, as well as the informants, and the instruments used are presented. In addition, the theoretical descriptive framework and proposals put forward by various researchers are considered. In the third section, the results and the quantitative analysis are discussed. In the last section, some general conclusions are drawn from the evidence presented in the previous section. The most important findings are described and some implications for teaching purposes are discussed.

2.0. OBJECTIVES

2.1. General objective

The general objective of this research study is to analyse and compare receptive and productive word associations produced by intermediate and advanced learners of English as a foreign language, and native speakers of English.

2.2. Specific objectives

a. To analyse and classify productive word associations produced by learners of English at two levels of competence, intermediate and advanced levels, and by a group of native speakers of English.

b. To analyse and classify receptive word associations produced by learners of English at two levels of competence, intermediate and advanced levels, and by a group of native speakers of English.

c. To identify quantitative similarities and differences between word associations produced by intermediate and advanced learners of English as a foreign language, and by native speakers of English.

d. To identify quantitative similarities and differences between frequent responses i.e., prototypical or canonical responses, produced by native speakers of English, and intermediate and advanced learners of English as a foreign language.

2.3. Research question

Are there any differences between the intermediate learners', the advanced learners' and the native speakers' receptive and productive word associations?

This research question can be understood in terms of the following:

1. Which type of productive word association (i.e., paradigmatic, syntagmatic, clang or other) shows the most significant frequency of occurrence within the intermediate and advanced learner groups, and the English native speaker group?
2. Which quantitative differences can be observed between receptive word associations produced by intermediate and advanced learner groups, and the English native speaker group?
3. Which group of subjects, i.e., intermediate and advanced learner groups, and the native speaker group, has the highest mean number of canonical responses, and what quantitative differences can be established between the three groups of subjects?

3.0. THEORETICAL AND DESCRIPTIVE FRAMEWORK OF THE STUDY

3.1. Word learning

Estimates on the number of words an average person knows have been made by various researchers. Pinker (1994) describes one such estimation performed by psychologists Nagy and Anderson. They estimated that on average a high school student knows about 45,000 lexical items. This figure can easily increase to 60,000 if proper names, numbers, and other common words are considered, or even soar to a staggering six-digit number for higher education students. A mental capacity of 60,000 words or more brings to mind just how fast words are learnt, and poses the questions of how and when we start learning them. Aitchison (2003) states that children start acquiring their first words some time after their first birthday. In addition, she describes three tasks involved in the process, 'labelling', 'packaging', and 'network building'. In the labelling task, also referred to as 'mapping', children learn that particular sounds can be used as names for particular objects or entities. For instance, a child that utters the word 'cat' is not able to recognise cats in general, but he is capable of visualising a whole situation built around a particular one. Aitchison (2003) states that a child's first words are mere ritual accompaniments to unanalysed situations. This scenario gradually changes as he learns to recognise and detach words from whole situations to apply them as labels to specific objects.

The packaging task refers to the process by which things can be grouped together under one label. Applying labels correctly is the issue at this stage. For instance, in trying to classify objects, the child will make two kinds of mistakes, underextension and overextension. In the first type of mistake, the child will take time to realise that

words often have wider applications. The word 'cold', for example, is generally used to describe a range of low temperatures, but it can also be used to characterise a person who is not affectionate or friendly. Hence, the noun phrase 'a cold person' will seem like an odd construction to the child. In overextension, the child uses one label to mean other objects with shared features, for example, labelling a 'sofa' or a 'stool' as 'chair'.

The last task, network building, refers to the process by which words are related through sense relations. Aitchison (2003) states that understanding the full scope of a word implies understanding the relation it has with other lexical items. She also observes that network building is a slow process, but one which fosters quality and organisation of the mental lexicon. Consider again the example of 'chair'. The child discovers how it relates to other objects through sense relations such as synonymy, 'seat'; hyponymy, 'furniture'; and even the extended sense of 'chair' as in 'the chair of the committee'. The relations between words will largely depend on word class, adjectives producing mainly synonymy, antonymy and gradation (Henriksen 1999).

In a second language, learners are faced with the same three tasks, although some differences can be observed. Henriksen (1999: 308) notes that "mature L2 learners do not experience the same mapping problems as young L1 learners who have to both develop concepts and learn to map words onto these concepts in the process of their cognitive development." Another noticeable difference is the learners' L1 lexical/ conceptual knowledge, that is, knowledge or assumptions about the world such as human emotions, phenomena in the natural world (rain falls, the sun shines), taboos, religious beliefs, etc, that will allow them to make informed guesses about what notions might be possible in the L2 (Wolter 2006).

Learning vocabulary, thus, involves adding words (size or breadth of lexical knowledge) to the lexical store through the labelling and packaging tasks, and expanding the knowledge of the lexical items (depth of lexical knowledge) via network-building. Meara (1996a) states that breadth is the basic component in constructing the notion of lexical competence: the ability to recognise and use the words of a language in the way that a speaker of that language uses them. He adds that learners with big vocabularies are more proficient than learners with smaller ones. Breadth, however, will become less important as knowledge across different frequency bands increases. At this stage, organisation becomes vital in ensuring effective access to the growing mental lexicon. Likewise, Henriksen states that adding new words to this network is not the only important aspect in developing lexical competence, but "it also includes the important process of developing our network knowledge through the process of creating links between the lexical items found in the mental lexicon" (2008: 27). In fact, Haastrup and Henriksen (2000) assert that depth is at the heart of network building, and a major aspect of lexical competence.

Henriksen (1999) conceives lexical competence as a construct of three dimensions: (a) a 'partial to precise knowledge' dimension, (b) a 'depth of knowledge' dimension, and (c) a 'receptive-productive dimension'. The first dimension refers to vocabulary knowledge as precise comprehension. This knowledge dimension basically correlates with vocabulary size. The second dimension refers to the learner's vocabulary

knowledge in terms of quality. Aspects such as syntactic restrictions, paradigmatic (e.g., synonymy, antonymy) and syntagmatic relations (collocations) are part of this dimension. The receptive – productive dimension focuses on the learner's capacity to use words in comprehension and production. Henriksen argues that much of the research done on L2 lexical acquisition and competence has concentrated on size. This has meant that L2 knowledge in relation to depth has been somewhat disregarded.

3.1.1. Breadth and depth of vocabulary knowledge

Lexical knowledge, suggests Henriksen (2008), in terms of a large vocabulary plays a crucial role in communication. For example, studies have shown that breadth or size correlates with learners' reading abilities. Laufer (as cited in Henriksen 2008) states that a learner needs a vocabulary size of about 5000 words to communicate and achieve comprehension effortlessly. As extra words are added, and as the mental lexicon gets larger, a way of managing size of lexical knowledge is necessary. Thus, organising the words in a network that will provide efficient and fast access is required. Meara (2009) explains this by using a metaphor. Breadth and depth of lexical knowledge are exemplified by randomly placing dots or nodes on a graph. These nodes are then connected by lines or arcs. Each node represents a word, and each line, a link between two words. As a learner encounters a word across different contexts, knowledge of that particular word increases, and so do the links of that word with the rest. It can be stated, then, that depth of knowledge has increased. As additional links start to build up between the numerous words, more and shorter access routes are created, enabling the learner to achieve faster retrieval times. Meara (2009) argues that recent work on vocabulary acquisition has tended to make a broad distinction between both breadth and depth, focussing on each dimension separately. He points out that this distinction is a misleading one, since the addition of a new lexical item to the lexical store has no implications for the rest of the lexicon, i.e., there is no intrinsic link between breadth and depth. Working with an integrating model, however, means that each extra word added to the mental lexicon will establish a new link and influence the rest of the network. The two diagrams below (Figure 1) exemplify this idea. The one on the left represents words as bars (breadth of lexical knowledge), while depth of knowledge is represented by the length of each bar. There is no link between the two. However, the diagram on the right represents words as nodes. As the links between words increase in number, so does the depth of vocabulary knowledge.
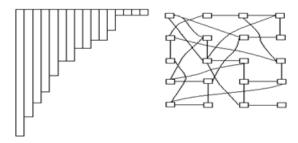

Figure 1. Two ways of conceptualising breadth and depth (Namei 2004: 371)

3.1.2. The network metaphor

Various network models have been proposed to account for the organisation of the mental lexicon. The two best-known proposals are the 'hierarchical network model' and the 'spreading network model'. The first one can be illustrated as an upside-down tree or a pyramid, where words are arranged from universal to particular characteristics. For example, the concept 'furniture' occupies a high rank, and a 'sofa', because it is an example of sitting furniture, a lower rank. Thus, every word which denotes a seat will occupy a rank depending on its commonality. The activation of words runs from top to bottom. In turn, the spreading network model sees concepts organised as a metaphorical electrical circuit. Words are interconnected with numerous others depending on their degree of association. As one word is activated, others which share semantic features will also get activated, while those which do not will simply fade away. This model is similar to Aitchison's cob-web theory (2003), which states that words are linked on the basis of features such as semantics, frequency of use, etc. Some of the implications of these models, though, need to be re-shaped when dealing with two languages. One of the issues which is raised when considering a bilingual learner is whether he has two mental lexicons for words in the first and second language, or only which stores both L1 and L2 entries. Although this is not the concern of this research, the development of a model which accounts for the storage of words in two languages is necessary for research into the bilingual mental lexicon.

Based on proposals put forward by Kroll and de Groot (1997) and Kroll and Tokowicz (2005), Henriksen (2008) postulates that the representation of the mental lexicon is a structure with three levels of lexical knowledge (Figure 2). Lexical links are established in our semantic memory between and across the different knowledge components. These components are (a) conceptual knowledge, (b) intra-lexical knowledge, and (c) meta-semantic knowledge, and the links between these in our representational system are of three types. Level I contains our knowledge of the world or conceptual knowledge derived from experience. This type of link is established between the conceptual knowledge elements which are then organised into schema knowledge. The links are created through the co-occurrence of objects, actions and events in the world as well as in our private experience. For example, the concept 'moon' co-occurs with the concept 'night', and the concept 'moonlight', with a romantic setting (Henriksen 2008). Other conceptual links will be established depending on our encyclopaedic knowledge, for instance, 'moon' and 'werewolves' and 'witches', etc. Level II describes our mental inventory of lexical entries, including syntactic and semantic characteristics. It also includes information concerning formal features of words such as phonemic and graphic forms, word class, and morphology. Level III contains meta-semantic knowledge of the lexical entries, that is, knowledge concerning specific aspects of words. For example, the words 'sun' and 'planet' are paradigmatically related to 'moon'; the words 'shine' and 'full' are syntagmatically related; and 'round' and 'yellow' are analytically related. Some of the links established across the knowledge components are more stable and prototypical, i.e., canonical. It is assumed that different word association tests and time restrictions may affect the

links informants are able to activate, thus this variables may affect the production of different response types.

I   CONCEPTUAL KNOWLEDGE
    BLUE – ROMANTIC – MOON -- NIGHT

II LEXICAL ENTRIES
    BLUE – ROMANTIC – MOON -- NIGHT

III META-SEMANTIC KNOWLEDGE
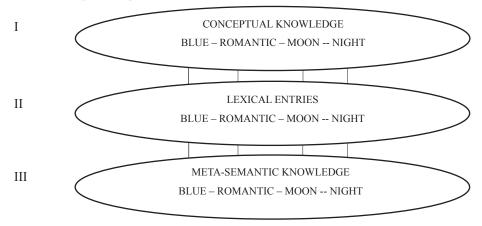   BLUE – ROMANTIC – MOON -- NIGHT

Figure 2. Links between and within the three levels of lexical representation (Henriksen 2008: 29)

The use of word tests to delve into the L2 mental lexicon and investigate the differences and similarities between the second or foreign language and the native speaker's lexicon has made it necessary to explicate the relations of the links between the knowledge elements across two or more languages. Thus, levels I and III are both perceived as language-neutral. The conceptual or encyclopaedic knowledge we have of the world is shared and most of it is probably cross-cultural. Level II is perceived as being language-specific. Information relevant to formal aspects such as form or grammatical features are language-specific, unless the languages in question have some degree of overlap.

3.1.3. Probing the network

Different tests have been designed to investigate the lexical network. Some tests have been designed to measure learners' vocabulary in terms of size or breadth of lexical knowledge. Some of these include word recognition tasks with simple yes/no answers. Other tasks require that test takers translate a number of words from the L2 into their L1, or that they look for the right option in a multiple-choice task (Henriksen 1999). All these tests measure informants' vocabulary in terms of the number of words they know. As stated above, in the initial stages of L2 vocabulary learning, the number of words a learner is able to incorporate into his mental inventory will be crucial for the development of the L2. Later, organisation will play a much more defining role in L2 proficiency. Other tests have been developed to measure the dimension of depth of lexical knowledge. One of the best known tests is the Word Association Task. It is a very simple test to apply, and it requires very little time on the part of the test takers. Other tests include Read's Word Associates. It differs from the first test in that the former is productive and the latter is receptive.

As mentioned above, word tests are employed by researchers to probe the mental lexicon and investigate the network knowledge of L1 and L2 informants. The responses to these elicitation tools are analysed and classified on the basis of response categories. Wolter (2001) presents four categories: paradigmatic, syntagmatic, clang-other, and no-response. He defines the paradigmatic category as a response belonging to the same word class as the prompt word, for example, 'cat' as a response to 'dog'. Responses that show a clear relationship (e.g. human " error) with the prompt word, or words which are used to make a longer noun phrase (e.g. discovery " channel) are classified as syntagmatic. A syntagmatic response is classified on the basis of the following premises. Firstly, it should have some kind of semantic or syntactic relation to the prompt word, and secondly, it should be a response that shows a sequential or an affective relation to the prompt word, such as 'orchestra' as a response to 'conductor'. Clang responses only resemble the prompt word phonologically and have no semantic relation of any kind. When a participant cannot supply a response because he does not know the word or simply because no word comes to his mind, a 'no-response' category is assigned.

Some research studies that have used the productive Word Association Task have revealed that native speakers produce a larger proportion of paradigmatic responses when compared to the responses given by a group of advanced learners and a group of beginner learners (Wolter 2001). Other studies which have compared the responses of schoolchildren of different ages showed that, as age increases, there is a tendency for the responses to shift from clang responses (responses which have no semantic connection to the words and only resemble them phonologically) to semantic-related responses. Linguistic explanations accounting for this shift in response types assume that lexical or cognitive development is responsible for this change. The results of the research studies carried out on native speakers have set the standards and competence levels L2 learners should aim at. Naturally, the L2 mental lexicon, due to less exposure to the target language, differs from the native speakers' mental lexicon in such aspects as size and structural properties.

Another test used to investigate the mental lexicon is Read's Word Associates Test (http://www.lextutor.ca/tests/associates/). It differs from the productive Word Association Task described above in that it is a receptive test. In the test, informants are asked to choose, from a set of eight words, four potentially meaning-related lexical items to the stimulus word. The relations between the words are either paradigmatic, syntagmatic or analytic (Greidanus et al. 2004). The number of correct links the learner is able to identify is an indication of the learner's level of network knowledge and lexical quality. The test can be administered through a paper-pencil format, but it is also available in a computer-based format in Read's webpage. Since there is no time restriction imposed, test takers can take as much time as needed to complete the test. Studies using the Word Associates Test have revealed that 'very advanced' learners identify a greater number of correct links than 'advanced' learners (Greidanus and Nienhuis 2001). These studies have also shown that depth of word knowledge grows more slowly than breadth.

An additional category will be used in the analysis of the responses supplied to the productive word test by the two learner groups and the native group. Canonical responses are those most frequently supplied by native speakers. For instance, Henriksen (2008) states that 'hot' is a very frequent response given to the prompt word 'cold'; likewise, 'butter' as a response to 'bread'. Meara (1983) observes that 60 to 70 percent of adult native speakers of English will provide a response of 'woman' to the prompt word 'man'. Similar response frequency is observed with words such as 'black' and 'hard'; they produce 'white' and 'soft' approximately the same proportion of times. These more stable responses are considered to "… play a central role in the structuring of the mental lexicon, perhaps functioning as bridges or pointers between different parts of the lexical net" (Henriksen 2008: 34). Therefore, in the present research study, it has been deemed important to analyse the number of canonical responses supplied by the two groups of learners and the group of native speakers, based on the assumption that there is a tendency for responses to stabilise as proficiency increases.

3.2. *Taxonomy for the analysis of the productive word association task*

In the present study, responses elicited by means of a productive Word Association Task have been classified into the following five categories: paradigmatic, syntagmatic, clang, other, and no response. This taxonomy was elaborated by the researcher based on proposals made by the following authors: Wolter (2001), Fitzpatrick (2007), and Meara (2009).

1. Paradigmatic: Paradigmatic relations are those based on sameness, opposition and inclusion (Jaszczolt 2002). Considering the example cited above, the word 'knowledge' can be substituted by the word 'understanding' through the paradigmatic relation of sameness.

   Sameness: The relation of sameness is called synonymy. Synonyms are words which have the same meaning but different pronunciation, for example 'boy' - 'lad', 'truck' - 'long', 'police officer' - 'cop'.

   Opposition: Words opposite in meaning are antonyms. Palmer (1981) states that antonymy is a natural feature of languages, and that there are different kinds of antonyms:

   Inclusion: The relationship based on inclusion implies that the meaning of a specific term can be included into the meaning of a more general term. For instance, the meaning of 'rose' in (1) can be included in the meaning of 'flower' in (2), but not the other way around.

   (1) I bought a rose.
   (2) I bought a flower.

The lexical relations described above are of two types. Firstly, the specific term 'rose' is a hyponym of flower, and secondly, 'flower' is a superordinate or hypernym of 'rose'. Words that sit at the same level of meaning are said to be co-hyponyms or sisters, as would be the case between 'rose' and 'tulip'. Another instance of inclusion can be exemplified between the terms 'bird' and 'robin'. In this case, 'bird' is the general term or hypernym, while 'robin' is the specific term or hyponym (Jaszczolt 2002). Another type of relation based on inclusion is meronymy. Here, a term is related to another through a whole-part relation, as the one present in 'hand' – 'nail', or 'house' – 'chimney'.

2. Syntagmatic: Words in a syntagmatic relation are those that fall into a collocational structure with other words, for instance, 'deep knowledge'. Here the word 'deep' is in a syntagmatic relation with the word 'knowledge'. In her categorisation of lexical relations, Fitzpatrick (2009) defines syntagmatic as position-based associations. A response to a prompt word will be classified as syntagmatic if one of the following provisos is observed:

a) y follows x directly: 'immigration' " 'politics'
b) y precedes x directly: 'association' " 'life'
c) y follows x but with other content word(s) between them:
   'specific' [learning] 'disability'

3. Clang: This type of response is heavily influenced by the form of the prompt word, rather than by its meaning. Some examples include rhyming responses such as 'bite' as a response to 'light', unchanged consonants as in 'him' as a response to 'hum', assonance responses such as 'light' as a response to 'late', and unchanged initial as the 'g' in 'go' as a response to 'goat' (Meara 2009).

4. Other: Responses that bear no obvious relation to the prompt word are classified as 'other'.

5. No response: The 'no response' classification has been assigned in the case of participants being unable to provide responses to the prompt words.

3.3. Method

3.3.1. Subjects

A number of 24 informants participated in the study: 8 intermediate and 8 advanced learners of English, and 8 native speakers of English. The two learner groups are students of the English Teaching Programme at a higher education institution in the city of Los Angeles, Chile. Although the test was administered to all students in each level (14 and 20 students at the intermediate and advanced level, respectively) only those that had passed a mock language exam the previous year, The First Certificate of English (FCE) for intermediate students and Certificate of Advanced English (CAE) for advanced students, were chosen as informants. Both FCE and CAE are language

exams prepared by Cambridge ESOL, a not-for-profit Department of the University of Cambridge, for nonnative speakers of English.

The native speakers who participated in this study are all educated adults from different professional backgrounds. Because some of them were not present in Chile at the time of the data collection, a PowerPoint presentation was elaborated and sent via e-mail. Originally, 10 participants had taken both word tests, but 2 of them did not send the tests back. Therefore, each group of informants was constituted by 8 participants.

3.3.2. Data elicitation instruments

In the present study, two word knowledge elicitation tools were used to collect the data: a productive Word Association Task, and a receptive Word Connection Test. While the first investigates the informants' ability to produce words that are related in a number of ways to the stimulus words, the second taps into the links the informants are capable of establishing between the different lexical items.

The Word Association Task is a productive test. It requires that the informants produce, verbally or written, a response to a prompt or stimulus word. Wolter (2001) states that there are different ways to go about collecting the data: the aural-oral method, the aural-written method and the written-written method. In this case, the aural-written method was used since it allows greater control of the testing conditions. Additionally, it was felt that the aural-written method could better access the connections of the items in the mental lexicon since it allows the researcher to control the time span between prompts and responses. The test used in this study contains a number of 48 prompt words, consisting of 24 adjectives and 24 concrete nouns, from a representative range of semantic topics (Henriksen 2008: 41, Meara 2009: 17). The nouns and adjectives were presented alternately, and countable nouns were denoted by placing an indefinite pronoun in front of them (Table 1). It has been suggested by researchers (Henriksen 2008, Fitzpatrick 2006) that a test should include an equal number of items belonging to the same word class since it has been observed that word class has an influence on the type of association subjects may produce.

Nouns	Adjectives
a moon, a child, a fruit, a house, a woman, a chair, a hand, bread, a head, a spider, a river, a lion, an eagle, an ocean, a soldier, butter, a window, a sheep, a bed, a stomach cheese, a mountain, a doctor, a foot	cold, beautiful, afraid, hungry, slow sweet, dark, deep, soft, short, quiet bitter, yellow, long, high, hard, blue thirsty, white, black, red, sour, heavy green

Table 1. Stimulus words included in the Word Association Task (Henriksen 2008: 41)

In 1993, Read developed a receptive version of the Word Association Task called the Word Associates Test. The test consists of 40 prompt words, each followed by eight other words, four of which are semantically related to the prompt words. The

subjects have to establish which four words are correctly related to the prompt word. In the following example (Figure 3), the correct associations are 'film', 'publishing', 'revise' and 'text'.

| *Edit* | arithmetic | film | pole | publishing |
| | revise | risk | surface | text |

Figure 3. Read's receptive version of the Word Connection Task (1993, in Greidanus et al. 2004: 221)

In the present study, a modified version of Read's Word Associates Test designed by Henriksen (2008) was used, the Word Connection Test (Figure 4). It contains 24 prompt words, 12 nouns and 12 adjectives. Each prompt word has 10 possible associations, but only 5 are the most frequent according to a native speaker norming list. A norming list refers to the commonest responses supplied by native speakers of English to word association tests. The other 5 lexical items are semantically related, but are infrequent responses. Test takers are asked to establish 5 strong connections out of the 10 lexical items. In the example below, according to the data available in the norming list, 'snow', 'frost', 'winter', 'hot', and 'ice' are the five strongest links to the prompt word 'cold'.

| COLD: | war ☐ | water ☐ | frost ☐ | hand ☐ | hot ☐ |
| | warm ☐ | snow ☐ | pain ☐ | winter☐ | ice☐ |

Figure 4. Word Connection Test sample (Henriksen 2008: 42)

3.3.3. Data collection procedure

The productive word association task was applied to the three groups of participants in three different sessions, one for each group. After handing out the test, the participants were asked to read the following instructions:

> The following test is a word test. You will hear several words and you will be asked to respond with the first word that comes to mind upon hearing the word. There are no right or wrong answers, so try not to take a long time considering your response.

In addition, before the test was applied, an example was provided on the whiteboard, and participants were encouraged to ask questions in case of any doubts. The prompt words were then read aloud one at a time at approximately 7-second intervals. A pilot test applied by the researcher to a different group of learners of similar level of competence in English revealed that 7 seconds was enough time to elicit a response from the subjects. The learners' responses to each prompt word were written down on an answer sheet provided for this purpose. The test takers were also provided with blank sheets of paper and asked to cover their answers to each prompt word so as to

avoid chaining, i.e. influence from the previous response. Additionally, a PowerPoint presentation was prepared for the native participants that could not take the test in situ.

The Word Connection Test is a pen-paper activity. The tests were handed out to the participants, and they were asked to read the following instructions before taking the test:

> Decide which of the words in the group has either a strong (S) or weak (W) link with each stimulus word. Write your answers between the square brackets. If you are not sure of a probable link, write N. You must find no more and no less than five strong links. There is no time limit.

Furthermore, two examples were written on the whiteboard, and time for additional questions was provided. As stated in the instructions, the participants were not given time restrictions to do the test. On average, the test took each group of subjects 40 minutes to complete.

3.4. Data processing

The following steps were taken to process the data:

1. Digitisation of the responses to the productive Word Association Task supplied by the two groups of learners and the group of native speakers.
2. Classification of responses into the five categories of the taxonomy, according to their relation to the prompt word: paradigmatic, syntagmatic, clang, other, and no response. Each response type was assigned a letter: paradigmatic (P), syntagmatic (S), clang (C), other (O), and no response (NR).
3. Classification of responses to the receptive word connection task using the norming data provided by Professor Henriksen.
4. Statistical analysis of the associations established by the two learner groups of English as a foreign language and the group of native speakers of English in the productive word test using one-way ANOVA, and Tukey's post-hoc test.
5. Comparison between the associations established by the intermediate and advanced learners of English as a foreign language, and native speakers of English using two-way ANOVA, and Bonferroni post-hoc test.

3.4.1. Receptive word connection test

The following steps were taken to process the results:

1. Categorisation of 'strong' connections produced by the two learner groups of English, and the native speakers of English using the norming data kindly provided by Professor Henriksen.
2. Statistical analysis of the number of 'strong' connections established by the two learner groups of English, and the native speakers of English in the receptive Word Connection Test using one-way ANOVA, and Tukey's post-hoc test.

3.4.2. Canonical responses

Canonical responses were elicited by means of the application of the productive Word Association Task. The analysis of these responses was performed on the basis of the responses present in The Edinburgh Associative Thesaurus available in the net. The Edinburgh Associative Thesaurus is a set of word association norms showing the counts of word associations collected from native speakers of English. The classification decided upon was based on the proportion of times the responses to each prompt word occurred. So, for instance, the prompt word 'house' produces a number of 42 responses supplied by 100 informants (Table 2), of which one response, 'home' makes up for 28% of the total. Other responses to the prompt word 'house' do not exceed more than 10%. Furthermore, because canonical responses can either be syntagmatic or paradigmatic, it was decided that the analysis would be performed separately from the rest of the analysis.

Associations	Mean Proportion of Responses
1. Home	28%
2. Garden	8%
3. Door	6%
4. Boat	4%
5. Chimney	4%
6. Roof	4%

Table 2. Sample of associations elicited by 'house' (The Edinburgh Associative Thesaurus)

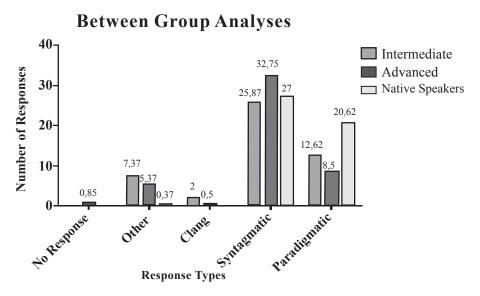The following steps were taken in the analysis of the canonical responses:

1. Categorisation of canonical responses using the Edinburgh Associative Thesaurus.
2. Classification of the responses supplied by the two learner groups of English, and the native speakers of English into the canonical category.
3. Statistical analysis of the number of canonical associations established by the two learner groups of English, and the native speakers of English in the productive Word Association Task using one-way ANOVA, and Tukey's post-hoc test.

4.0. Discussion of results

The analyses of the results of the three groups were performed using two-way ANOVA, and the Bonferroni post hoc test. The analyses revealed that there are statistically significant differences across the three groups ($p < 0.0001$). The Bonferroni post hoc

test also identified differences in the responses provided by the two groups of learners and the group of native speakers.

Graph 1 below represents the differences in number of responses, and the types of responses produced by the three groups of participants. Some very interesting observations can be made. Due to the high frequency of the words, only semantically related responses were expected: syntagmatic or paradigmatic. Nonetheless, a very small proportion of the links in the learners' mental lexicon are still phonological (intermediate, 4.16%; advanced, 1.04%). Additionally, concerning the responses provided by the advanced learners, a relatively small number of subjects could provide neither form-related nor semantically related responses (no response, 1.77%). Moreover, the three groups gave responses which were difficult to classify, resulting in 15.35% of unclassifiable responses for the intermediate learners, 11.18% for the advanced learners, and 0.77% for the native speakers. As competence reaches higher levels, there are fewer 'other' responses.

Between Group Analyses

Graph 1. Analyses of the associations produced by the intermediate and advanced learners of English, and the native speakers

Researchers have observed that as the knowledge of individual words increases, the organisation of the mental lexicon favours semantically-related links. This is evident in the mean proportion of semantically-related responses, i.e., syntagmatic and paradigmatic, provided by the two groups of learners and the group of native speakers: intermediate, 80.19%; advanced, 85.93%; native speakers, 99.2%. A more detailed analysis of these semantic responses reveals that both learner groups have a tendency towards syntagmatic associations. However, a higher number of paradigmatic links was expected as the result of the progression from the intermediate to the advanced level. This could be interpreted as a late syntagmatic development or

stage as both learner groups provided a high number of syntagmatic associations. In fact, the intermediate group produced a mean number of 25.87 (53.89%) syntagmatic associations, twice the number of the paradigmatic associations, 12.62 (26.29%). Likewise, the advanced group of learners also produced a very high mean number of syntagmatic associations, 32.75 (68.22%). This figure is almost four times as much as the paradigmatic associations, 8.5 (17.70%). Furthermore, in terms of descriptive statistics, the Bonferroni post hoc test identified significant differences between the syntagmatic and the paradigmatic associations for both learner groups (Table 3). These results are similar to those of previous studies. In a study of a group of nonnative speakers and a group of native speakers, Wolter (2001) used his own version of the Word Association Test, which incorporated lexical items of various frequencies. Results revealed that the L2 mental lexicon is principally organised in terms of syntagmatic associations for words which are well known. He observed, counter to what other models of the L2 mental lexicon had proposed, that a syntagmatically-dominated L2 mental lexicon is by no means inferior. In fact, he states that the nonnative participants in his study managed to use their vocabulary quite effectively, "...a task that requires a high rate of mental processing" (p. 61). There were, however, no statistical differences identified between the syntagmatic and the paradigmatic associations produced by the native group (p > 0.05). This last fact is interesting as research (e.g., Meara 2009) has provided ample evidence that supports the idea that native speakers favour paradigmatic associations, especially when dealing with high frequency words. Graph (1) shows that the mean number of syntagmatic associations (27) is higher than the paradigmatic associations (20.62).

Syntagmatic vs. Paradigmatic	t value = 2.306
Intermediate	4.965
Advanced	9.088

Table 3. Significant values for the syntagmatic and the paradigmatic associations produced by the intermediate and advanced learners

4.1. Results from the receptive word connection test

This section will present an analysis of the number of correct associational links the three groups of subjects were able to provide in the Word Connection Test. This test is the receptive version of Read's Word Associates Test, and it differs from it in that the participants have to relate a number of words to a specific stimulus word. The assumption that underlies the Word Connection Test is that it is possible to tap the subjects' network knowledge at levels I and III, as considered in the model adopted by Henriksen (2008). Level I contains our knowledge of the world, and level III contains meta-semantic knowledge. In a recent publication, Meara (2009) describes a study in which L2 learners and native speakers were asked to decide the number of links

that could be established between two unrelated lexical items (for instance, 'oven … veil'). Meara's assumption was that L2 participants would produce fewer links than native speakers. His findings showed that L2 subjects produce fewer links than native speakers, revealing a much denser mental lexicon for the latter.
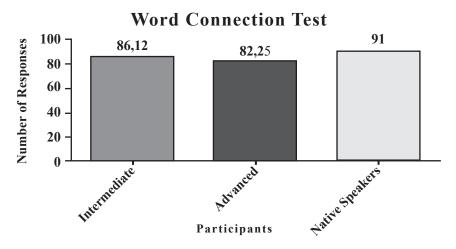
The Word Connection Test used in the present study consists of 24 prompt words, and each prompt word contains 10 possible associations. Each subject, as stated in the instructions, had to decide which were the 5 strongest connections to each prompt word. The tests were then compared to the native speaker norming data. One point was awarded on the basis of each 'correct' associational link identified by the test takers, the highest possible score being 126 points. The expectation is that this test would force test takers to consider the relative relatedness of the options given to each prompt word, revealing their current status of network knowledge at the receptive level.

One-way ANOVA revealed that there are no statistically significant differences between any of the three groups ($p = 0.0626$). Table 4 summarises the critical values for q between the two learner groups and the native speaker group.

Tukey's Multiple Comparison Test	q value = 8.25
Intermediate vs. Advanced	1.574
Intermediate vs. Native Speakers	1.980
Advanced vs. Native Speakers	3.554

Table 4. Bonferroni post hoc for the Word Connection Test

Although there were no statistical differences identified in the Word Connection Test, the native speakers produced a higher mean number of strong connections (91) than the two learner groups (intermediate, 86.12; advanced, 82.25) (See Graph 2). In turn, the group of intermediate learners produced a higher number of strong connections than the advanced learners. However, it was assumed that the opposite would occur due to the different competence levels. A detailed analysis of the advanced group shows that 6 of the 8 subjects are under the overall mean (86.45), whereas only 3 subjects of the intermediate group are under it.

Word Connection Test

Graph 2. Number of responses in the Word Connection Test

One possible explanation is that the advanced group is simply less proficient than the intermediate learner group. A retrospective analysis of the data revealed that some of the students in the advanced group had failed the Certificate of Advanced English exam once, and that some had interrupted their studies for a semester due to personal reasons, all this affecting the overall performance of the group.

4.2. Canonical responses

The main objective of this section is to analyse the number of canonical responses produced by the two learner groups and the group of native speakers. It is assumed that the number of canonical responses that each group of learners is capable of producing will shed light on their current status of lexical knowledge. Furthermore, the canonical associations that the native speaker group is able to establish will serve as a benchmark against which the learners' results will be compared. It must be made clear that there is no taxonomy for canonical responses; therefore, the criterion used for deciding on these responses was to consider the most frequent responses found in the Edinburgh Associative Thesaurus as canonical associations.
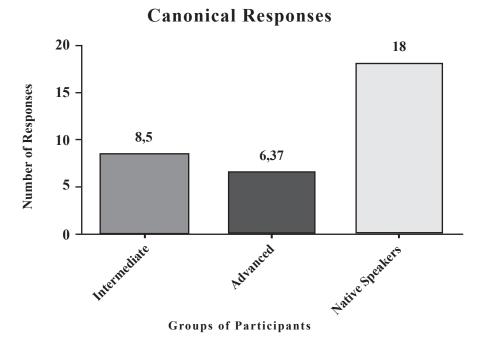
Meara (1983) observed that native speakers' responses to word association tasks were significantly stable. In fact, he stated that if a group of native speakers took the same test twice, it would be very unlikely that the second test would produce responses that differed largely from the ones produced in the first test. This observation leads to the notion that native speakers' links in the mental lexicon are stable, and that word retrieval is realised through fairly fixed routes. On the contrary, studies on learners' response stability have revealed that the L2 mental lexicon is less stable. For instance, Hughes (as cited in Meara 1983) found that responses produced by learners in terms of stability differed considerably from group to group, suggesting that an increase in response stability is expected as a result of proficiency level. Henriksen (2008) also

analysed learners' responses to word association tasks. Her study revealed differences in three learner groups, advanced learners producing a higher number of stable responses than less competent learners.

In the present study, the number of canonical responses produced by the three groups were analysed using one-way ANOVA, and Tukey's post hoc test. The results were charted on a bar graph to show the mean number of canonical responses produced by each group (see Graph 3). The intermediate learner group scored a mean number of 8.5 responses, while the advanced scored 6.37. The native speaker group scored the highest mean number of responses, 18. One-way ANOVA revealed significant differences (p<0.0003). Furthermore, Tukey's post hoc identified differences between the intermediate learner group and the native speaker group, and between the advanced learner group and the native speaker group (Table 5). However, there were no statistical differences observed between the intermediate and the advanced learner groups (q=1.994).

Groups	q value = 2.95
Intermediate v/s Native Speakers	5.339
Advanced v/s Native Speakers	6.533

Table 5. Significant statistical differences as identified by Tukey's post-hoc

Canonical Responses

Graph 3. Mean number of canonical responses produced by the two learner groups and the native speakers

Concerning the learner groups, the results obtained indicate that there is no progression in the number of canonical responses from the intermediate to the advanced levels. An analysis based on the statistical differences shows that the mean number of responses produced by the native speakers is well over the mean of the three groups, 10.95. Both learner groups, nonetheless, are under the mean. These findings lead to assume that learners' lexical links are influenced by L1 conceptual knowledge. Kroll and De Groot's Lexical/Conceptual Feature Model (1997) includes three levels of representation, a lexical feature level, which contains information regarding the form of words, and a conceptual feature level, which contains information regarding aspects of meaning. Between these two levels, they postulate a lemma level containing semantic and syntactic information which is specific for each language. It could quite possibly be that learners did not produce the same number of idiosyncratic associations as native speakers, due to their L1 conceptual knowledge. It must be considered that learners' mapping process is aided by their L1, and the paths which are built in their mental lexicon are heavily influenced by it. Meara (2009) states that the idea of starting a new L2 network from scratch is very unlikely as it would render the whole learning process inefficient. This would explain why, in the present research study, learners obtained responses which were neither idiosyncratic nor infrequent, that is, their L2 mental lexicon is modeled by their L1. For instance, in the word association norms available in the Edinburgh Association Thesaurus, 'moon' has a total of 45 responses, of which 'sun' and 'shine' are considered canonical, while the other 43 responses are common, but not sufficient enough to be viewed as canonical. The two learner groups did produce responses which were classified as canonical, but they also produced a great number of responses which, although common enough, could not be classified as such.

5.0. Conclusions

The objective of the present study was to describe and compare the results of word association tasks across two learner groups and a group of native speakers and to relate them to their lexical network knowledge. To achieve these aims, two word association tests usually applied in L2 lexical acquisition research were used to collect the data, the productive Word Association Task and the receptive Word Connection Test. The assumption for the first test, the Word Association task, was that a shift from form-related (phonologically alike) to semantically-related associations (syntagmatic-paradigmatic) would be indicative of a 'native-speaker-like' mental lexicon. Research studies in the L1, especially the ones carried out by Meara (2009), suggest that children favour phonological or form-related associations in word tests. This gradually changes as children get older (Aitchison 2003). At the age of seven, approximately, their associations are predominantly syntagmatic, and at adulthood, paradigmatic. Studies on L2 word associations reveal a similar pattern: as proficiency increases, the form-semantic shift becomes evident. However, the type of semantic relations which nonnative speakers favour is a matter of debate. For instance, the results of a

study performed by Wolter (2001) using a productive word test with different word frequencies suggest that nonnative speakers favour syntagmatic associations for words which are well known, whereas native speakers favour paradigmatic associations. The results in the present research study tally with the ones obtained in the aforementioned study, as far as nonnative speakers are concerned. The results show that both the intermediate and the advanced learners favoured syntagmatic associations, the latter producing the highest mean number. An interesting fact is that the native speakers did not favour paradigmatic associations over syntagmatic ones, as reported in the literature. In this respect, it must be stated that studies have also shown that there is a tendency for advanced learners and adults to shift back to syntagmatic associations, or what Entwisle (1966) calls, 'late syntagmatic' associations. A different study (Namei 2004) that tested 100 Persian-Swedish bilingual subjects using a productive word association test revealed that high levels of syntagmatic and paradigmatic associations were produced by both L1 and L2 subjects. What is even more striking is the fact that clang associations were also found among the responses of very advanced L1 and L2 speakers. A similar case can be drawn here. Both learner groups produced clang responses. The intermediate group produced the highest number of clang associations with 16 responses in total, and the advanced group produced 4.

The findings of a study performed by Fitzpatrick (2007) suggest that the form-semantic shift is not reliable as L1 and L2 subjects tend to produce response patterns that vary quite drastically. She (2007: 327) states that subjects' responses to word associations, "…cannot reliably be traced back to their maturity or whether they are operating in the L1 or L2; despite the fact that the subjects in this study were all adult native speakers, their response preferences varied greatly". Similar results can be observed in a research study carried out by Wolter (2006). One of the conclusions that he draws from the results is that paradigmatic associations are not indicative of a higher level of development and of organisation of the mental lexicon. In fact, he observes that building syntagmatic connections seems to be a harder task since it demands a constant restructuring of learners' lexical network as new items are added. Providing paradigmatic connections does not put such a burden on learners. In fact, he states that paradigmatic connections can be established in the learner's network quite easily through his L1 lexical/conceptual network.

The response patterns produced by the two groups of learners in this study cannot be held as support for a syntagmatic-paradigmatic shift along the lines of proficiency. The number of associations and the patterns that they established cannot be seen as signs of development and higher capacity for lexical organisation. Both learner groups' preference for syntagmatic associations can be explained on the basis of the bilingual network model adopted here (Henriksen 2008). This model postulates that lexical representation is organized as a multi-layered structure with three levels of lexical knowledge. It is assumed that because of time limits imposed, productive word tests tap into the second level. The nature of the information found at this level comprises a word's, "phonemic and graphic form, word class and morphology, syntactical and pragmatic restrictions, and semantic specifications" (Henriksen 2008). Furthermore, the data is perceived as being language specific, unless the L1 and the

L2 are from the same language family. In this case, learners' L1 and native speakers' L1 are from different language families. Consequently, any new word incorporated into the learners' L2 mental lexicon will require specific information concerning its phonological and grammatical functions, and particularly, its semantic restrictions. Observations made by Henriksen (1999) suggest that thorough knowledge of a single lexical item will determine how productive it will be. The author also states that the types of associations learners are able to establish also depend on the transition from general to defining features of individual lexical items. This could also explain why learners at the beginner level favour form-related associations, this aspect being the one that they encounter first. A word's semantic restrictions would be situated at a more developed stage of learning, when the use of words in speech and writing become essential. In this phase, syntagmatic relations are established as responses to the need for proper language use.

An analysis of why native speakers produced a greater number of syntagmatic associations is not very clear though. A possible reason is the high frequency of the words used. It is believed that most of the lexical items in the productive Word Association Task, as confirmed by the results, are syntagmatically biased, i.e., words which fall into a syntagm. For instance, native speakers produced 'water' three times, and 'blue' twice as a response to the prompt word 'deep'. The other responses were 'pond', 'pool' and 'shallow', all considered syntagmatic. Likewise, the nonnative speakers also produced a high number of syntagmatic responses for the same prompt word. The intermediate group produced 5, and the advanced group produced 6. Another example is 'spider'. It elicited 8 syntagmatic associations from the native speakers, and 6 and 7 syntagmatic associations from the intermediate and the advanced learners, respectively. Another possible reason for this trend observed across all three groups is the word class chosen as prompt words; equal number of nouns and adjectives were used. Nissen and Henriksen (2006) observed that word class has an influence on the types of word associations which subjects are able to establish. For instance, adjectives are characterized in terms of what they modify –a noun– resulting in a higher number of syntagmatic associations. It could also be stated that the syntagmatic associations established are, in fact, late syntagmatic, as mentioned earlier.

The results obtained from the receptive Word Connection Test do not show significant statistical differences across the three groups. It was expected, though, that the intermediate learners would produce fewer stronger connections than the advanced group. It is thought that because of the receptive nature of the Word Connection Test, and with time for reflection, the vocabulary knowledge accessed is found both in levels I and III of the mental lexicon model used here. The information in each of the two levels is considered language neutral. Probably much of the conceptual knowledge in level II is universal; the fact that the 'moon' is considered by some to have astrological influence in our lives is cross-culturally shared. The same can be said for the meta-linguistic knowledge contained in level III. It is believed that the information regarding specific paradigmatic relations and the various syntagmatic associations that can hold between different words; for instance, 'white' plus 'snow', 'white' plus 'cloud', etc, are universal features (Murphy 2003). It is estimated that the

responses provided by the two groups of nonnative speakers and the native speakers group did not differ greatly, due to the universal characteristics of the concepts and ideas that underlie some words. In other words, the knowledge that was activated was similar for all subjects.

In trying to relate the two word association tests applied in this study, and the current state of vocabulary knowledge of the two learner groups and that evidenced by the nonnative speakers, it can be concluded that the results obtained are conflicting and do not reveal any clear development in terms of the syntagmatic-paradigmatic shift described in vocabulary studies. The efficiency of a word association test in accurately determining the lexical links at a certain moment of lexical development may be questioned. Firstly, subjects' progress along the semantic shift and development of lexical knowledge was not manifest in the word association tests. Secondly, the responses produced by the native speakers did not differ greatly as the ones produced by the nonnative speakers. It could be argued that the responses supplied by the learner subjects reveal a less developed mental lexicon, but the statistical analysis did not identify important differences between the responses supplied by the nonnative speakers and those supplied by the native speakers. Likewise, the receptive Word Connection Test did not reveal any concluding differences about the actual stage of lexical development of the nonnative speakers.

The results of the canonical responses show that both groups of learners, intermediate and advanced, produced a relatively small number of canonical associations, 8.5 and 6.37, respectively, versus the native speaker group, which produced a total mean number of 18 responses. It is suggested that canonical responses reflect well-established routes through which native speakers have access to their mental lexicon. It was expected that there would be a marked increase in the number of idiosyncratic responses that the two learner groups were able to produce. However, the fact that both learner groups did not establish a significant number of canonical associations does not mean that their lexical links are of a poorer quality. It could simply mean that learners have fewer links established in their mental lexicon, and they make use of the ones available at their current stage of lexical knowledge. This correlates with the relevant research findings (Meara 2009, Wolter 2001, Henriksen 2008) that learners' links in the L2 are fewer in number when compared to those in the L1.

The theoretical and descriptive framework used in the present study is based on proposals made by various researchers that have studied L1 and L2 lexical acquisition and are also interested in probing into the mental lexicon. These different approaches to the acquisition of lexis have allowed the present study to be comprehensive and updated, in terms of considering both research previously done and also recent findings in the field. Concerning the taxonomy, it was useful and pertinent in the analysis of the responses provided by both the learner groups and the group of native speakers. Previous problems encountered by researchers during the categorisation process were considered before collecting the data in an attempt to prevent complications in the data analysis. However, there still persist some drawbacks, especially with responses which are ambiguous. To solve this problem, many authors (e.g., Fitzpatrick

2006, Henriksen 2008) have proposed the use of follow-up tests in the form of an interview to elucidate doubts concerning the responses produced by the participants. In this study, a follow-up test was not possible due to time limitations. With regard to the instruments used, the words included in both tests were all high-frequency items. This fact could have influenced the number of syntagmatic responses that the participants were able to produce. Another point to consider in the WAT test format is the administration procedure. It is done sequentially, possibly affecting the responses which the participants produced. Meara (2009), in an attempt to avoid chaining due to the sequential order in which the lexical items are presented, has recently devised a computerised word test in which participants are asked to click on words which they think are related in any order.

Concerning future studies, the use of follow-up tests could allow a more adequate identification of participants' word associations. Besides, in order to make the results of the present study generalisable, a larger number of participants is needed, both L1 and L2 subjects. Moreover, continued research on lexical knowledge is of great importance to the study of second language acquisition, and learning and teaching of a foreign language. It is essential that learners benefit from activities that present vocabulary in a systematic manner through authentic texts. Additionally, the use of vocabulary in different contexts should help learners develop their mental lexicon in terms of breadth and also depth.

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