Univerzitet u Sarajevu

Filozofski fakultet

Odsjek za anglistiku

Paradigmatic and Syntagmatic Associations in the Bilingual Lexicon

Paradigmatske i sintagmatske asocijacije u bilingvalnom leksikonu

Završni magistarski rad

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Sarajevo, 2021.

Contents

Abstract

The present master's thesis aims to examine how L1 and L2 mental lexicons of bilinguals operate individually and how they interact through word association tests (WAT). The first part of the paper offers theoretical background on word recognition (language selective/nonselective access), paradigmatic and syntagmatic relations, cognates and noncognates and conceptual/ semantic representations. The research part of the paper examines the theoretical background via word association tests (WAT) which are applied on the basis of the Kent-Rosanoff (1910) list. The first part of the research examines paradigmatic and syntagmatic relations in L1 and L2 and compares them. The second part of the research examines paradigmatic relations between cognates (words that are morphologically, phonologically and semantically very similar or identical in both L1 and L2) and noncognates (words that are similar or identical only in terms of semantics/meaning in L1 and L2). The third part of the research examines the responses given to the prompt words in L2 and their equivalents in L1 to find out the percentage of responses with similar meaning (translation equivalents in L1 and L2). The results of the word association tests suggest that L1 and L2 mental lexicons operate in a similar way regarding paradigmatic and syntagmatic relations. The data also suggests that cognate pairs in L1 and L2, despite their common morphology and phonology, might show fewer similarities than noncognate pairs in terms of paradigmatic and syntagmatic relations. The responses in L1 and L2 resulted in a high degree of translation equivalents which supports the notion of a common semantic representation for L1 and L2 mental lexicons. Noncognate pairs elicited a higher degree of responses with similar meaning in L1 and L2 than cognates, which is an indication that semantics play a more significant role than morphology and phonology with regard to word recognition, retrieval and storage. Each part of the research indicated that L1 and L2 mental lexicons operate in a similar way, that they are continuously interacting and that L1 and L2 might share a common system of semantic representation.

Key terms: bilingual, word recognition, paradigmatic and syntagmatic relations, cognates, noncognates, word association tests

Sažetak

Cilj ovog završnog magistarskog rada je, kroz test asocijacija, ispitati na koji način funkcioniraju L1 i L2 mentalni leksikoni kod govornika dva jezika i na koji način međusobno komuniciraju. Prvi dio rada se bavi teorijom prepoznavanja/identifikacije riječi (selektivni i neselektivni jezički pristup), paradigmatske i sintagmatske relacije, kognatima i djelimičnim kognatima, te semantikom/značenjem. Istraživački dio rada propituje teoriju u praksi koristeći test asocijacija koji je zasnovan na Kent-Rosanoffoj listi (1910). Prvi dio rada ispituje paradigmatske i sintagmatske relacije u L1 i L2 i upoređuje ih. Drugi dio rada ispituje paradigmatske i sintagmatske odnose između kognata (riječi koje imaju identičnu ili jako sličnu morfologiju, fonologiju i semantiku u L1 i L2) i djelimičnih kognata (riječi koje su identične ili jako slične samo po pitanju semantike/značenja). Treći dio istraživanja poredi odgovore na riječi-stimule u L2 i njihove ekvivalente u L1 ciljem utvrđivanja procenta odgovora sa sličnim značenjem (ekvivalenata u L1 i L2). Rezultati testa asocijacija sugeriraju da L1 I L2 mentalni leksikoni funkcionišu na sličan način u pogledu paradigmatskih i sintagmatskih relacija. Rezultati također ukazuju da kognati u L1 i L2, uprkos sličnoj morfologiji i fonologiji, mogu pokazivati manje sličnosti od djelimičnih kognata u pogledu paradigmatskih i sintagmatskih relacija. Veliki dio odgovara u jezicima L1 i L2 su bili ekvivalenti što potvrđuje mogućnost zajedničkog semantičkog predstavljanja. Djelimični kognati su dobili više odgovora sa sličnim značenjem u jezicima L1 i L2, što je još jedna naznaka da semantika/značenje ima značajniju ulogu od morfologije i fonetike kada su upitanju prepoznavanje, aktivacija i skladištenje riječi. Svaki dio istraživanja je ukazao da L1 i L2 mentalni leksikoni funkcioniraju na sličan način, da neprestano komuniciraju i da postoji mogućnost da L1 i L2 imaju zajednički semantički/značenjski sistem.

Ključne riječi: dvojezičnost, prepoznavanje riječi, paradigmatske i sintagmatske relacije, kognati, djelimični kognati, test asocijacija

1 Introduction

The bilingual semantic and conceptual organisation has been a subject of interest for many cognitive researchers and psycholinguists. To produce ways in which L2 acquisition can be easier and faster, it is vital to understand how two languages may be utilised properly inside the mind, and, maybe even more important, to understand how languages interact with each other. In addition, one of the primary goals of bilinguals is to communicate well in their second language (L2). This means that they want to acquire the skills which should enable them to master the understanding of spoken and written information. When we adopt a scientific perspective, language understanding or comprehension seems fairly complicated and challenging to be explained in a simple way. Comprehension, on the other hand, should not problematic at all for a skilled speaker. A skilled speaker is quick to process speech and does not even think about comprehension as a complicated mental process. In the mind of such a speaker, all the lexical, semantic, syntactic, and textual processes that compete for mind resources are carried out smoothly and, to use computer terminology, in the background. However, this may not be the case for the L2 learner or the reasonably experienced bilingual. However, it has to be noted that with an expert bilingual, or an expert monolingual, the machinery operating behind the process of comprehension may be so well-tuned and well-managed that only the most ingenious experimental designs may reveal any confusion or weaknesses.

Word identification/recognition provides access to word meanings and associated ideas and can provide useful insights into the complex machinery that operates behind L1 and L2 lexicons. Through experiments that make use of word recognition, we can understand some of the basic operations in L1 and L2 and, perhaps, the operations between L1 and L2. Forster (2007) agrees on the importance of word recognition:

> The study of visual word recognition is about much more than just reading. It's about one of the most fundamental properties of the brain– the ability to store and rapidly retrieve information about familiar visual patterns. Without this ability, no learning or adaptation to the environment could occur, since each stimulus would essentially be novel. Visual word recognition is also particularly appropriate as an arena to stage the battle between different models of pattern recognition, and it is no accident that much of the debate about neural network models of cognition centers on this topic. (p. 31)

A fundamental topic, that could be investigated through word recognition, has been how words are represented in the memory of a bilingual. There is very little bilingual research that truly conforms to this level of analysis. The analyses of the mental lexicon and of how the mind operates have always been challenging and shrouded in uncertainty. Lexicon research has always been difficult to conduct since descriptions of cognitive and language development are constantly open to inference and ambiguity. Questions of integration, storage, vocabulary acquisition and assessment, word retrieval and lexical access are already challenging enough with monolingual research but when we include another language, it becomes even harder to understand the complex machinery of the mind and to find evidence that proves how they operate. However, the way forward is to be persistent and to keep investigating the secrets of the bilingual mind. One way we can gain a better understanding of the mental lexicon is via experiments based on paradigmatic and syntagmatic relations. Paradigmatic and syntagmatic relations are just one manifestation of the complex language operations that take place in the mind. However, they are very useful in demonstrating some of the basic operations related to words and the mental lexicon in general. We will elaborate on paradigmatic and syntagmatic relations a bit more in the next section.

This paper also investigates how bilingual mental lexicons operate individually and how they interact. The paper and research will make use of paradigmatic and syntagmatic relations to investigate whether L1 and L2 mental lexicons operate similarly. The relation between cognates (words that are morphologically, phonologically and semantically identical or nearly identical in L1 and L2) and noncognates (words that are only identical or similar in meaning in L1 and L2) will show whether there is a connection between L1 and L2 mental lexicons and how powerful that connection is. The results of the research will be used to comment and make certain conclusions on the structures of L1 and L2 mental lexicons and to comment on the relation between them (whether they are “separated”, “unified” or “partially unified”). While investigating the mentioned issues, the paper will also tackle the following questions:

- Are words from the two languages preserved separately in their respective languages, or are they linked together by their related meanings?
- Do translation counterparts cause the same meaning representations to be activated?
- Is it possible to store cognate translations differently from noncognate translations?
- If we understand the complex system behind language learning and production better, can we identify the best ways to make language learning and acquisition as effective as possible?

2 Theoretical Background

2.1 Paradigmatic and Syntagmatic Relations

In language research, there are two types of word associations: phonological and semantic associations. According to Meara (1984), beginners and young learners tend to make phonological links between words or clang associations. An example of clang associations in L1 (Bosnian) is *staklo* as a response to *slatko*. This type of association is characteristic for beginners and young learners but if the link is strong, it can remain even as learners progress. We can roughly divide the semantic associations into paradigmatic and syntagmatic associations. Paradigmatic relations are relations between words that belong to the same word class and the same semantic field. Paradigmatic relations can be further divided into coordinates, superordinates, synonyms, antonyms and many other subcategories. Murphy (2010) explains paradigmatic relations in the following way: "Words in paradigmatic relations belong to the same word class and share some characteristics in common. The words in such relations can be said to form a paradigm—that is, a set of examples that show a pattern" (p. 109). Syntagmatic relations are relations between words that can be part of a syntactic/grammatical sequence and therefore represent collocates of the word. Murphy (2010) comments on syntagmatic relations as well:

> Syntagmatic relations are relations between words that go together in syntactic phrases—like ship's and captain or dogs and bark. Notice that syntagmatic and syntax are from the same Greek roots, meaning 'touching together'—in other words, words in syntagmatic relations are in proximity to each other in phrases. Because they go together in phrases, syntagmatically related words often belong to different word classes—e.g. dog (noun) + bark (verb). Syntagmatic relations are studied more and more these days as corpus research highlights the ways in which words tend to occur with certain words rather than others. (p. 108-109)

As explained by Murphy, paradigmatic and syntagmatic relations can reveal links between words and reveal how those links are formed. If these links appear to be similar for L1 and L2, then perhaps the notion of a unified mental lexicon is possible. One way to contrast and compare paradigmatic and syntagmatic relations in L1 and L2 mental lexicons is to test something that they should have in common. What L1 and L2 have in common are, in the first place, cognates and, in the second place, noncognates. Cognates are words that are identical in L1 and L2 in

terms of morphology, phonology and semantics. Noncognates are words that are identical or similar only in terms of meaning. If they are closely related in the mental lexicon, cognate pairs and noncognate pairs in L1 and L2 should show some considerable similarities in terms of paradigmatic and syntagmatic relations.

However, issues concerning the human mind have never been simple and straightforward and the same goes for the language or to put in Chomsky's words: "When we study human language, we are approaching what some might call the 'human essence', the distinctive qualities of the mind that are, so far as we know, unique to man…" (2006, p. 88). This gave way to a lot of different perspectives and interpretations and there is no unified view on the bilingual mental lexicon. As a result, theory centred around this issue has become fairly complex and demands considerable knowledge in several fields of research. For that reason, the present paper will examine and present core principles relevant to this issue and present them in a clear and systematic way.

We will look into the process of word recognition/word identification to understand how our mind identifies the language/lexicon to which the word belongs. Concerning this, we will explore the concepts of language-selective access and language nonselective access. The paper also elaborates on the most important computational models of bilingual comprehension, which present models of bilingual comprehension in a simplified manner. Then we will use the computational models to illustrate the possible models of bilingual comprehension for cognates and noncognates. In the end, we will put all this theory to the test and see whether the mental lexicons of speakers whose L1 is Bosnian and L2 is English, interact and, if so, to what degree.

2.2 Bilingual Word Recognition and Lexical Access

Some readers of this paper will probably be bilinguals or even multilinguals. The question is—while they read—which one of their lexicons will be active L1, L2, L3 or perhaps even all of them? In this section of the paper, we will examine the existing empirical evidence and theoretical viewpoints on bilingual word recognition and lexical access. Based on the research and experiments conducted so far, it is widely accepted that bilingual word recognition appears to be essentially linguistically nonselective: "The evidence suggests that the non-target lexical system is always operational to a certain extent, giving rise to between-language interference even in the most monolingual of processing situations." (Grainger, 1993, p. 11).

This means that bilingual word recognition is automated or that it is not controlled by the reader. Another observation that is generally considered to be true is, although task-dependent, early processing stages of bilingual word recognition may be unaffected by non-linguistic contextual circumstances (Dijkstra, 2005). The process of entering the mental lexicon to retrieve information about words is known as lexical access. The mental lexicon could be defined as a database that contains all the words in the language user's mind where lexical information such as orthographic (spelling), phonological (sound), or semantic (meaning) information may be classified further. The process of extracting these (word) features based on the input letter string is therefore termed word recognition (Dijkstra, 2005). These various features may become active in a variety of settings or specific activities/situations may need the use of specific types of lexical information.

For example, if it is necessary to determine if a specific letter string is a word in the target language or not (lexical decision), orthographic, phonological, and semantic information might all be employed. However, if a displayed word must be named, retrieval of its phonological information is required to access the word's articulatory code. Finally, if requested to semantically categorise the item represented by the word (e.g., *Is an axe a tool?*), the meaning information of the word must be retrieved before responding. It takes time to retrieve information about a word's features from the mental lexicon.

Studies in the monolingual domain show that the display of a letter string initially activates many potential orthographic word candidates in reasonably close correlation to the input signal. For example, there are indications that any words that differ from the provided input string by only one letter position are markedly active. Such terms are referred to as "neighbours" (for

example, in English *pit* is a neighbour of *sit* or in Bosnian, for instance, *teče* is neighbour of *peče*). Aitchison (1987) explains this process: "Speakers flash on their mental screen, as it were, any word that is consistent with what they hear, then make use of all the available evidence-syntactic and semantic, to narrow down the possibilities" (p. 185). In the additional phases of word recognition, the input signal is analysed more thoroughly, resulting in a decreased number of probable lexical candidates and, eventually, recognition of the provided word. This approach is frequently represented in localist connectionist network models as an activation process. A letter string triggers several word possibilities, one of which is the desired target word (Dijkstra, 2005). Additional lexical processes and interactions between word candidates reduce the number of word candidates, eventually arriving at the target word. Finally, the target word is the most active, and it is recognised when it exceeds a recognition threshold.

Compared to the monolingual realm, the bilingual word recognition process raises two distinct problems. The first question is whether when a letter string is provided, lexical candidates from various languages that share their script are active. There are three possibilities. The first one is that when a letter string or word is provided, lexical candidates from only one language are active. This would imply language-specific lexical access. The second possibility is that when a letter string is provided, lexical candidates from various languages that share their script are active. Basnight-Brown (2014) provides support for language-independent access:

> The bilingual brain introduces several challenges during lexical access, in that word recognition processes involve simultaneous activation of words in both lexicons, followed by competition between words with similar orthographies or semantics, and lastly, inhibitory processing in order to assist with selection of the appropriate choice. It has been known for quite sometime, in both the monolingual and bilingual domains, that lexical access is affected by several basic attributes of words, such as concreteness, word frequency, and word length. However, other factors such as the number of orthographic neighbours (both within the L1 and L2), cognate status, and the characteristics of interlingual homographs, are all additional factors that have been considered in bilingual models. (p. 101)

The third possibility is that everything depends on the situation or context. Therefore, the last option implies that, depending on the conditions, lexical access can be selective or nonselective. It indeed seems possible to induce language-specific access by specific tasks or experimental conditions. Several studies were conducted in this area and the results supported language nonselective access:

> [In this study,] Russian-English bilinguals viewed physical arrays of objects and were verbally instructed to move one of the objects to a different location while their eye movements were monitored. On critical trials, the name of the to-be-moved object (e.g., marker) had a similar beginning sound to the other-language name of the "competitor" object (e.g., *marku*, which means *stamp* in Russian). Spivey and Marian (1999) reasoned that if participants activated words in both of their languages, they would be more likely to look at the competitor object than to a control object that did not share a beginning sound with the intended object. The results confirmed that the participants did indeed briefly look at the competitor objects more often than they looked at control objects. (Tokowicz, 2015, p. 24)

The full nonselective access perspective and the context-dependent nonselective access have in common the view that the basic word recognition machinery should provide language nonselective lexical access in some cases, but they disagree on how task-dependent and experiment-dependent outcomes should be interpreted. The second dilemma that is characteristic of the bilingual lexicon is whether language information can be employed to speed up word processing. Language information might be provided by the non-linguistic or linguistic environment in which the item is given (experiment instruction or stimulus list or the language of a book) or by the object itself (language membership). If the context provides linguistic information, it seems possible that the word identification system can use it to minimise the number of items in the candidate set (by suppressing the activation of items from the "irrelevant language") (Dijkstra, 2005). If the object itself provides linguistic information, the question is whether it is available in time to affect word recognition or comes after the word has already been identified.

2.3 Language-Selective Access of Interlingual Homographs and Cognates

Research on whether lexical candidates from different languages are activated during bilingual word recognition used two types of stimulus materials: words that are identical or very similar in meaning or form between two languages (the so-called cognates and interlingual homographs), and words that exist only in one language but vary in the number of similar words (interlingual neighbourhood density variations).

Interlingual homographs are words that have the same spelling but not different meanings. Interlexical homographs, false friends or false cognates are other terminologies that are employed. One example is the term *brat* which in English means "a person, especially a child, who behaves badly" (Hornby, 2010). In Bosnian, the term *brat* has a completely different meaning: "brother". Cognates are words from two languages that are orthographically identical (or highly similar) and mainly overlap in meaning. The word *film* is an example of a Bosnian-English cognate.

Researchers have utilised these sorts of items in their studies (see Soares and Grosjean, 1984) to see if bilinguals interpret them differently than matching control terms that only occur in one language. If there are disparities in response time (RT) between the two item kinds, it is most likely because of their existence in two languages rather than one. As a result, such RT disparities encourage language nonselective access, whereas their absence favours language-selective access (Dijkstra, 2005). There were no obvious RT differences between test items and controls in a lot of early trials.

A lexical choice experiment involving interlingual homographs and cognates was carried out by English monolinguals and Spanish-English bilinguals (Gerard and Scarborough, 1989). The results supported the idea of language-selective access. There were no significant variations in delay between bilinguals and monolinguals, suggesting that they were all functioning in a language-selective mode. However, an increasing number of studies that followed Gerard and Scarborough's study found evidence in support of language nonselective access.

2.4 Language Nonselective Access of Interlingual Homographs and Cognates

Some studies (Beauvillain & Grainger, 1987) have shown cross-linguistic impacts of orthographic and semantic overlap between alternative interpretations of cognates and interlingual homographs. The tests that employed the so-called neighbours as stimulus materials produced some of the most compelling results in favour of nonselective access. L2 impacts on L1 are frequently less present than L1 effects on L2, although this appears to be due to the relative strength of the two languages and is therefore partly reliant on L2 proficiency (Jared and Kroll, 2001).

Caramazza and Brones (1979) found out in an experiment that the bilinguals were processing cognate words in a Spanish lexical decision task as if they were English words. In addition, many studies favour the language nonselective access theory in terms of both form (orthographic and phonological) and semantic representations. In the studies related to the bilingual mental lexicon, the number of orthographic neighbours was utilised as a proxy for the relative influence of nontarget language words on target word recognition in various experimental tasks and settings.

Whatever the right reason is, the studies clarified that during the presentation of a target word, neighbours from both the same and the other language are engaged. This shows that, in terms of orthographic codes, bilinguals' vocabulary is integrated and nonselective. Neighbourhood studies (Jared and Kroll, 2001) show that the bilingual lexicon is integrated into nature for language pairings with a shared script (the writing system-letters, characters and symbols), such as Dutch-English and French-English. They also reveal that word candidates from both languages of the bilingual are activated simultaneously, once again, supporting the language nonselective access theory.

2.5 Language Information and Bilingual Word Recognition

Bilinguals understand, of course, which language a specific term belongs to. This type of information must be retained in the bilingual's mental lexicon for each word. This is usually referred to as a language tag or a language node. Furthermore, there are not many studies on such tags or nodes for different language pairs. The linguistic information relevant to an object/item/word can be obtained via its form (orthographic or phonological) representation or its lemma, a more abstract syntactic/semantic representation (Dijkstra, 2005). Each word may have its language tag; alternatively, all words in one language may share the same language tag.

An intriguing topic is when linguistic information becomes available concerning word identification. If such information is accessible quickly enough, it may assist to speed up word recognition by removing non-target language lexical possibilities. For example, if the task is to reply to English words, any non-English word choices might be eliminated from consideration (Dijkstra, 2005). The language of instructions during an experiment or study can also have a similar effect. If linguistic information from the context might alter the speed of word recognition, bilinguals may be slower to recognise a target word if it is preceded by an item in a different language than the target.

The mechanism must eventually arrive at a selection of one lexical item alone, but the language of that item appears to play just a tiny part in assisting selection. In practice, determining the language of the item may be dependent on lexical selection. It does not seem viable to disregard the homograph reading from the non-target language and focus solely on the target reading based on the instruction that only the target language requires a response.

3 Models of Bilingual Memory

Since the first empirical investigations on bilingual word recognition, linguists have sought to develop theories that explain the results of the studies, whether they be in favour of selective or nonselective language access. Therefore, it is no surprise that the first models frequently depicted bilingual lexical access as selective in nature and that the two languages of a bilingual were stored independently.

3.1 Classical Models of Bilingual Representation and Translation

Traditionally three forms of bilingualism are defined: coordinative, compound, and subordinative. In coordinate bilinguals, the lexicons of their two languages would be maintained distinct, resulting in a unique word form and meaning representation for each lexical item. For example, the English term *book* and its Bosnian equivalent *knjiga* would have different forms and meanings. On the other hand, compound bilinguals would recognise the word forms *book* and *knjiga* but would share only one meaning. Finally, subordinate bilinguals would interpret their weaker language's (typically L2) words through the stronger language's terms (usually L1). A Bosnian-English bilingual, for example, would identify the term *book* because it invokes the Bosnian term *knjiga* and, as a result, its meaning.

Bilingual word recognition appears to be automatic in the sense that it appears to be unaffected by non-linguistic environmental influences. This is true for the lexical items from the first language (L1) but also for the lexical items from the second language (L2). Simultaneously, when words are evaluated in context, their processing appears to be sensitive to the semantic and syntactic features of the phrase.

3.2 Computational Models

Computational models combine theory and experimental results on word recognition and provide graphical models on how L1 and L2 mental lexicons operate both independently and when combined. Early bilingual word recognition models shared a common feature. Namely, most of them were focussing on whether the bilingual system should include a single list including terms from both languages or separate lists for each language (in which case, the question would be whether the lists would be searched in parallel or one after the other). Lexical organisation theories focused on whether bilingual "memories" would be separated or integrated across languages, as well as what "links" may exist between translation counterparts in each language or between semantically similar terms in each language (Thomas & Van Heuven, 2005).

Computational models provide clarity on theories by requiring previously ambiguous and vague descriptive ideas to be elaborated sufficiently for implementation to be feasible. The implemented model may then serve as a tool that can be used to assess the feasibility of the original hypothesis by quantitative comparisons of the model's output to empirical data (Thomas & Van Heuven, 2005). This is especially useful when the consequences of a theory's assumptions are difficult to predict, such as when behaviour is based on intricate interactions within the model.

A model may be appropriate for addressing only some types of actual phenomena but not others. The specific processing structure selected may also have an impact on the theoretical ideas that are later evaluated. For that reason, we are going to take a look at some of the different models proposed.

As can be observed from Fig. 1, words in both languages are fully related to one another, and the BIA model assumes an integrated vocabulary. Furthermore, because the letters at the letter layer activate words from both languages at the same time, the model follows the premise of nonselective access. On the other hand, lateral linkages allow the words of the two languages to compete and hinder each other.

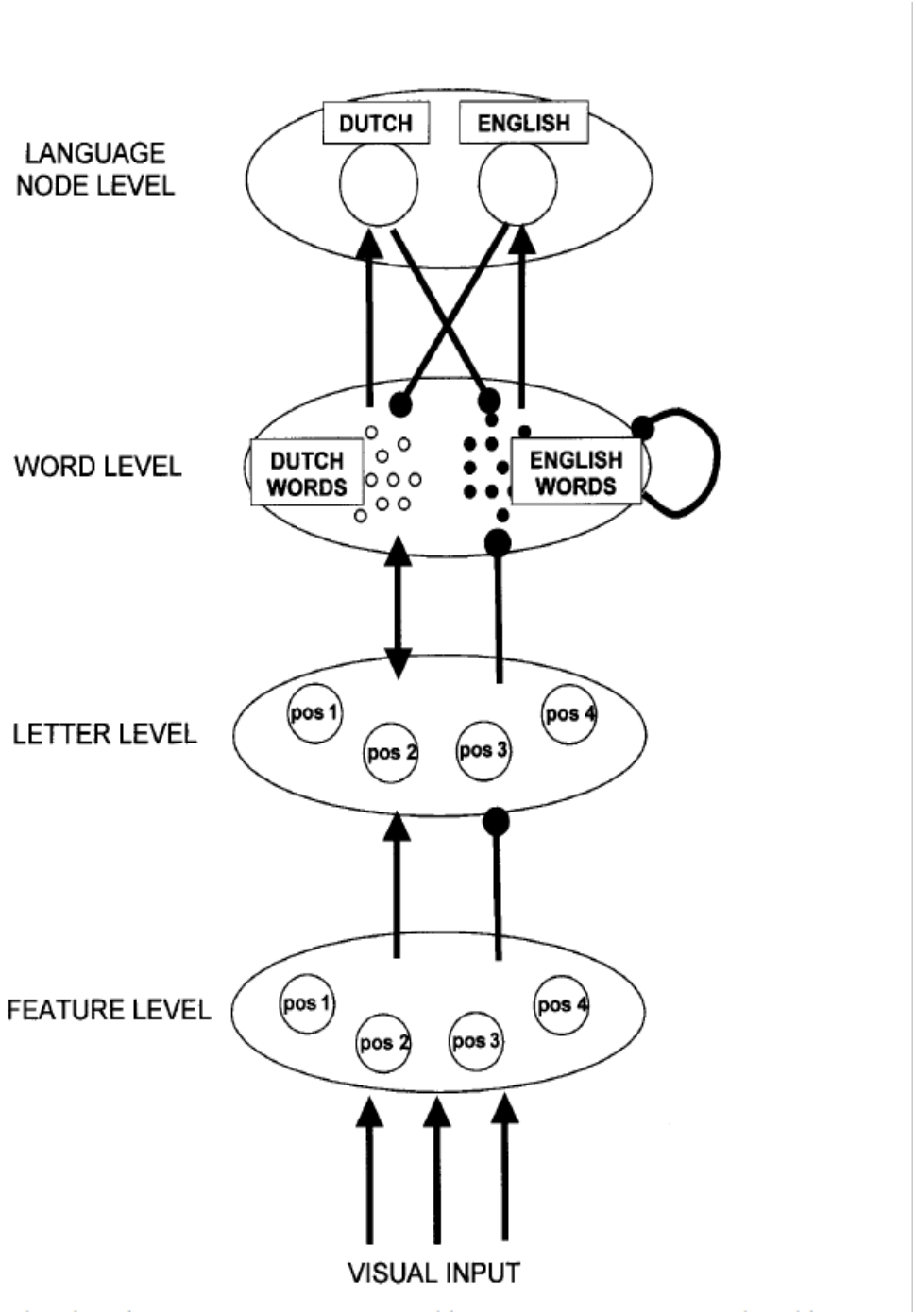

Fig. 1 BIA- The Bilingual Interactive Activation Model (Dijkstra and Van Heuven, 1998)

On the other hand, BIMOLA (Fig. 2) shares a feature level with both languages. The phoneme and word levels, on the other hand, are arranged by language. In contrast, the BIA model distinguishes languages at the letter and word levels only by the fact that L1 and L2 words are associated with separate language nodes. The BIA model features an integrated lexicon, whereas the BIMOLA approach has distinct lexicons for each language. This means that in BIMOLA, L1 words compete only with other L1 words and L2 words compete only with other L2 words to reach the threshold, but in the BIA, all words compete with all other words.

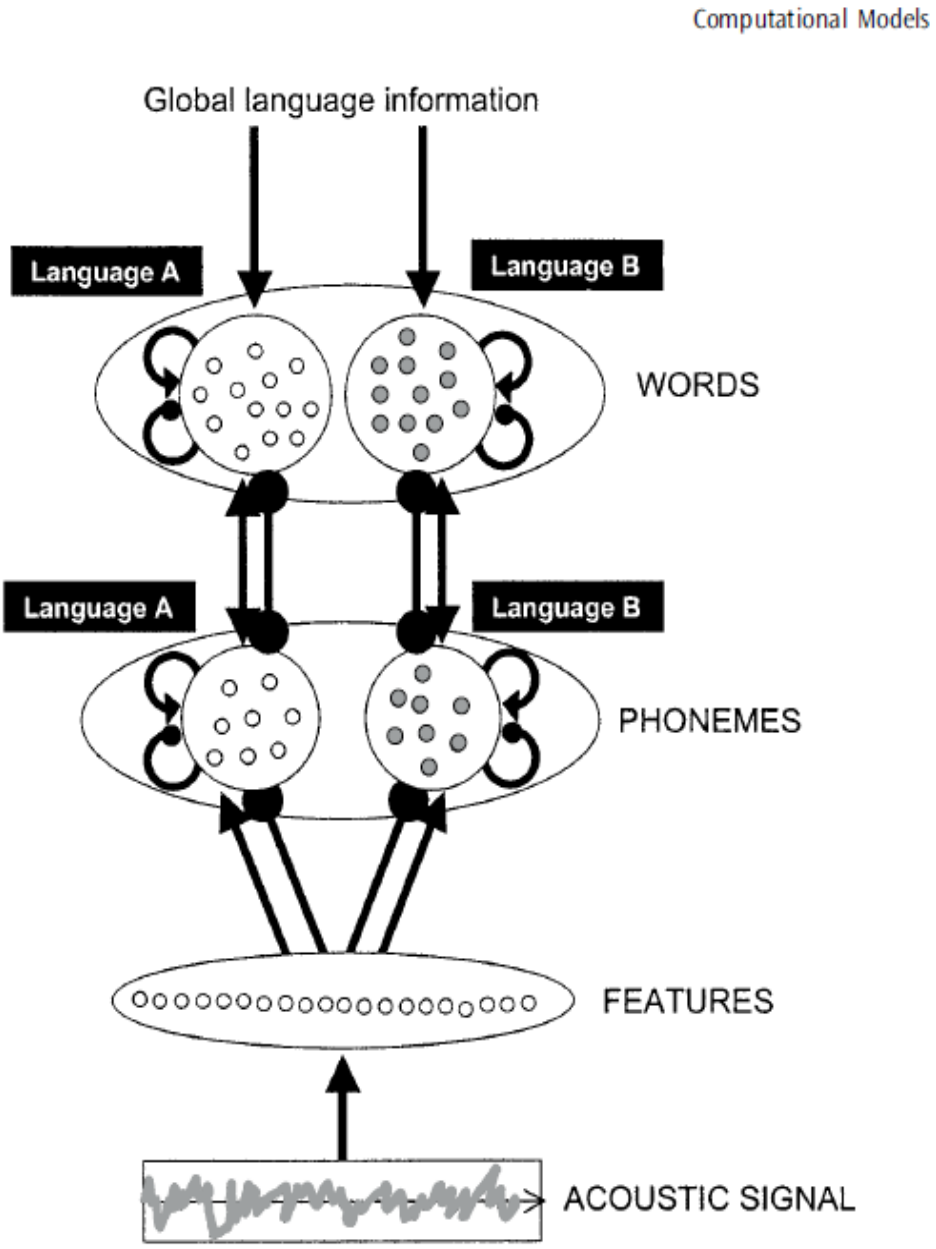

Fig. 2 BIMOLA-Bilingual Interactive Model of Lexical Access (Léwy & Grosjean, 2008)

The SOPHIA model (Fig. 3), although a monolingual model, is important because it incorporates the layer of semantics, which will later be introduced into other bilingual models.

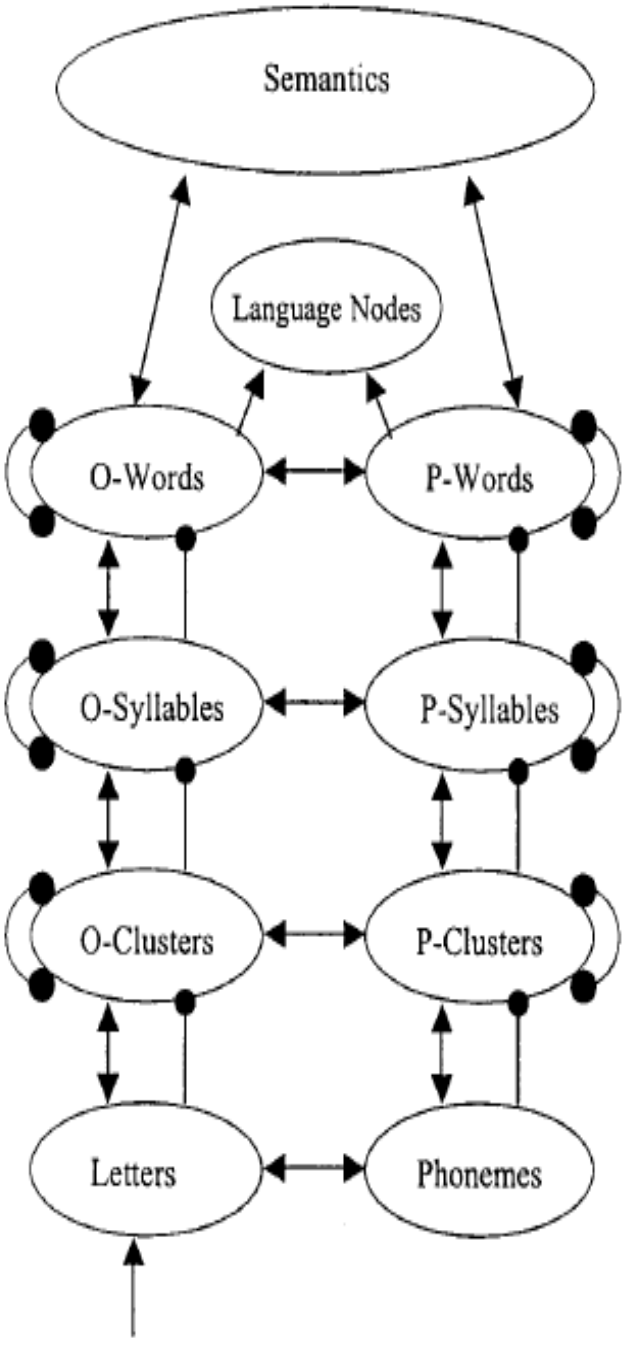

Fig. 3 SOPHIA-Semantic, Orthographic, and Phonological Interactive Activation model (Van Heuven and Dijkstra, 2001)

In addition, SOMBIP model (Fig. 4) is aimed at capturing both bilingual production and comprehension. This paradigm has the unintended consequence of establishing two completely distinct meaning systems. This contradicts the widely believed belief that the bilingual lexicon has a single, language-common level of semantic information (Chen & Ng, 1989).

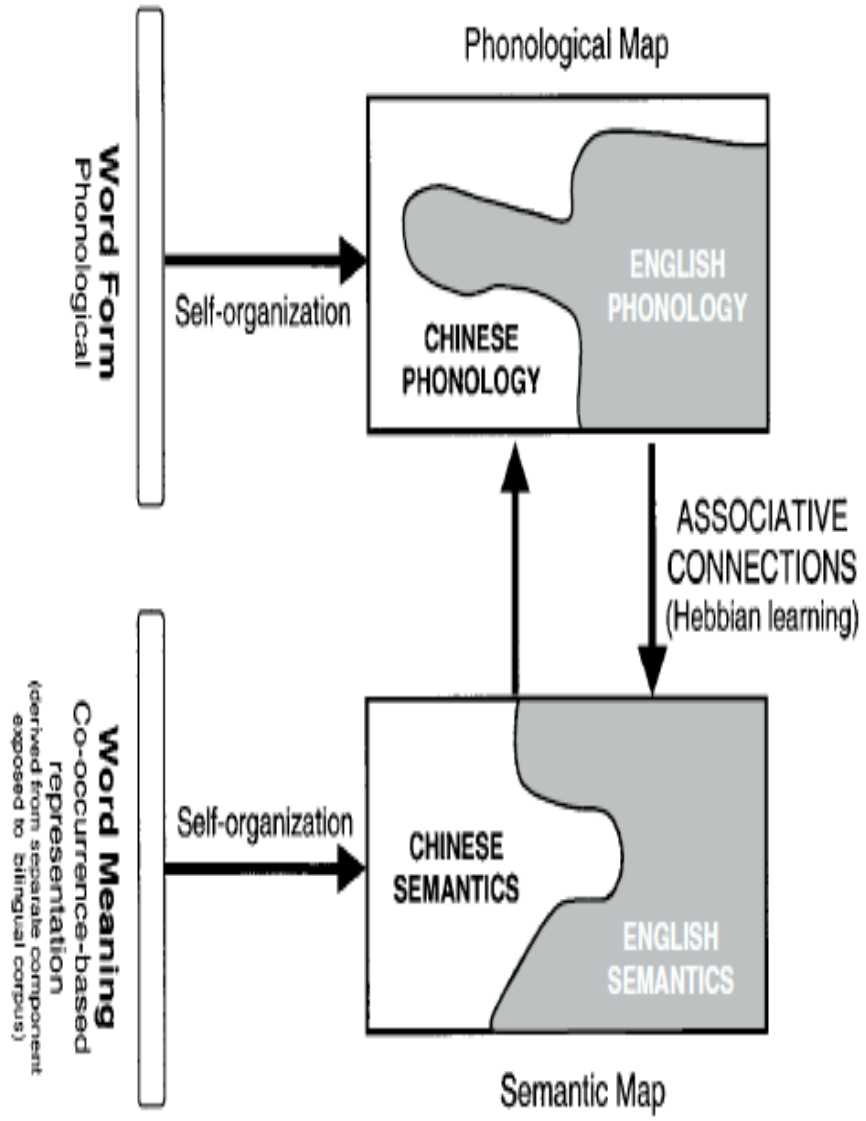

Fig. 4 SOMBIP-The Self-Organizing Model of Bilingual Processing (Li and Farkasˇ, 2002)

These models have been presented to show what complex theories have emerged from studying bilingual mental lexicons. In the case of the present research, we will see how the theoretical approaches presented may be applied to the language pair discussed in this thesis.

4 The Representation of Cognate and Noncognate Words in Bilingual Memory

Two major issues are currently in focus concerning bilingual lexical research. The first one is how words from different languages are represented and structured in bilingual memory and the second one is how these words are retrieved during language processing.

There are two dominant ideas about bilingual lexical representation: the common memory hypothesis, which proposes a single integrated memory system for both languages (compound bilingualism). De Groot (1993) discusses compound bilingualism in the following way:

> Compound bilingualism was, for instance, thought to emerge from a common foreign-language-learning practice in school settings, in which signs from an L2 are associated with the corresponding signs and their meanings in L1. A second learning situation that was thought to result in a compound system is when a child grows up in a home where two languages are spoken interchangeably by the same people and in the same situations. (p. 30)

Another approach in contrast to this one, known as the multiple-memory theory, contends that words from each language are represented individually (coordinate bilingualism). De Groot (1993) defines coordinate bilingualism as well:

> Coordinate bilingualism was regarded to be the consequence of a strict separation between the use of the two languages, for instance, language A being used exclusively at home and language exclusively outside the home, in school or at work. Alternatively, coordinate bilingualism emerges when the bilingual's two languages are acquired in two totally distinct national or cultural settings. (p. 30)

A fundamental concern raised within the context of this approach is not whether there are one or two bilingual systems, but how and to what degree the words from the bilingual's two languages are interrelated at both the lexical and conceptual levels.

The response appears to be dependent on two categories of variables: characteristics connected to the language user, such as degree of skill, experience, and second language (L2) learning environment, and word type characteristics, such as "cognate status" and word frequency. The role of morphology in language processing has received increased attention in psycholinguistic research in recent years, particularly regarding lexical representation and processes. This is not

unexpected, given that morphological traits are thought to be crucial in establishing the structure of words, influencing other language levels (semantic, syntactic, and phonological/orthographic). This is an important topic because words that are morphologically related share the same root or stem; as a result, they tend to share orthographic/phonological as well as semantic qualities. As a result, morphological links may have to be reduced to a convergence of semantic, phonological, and orthographic correlations in the absence of explicit representation in the lexicon (Sánchez-Casas & García-Albea, 2005).

We are particularly interested in cognates, which, like morphologically related terms, share the same root and are semantically and orthographically (and even phonologically) similar. For example, *sistem* in Bosnian and *system* in English, *grupa* in Bosnian and *group* in English. Sometimes cognates can be even identical (*problem* in Bosnian and *problem* in English). Given these similarities, it is possible that a cognate relationship between words can be reduced to a basic form or meaning similarity. However, it is possible that a cognate relation is a type of morphological relation, and that they are jointly reflected in the bilingual lexicon as certain morphologically related terms.

The notion is that words with similar form and meaning would be represented as one or at least they should be very similar. So, how do cognate translations appear in bilingual memory? There is a possibility that they share a similar lexical representation, as opposed to noncognates, which are considered to be stored independently (Sánchez-Casas & García-Albea, 2005). Cognates may share representational nodes or properties at both the lexical (form) and conceptual (meaning) levels. Noncognates, on the other hand, may merely share semantic traits.

The next part of the thesis elaborates on the possible computational models of cognates and noncognates. These models illustrate the ways in which cognates and noncognates interact.

4.1 Computational Models of Cognates and Noncognates

Kroll and De Groot (1997) offered a model (see Fig. 5) that includes a language-independent (shared) lexical feature level of representation, which contains information on the form of words, and a conceptual feature level, which represents characteristics of meaning. In addition to these two levels of representation, they proposed a third level of lemma representations that acts as a bridge between the first two. The lemma level, which incorporates some syntactic and semantic properties of words, is unique to each language and might be thought of as a way to express the activation patterns that occur from word form to word meaning mappings. Cognates may share traits at both the lexical (orthographic and phonological aspects) and conceptual-semantic levels of representation within this paradigm.

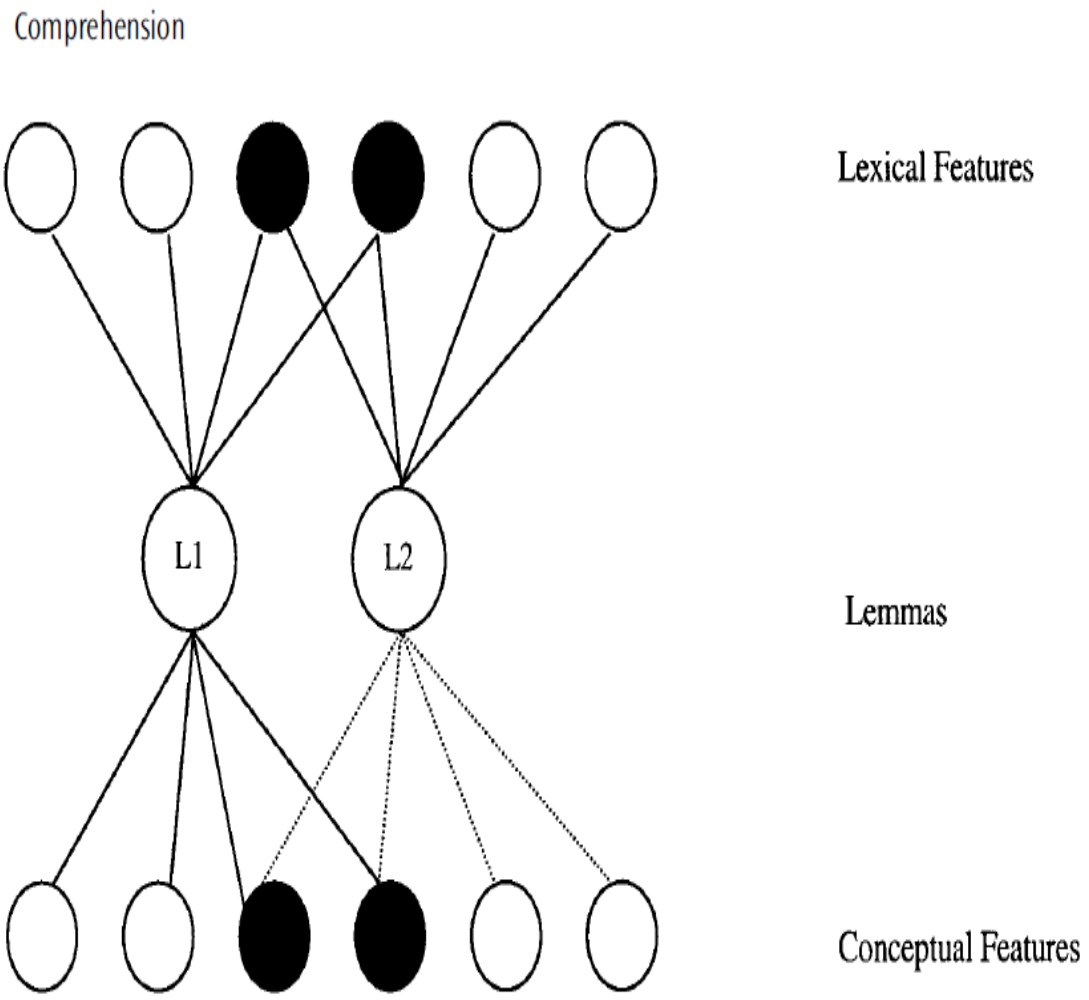

Fig. 5 The Lexical/Conceptual (Semantic) Feature Model (Kroll and DeGroot, 1997)

As can be observed in Fig. 6, cognates share lexical and conceptual features as well as morphological representations. Cognate words (*film* (L1)–*film* (L2)) would share, besides form and meaning features, a common root under which words morphologically related both within and between languages would be represented.

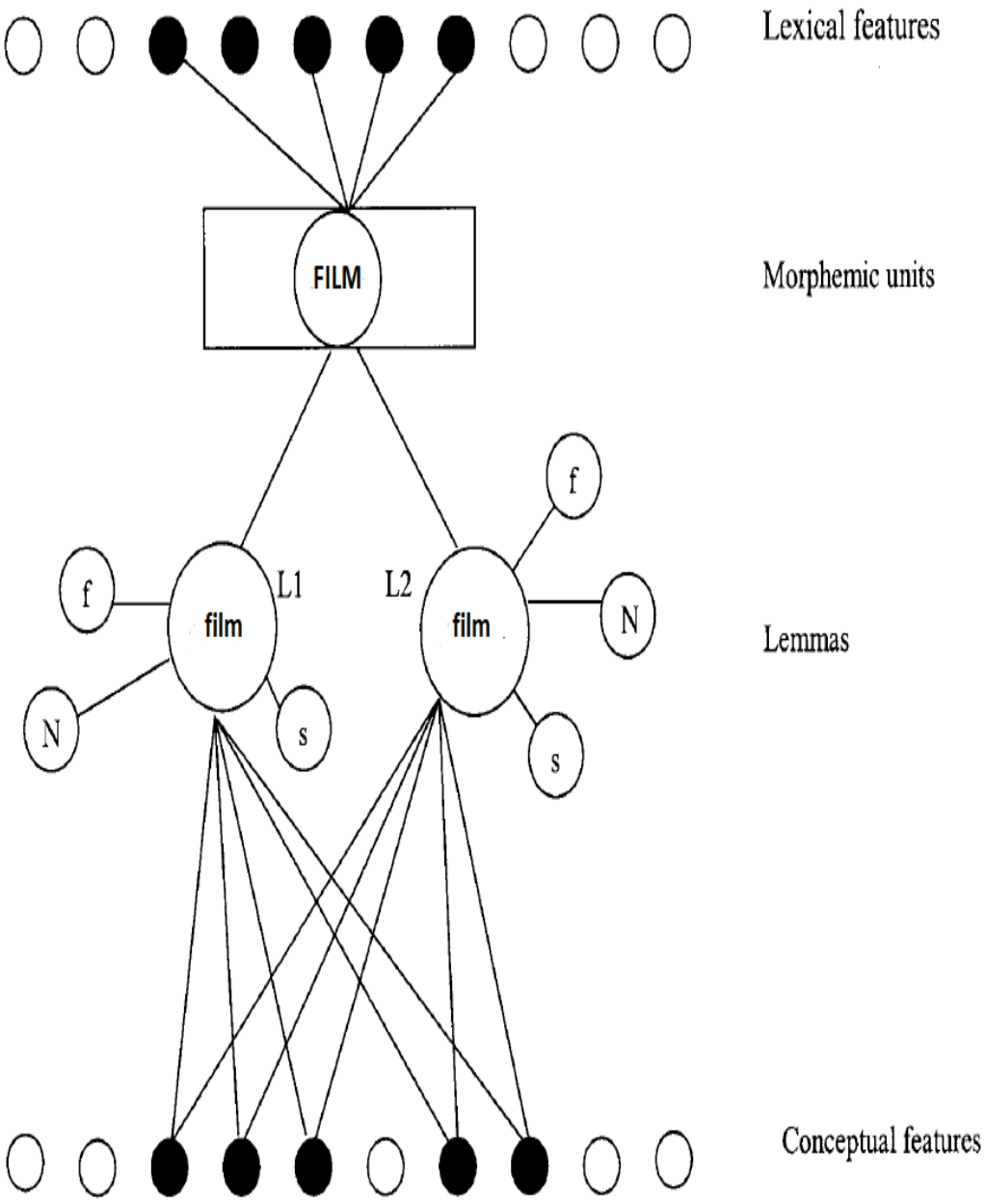

Fig. 6 The lexical/conceptual (semantic) feature model for cognates (Kroll and De Groot (1997)

Fig. 7 shows the distributed lexical/conceptual feature model for noncognates. These translations do not have lexical or morphological features in common, but they do share conceptual/semantic features. Opposite to cognates, the roots of noncognates would be represented separately and these words would generally not share form features.

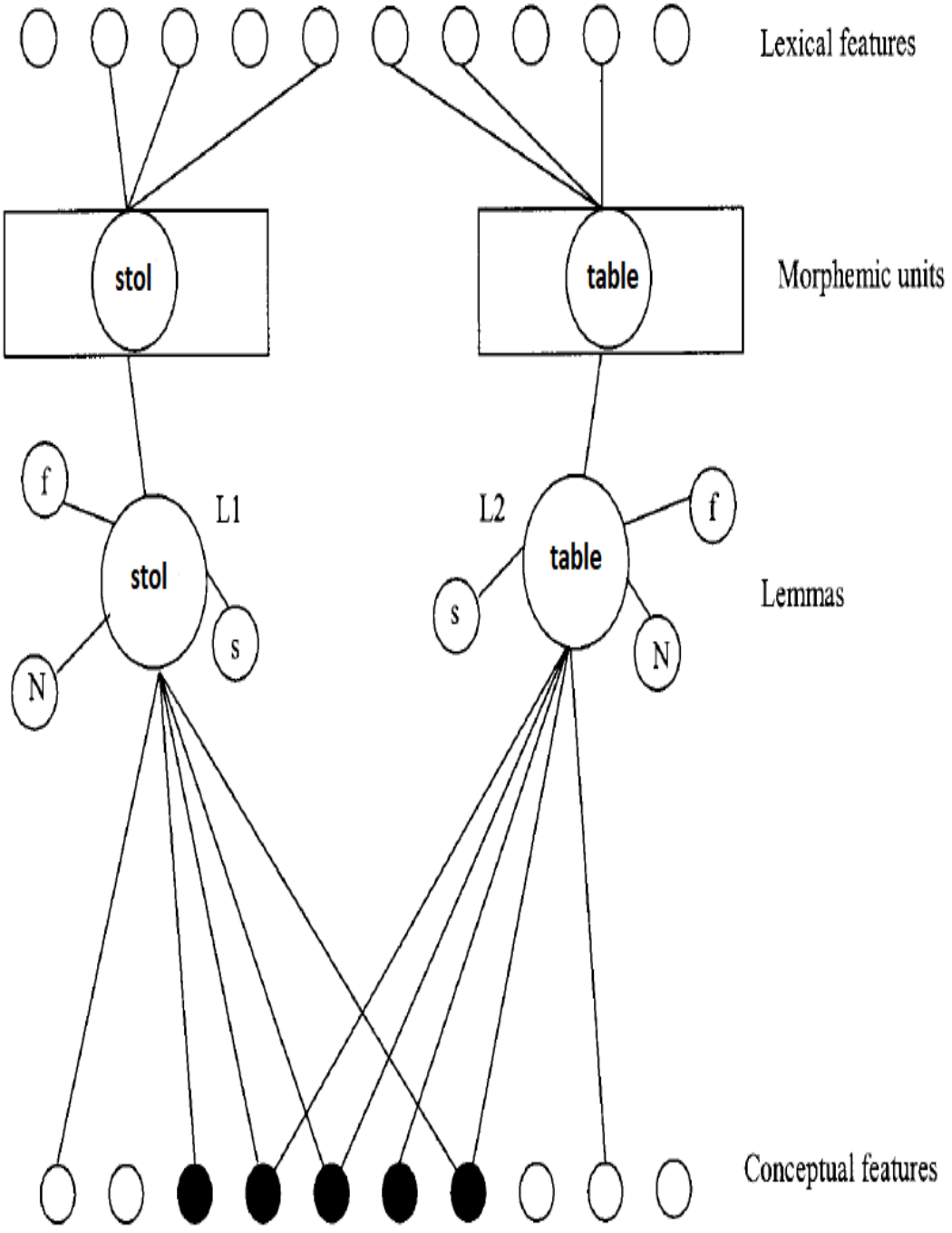

Fig. 7 The lexical/conceptual feature model for noncognates (Kroll and De Groot (1997)

As can be seen in Fig. 8, cognates share a common root. They are identical or very similar in terms of morphology, phonetics and semantics. In theory, cognates (because they share several features) should display stronger links than noncognates.

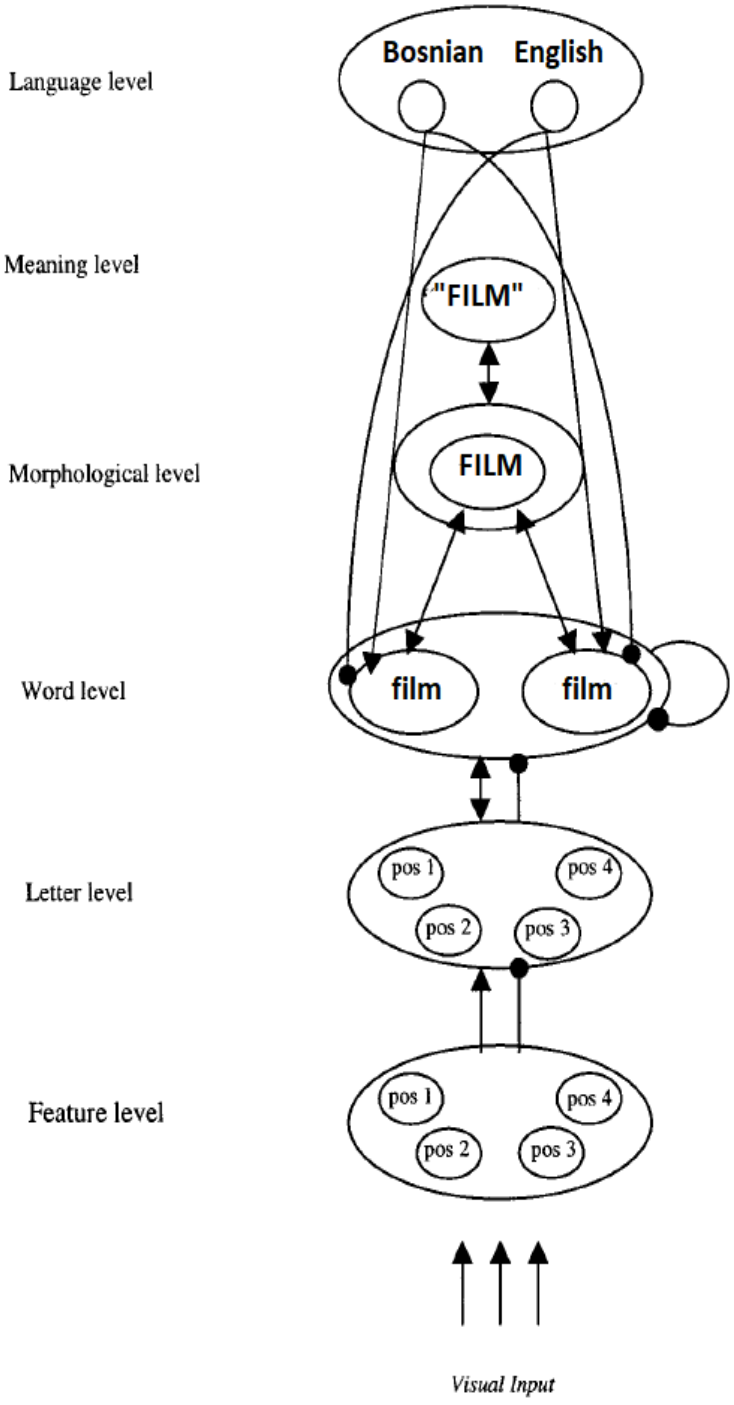

Fig. 8 Cognates as represented in the bilingual interactive activation model (BIA) (Dijkstra and Van Heuven (1998)

As can be concluded from Fig. 9, noncognates do not share a common root. They are identical or very similar only in terms of semantics/meaning. In theory, noncognates share only semantic representation in the mental lexicon.

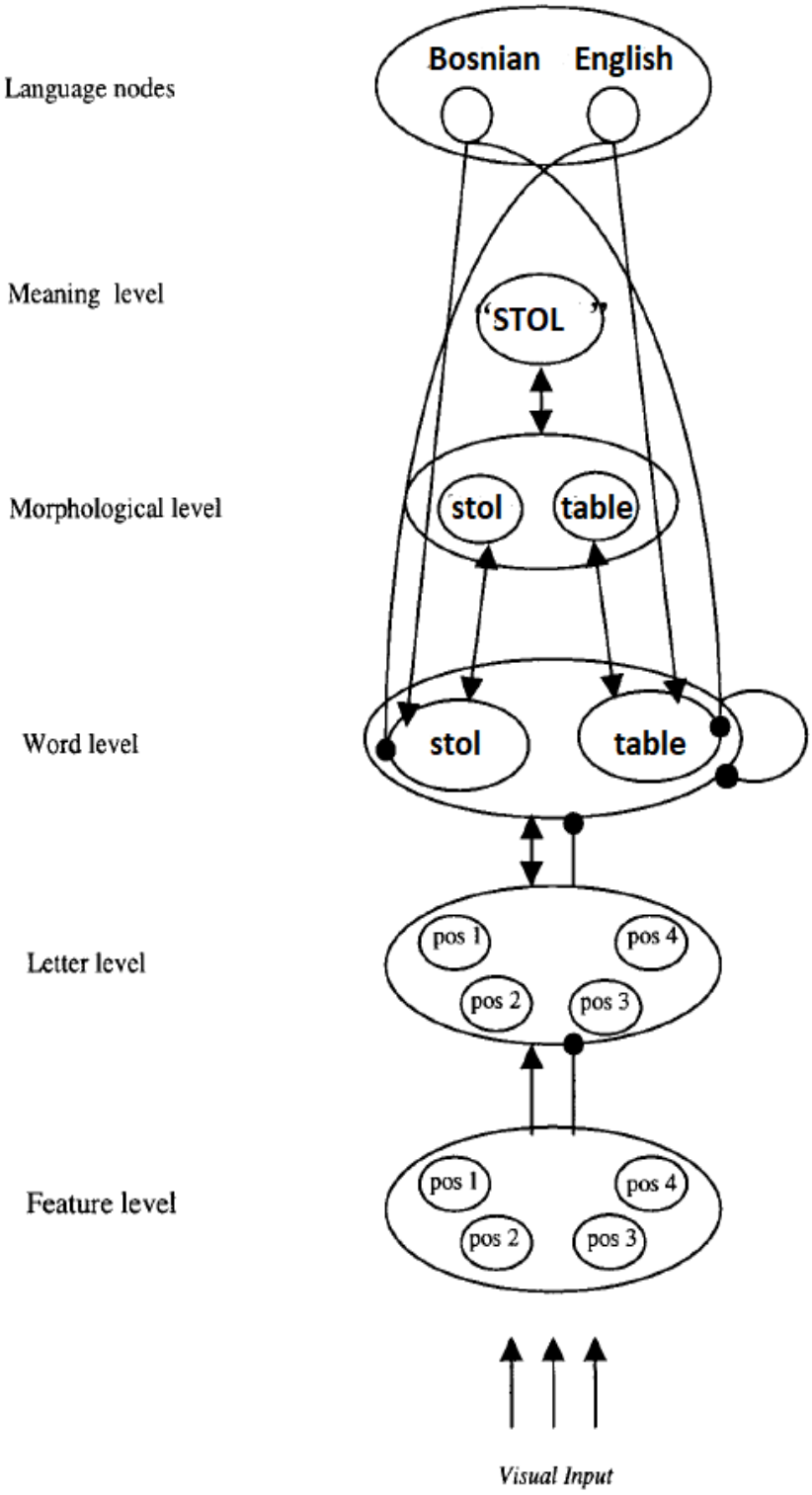

Fig. 9 Noncognates as represented in the bilingual interactive activation model (BIA) (Dijkstra and Van Heuven (1998)

4.2 Conceptual/Semantic Representation

Semantic representations can be defined as concepts that are referenced by certain words or phrases. Thus, semantic representations would be representations of the meaning of a word or sentence. Word meanings, or semantic representations of words, are an illustration of a concept. Another way to think about this relationship is to think of semantic representations or word meanings as verbal label-to-concept mappings (Francis, 2005). An essential question of bilingual semantic/conceptual representations is how well they are integrated across languages. It is also necessary to separate the semantic/conceptual level of representation from other levels of representation. Cognitive psychologists commonly refer to this as the lexical level of representation when referring to mental representations of words (the phrase lexical literally means "pertaining to words"). Although this phrase distinguishes between the word and sentence levels, it does not clarify what information about words is labelled. According to Francis (2005), the term "lexical" is used quite broadly in linguistics— e.g. a lexical entry comprises information/knowledge about a word, including phonological, morphological, syntactic, and semantic information, and the lexicon could be understood/observed as a "collection" of lexical entries that each individual has gained.

The structure of bilingual memory and language, especially the degree of linguistic "integration" in representation, has been a prominent concern in bilingual studies. As already mentioned, there are two dominant views on the structure of bilingual memory: the first one is that L1 and L2 "memory" are shared/common and there is also the opposite view that L1 and L2 "memories" are separate (Francis, 2005). The terms *compound* and *coordinate* are used to characterise the mental configurations of bilinguals' phonological and semantic representations of translation equivalents. Some studies (De Groot and Nas, 1991; Williams, 1994) found that activating semantic representations in one language speeds up the processing of translation equivalents in the other, implying that semantic representations of translation equivalents in linguistic memory are at least partially shared. These studies refute extreme separate concept models of bilingual memory. In addition to these findings, all of the effects demonstrating little or no transfer or interaction between languages could be satisfactorily explained in nonconceptual terms. As a result, representation must be shared at least partially (Francis, 2005). At the moment, the evidence is not strong enough to demonstrate fully shared representation at the semantic level, but it cannot be ruled out completely.

In conclusion, this part of the paper examined the most influential theories and views on the bilingual mental lexicon. The human mind and the ways in which it operates, as complex as they are, can be very challenging to examine and to test. Experiments and tests usually require stable data and results that can be achieved repeatedly. In the case of language research, and especially in the case of the mental lexicon, experiment results and data depend on numerous factors which is why it is always challenging to come to conclusive results. It is, however, not fully required as the focus of research conducted so far attempted to understand the mental lexicon by using different methods and tests, among which are word association tests as well.

4.3 Word Association Tests

Word association tests (WAT) have become one of the most frequently used tools in language research. Word association tests usually elicit answers that are spontaneous and natural, and therefore, provide insight into the essence of language operations that are taking place in the mental lexicon. A word association test is made up of a list of words that are presented one at a time. Participants are asked to write down or utter aloud the first word that comes to their mind for each word in the list. It is common to assert that word association responses may be divided into two categories: syntagmatic associations and paradigmatic associations. Syntagmatic associations are responses that have a clear sequential relationship with the stimulus word. Furthermore, word associations in a foreign language can sometimes produce interesting and surprising facts, as Meara (2009) points out:

> The word associations produced by non-native speakers differ fairly systematically from those produced by native speakers. Surprisingly, learners' responses tend to be more varied and less homogeneous than the responses of a comparable group of native speakers. This is an odd finding because learners must have a smaller, more limited vocabulary than native speakers, and this might lead one to expect a more limited range of possible responses. Learner responses are not generally restricted to a subset of the more common responses made by native speakers, however. On the contrary, learners consistently produce responses which never appear among those made by native speakers, and in extreme cases, it is possible to find instances of stimulus words for which the list of native speaker and learner responses share practically no words in common. The reasons for this are not wholly clear, but one contributory factor is the

> fact that learners have a tendency to produce clang associations like young children. (p. 22)

Still, paradigmatic and syntagmatic relations can be used to investigate the structure and organisation of the mental lexicon. When we examine these relations, we can understand the way in which words and meanings are linked with other words and meanings. Through paradigmatic and syntagmatic operations we can follow some "operations of the mind" in which words are activated, retrieved and put into mental storage.

Word recognition is challenging when we think of monolinguals but becomes even more complex when we think of bilinguals. In monolinguals, a certain string of letters may activate several words from L1 but in bilinguals, such a string might activate words from both L1 and L2. However, this can get even more complex if we add multilingual people into the equation. There are also additional questions regarding word recognition. For example, which language is activated first, and many other intriguing questions.

Furthermore, language-selective access means that only one language or mental lexicon (L1 or L2) is operational at a time. This approach also supports the notion that readers or speakers can willingly choose or select one language or mental lexicon to use. In opposition to selective access, language nonselective access means that both mental lexicons are operational at all times with only the degree of their participation changing.

When it comes to cognate and noncognate pairs, cognate pairs share morphological, phonological and semantic features and, in theory, they should closely be related and, possibly, share the same representational unit in the metal lexicons. Noncognate pairs share only semantic features and should display weaker links between L1 and L2 than cognate pairs.

There are indications that L1 and L2 might interact to a high degree and there are even theories that L1 and L2 mental lexicons are one, undifferentiated mass. The best way to at least partly investigate this is to take a look into the conceptual/semantic layer of representation and to look for similarities between L1 and L2. Studies so far clearly indicate that there is close interaction between L1 and L2 mental lexicons. This sums up the theoretical part of this paper and some of these concepts will be examined and tested in the research that represents the research part of this paper.

The research will investigate (using word association tests) paradigmatic and syntagmatic relations between different word classes in both L1 and L2 and compare them to see whether

there are any similarities in their way of operating. Then the research will investigate paradigmatic and syntagmatic relations between cognate and noncognate pairs in L1 and L2, in order to assess the influence of morphology and phonology on word recognition and word storage. Based on the similarity of responses in L1 and L2 to cognate and noncognate pairs we will identify the degree to which L1 and L2 lexicons share semantic/conceptual representations. After gathering all the data, it will be possible to comment on the possible ways in which L1 and L2 mental lexicons are organised.

5 Research Framework

The purpose of this thesis is to try and provide some insight into syntagmatic and paradigmatic associations of speakers whose L1 is Bosnian and L2 English. It aims to compare the connections elicited by a set of frequent lexical items in L1 (Bosnian) and L2 (English). Therefore, in this research, the following hypotheses will be tested:

> H1: If L1 and L2 mental lexicons interact and operate in a similar way, then they should display similar features in terms of paradigmatic and syntagmatic relations.
>
> H2: Cognates, or words that are morphologically, phonologically and semantically very similar or identical in both L1 and L2, should display stronger links and more similarities, in terms of paradigmatic and syntagmatic relations, between L1 and L2 than noncognates.
>
> H3: Noncognates, or words that are similar or identical only in terms of meaning in L1 and L2, should display weaker links and less similarities, in terms of paradigmatic and syntagmatic relations, between L1 and L2 than cognate pairs.

First, by comparing the proportion of paradigmatic and syntagmatic responses for several word classes (in both L1 and L2) we will investigate whether word classes and their organisation in L1 and L2 are similar. Second, we will go one step further, and investigate the paradigmatic/syntagmatic response proportion in cognates (words that are morphologically, phonologically and semantically very similar or identical in both L1 and L2) and noncognates (words that are similar or identical only in terms of semantics/meaning in L1 and L2). In theory, if cognates are represented by a single unit in a bilingual mental lexicon, they should elicit nearly identical paradigmatic/syntagmatic response proportion in both L1 and L2. Noncognates will also be analysed in the same way. Finally, we will investigate whether the prompt words will elicit similar responses (translation equivalents) in L1 and L2. After dealing with each research question, it will be possible to comment on the relation between L1 and L2 mental lexicon.

In order to test the set hypotheses, three research questions were taken into consideration:

RQ1: To what extent the word class of the prime word determined that of the retrieved word (paradigmatic or syntagmatic response) and whether the proportion of paradigmatic and syntagmatic responses is similar in L1 and L2?

RQ2: To what extent is the proportion of paradigmatic and syntagmatic responses similar for cognates and noncognates?

RQ3: To what extent the prompt words (cognate and noncognate pairs in L1 and L2) would give rise to similar responses (translation equivalents) in both LI and L2?

5.1 Method

The research was conducted by means of WATs (Word Association Tests) designed for the purpose of the present research. The aim of conducting the tests was to make a comparison between the L1 and L2 mental lexicons of 18 participants. The research is descriptive in nature and does not seek to generalise any population. The data was collected via written word associations tests generated by a written prompt. It is important to note that a similar study conducted via oral prompts and oral responses may provide different results.

The participants were a group of 18 students of English Language and Literature, with all of them in their final year of the master's degree programme. The participants have highly developed language skills and high proficiency and, also, their language competencies are approximately the same.

As for the description of the WAT procedure administered, a list of 40 prompt words was distributed to participants using *Google Forms*. The list was separated into two sections, each section containing prompt words in L1 and L2 respectively. Out of 40 prompt words, 20 were translation equivalents (cognates and noncognates-chosen from the Kent-Rosanoff (1910) list) and the other 20 (equally distributed among L1 and L2) were inserted, primarily, to investigate and compare word class relations in L1 and L2 and, secondary, to serve as a distraction to prevent participants from realising that some of the prompt words are translation equivalents, which could influence the responses.

First, the proportion of paradigmatic and syntagmatic responses for several word classes used as a sample in both L1 and L2 (nouns, adjectives, verbs, adverbs and prepositions) was compared. Following that, paradigmatic/syntagmatic response proportion in cognate and noncognate pairs in L1 and L2 was compared. As a final step, all responses were examined for translation equivalents.

One challenge regarding the method is that translation equivalents may or may not fully carry the meaning without a context and the connotations of the original should be taken into account both in terms of prompt words and responses.

5.2 Research Results

5.2.1 RQ1

The purpose of the first part of research pertaining to RQ1 is to investigate whether there are similarities between word classes when it comes to the proportion of the paradigmatic and syntagmatic responses. If these proportions are similar, that would indicate that word classes in L1 and L2 operate in a similar way and that they are organised in a similar fashion. The participants were presented with a *Google Form* that contained two separate sections. The first section contained prompt items in L2 and the second section contained prompt items in L1. Among the prompt items in the L2 section, there were two nouns, two adjectives, two verbs, two adverbs and two prepositions. The same approach was used for the L1 section. Besides these prompt items, both sections contained cognate, noncognate and false cognate pairs which are not relevant for this stage of the research. The prompt items in both sections were randomly placed. The participants were required to write a single word for each prompt item. The time was not measured.

Nouns

Table 1a shows that the majority of responses (83% and 89%) given to two prompt words (*eagle and soldier*) in English (L2) which were nouns maintained their word class (paradigmatic response). Table 1b shows that there was a similar result for two nouns (*knjiga*, *krava*) in Bosnian (L1) where the percentage of paradigmatic responses was 72% and 89%. There were not many syntagmatic responses in both L1 and L2. In L1 (Bosnian) syntagmatic responses came from the word categories of verbs and adjectives. A similar result was obtained in L2 (English), where some syntagmatic responses originated from the verb category as in L1 but, in English, adjectives were more dominant than verbs. This could indicate that there are some differences between nouns in L1 and L2 when it comes to syntagmatic relations but we will see in the next section that adjectives, as a syntagmatic response to nouns, can be dominant in Bosnian as well. These results indicate that nouns in L1 and L2 operate in a similar way when it comes to paradigmatic and syntagmatic relations.

Table 1a

Noun	Paradigmatic	Syntagmatic	Ratio	Word Classes
eagle	15	3	83:17	15 nouns, 2 adjectives, 1 verb
soldier	16	2	89:11	16 nouns, 2 adjectives

Table 1b

Noun	Paradigmatic	Syntagmatic	Ratio	Word Classes
knjiga	13	5	72:28	13 nouns, 3 verbs, 1 adjective
krava	16	2	89:11	16 nouns, 2 verbs

Verbs

When it comes to verbs, as can be seen from Table 2a and Table 2b, syntagmatic relations are dominant in both L1 and L2 when it comes to the category of verbs. There are no significant differences when we compare word classes of syntagmatic responses in L1 and L2. It may be concluded that responses to verbs in L1 and L2 are very similar when it comes to paradigmatic and syntagmatic relations.

Table 2a

Verb	Paradigmatic	Syntagmatic	Ratio	Word Classes
write	3	15	17:83	3 verbs, 12 nouns, 3 adverbs
fly	2	16	11:89	2 verbs, 13 nouns, 2 adj., 1 adv.

Table 2b

Verb	Paradigmatic	Syntagmatic	Ratio	Word Classes
kopati	1	17	6:94	1 verb, 17 nouns
plesati	3	15	17:83	3 verbs, 12 nouns, 3 adverbs

Adjectives

As can be seen from Table 3a and Table 3b, syntagmatic relations are dominant for adjectives both in L1 and L2. No significant differences exist when it comes to the word classes of syntagmatic responses in L1 and L2. It seems that responses to adjectives are also very similar in L1 and L2 in terms of paradigmatic and syntagmatic relations.

Table 3a

Adjective	Paradigmatic	Syntagmatic	Ratio	Word Classes
angry	5	13	28:72	5 adjectives, 12 nouns, 1 adv.
slow	6	12	33:67	6 adjectives, 12 nouns

Table 3b

Adjective	Paradigmatic	Syntagmatic	Ratio	Word Classes
kiselo	4	14	22:78	4 adjectives, 14 nouns
slatko	7	11	39:61	7 adjectives, 11 nouns

Adverbs

Results from Table 4a and 4b indicate that adverbs are fairly similar in L1 and L2 in terms of paradigmatic and syntagmatic relations. In both L1 and L2, in the case of adverbs, syntagmatic responses dominate. The only exclusion is the adverb *rarely* in L2 where the ratio of paradigmatic and syntagmatic responses is 50:50 percent.

Table 4a

Adverbs	Paradigmatic	Syntagmatic	Ratio	Word Classes
carefully	3	15	17:83	3 adv., 6 verbs, 5 nouns, 4 adj.
rarely	9	9	50:50	9 adv., 5 nouns, 3 verbs, 1 adj.

Table 4b

Adverb	Paradigmatic	Syntagmatic	Ratio	Word Classes
radosno	7	11	39:61	7 adverbs, 11 nouns
tajno	7	11	39:61	7 adverbs, 10 nouns, 1 adjective

Prepositions

Table 5a and 5b indicate that syntagmatic responses dominate in the category of prepositions in both L1 and L2. The only notable difference is that the preposition *nadomak* in L1 (Bosnian) has a slightly higher percentage of paradigmatic responses (44%).

Table 5a

Preposition	Paradigmatic	Syntagmatic	Ratio	Word Classes
across	2	16	11:89	2 prepositions, 16 nouns
beyond	5	13	28:72	5 prepositions, 9 nouns, 4 adv.

Table 5b

Preposition	Paradigmatic	Syntagmatic	Ratio	Word Classes
povodom	1	17	6:94	1 preposition, 17 nouns
nadomak	8	10	44:56	8 prepositions, 7 nouns, 3 adv.

After examining each word class, it can be concluded that nouns, verbs, adjectives, adverbs, and prepositions in L1 and L2 operate in a similar way in terms of paradigmatic and syntagmatic relations. This means that L1 and L2 are proposed to be similar when it comes to how word classes are organised and the way in which they operate. Furthermore, syntagmatic relations are an indication in which way phrases and sentences are formed but this topic can be addressed in future research for different language pairs as well, or for different language types.

5.2.2 RQ2

As stated earlier, cognates are words that are morphologically, phonologically and semantically very similar or identical in both L1 and L2. Their similarities may indicate that they are jointly represented in a bilingual mental lexicon. In theory, if cognates are represented by the same unit in the mental lexicon, they should elicit at least a very similar if not identical paradigmatic/syntagmatic ratio and the word classes from which syntagmatic responses originate should be similar for L1 and L2. The data gathered for cognates will be compared to data gathered for noncognates to see if there are any major differences.

Cognates

Cognate pairs in L1 and L2 were placed randomly in both sections of the word association test. The prompt items (words) that were used in the RQ1 were used as a distraction in order to prevent participants from realising that some of the prompt items in both sections are cognate and noncognate pairs. This would make sure that their responses are genuine and spontaneous. As an example, *music* was in the L2 section and placed randomly among other prompt items in L2. On the other hand, *muzika* was in the next section (L1 section) and, likewise, placed randomly among other prompt items in L1.

For *music* in English and *muzika* in Bosnian, as can be seen in Table 6a, the paradigmatic/syntagmatic ratio is, interestingly, the same (83% to 17%). However, the word categories of syntagmatic responses differ. In L2 (English) all syntagmatic responses are verbs and in L1 (Bosnian) all syntagmatic responses are adjectives.

Table 6a

Noun	Paradigmatic	Syntagmatic	Ratio	Word Classes
music	15	3	83:17	15 nouns, 3 verbs
muzika	15	3	83:17	15 nouns, 3 adjectives

Table 6b provides the paradigmatic/syntagmatic ratio for *doctor* in English and its cognate in Bosnian *doktor*. The paradigmatic/syntagmatic ratio for *doctor* (L2) is 72:28 and for *doktor* (L1) the ratio is 94:6. There is also a difference in terms of the word class of the syntagmatic responses. The three syntagmatic responses in English were all verbs and the only syntagmatic response in Bosnian was an adjective.

Table 6b

Noun	Paradigmatic	Syntagmatic	Ratio	Word Classes
doctor	13	5	72:28	15 nouns, 3 verbs
doktor	17	1	94:6	17 nouns, 1 adjective

As can be concluded from this sample, the paradigmatic and syntagmatic ratio between cognates *music* (L2) and *muzika* (L1), *doctor* (L1) and *doktor* (L2) is similar in the way that paradigmatic relations dominate. In the case of the first pair (*music*/*muzika*) the paradigmatic/syntagmatic ratio is the same for both of them (83:17) but the word class of the syntagmatic responses is different. In L1, the word class of syntagmatic responses is the class of adjectives and in L2 responses belong to the class of verbs. In the case of the second pair (*doctor*/*doctor)* paradigmatic/syntagmatic ratios differ. For *doctor* (L2) the ratio is 72:28 and for *doktor* (L1) the ratio is 94:6 in favour of paradigmatic responses. The second pair revealed similar differences in terms of the word class of syntagmatic responses: in L1 syntagmatic responses were verbs and in L2 the responses were adjectives. These results indicate that the mentioned cognate pairs in L1 and L2 operate differently in terms of paradigmatic and syntagmatic relations.

Noncognates

The second category that will be analysed within the framework of RQ2 are noncognates or words that are similar or identical only in terms of semantics/meaning in L1 and L2. Since noncognates do not share morphological and phonological features, it is expected that they should display fewer similarities than cognates in terms of paradigmatic and syntagmatic responses.

Participants first answered to noncognate prompt items in the L2 section and then to their pairs in the L1 section. For example, in the L2 section of the word association test participants answered to noncognate prompt item *table* and then in the next section (L1 section) to prompt

item *stol* which is the noncognate pair of *table.* Both prompt items were placed randomly in their respective sections among other cognates, noncognates and "distraction words" from RQ1.

Table 7 provides the paradigmatic/syntagmatic ratio for noncognate pairs. The results indicate that some of the noncognate pairs show more similarities in terms of paradigmatic and syntagmatic relations than cognate pairs. For example, noncognate pairs like *slow/spor* and *man/muškarac* are completely identical not only in terms of the ratio of paradigmatic and syntagmatic responses but also in terms of the word categories of syntagmatic responses. This is contrary to the earlier mentioned notion that cognates should display more similarities because they do not only share semantics but also phonological and morphological features. Other noncognate pairs in Table 7 show a great degree of similarity both in terms of paradigmatic/syntagmatic ratio and also in terms of the word class of syntagmatic responses. In the next section, the responses to cognate and noncognate prompt words in L1 and L2 will be examined in terms of semantics/meaning and then one can gain a better insight into the relations between these pairs.

Table 7

Word	Paradigmatic	Syntagmatic	Ratio	Word Classes
table	16	2	89:11	16 nouns, 2 adjectives
stol	15	3	83:17	15 nouns, 3 adjectives
slow	6	12	33:67	6 adjectives, 12 nouns
spor	6	12	33:67	6 adjectives, 12 nouns
moon	11	7	61:39	11 nouns, 6 adjectives, 1 verb
mjesec	15	3	83:17	15 nouns, 3 adjectives
red	3	15	17:83	3 adjectives, 15 nouns
crvena	1	17	6:94	1 adjective, 17 nouns
man	16	2	89:11	16 nouns, 2 adjectives
muškarac	16	2	89:11	16 nouns, 2 adjectives
sweet	5	13	28:72	5 adjectives, 13 nouns
slatko	7	11	39:61	7 adjectives, 11 nouns
dream	15	3	83:17	15 nouns, 3 adjectives
san	15	3	83:17	15 nouns, 2 adjectives, 1 adv.
house	15	3	83:17	15 nouns, 3 adjectives
kuća	16	2	89:11	16 nouns, 1 adjective, 1 verb

Cognate pairs in L1 and L2 may share common morphology and phonology but, in this research, they displayed significant differences in terms of paradigmatic and syntagmatic relations. On the other hand, since some of the noncognate pairs displayed more similarities or were even identical in terms of paradigmatic and syntagmatic relations, it seems possible that semantics or meaning play a more important role than morphology and phonetics (even combined) when it comes to storage and connections in the mental lexicon. This possibility will be discussed in the next section.

5.2.3 RQ3

If the bilingual mental lexicon was an undifferentiated mass made out of L1 and L2 mental lexicons, a word in the L1 lexicon would have word associations similar to its counterpart word in the L2 lexicon. We are going to test this using cognate and noncognate prompt words. Since cognates share more common features than noncognate translations (morphology and phonetics), cognates should elicit more responses that are similar or translation equivalents in L1 and L2. For this part of the analysis, we are also going to take a look into the type/token ratio. The number of types is the number of words necessary to account for all the responses. For example, if there are 3 same responses, like *doctor* (3x), that is 1 type. The number of tokens is the number of all responses no matter how many times some of the responses are repeated. The type/token ratio is important because it indicates how established are the links between words. The smaller number of types means better-established links between words (Meara, 2009).

As shown in Table 8a, cognates *muzika* and *music* are similar only in terms of the first most common response. For *muzika* (L1) the first most common response is *život (3x)* and for *music* (L2) the first most common response is *life* (3x) which is a translation equivalent of *život*. When we consider the second and third most common responses cognates *muzika* and *music* differ greatly. In terms of type ratio (see Table 8b) this cognate pair is very similar.

Table 8a

Cognates		
L1 Bosnian		**L2 English**
muzika		music
Responses and their frequency		**Responses and their frequency**
1st most common response	život (3x)	life (3x)
2nd most common response	glasna (2x)	muzika (2x)
3rd most common response	music (1x) ples (1x) ukus (1x) trčanje (1x) note (1x) rok (1x)	dance (1x) taste (1x) running (1x) chords (1x) rock (1x)

Table 8b

	types	**tokens**	**type ratio**
muzika	15	18	83%
music	15	18	83%

As can be concluded from Table 9a, the first most common response for *doktor* (L1) was *bolnica* (5x) and for its cognate pair in L2 (*doctor*) the most common response was *hospital* (5x). *Hospital* is a translation equivalent of *bolnica*, so this cognate pair is similar in terms of the first most common response. However, there are little or no similarities in terms of the second and third most common response. Type ratio is identical for *doktor* and *doctor* (see Table 9b).

Table 9a

Cognates		
L1 Bosnian		**L2 English**
doktor		doctor
Responses and their frequency		**Responses and their frequency**
1st most common response	bolnica (5x)	hospital (5x)
2nd most common response	nauka (2x) bolest (2x)	white (3x)
3rd most common response	bijelo (1x) pomoć (1x) strah (1x) doctor (1x)	help (1x) anxiety (1x) doktor (1x) disease (1x)

Table 9b

	types	**tokens**	**type ratio**
doktor	12	18	67%
doctor	12	18	67%

Noncognate pair *stol* (L1) and *table* (L2) elicited similar responses in terms of both the first and second most common response (Table 10a). In L1 the first most common response was *stolica* (7x) and in L2 *chair* (3x) and *food* (3x). *Chair* is a translation equivalent of *stolica*. The second most common responses in L1 and L2 are similar in meaning as well. *Ručak* (3x) is a translation equivalent of *lunch* (2x). The type ratio of *stol* and *table* is identical (see Table 10b).

Table 10a

Noncognates		
L1 Bosnian		**L2 English**
stol		table
Responses and their frequency		**Responses and their frequency**
1st most common response	stolica (7x)	chair (3x) food (3x)
2nd most common response	ručak (3x)	lunch (2x) dinner (2x) wood (2x) school (2x)
3rd most common response	hrana (1x) škola (1x) koristan (1x) drvo (1x)	useful (1x)

Table 10b

	types	**tokens**	**type ratio**
stol	10	18	56%
table	10	18	56%

Noncognate pair *spor* and *slow* were also similar in terms of the first and second most common response (see Table 11a). *Puž* (7x) is a translation equivalent of *snail* (4x). *Brz* (4x) is a translation equivalent of *fast* (4x). The type ratio of *spor* and *slow* is identical (see Table 11b).

Table 11a

Noncognates		
L1 Bosnian		**L2 English**
spor		slow
Responses and their frequency		**Responses and their frequency**
1st most common response	puž (7x)	snail (4x) fast (4x)
2nd most common response	brz (4x)	turtle (3x)
3rd most common response	star (1x) slow (1x)	me (2x) old (1x) spor (1x)

Table 11b

	types	**tokens**	**type ratio**
spor	9	18	50%
slow	9	18	50%

The noncognate pair *mjesec* and *moon* elicited similar responses in the case of the first most common response (see Table 12a). *Noć* (5x) is a translation equivalent of *nigh*t (5x). The type ratio is the same in the case of this noncognate pair (see Table 12b).

Table 12a

Noncognate		
L1 Bosnian		**L2 English**
mjesec		moon
Responses and their frequency		**Responses and their frequency**
1st most common response	noć (5x)	night (4x)
2nd most common response	godina (2x) dana (2x)	space (2x) pretty/beautiful (2x) full (2x)
3rd most common response	svemir (1x) lijep (1x) zvijezda (1x) pun (1x) nebo (1x) mir (1x) moon (1x)	star (1x) sky (1x) peace (1x) mjesec (1x)

Table 12b

	types	**tokens**	**type ratio**
mjesec	12	18	67%
moon	12	18	67%

The noncognate pair *muškara*c and *man* (see Table 13a) elicited similar responses in the first, second and third most common response. *Žena* (8x) is a translation equivalent of *woman* (6x) and *čovjek* (2x) is a translation equivalent of *human* (3x). *Ratnik*, *ljubav* and *brada* are translation equivalents of *warrior*, *love* and *beard* respectively. The type ratio (see Table 13b) is slightly higher for *man* (61%) than for *muškarac* (56%).

Table 13a

Noncognate		
L1 Bosnian		**L2 English**
muškarac		man
Responses and their frequency		**Responses and their frequency**
1st most common response	žena (8x)	woman (6x)
2nd most common response	čovjek (2x)	human (3x)
3rd most common response	ratnik (1x) ljubav (1x) brada (1x)	warrior (1x) love (1x) beard (1x)

Table 13b

	types	**tokens**	**type ratio**
muškarac	10	18	56%
man	11	18	61%

Surprisingly, noncognate pair *crvena* and *red* (see Table 14a) were not similar in the case of the first, second or third most common response. The type ratio (see Table14b) is also significantly higher for *red* (86%). It should also be noted that different forms of adjectives in L1 should be given more attention in future research.

Table 14a

Noncognate		
L1 Bosnian		**L2 English**
crvena		red
Responses and their frequency		**Responses and their frequency**
1st most common response	boja (7x)	dress (3x)
2nd most common response	krv (1x) bik (1x) svjetlo (1x) karmin (1x)	blue (2x)
3rd most common response		color (1x) blood (1x) bull (1x) light (1x) lipstick (1x)

Table 14b

	types	**tokens**	**type ratio**
crvena	12	18	67%
red	15	18	83%

As can be seen in Table 15a, Noncognate pair *san* and *dream* were similar in terms of the first most common response. *Spavanje* (3x) is a translation equivalent of *sleep* (3x). The type ratio (see Table 15b) is slightly higher in the case of *dream* (83%).

Table 15a

Noncognate		
L1 Bosnian		**L2 English**
san		dream
Responses and their frequency		**Responses and their frequency**
1st most common response	spavanje (3x)	sleep (3x)
2nd most common response	noć (2x) java (2x)	nightmare (2x)
3rd most common response	krevet (1x) noćna mora (1x) nestvarno (1x) dream (1x)	night (1x) bed (1x) unreal (1x) san (1x)

Table 15b

	types	**tokens**	**type ratio**
san	14	18	78%
dream	15	18	83%

As can be seen from Table 16a, noncognate pair *slatko* and *sweet* were not similar in the case of the first or second most common response. The type ratio (see Table 16b) is slightly higher for *sweet* (67%).

Table 16a

Noncognate		
L1 Bosnian		**L2 English**
slatko		sweet
Responses and their frequency		**Responses and their frequency**
1st most common response	slano (6x)	chocolate (3x) cake (3x)
2nd most common response	čokolada (4x)	candy (2x) taste (2x)
3rd most common response	voće (2x) kolač (1x) sltakiš (1x) sweet (1x)	slatko (1x)

Table 16b

	types	**tokens**	**type ratio**
slatko	9	18	50%
sweet	12	18	67%

Noncognate pair *kuća* and *house* displayed similarities only in terms of the first most common response (see Table 17a). *Dom* (6x) is a translation equivalent of *home* (4x). The type ratio (see Table 17b) is higher for *house* (83%).

Table 17a

Noncognate		
L1 Bosnian		**L2 English**
kuća		house
Responses and their frequency		**Responses and their frequency**
1st most common response	dom (6x)	home (4x)
2nd most common response	krov (3x)	roof (1x) television (1x) building (1x) kuća (1x)
3rd most common response	televizija (1x) objekt (1x) house (1x)	

Table 17b

	types	**tokens**	**type ratio**
kuća	11	18	61%
house	15	18	83%

As can be seen from Table 8a to Table 17a, most of the responses for L1 and L2 are similar when it comes to the first most frequent response. The only exceptions are noncognate pairs *red/crvena* (Table 3.6) and *sweet/slatko* (Table 3.8). In the case of the first pair (*red/crvena*) the responses differ greatly. The first most common response for *red* was *dress* (3x) and for *crvena* the first most common response was *boja* (7x). The exact reason behind this difference could be hard to identify but the type ratio might suggest some explanations. The type ratio for *crvena* (67%) is significantly lower than the type ratio of *red* (83%). The second noncognate pair which is not similar in terms of the first most common response in *sweet/slatko*. The first most common response for *sweet* is *chocolate/cake* (3x) and for its counterpart in Bosnian (*slatko)*

the first most common response is *slano* (6x). However, the responses for this pair are not significantly different since the second most common response for *slatko* is *čokolada* (3x) and *čokolada* is a translation equivalent of *chocolate.* The type ratio for *sweet* is 67% and for *slatko* 50%. As can be seen in Table 18, in general, the type ratio is slightly higher for L2 (English) than for L1 (Bosnian) but it is not a significant difference.

Table 18

	types	**tokens**	**type ratio**
L1 Bosnian	114	180	63%
L2 English	126	180	70%

When we move further and consider the second most common response the similarities between pairs decrease significantly. An interesting observation is that both cognate pairs do not have similar responses in terms of the second most common response (Table 8a and Table 9a). This means that the considerations from the previous section have been confirmed. In other words, the fact that cognate pairs share morphological and phonological features across L1 and L2, in addition to semantics, does not always bolster and aid their recognition, retrieval and storage in the bilingual mental lexicon. On the contrary, some noncognate pairs elicited responses that showed similarities both in terms of the first and second most common responses. Such pairs were *table/stol* (see Table 10a), *slow/spor* (see Table 11a), *man/muškarac* (see Table 13a). The result in which noncognate pairs in L1 and L2 elicited more similar responses than cognate pairs indicates that semantics has more influence than morphology and phonology combined when it comes to the recognition, retrieval and storage of words in the bilingual mental lexicon. The result showing that a noncognate pair *man/muškarac* elicited more similar responses than a cognate pair *doktor/doctor* puts forward the notion that strong semantic links and chains play a more important role than morphology and phonetics combined. Common morphology and phonetics can be useful but, sometimes, they can be counter-productive. This is the case with the false cognates. Among 20 prompt words that served as a distraction, there was one false cognate inserted. In L1, *fabrika* was used as a prompt word (English equivalent is a *factory* or a *plant*). In L2 as its false cognate the word *fabric* was inserted. Participants first filled out the L2 section and then moved onto the L1 section with word prompts. There was a possibility that similar phonetic and morphological features could lead participants to wrongly interpret *fabrika* in L1 as *fabric*. The results showed that one of the participants did fall into the false cognate trap. That participant responded to *fabrika* with *tkanina* and *tkanina* is a Bosnian translation

equivalent of *fabric.* The negative impact that morphological and phonetic similarities can have on L2 acquisition has to be taken seriously. Pavlenko (2009) warns that similar morphology and phonology may misguide learners: "At the same time, there is no doubt that cognate status may lead L2 learners to assume a shared meaning, even in the case of partial equivalence or false cognates" (p.145). We have to keep in mind that the participants were all highly skilled and proficient in both Bosnian and English and, in accordance with that, less skilled and experienced L2 learners might face much more trouble in terms of false cognates.

The category of the third most common response was included in the tables to indicate that many of the single responses in L1 have their translation equivalents in L2. This means that many of the participants have the same understanding of the prompt words in both L1 and L2 and they provided answers that are very similar in meaning or even translation equivalents for L1 and L2. If we consider the results on the individual level, it becomes obvious that many participants responded to the equivalent prompt words in L1 and L2 with the equivalent answers in L1 and L2. Singleton (1999) confirms that the relationship between words may vary from individual to individual:

> It appears from the evidence reviewed that L1 and L2 lexis are separately stored, but that the two systems are in communication with each other - whether via direct connections between individual L1 and L2 lexical nodes, or via a common conceptual store (or both). It also seems likely, on the basis of the current state of research, that the relationship between a given L2 word and a given L1 word in the mental lexicon will vary from individual to individual, depending on how the words have been acquired and how well they are known, and also on the degree to which formal and/or semantic similarity is perceived between the L2word and the L 1 word in question. (p. 189-190)

This is a good indication that there is certainly some kind of interaction and connection between L1 and L2 lexicons. Table 19 shows that 67,2 % of responses in both L1 and L2 were translation equivalents. This means more than a half and is strong evidence in support of interaction and connection between L1 and L2 mental lexicons (see Table 19).

Table 19

L1 and L2 responses that are translation equivalents	**All responses**	**Ratio of translation equivalents**
242	360	67,2 %

6 Conclusion

The bilingual mental lexicon is an incredibly interesting field to research but, at the same time, incredibly challenging. There is no shortage of theoretical approaches but practical results are often inconsistent and open to different interpretations. This paper focused on some of the core and basic principles of the paradigmatic and syntagmatic associations in the bilingual mental lexicon and tried to present them in a simple way. The section of the paper on the theoretical background focused on paradigmatic and syntagmatic relations, word recognition and lexical access, and models of cognate and noncognate representation in the bilingual mental lexicon. The paper elaborated on these theoretical concepts because these concepts, when tested in practice could provide valuable data on the structure and interaction of and between L1 and L2 mental lexicons.

In the research part, this master's thesis aimed to investigate whether there are similarities in how word recognition, retrieval and storage operate in the mental lexicon of speakers whose first language (L1) is Bosnian and whose second language (L2) is English. It was done so through word association tests (WATs) comprising 40 words in 2 categories. The word association tests incorporated, among others cognate and noncognate pairs and one false cognate in L1 and L2. Paradigmatic and syntagmatic relations were examined to find out similarities between L1 and L2 mental lexicons.

Results obtained in RQ1 suggest that word classes (nouns, verbs, adjectives, adverbs and prepositions) operate in a similar way in terms of paradigmatic and syntagmatic relations in both L1 and L2. Results in RQ2 suggest that some cognate pairs between L1 and L2 do not demonstrate identical or very similar features in terms of paradigmatic and syntagmatic relations and that some noncognate pairs between L1 and L2 were more similar in terms of paradigmatic and syntagmatic relations than cognates. This might suggest that semantics might be more influential in mental lexicons than morphology and phonology combined. Finally, observations related to RQ3 revealed that prompt words that were noncognate pairs in L1 and L2 elicited more similar responses than prompt words that were cognate pairs in L1 and L2. In this section, we also identified 67,2% of answers in both L1 and L2 as translation equivalents which is another indication that there are interactions and connections between L1 and L2 lexicons.

Language-selective access and language nonselective access were discussed in the theoretical part of the paper. Although there was no intention to test these two concepts using word association tests, some interesting observations were noted upon examining the data. The word association test was constructed in a way that encouraged language-selective access. The test was split into two separate sections. The first section contained prompt words in L2 (English) and instructions were written in L2. Instruction was very simple stating only that participants should respond to prompt words by using only one word (without giving instruction on which language to use). The same instruction was given for the L1 section but the language of instructions was Bosnian. These conditions favoured language-selective access but the results suggest that there were instances of language nonselective access. One of the participants responded to each L2 prompt word with its translation equivalent in L1 and the other way around. Two participants responded to *music* with its equivalent in L1 (*muzika*). These instances could be considered simple isolated cases. However, when we consider that instructions, language and context of the word association test were generally encouraging language-selective access and that, despite that, there are instances of language nonselective access it seems possible that the mental lexicon is indeed always in the language nonselective access mode. This would mean that L1 and L2 mental lexicons are always interacting. However, a study of a much larger scale is necessary to find the essential evidence in support of such notions.

Finally, results from RQ1 support Hypothesis 1 which claims that L1 and L2 mental lexicons operate similarly in terms of paradigmatic and syntagmatic relations. This means that word classes and the links between words could be organised in a similar way in L1 and L2. Furthermore, results from RQ2 and RQ3 do not support Hypothesis 2 which claims that cognates should display stronger links and more similarities, in terms of paradigmatic and syntagmatic relations, between L1 and L2 than noncognates. As a result, it can be assumed that common morphology and phonetics of cognates do not necessarily mean strong links between cognates. Hence, results from RQ2 and RQ3 do not support Hypothesis 3 which claims that noncognates should display weaker links and less similarities, in terms of paradigmatic and syntagmatic relations, between L1 and L2 than cognates. Noncognate pairs in L1 and L2 may display stronger links than cognate pairs. This could be interpreted as an indication that semantics could be more influential than morphology and phonetics in terms of word recognition, retrieval and storage.

A large number of responses were translation equivalents in L1 and L2 which supports the claim that L1 and L2 might have a common layer of semantics. Even though the word association test was constructed in a way that was likely to activate language-selective access there were instances of language nonselective access and this is another argument that supports a close and continuous interaction between L1 and L2 mental lexicons.

These conclusions clearly indicate that there is a strong interaction between L1 and L2 mental lexicons. The exact degree of interaction, unfortunately, cannot be identified. The same goes for the structure of the bilingual mental lexicon. However, there are indications that L1 and L2 might at least share a common layer of semantics which is very influential. Even though the exact structure of L1 and L2 mental lexicons and the degree of their interaction cannot be described, it can be concluded that they are similar in certain areas and that they constantly interact.

APPENDIX

Word Association Test

Respond to each item with ONE WORD that first comes to your mind.

*Required

1. table *
2. fly *
3. slow *
4. carefully *
5. moon *
6. across *
7. man *
8. soldier *
9. red *
10. fabric *
11. dream *
12. write *
13. music *
14. rarely *
15. sweet *
16. angry *
17. house *
18. beyond *
19. doctor *
20. eagle *

Test asocijacija

Na svaku riječ-stimulu odgovorite sa samo JEDNOM RIJEČJU, onom na koju prvo pomislite.

*Required

1. radosno *

2. spor *

3. kopati *

4. san *

5. kiselo *

6. muzika *

7. povodom *

8. crvena *

9. krava *

10. stol *

11. plesati *

12. slatko *

13. knjiga *

14. mjesec *

15. nadomak *

16. doktor *

17. tajno *

18. muškarac *

19. fabrika *

20. kuća *

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